Broadband Assessment GIS Study

Prepared for

Arizona Government Information Technology Agency

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January 2009

Arizona Government Information Technology Agency

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Forward to GITA Broadband Assessment GIS Study

The ubiquitous availability of Broadband has become as essential to quality of life as are the availability of other critical infrastructures of power, water, and transportation. There is no longer any doubt regarding the necessity of broadband capacity as a critical component for a region's economic success or life choices for its citizens. Indeed, our increasing reliance on broadband communication for everything from commerce and public safety to education and healthcare has marked this first decade of the 21st Century as the "Information Age." Knowing the conditions of Broadband capacity or deficits in all parts of our State, especially underserved rural areas, is critical information for decision making and informed policy. Currently we know little for certain, and can only just guess on the rest.

Because of this uncertainty, undertaking a Broadband GIS Survey and Assessment to identify the availability of advanced communications capacities in the State of Arizona has long been a high priority for the Government Information Technology Agency (GITA), on behalf of Arizona's Broadband stakeholders. With this report, such a GIS Survey initiative is advanced to its next phase.

Recent legislation by Congress, along with policy announcements by the incoming Obama Administration adds urgency to the need to have such a GIS Survey in place. It is likely that allocations of Federal dollars to the States for Broadband infrastructure upgrades will be determined in large part through independent and objective statements of Broadband deficits for each State. This Phase 1 Study sets the stage and priorities for an Arizona GIS Broadband Survey.

Background Information

The need for a comprehensive GIS Broadband Survey was consistently identified by the Governor's Council on Innovation and Technology (GCIT) and by its Communication Infrastructure Advisory Committee (CIAC). A policy statement from GCIT was first published to the State in 2005. In 2006, another independent study on Broadband, funded from within the Commerce Department and by GITA, again called for a GIS Broadband Survey as the critical first step of a series of policy initiatives to improve availability of Broadband for all Arizona citizens.

In 2007, a high level parsing of the component steps of a proposed GIS Broadband Survey was identified by GITA, even as various funding opportunities for a Survey were sought. The key element of "Phase 1" of the GIS Survey was an inventory of all broadband GIS data sources owned or held by the State or its political subdivisions, and the access requirements to obtain and utilize such data. To actuate this first phase, a grant was proposed by a member of the State Board of Regents, who was also a member of CIAC.

In early 2008, use of the funds were approved by the State Board of Regents, and made available to GITA to begin the inventorying process. Procurement for a contractor was completed in February and a contract was signed in March of 2008. From April through November, data, processes, and examples were analyzed and compiled. Finalization of the Study began in mid-December 2008. GITA feels the document is now ready for publication and use.

Expertise and Academic Approach Used

Befitting of the source of funding for this Phase 1 document (the Arizona Board of Regents, who helps administer Arizona's University system), an Academic approach is evident as the 287 page document is read.

There are two reasons for this. First, team members of what became known as the GITA Broadband Assessment Study (or GBAS) team are highly skilled and recognized experts of Broadband issues in Arizona and beyond. The team combines some 90 years of experience in successfully dealing with Broadband issues. Three team members have served as Chair of the Arizona Telecommunication and Information Council (ATIC), which is relied upon by State government and by Broadband stakeholders alike as a center for information, education, and influence regarding Broadband issues.

Second, the issues involved in a GIS Broadband Survey are complicated, highly technical, fraught with bias and vested interests, and very important to Arizona's future. An Academic approach matches both the requirements for the technical discussions (including GIS database taxonomies, telecommunication technologies, government bureaucracy issues, and legal and contractual issues), and the "trust" factors of scientific methodologies and bias.

Though an Academic approach complicates the documents readability for the general public and increases comprehension times necessary for public policy leaders, the technical discussion will aid the effective implementation and lead to better decision making as an Arizona GIS Broadband Survey becomes a reality.

Phase 1 Goals and Accomplishments

To identify what has been accomplished, following are the project's activities and goals identified as necessary for a finished Phase 1 deliverable:

- Identifying, qualifying, and profiling relevant available [broadband GIS mapping] data sources including their utility, structure, limitations, constraints, and costs
- Scoping and comparing options for the [Survey] project design, architecture, developmental roadmap, user access and interface, ongoing maintenance, and demand modeling
- Providing a gap analysis of what data can't be derived from available sources and how that data may best be obtained through provider cooperation, end user surveying, remote data gathering or other means
- Identifying and characterizing other selected regional broadband assessment projects and detailing best practices and lessons learned relevant to Arizona's efforts
- Providing recommendations for the responsibilities, collaborative opportunities, developmental process, critical issues, necessary resources, timeline, and costs of implementing an Arizona Broadband Assessment GIS Project

Results and Benefits

Each activity and scope of work goal was robustly accomplished, with the following results and benefits now available to the State as result of this Phase 1 endeavor.

1. We now know in detail what objective GIS mapping data is available from Arizona governmental sources and commercial and open sources, for use in a future Survey. We know the scope of restrictions for this data, and in large measure, who to talk to and how to go about appropriately accessing the data. This will save substantial time and costs as a future Survey is accomplished.

2. We know the scope of several alternative approaches for an Arizona Survey, and example methodologies used, for better or worse, by other states in their respective approaches. We also know the approximate costs, policy impacts, and ongoing benefits for each approach.

3. We have identified definitive measuring tools and key performance indicators to ascertain success of a Survey project. They are easily translated into the necessary procurement documents (RFQ or RFP). The costs normally associated with formulating such procurement processes are thereby greatly reduced.

4. In the process of identifying key components from other States' broadband surveys, the issues of assuring the validity of Data from Telecom sources was a hot topic, leading to much continuing controversy. With information from this Phase 1 study, the major issue of Survey bias can now be abated. The Phase 1 Survey study identifies the process of a blended approach, both as to scope of Survey, and with regards to complementary sources for Data, and the requisite checks and balances for that Data, assuring that a non-biased, objective and comprehensive survey can be done in Arizona.

5. The Phase 1 Survey recommendations include not just methodologies for tracking broadband usage or Demand factors, but also ways of identifying broadband capacities or Supply factors, as well as underlying communication infrastructure. Including such Supply factors will make Arizona's proposed Survey unique among the surveys already done or in progress in other regions of the U.S., and enabling new local area economic development initiatives.

It is felt by GITA that this study will become the basis of an excellent and useful Arizona GIS Broadband Survey, whether that Survey is just a snapshot in time, or becomes a continuous or ongoing collection of broadband information for use by successive policy makers and stakeholders.

And in our opinion, this completed Phase 1 document will become a hallmark study for any Broadband Survey, not just for Arizona, but for all the States contemplating such a Survey. As new Federal policies and guidelines for Broadband are articulated, the Survey process defined herein will enhance those policies, leading to an eventual ubiquitous Broadband availability in Arizona and across the Nation.

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Broadband Assessment GIS Study

Broadband Assessment GIS Study Executive Summary

> A culture of evidence-based decision-making has to be promoted at all levels, to increase the welfare of societies. And in the "information age," welfare depends in part on transparent and accountable public policy making. The availability of statistical indicators of economic, social, and environmental outcomes and their dissemination to citizens can contribute to promoting good governance and the improvement of democratic processes. It can strengthen citizens' capacity to influence the goals of the societies they live in through debate and consensus building, and increase the accountability of public policies.
>
> Source: OECD World Forum on Statistics, Knowledge and Policy - Istanbul Declaration 6/30/07 (http://www.oecd.org/dataoecd/23/54/39558011.pdf)

Arizona's Government Information Technology Agency (GITA) intent for this Broadband Assessment Geographic Information System (GIS) Study is to provide findings and specific recommendations regarding the benefits, value, implementation options, pros and cons, collaborative opportunities, developmental processes, architectural framework, critical issues, necessary resources, timeline, and costs to implement and sustain a proposed Broadband Assessment GIS Project. The report and appendices that follow provide detail and backup to these top-level findings and recommendations.

In brief, the consultant team strongly recommends that GITA and other supportive agencies implement a full Broadband Assessment GIS Project in a deliberate and expeditious manner. Understanding the location and characteristics of major broadband assets and gaps is essential to developing and implementing a flexible and effective broadband strategy. This Study presents the success of similar projects in numerous other states and supports the viability and value of such an undertaking here in Arizona as soon as practical.

The consultant team congratulates the State of Arizona for identifying and investigating Broadband Assessment as a means of informing policy strategies, initiatives and evidence-based decision-making. The consultant team found common ground with regional policy makers that the current knowledge gap in Arizona broadband capabilities and usage are critical issues impeding informed and accountable public policy making.

The consultant team thanks the Government Information Technology Agency (GITA), the Arizona Board of Regents, and other State agencies and organizations for their support and cooperation in the course of this study. Appendices A, B, and C contain a wealth of knowledge and resources from these supporters and participants that will prove quite useful to these Arizona stakeholders and others going forward.

This Study identifies implementation options, sources, processes, and resources to estimate the location and capacity (current supply), as well as utilization (current demand) of broadband. The consultant team cataloged an extensive series of regional case studies that document how other states and regions have implemented such broadband assessment capabilities and utilized them for informed policymaking.

The consultant team also identified a variety of unique broadband-related information sources existing within State agencies. We found the Arizona Government Information Technology Agency (GITA) has particular insight, statutory authority, and relations with other State agencies which hold a variety of specific and unique graphical information systems (GIS) and database assets of use to a proposed Broadband Assessment GIS Project. Thus, GITA is in a unique position to manage the initial stages of any Broadband Assessment GIS Project, though if the project is to play an ongoing role, oversight and management could migrate over time to another State agency or vendor depending on a number of factors.

The consultant team includes three former Chairs of the Arizona Telecommunications and Information Council (ATIC), with all team members currently serving on the ATIC Board. ATIC was created by statute and has long engaged in Arizona telecom policy initiatives. The consultant team, having examined broadband assessment efforts around the nation, strongly believes there are significant statewide benefits and ROI to Arizona in internally undertaking a Broadband Assessment GIS Project and providing ongoing access to its capabilities.

The proposed Broadband Assessment GIS Project, if brought to fruition, will document and model telecommunications infrastructure and capabilities which are of great interest and use to state and local government emergency planners, first responders, and other decision makers to help ensure public safety and continuity of government operations in the event of an emergency or disaster.

The specific Broadband Assessment GIS Phase 1 Study top-level findings follow:

- **Because of the dearth of useful national and regional broadband status and infrastructure data from the Federal Communications Commission (FCC), from commercial sources or elsewhere, numerous other states have mounted their own regional broadband assessment and mapping projects.** They have consistently been able to use the process and results from these assessments to inform and refine policy strategies and initiatives to good effect in their respective states. Government entities and other stakeholders in Arizona also face the same challenge of not clearly knowing where broadband assets and services are deployed, or the specifics of unserved and underserved communities, especially in rural areas. Until such information is available, the ability to perform proper gap analyses and to develop appropriate remediation strategies and programs will remain elusive.
- **GITA and the Arizona Department of Commerce, by statute and assignment, share responsibility for telecom and broadband policy development and initiatives within The Executive Branch of State government.** Their efforts are augmented by the Arizona Telecommunications and Information Council (ATIC) and other stakeholder groups. These parties all concur that the knowledge gap in Arizona telecom and broadband capabilities:
    - Is a critical issue impeding informed and accountable public policy making,
    - Is not likely to be solved for us by external sources in the foreseeable future,
    - And that it is an essential and worthy investment to develop the necessary resources to resolve this impediment and take charge of our own situation, so as to better deliver on broadband's promise to the citizens of Arizona.

- **To date, GITA has been the primary proponent and organizing force behind the proposed Broadband Assessment GIS Project to implement:**
    - The vision to utilize a variety of sources and processes to estimate the location and capacity (current supply) tied to Geographic Information System (GIS) coordinates and various area boundaries
    - To determine the utilization (current demand), capacity, and future demand for broadband services throughout the State of Arizona
    - And promoting a culture of evidence-based decision-making supporting policy initiatives to extend broadband availability in unserved and underserved areas
- **GITA, as the strategic planning and coordination agency for information technology (IT) for the State of Arizona, has particular insight, statutory authority, and relations with other State agencies.** These State agencies hold a rich variety of specific and unique graphical information systems (GIS) and database assets of interest and use to the proposed Broadband Assessment GIS Project. Thus GITA is in a unique position to manage the initial stages of any Broadband Assessment GIS Project whether insourced or outsourced, though if the project is to play an ongoing role, oversight and management could migrate over time to another State agency or outside vendor depending on a number of factors.
- **This Broadband Assessment GIS Study, as Phase 1 of the State of Arizona's Broadband Assessment GIS Project, identifies the implementation options, sources, and processes necessary to estimate the location and capacity (current supply), as well as utilization (current demand) of broadband services throughout the State of Arizona tied to Geographic Information System (GIS) coordinates and various area boundaries.** The results of subsequent phases of the Broadband Assessment GIS Project are intended to inform stakeholders by:
    - Identifying and providing access to detailed geographic information and analysis regarding overall broadband availability
    - Yielding specifics regarding 'middle-mile' broadband deficits in rural Arizona and local distribution gaps
    - Enabling the forecast of future projected demand and supply needs for such broadband services as applications and requirements evolve, to insure our ability to meet growing consumer, business, and government demand
    - Thus leading to specific and effective remediation planning and support the ability to garner grants and attract telecom provider investment.
- **The State has multiple possible approaches to implement a GIS-based Broadband Assessment GIS Project.** The primary project implementation options, along with their associated cost, benefits, shortcomings, collaborative opportunities, ultimate capabilities and projected impact are detailed later in this report and have been identified as:

- Awaiting the possible eventual development of appropriate broadband assessment capabilities from the FCC,
- Contracting for a one-shot broadband assessment to be performed by an external vendor or organization,
- Developing an internal State resource that can provide both initial and ongoing broadband assessments.

- **In short, the consultant team feels there are significant benefits to the State of Arizona undertaking and managing the project internally and strongly recommends the State does so.** Such an approach would require significant dedicated staff or contract resources, software and data licensing costs, and a modest amount of hardware acquisition. However, it would provide ongoing analysis capabilities that would grow and adapt to circumstances and needs, supporting informed decision-making for the present and into the future.
- **GITA's work in developing a Broadband Assessment GIS Project through this Phase 1 Study has uncovered and documented numerous existing GIS capabilities, datasets, and resources across many State agencies, representing a significant investment of resources**. These have been investigated and detailed in the course of this study including many core elements for the desired broadband assessment capabilities which can and should be complemented by:
  - Data from the existing ATIC's Arizona Telecom Directory (ATD) augmented and supported by an ongoing linkage to the State's efforts
  - External licensed commercial data sources and open sources with ongoing updates
  - Information provided by telecom carriers in a cooperative environment with appropriate proprietary and confidentiality management and protection
  - And selective surveying of end users periodically or continuously.
- **Previous projects in other jurisdictions** have relied on a limited domain of information sources for a variety of reasons, however a blended approach utilizing all of the above data sources in a coherent, integrated fashion would derive substantial additional accuracy, relevance, and value, while overcoming the shortcomings of more limited approaches and further optimizing the accuracy and utility of the State's broadband assessment capabilities.
- **Subsequent broadband grant funding opportunities are anticipated from State and Federal programs as well as NGO sources.** These can be coordinated to augment the State's broadband assessment efforts and address 'middle-mile' broadband deficits, through initiatives like the proposed Arizona Broadband Connection or other means. This Broadband Assessment GIS Study helps set the stage to accurately identify unserved and underserved areas of the state, justify and coordinate grant opportunities, measure progress achieved by various policy initiatives and community investment, as well as help insure the ultimate success of such efforts.

- **A Broadband Assessment GIS Project would enable the telecom provider community to more clearly and accurately identify unserved and underserved areas, targeting investment and resources more appropriately and accurately.** GITA's Broadband Assessment GIS Project can be used to assist providers in modeling and forecasting future supply and projected demand for broadband service in anticipation of advanced services and applications, as well as supporting their ability to meet evolving consumer and business demand.
- **GITA's Broadband Assessment GIS Project, if brought to fruition, would document and model telecommunications infrastructure and capabilities which would be of great interest and use to numerous state agencies, local government, and economic development groups in a variety of situations and ways.** Most other State agencies interviewed have also perceived significant benefits to their potential use of the planned Broadband Assessment capabilities as detailed in Appendix A.
- **In any sort of regional or statewide emergency, communications capabilities are critical to first responders, as well as for the operational continuity of a variety of government entities, and certainly to the citizens whose lives are impacted.** The projected capabilities of the Broadband Assessment GIS Project when integrated to AZ3D will enable emergency planners, first responders, and other decision makers to identify and analyze communications pathways and capabilities in real time. This will provide crucial assistance in the event of an emergency or disaster to agencies such as DPS, OHS, DHS, DEM, AZ3D, and others in restoring critical communications capabilities and accelerating special deployments as needed to help ensure public safety and continuity of government operations.
- **The projected Broadband Assessment GIS capabilities would support data extraction and presentation to various end user communities on request or via direct user access as appropriate to the constraints on data sources consistent with privacy, proprietary, or licensing requirements.**
    - The platform and architecture would enable optimal automatic processes for ongoing updates of the various underlying data sources to the greatest extent practical complemented by appropriate manual processes for integrating unique data sources as needed and ongoing database maintenance.
    - Such concrete information and situational awareness should prove useful to regional and local government and NGOs in a variety of ways for planning and building local awareness and involvement in solutions.
- **The consultant team has worked through some significant issues of governance and compliance in the use of such an array of varied data sources each with their own rights and obligations and believes them to be manageable.**
    - The anticipated lack of personally identifiable data limits privacy concerns,
    - Certain data will be proprietary to its contributors and should be protected, and
    - Other data is limited in its application by licensing terms and conditions.
    - However, internal analysis and use will be unfettered and limits on external access to underlying data sources achievable while still delivering useful aggregated data and regional mapping excerpts.

- Thus this study projects various use based scenarios and opportunities, identifies appropriate application restrictions, and recommends critical metrics, governance and oversight responsibilities and structures to insure the project's ultimate utility while constrained by various circumstances, expectations, and obligations.
- Simply determining broadband availability to end users is insufficient to the fuller understanding of communications infrastructure and capabilities that can be achieved by blending a variety of data sources and techniques. Such a geospatial environment will readily accommodate the integration of crowdsourcing, network performance monitoring, and remote sensing data from mobile devices, vehicles, and distributed arrays in the future. The resultant Broadband Assessment GIS data will also prove valuable in various other economic forecasting efforts and policy deliberations.
- As **AZ3D** progresses past the proof of concept phase, securing its permanent base and ongoing budget support, it likely becomes a possible platform to migrate the GITA Broadband Assessment GIS Project datasets and analysis capabilities to. It may also prove practical and beneficial for the State Land Department, with their core GIS competencies and resources, to provide a home to any ongoing solution, integrating the data sources and query capabilities into their GIS platform and responsibilities. These or other similar migration strategies would serve to free GITA from redundant data maintenance and allow it to focus on telecom data and applications that meet their unique business requirements.
- An extensive series of **Broadband Assessment case studies** for other States have documented how other states and regions have implemented such capabilities and utilized them for informed policy making in the past. Their best practices and lessons learned are detailed later in this report and serve to confirm the potential positive impact to Arizona of implementing their own Broadband Assessment capabilities, as well as illuminate the structure, processes, and collaborations that can insure the success and optimum utility and positive impact of such a project here.

Arizona Broadband Initiative Framework Analysis and Report
Statement on Broadband Assessment Informing Policy/Strategy:

The experience of other states shows that cataloging (or mapping) broadband infrastructure accurately can be accomplished effectively if it is undertaken by a lead organization in cooperation with service providers, and if sufficient resources are allocated to sustain the effort over time. ***Knowing the location and characteristics of major broadband gaps is essential to implementing a flexible broadband strategy.*** (For example,) Kentucky is able to produce an inventory of existing broadband infrastructure and service availability at a statewide and census-block level. Some of the items mapped include water towers, wireless towers, proposed sewer lines, roads and population density. The maps also plot which areas are served by municipal, local exchange carrier, cable, and wireless broadband providers. In this way, Kentucky is able to identify and select high-priority deployment areas.

http://www.azcommerce.com/Research/Arizona+Broadband+Initiative+Framework+-+Analysis+and+Report.htm

From **Arizona Broadband Initiative Framework Analysis and Report**, published by the Government Information Technology Agency (GITA) and the Arizona Department of Commerce and authored by Center for Digital Government in April 2007

This concludes the Arizona GITA Broadband Assessment GIS Study's Executive Summary. The consultant team's Recommendations for Arizona action are next, followed by the main report and extensive appendices with backup information and resource guides.

Broadband Assessment GIS Study Recommendations

- **Broadband Assessment GIS Project Phase 1:** The preparation of this report concludes Phase 1 of the State of Arizona's Broadband Assessment GIS Project. Based on the success of such projects in other States and Arizona's need for such a project to inform broadband policy making, the consultant team strongly recommends that GITA proceed to consider the implementation options presented, seek appropriate funding and support, and implement a full Broadband Assessment GIS Project in a deliberate and expeditious manner.

- **Broadband Assessment GIS Project Phase 2:** Assuming an insourced implementation model is chosen, Phase 2 would provide access to detailed geographic information and analysis regarding overall broadband availability, yielding specifics regarding 'middle-mile' broadband deficits in rural Arizona and local distribution gaps. The planned GIS implementation could also be used to forecast future projected demand and supply needs for such broadband services as applications and requirements evolve, to insure our ability to meet growing consumer, business, and government demand. This Phase would demonstrate the value of such capabilities and drive the decisions as to whether the initial implementation met the needs of policy makers and would be best continued and evolved over time to provide current data and analysis as needed.

- **Broadband Assessment GIS Project Phase 3:** If indeed the State desired to retain and evolve these Broadband Assessment capabilities on an ongoing basis, Phase 3 activities would address project evolution and sustainability. Likely by that decision point, federal matching grants under the Broadband Data Improvement Act would help support follow-on activities. As AZ3D progresses past the proof-of-concept phase, securing its permanent base and ongoing budget support, it would become a possible platform to migrate the GITA Broadband Assessment GIS Project datasets and analysis capabilities to. It may also prove practical and beneficial for the State Land Department with their core GIS competencies and resources to provide a home to any ongoing solution, integrating the data sources and query capabilities into their GIS platform and responsibilities.

- **The Arizona Board of Regents (ABOR) should consider formulating additional programs of study and research centers focused on an Interdisciplinary Broadband Program.** Broadband programs in other states help drive economic development associated with broadband applications and here at Arizona's Universities could be oriented towards such related revenue generating and fiscally responsible fields. This report's Case Studies have highlighted the academic works of many other states and academic institutions and the strong contribution they have made to their State's efforts. ASU has recently revealed that under a proposed reorganization plan, they intend to establish a School of Geographical Sciences and Urban Planning in their College of Liberal Arts subject to ABOR approval that could well serve as a focus of the proposed interdisciplinary broadband studies along with other existing or future University centers around the State.

Broadband Assessment GIS Project Implementation Options

Broadband Assessment GIS Project Phases:

Phase 1 - Broadband Assessment GIS Study:

This Broadband Assessment GIS Study, as Phase 1 of the State of Arizona's Broadband Assessment GIS Project, identifies the implementation options, sources, and processes necessary to estimate the location and capacity (current supply), as well as utilization (current demand) of broadband services throughout the State of Arizona tied to Geographic Information System (GIS) coordinates and various area boundaries. GIS and mapping case studies from other U.S. States provide an overview of best practices and lessons learned.

GITA and other State stakeholders must now evaluate these findings and recommendations, decide on committing to an implementation model, determine budget and resource capacity and project priorities, and proceed accordingly. The consultant team will remain available to field any State inquiries regarding this report, participate in strategic discussions as desired, and otherwise assist in evaluating approaches and planning for implementation.

Phase 2 - Broadband Assessment GIS Project Implementation and Use:

Phase 2 is focused on the implementation of the Broadband Assessment GIS Project and its initial use in informing stakeholders by identifying and providing access to detailed geographic information and analysis regarding overall broadband availability, yielding specifics regarding 'middle-mile' broadband deficits in rural Arizona and local distribution gaps. The planned GIS implementation could also be used to forecast future projected demand and supply needs for such broadband services as applications and requirements evolve, to insure our ability to meet growing consumer, business, and government demand.

As discussed at length later in this report, if the State desires to move forward with a Broadband Assessment GIS Project, they can choose either to outsource a one-off study or internally develop an insourced implementation. This Phase would demonstrate the value of such capabilities and drive the decisions as to whether the initial implementation met the needs of policy makers and would be best continued and evolved over time to provide current data and analysis as needed. A discussion of costs and timelines for each approach follows.

Phase 3 - Broadband Assessment GIS Project Evolution & Sustainability:

If the availability of the Broadband Assessment GIS Project proves its worth in the initial operational phase, the State should consider and plan for its ongoing operation, updating, enhancements, and evolution. Assuming an insourced Phase 2 project, GITA could continue to staff and operate the Broadband Assessment GIS Project or enlist another State agency with core GIS competencies and operations to host and maintain it, freeing GITA from redundant data maintenance and allowing it to focus on telecom data and applications that meet their and broadband stakeholders' unique business requirements. The State Land Department (SLD) with their core GIS competencies and resources or AZ3D as it further develops would be possible long-term homes for these broadband assessment GIS capabilities to provide the platform for an ongoing solution, the integration of data sources, and support of query and reporting capabilities as part of their GIS support roles and responsibilities.

Broadband Assessment GIS Project Phase 2 Approaches:

There are several possible **Broadband Assessment GIS Project** approaches to be considered for Phase 2 implementation that have various coverage and depth, benefits, risks, and costs. The primary approaches considered can be categorized in brief as follows:

- **Option 1: Await Federal Broadband Assessment Initiatives:** There is a general consensus as to the absence of useful national and regional broadband status and infrastructure data from the Federal Communications Commission (FCC). However, a Broadband Data Improvement Act (S. 1492) has recently been signed into law and its impact as detailed below may deliver usable broadband deployment data from an end user perspective within the next several years. The NTIA is expected to undertake a national broadband assessment effort as well. One approach thus is to await better FCC, NTIA or other data sourcing and analysis tools to solve the problem for Arizona.
- **Option 2: Outsourcing One-Off Approach**: A number of states have contracted for an outsourced, initial, one off broadband assessment. This approach utilizing a firm practiced in such assessments may yield the quickest results at a fixed contract cost, but is often limited to specific broadband assessment approaches and generally a static snapshot. However, such results can be designed to be imported to an ongoing broadband assessment effort and used to kick start such a process with baseline data to be augmented and updated over time.
- **Option 3: GITA Phase 2 Broadband Assessment GIS Project and Migration Strategy:** GITA could undertake development of proof of concept Broadband Assessment capabilities and developing a longer term support or migration strategy for continuity. As part of this strategy, GITA could enlist another State agency to develop and host an internal continuous Broadband Assessment GIS Project allowing GITA focusing on telecom data and applications. Alternately, GITA could assist in the development of a separate in-house GIS Agency including Broadband Assessment functions, which other states have effectively carried out, such as Massachusetts and Tennessee. Further, the State could consider outsourcing ongoing maintenance and evolution to a private non-profit or for-profit organization under contract. With any of these insourced, ongoing strategies, the State should encourage and support the evolution and growth of ATIC's Arizona Telecom Directory as both a core data source and potential outlet for data distribution and end user engagement.

Geographic Information System (GIS), also known as a geographical information system, is an information system for capturing, storing, analyzing, managing and presenting data which are spatially referenced (linked to location). In the strictest sense, it is any information system capable of integrating, storing, editing, analyzing, sharing, and displaying geographically referenced information. In a more generic sense, GIS applications are tools that allow users to create interactive queries (user created searches), analyze spatial information, edit data, maps, and present the results of all these operations. Geographic information science is the science underlying the geographic concepts, applications and systems, taught in degree and GIS Certificate programs at many universities. Geographic information system technology can be used for scientific investigations, resource management, asset management, environmental impact assessment, urban planning, cartography, criminology, geographic history, marketing, and logistics to name a few.

Source: Wikipedia (http://en.wikipedia.org/wiki/Geographic_information_system)

Possible Phase 2 Approaches Comparison

Approach	Pros	Cons
Option 1: Await better FCC, NTIA or other data sourcing and analysis tools and/or Broadband GIS Mapping capabilities	Lowest cost or no cost; Consistent data across jurisdictions; Significant improvements in broadband tiering and data collection expected; Granting authorities likely to require FCC &/or NTIA data if improvements implemented	Current Form 477 suspect and of little value; Expected improvements based on FCC Order & S.1492 Broadband Data Improvement Act and NTIA role defined in Broadband Stimulus initiatives that may take years to yet be realized; Still would be based on provider data alone rather than blended approach and detailed provider data would likely remain proprietary
Option 2: Contract for an outsourced one off broadband assessment with possible outsourced ongoing updates and evolution	Modest one time cost and results in a short timeframe; Vendors have experience doing broadband assessments in other states; Could be focused on gap analysis to inform specific policy initiatives; Could be designed so that the results could be incorporated to a fuller insourced effort at a later time	Still would require significant funds to execute; RFP would be complex and time consuming; Would likely employ limited data sourcing rather than balanced blended approach; Static view that would become quickly outdated and not track future improvements
Option 3: GITA or another State agency to undertake development of proof of concept Broadband Assessment capabilities and developing a longer term support or migration strategy	Blended approach utilizing a rich variety of data sources in a coherent, integrated fashion would derive additional value while overcoming the shortcomings of more limited approaches and optimizing the accuracy and utility of the broadband assessment capabilities. Eventual project migration from GITA to another State agency would allow GITA to focus on telecom data and applications;	Highest cost option requiring specific staffing or expertise and management resources. Great variety of data sources and formats will require significant efforts to ETL initially and to maintain over time.

Phase 2 Option 1 - Await Improvements in FCC, NTIA, and Other Federal Broadband Data Collection and Assessment Programs:

Federal Communications Commission (FCC) Form 477:

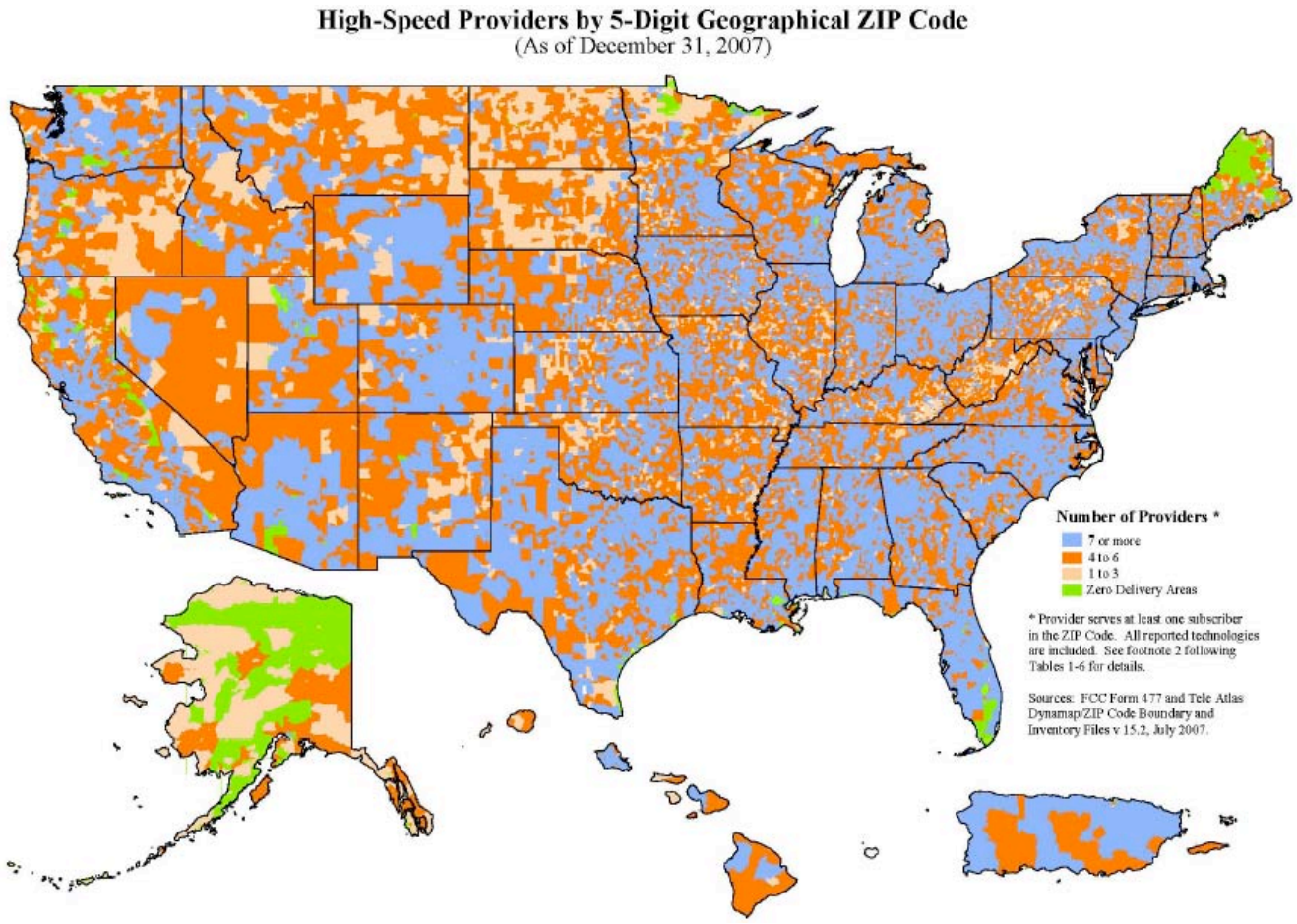
The FCC currently collects snapshots of the extent of broadband deployment and local telephone competition throughout the United States by zip codes, however this data is of little current value due to various shortcomings. The FCC aggregates and analyzes the mandatory biannual filing of Form 477 by broadband providers including the following entities:

- Facilities-based providers of broadband connections to end-user locations. A facilities-based broadband provider may or may not have a retail relationship with the end user of the broadband connection. Some retailers of high-speed Internet-access service are not facilities-based broadband providers for purposes of Form 477.
- Local exchange carriers (LECs) such as Incumbent LECs (ILECs) and competitive LECs (CLECs), including resellers as well as facilities-based carriers.
- Commercial mobile radio service (CMRS) providers that serve mobile telephone service subscribers using spectrum for which the CMRS provider (or its affiliate) holds a license, or using spectrum that it manages for or leases from a spectrum licensee.

A broadband connection is a fixed line of copper or fiber or a wireless channel that terminates at an end-user location and enables the end user to receive information from and/or send information to the Internet at information transfer rates exceeding 200 kilobits per second (kbps) in at least one direction. There are no exceptions to filing based on the number of connections, lines, or subscribers. The information is incorporated into the FCC's reports to Congress on broadband deployment as it affects all Americans, including those who live in rural, sparsely populated areas and assists in identifying regulations that should be modified or are not necessary. Twice each year, the FCC publishes the information collected on Form 477 in an aggregated format to inform the public and policymakers about trends in broadband and local telephone competition while protecting the competitively sensitive information of individual filers. The latest available data is as of 12/31/07 and was released in January 2009, yielding the map view on the following page.

There is a general consensus among policymakers and in industry as to the severe limitations of the current Form 477 data collection and reporting, due to the reliance on a 200K bps broadband threshold, that one such broadband user per zip code is considered sufficient for counting the entire zip code area as served, and because provider specific data is held as privileged and confidential. In Arizona, the current FCC data bears little concurrence or utility compared with anecdotal and other evidence from underserved areas.

- Form 477 Reporting Requirements & Deployment Data - http://www.fcc.gov/broadband/data.html
- Form 499-A Data Search - http://fjallfoss.fcc.gov/cgb/form499/499a.cfm
- FCC Statistical Reports by Bureau - http://www.fcc.gov/statistical-reports/
- Wireline Competition Bureau (WCB) Industry Analysis and Technology Division (IATD) Statistical Reports (formerly FCC-State Link) - http://www.fcc.gov/wcb/iatd/stats.html
    - Local Telephone Competition and Broadband Deployment Reports - http://www.fcc.gov/wcb/iatd/comp.html



Source: U.S. FCC Wireline Competition Bureau (WCB) Industry Analysis and Technology Division (IATD)

FCC Recent Order on Broadband Tiers:

The FCC adopted an Order in March 2008 and expanded it in June 2008 to collect dramatically improved data on broadband services so as to enable policymakers to better identify and analyze the deployment of broadband throughout the nation. The Order requires detailed subscribership information on a local level and detailed information about the download and upload speeds of broadband services offered to consumers.

Specifically, the FCC will collect information in the following tiers of service for both business and residential service:

- 1st Generation Data from 200 kbps to 768 kbps
- Basic Broadband from 768 kbps to 1.5 Mbps
- Broadband from 1.5 Mbps to 3 Mbps
- Broadband from 3 Mbps to 6 Mbps
- Broadband Greater than 6 Mbps

Expanding the number of broadband reporting speed tiers will certainly capture more precise information about upload and download broadband speeds in the marketplace. The Order also requires broadband providers to report numbers of broadband subscribers by Census Tract, broken down by speed tier and technology type and will also improve the accuracy of information gathered about mobile wireless broadband deployment.

U.S. Congress Broadband Data Improvement Act (S. 1492):

Congress recently passed the Broadband Data Improvement Act (S. 1492) introduced by Senator Daniel Inouye (D-Hawaii) and on October 10, 2008 President George W. Bush signed the bill into law. As Senator Inouye commented, "If the United States is to remain a world leader in technology, we need a national broadband network that is second-to-none. The federal government has a responsibility to ensure the continued rollout of broadband access, as well as the successful deployment of the next generation of broadband technology. But as I have said before, we cannot manage what we do not measure. This bill will give us the baseline statistics we need in order to eventually achieve the successful deployment of broadband access and services to all Americans." The Broadband Data Improvement Act specifically:

- Directs the Federal Communications Commission (FCC) to conduct inquiries into the deployment of advanced telecommunications services on an annual, rather than periodic, basis.
- Directs the Census Bureau to include a question in its American Community Survey that assesses levels of residential computer use and dial-up versus broadband Internet subscribership.
- Directs the Government Accountability Office (GAO) to develop broadband metrics that may be used to provide consumers with broadband connection cost and capability information and improve the process of comparing the deployment and penetration of broadband in the United States with other countries.
- Directs the Small Business Administration's Office of Advocacy to conduct a study evaluating the impact of broadband speed and price on small businesses.
- Establishes a program that would provide matching grants to State non-profit, public-private partnerships in support of efforts to more accurately identify barriers to broadband adoption throughout the State.

Further, FCC federal level Broadband Mapping has been proposed to be produced and managed at NTIA, which suggests that the FCC conduct and share the results of improved national GIS broadband data collection showing service providers geographic availability and unavailability. Such proposals are supported by, among others, a group of Kentucky utilities. (See the Case Study on Kentucky in Appendix F and FCC WC Docket No. 07-38, dated 8/1/08.) Many issues may have yet to be resolved by Congressional action before the FCC and NTIA could mount such a project, such as hearings from constituent groups including state governments, non-profit associations, service providers, and private consultants.

These recent actions by the FCC, Congress, and President George W. Bush are indeed laudable and forward looking. They should over time yield better and more useful federal broadband statistics and help fund State broadband assessment projects such as Arizona is considering. The anticipated Stimulus Package from President Barack Obama and Congress will allocate significant funding to furthering rural broadband deployment and likely fund the implementation of S. 1492's mandates, as well as support State assessment initiatives while also creating an NTIA broadband assessment program. However, at this time the FCC's focus on end user broadband metrics remains a limited approach which though potentially useful, only tells part of the story that a blended data approach can realize. Further, provider proprietary and confidential concerns submitted through such programs tend to constrain shared data access and thus limit the usefulness of the collected data to outside parties.

Phase 2 Option 2 - Utilize Outsourced Broadband Assessment:

Another approach would be for the State of Arizona to secure appropriate funding capacity, prepare an RFP, and contract for an Outsourced Broadband Assessment as a one off project. This likely represents the lowest cost and least resource intensive approach, while providing sufficient details for performing a variety of strategic broadband analysis tasks and could be focused on gap analysis to inform specific policy initiatives. Further, the RFP and requested deliverables could be used to jump start the process and designed so that the results could be incorporated into a fuller insourced effort at a later time.

Such an approach would have a more modest one time cost and deliver results in a relatively short timeframe. There are a number of vendors that have experience doing broadband assessments in other states or regions that would be likely to reply. However, it would still require significant funds to execute and developing the RFP would be complex and time consuming. It is also likely that such an approach would employ limited data sourcing focusing on vendor provided data or commercial data sources, rather than the rich range of data sources anticipated in the balanced blended approach proposed below.

Outsourcing a one-off broadband assessment study would consist of preparing and issuing an RFP for an outside contractor to execute a specific assessment strategy and for the selected contractor to deliver the results on time and on budget. Utilizing a firm practiced in such assessments may yield the quickest results at a fixed contract cost, but is often limited to specific broadband assessment approaches and generally a static snapshot. However, such results can be designed to be imported to an ongoing broadband assessment effort and used to kick start such a process with baseline data to be augmented and updated over time.

The estimated cost for this approach comprises a wide range of from $200,000 to as much as $1,000,000. This Phase 1 report describes a variety of approaches that can be individually selected or blended to optimum effect, and thus be chosen in menu-like fashion to design and build the requirements for the Request for Proposal to best meet the State's strategic needs within the available budget capacity. An external consulting team should likely be engaged to work with GITA on an optimum approach and to assist in RFP development, as well as potentially vendor selection and/or in a project liaison or management role.

An approximate project timeframe would be from 8-12 months, including RFP development of 2-3 months, RFP issuance and contractor selection of 2-3 months, and implementation of 4-6 months depending of the approach and vendor selected.

In the course of researching the Broadband Assessment Case Studies (see Appendix F) and interviewing both policy makers and vendors who had been involved in similar efforts elsewhere, two detailed informal bids were received from the vendor community. The vendor names, budgetary estimates, and bid specifics are not disclosed at their request, but their responses are summarized as follows:

Phase 2 Option 2 - Utilize Outsourced Broadband Assessment (Continued):

Informal Mapping Bid #1 Submitted for Arizona Broadband Assessment Consideration:

Background: From previous experience with this type of mapping work, the organization believes getting availability data directly from Broadband Service Providers is the most effective method for mapping broadband. “In order to accomplish this we see the formation of a state broadband authority, state-chartered non-profit, or similar, as outlined in the April 2007 Arizona Broadband Initiative and Framework Analysis and Report.”

The organization has a great deal of previous experience with military, government and international work. Security would be highly guarded for Service Providers information within the firm. “Obtained information will be held confidential and used exclusively by (the organization) to identify availability by ... Speed Range.” Incoming Service Provider information would be coded and remain code-named throughout the processes. Internal company security procedures would be maintained to keep the data secret. Data would be collected directly from Service Providers using the non-disclosure agreement (NDA) method.

The purpose would be to “seek only a current availability picture geographically in the state and not seek any particulars on market development, new market areas, increased infrastructure development, or time-sensitive information which is competitively sensitive. We recognize that much of this data is already publicly available...for customer use in determining availability.”

Mapping Deliverables would include an aggregated map displaying only:

- Wireline Broadband Coverage with city and place names that do not have Broadband coverage
- Wireless Broadband Coverage with city and place names that do not have Broadband coverage
- Final maps containing dashboard style charts to display the relationship of various available speed ranges and their geographic location
- Locations of Access Available/Unavailable
- General Availability Speed
- Neither Individual Technologies nor Service Providers would be specified

Phase 2 Option 2 - Utilize Outsourced Broadband Assessment (Continued):

Informal Mapping Bid #2 Submitted for Arizona Broadband Assessment Consideration:

Background: The organization has previous experience with other similar governmental work. They are suggesting a more state-wide approach to the Broadband endeavor, with Mapping and Research only a preliminary stage. The full scope and depth of their proposal will not be included here since Mapping is the focus of this report. However, briefly, they propose a top level new organization within the state to spearhead and lead the Broadband efforts. Goals/Objectives and a Comprehensive Plan would be constructed by the top level administration to include a state-wide program with all counties/communities involved in supply-demand issues, broadband awareness campaigns, planning technology applications/uses and other issues with Broadband. Multiple stages and programs are planned where various sectors of the economy, e.g., Education, Business, Agriculture, Healthcare, Governments, Community-based Organizations, Libraries, Tourism/Recreation and others, are included in technology/broadband endeavors to stimulate and utilize Broadband for economic development of the State. Mapping Stage Deliverables:

- GIS Mapping: GIS mapping and inventory data at street-level of Broadband Service Providers information will be obtained from non-disclosure agreements (NDAs). Data will include geographic coverage of broadband availability/non-availability, residential and/or business, types of broadband service offered and speeds offered.
- Survey Research: Conduct statistical telephone survey research that seeks to find barriers for adopting broadband, whether interviewees think they have broadband available currently, what costs are for broadband and county-level uses of broadband.
- Qualitative Research: Statewide select interviewing will be conducted for data on Broadband: economic benefits and methods for increasing those benefits within each community, efforts and best practices of various governmental, business or citizen groups using broadband deployment to create a better quality of life for Arizona, and current endeavors in counties, communities that could be used in tandem with future broadband efforts.
- Community-Level Plans: Leverage current county/community organizations for technology planning input and assessment. Include all public, private sectors to "...identify applications and drive adoption across all sectors...", such as Governmental levels/agencies, Education, Healthcare, Business/Industry, Community organizations. Broadband Service Providers encouraged to provide services where currently unavailable, or to underserved populations where demand is located. Distribute computer equipment/applications to disadvantaged populations in Arizona; seek business partners, GAZeL and other organizations to donate equipment and/or funds.

Phase 2 Option 3 - GITA or Other Arizona State Agency to Develop and Host Insourced Broadband Assessment Project:

The DSC-IRC consultant team feels there are significant benefits to the State of Arizona to undertake and manage the project internally, utilizing what has been described as a blended approach, though it would require significant dedicated staff resources, software and data licensing costs, and a modest amount of hardware acquisition. Such a project when insourced would provide ongoing analysis capabilities that would grow and adapt to circumstances and needs, supporting informed decision-making for the present and into the future unlike the static and perishable results from a one off outsourced effort.

An insourced Broadband Assessment GIS Project would have as its primary function the ability to estimate the location and capacity (current supply), as well as utilization (current demand) of broadband services throughout the State of Arizona tied to Geographic Information System (GIS) coordinates and various area boundaries. The derived results and analysis are intended to inform policy makers and various stakeholders by identifying and providing access to detailed geographic information and analysis regarding overall broadband availability, yielding specifics regarding 'middle-mile' broadband deficits in rural Arizona and local distribution gaps. The planned GIS implementation could also be used to forecast future projected demand and supply needs for such broadband services as applications and requirements evolve, to insure our ability to meet growing consumer, business, and government demand.

A variety of unique broadband-related information sources already exist within various State agencies representing a significant investment of resources and have been investigated and detailed in the course of this study. They provide many core elements for the desired broadband assessment capabilities when complemented by data from the existing ATIC's Arizona Telecom Directory (ATD), external licensed commercial data sources, information voluntarily provided by telecom carriers, and selective surveying of end users including crowdsourcing. Previous projects in other jurisdictions have relied on a limited domain of information sources for a variety of reasons, however a blended approach utilizing all of the above in a coherent, integrated fashion would derive additional value while overcoming the shortcomings of more limited approaches and optimizing the accuracy and utility of the State of Arizona's broadband assessment capabilities.

The projected Broadband Assessment GIS capabilities with its blended approach to utilizing the best available data sources and techniques would support data extraction and presentation to various end user communities on request or via direct user access as appropriate to the constraints on data sources. Internal analysis tasks would utilize the entire suite of available data elements, while selective sources as appropriate could be made available through a portal via geographic mashups or other Web 2.0 tools and techniques.

The platform and architecture would enable optimal automatic processes for ongoing updates of the various underlying data sources to the greatest extent practical, complemented by appropriate manual processes for integrating unique data sources and updates as needed to support ongoing database maintenance and evolution. Such concrete information and situational awareness should prove useful to regional and local government and NGOs in a variety of ways for planning and building local awareness and involvement in solutions.

The Arizona Government Information Technology Agency (GITA) has particular insight, statutory authority, and relations with other State agencies which hold a variety of specific and unique graphical information systems (GIS) and database assets of use to a proposed Broadband Assessment GIS Project. Thus, GITA is in a unique position to manage the initial stages of any Broadband Assessment GIS Project, though if the project is to play an ongoing role, oversight and management could migrate over time to another State agency such as AZ3D or the State Land Department or even an external vendor, depending on a number of factors.

Phase 2 Option 3 - Insourced Implementation Budget:

Alternately, GITA could undertake development of the desired Broadband Assessment GIS Project for meeting immediate strategic and policy planning needs and then consider the project's continuity and if appropriate develop a longer term support or migration strategy. Assuming GITA undertakes the blended approach recommended in this Phase 1 study and plans to have staff administer and manage the GIS data integration and survey activities in cooperation with other agencies, a presentation of cost estimates and timelines follows.

Insourced Implementation Budget Summary

Phase 2 Items	Description	Estimated Cost
Project Expenses:		
Computer Hardware	Server and workstations	$20,000.
Computer Software	Operating system and office functionality	$2,000.
ESRI Platform Software	See table below for breakdown	$55,000.
External Broadband Licensed Data Sources	See Relevant Data Sources discussion	$45,000.- $80,000.
ESRI Training & Travel	Depending on staff skill levels and needs	$12,000.
	Subtotal	**$134,000.- $169,000.**
Staff & Contractor Expenses:		
Strategic & Project Management Consulting	Project implementation design, details, coordination, and management	$60,000.- $90,000.
GIS Consulting	GIS system configuration and management, data integration, analysis, mapping, and reporting	$150,000.- $250,000.
Telecom Consulting	Data inventory, field surveying, provider engagement and data acquisition	$60,000.- $90,000.
Survey Consulting	Survey broadband demand and validate broadband supply, work with communities, school districts, and regional stakeholders	$60,000.- $200,000.
Administration		$32,000.- $60,000.
	Subtotal	**$362,000.- $690,000.**
Total Estimate		**$496,000.- $859,000.**

Phase 2 Option 3 - Insourced Implementation Timeline:

A general task breakdown and approximate timeframe for internally implementing the Broadband Assessment GIS Project is presented in the following table. Some acceleration could be achieved by tasking a State agency with existing GIS core competencies and sufficient resources to appropriately focus on this task among their portfolio of operations.

Tasks	Timeframe
Acquisition of hardware, software, and data sources, as well as consultant and staff engagement	2-3 Months
Initial configuration, integration, implementation, data ETL, output definition	3-4 Months
Generation of initial analysis and results	1-2 Months
Refinement of analysis and results plus integration of additional data sources and capabilities	2-4 Months
Total Phase II Timeframe	**8-13 Months**

ESRI Software and Training Cost Estimate Details:

GITA or other State agencies can purchase ESRI software and training per the State contract for their products with the State of Arizona. All these licenses are for concurrent use. A likely complement of ESRI products suitable for the Broadband Assessment GIS Project platform follows. Additionally, ESRI is a supplier of several licensable data sources at additional cost.

ESRI Product	Description	Cost
ArcInfo	Professional GIS license to be used to manage the data and the database and for any advanced geo-processing for up to 3 concurrent users	$9,020.00
ArcEditor	Editing the data and performing analysis. This license can also be used to administer the SQL database and publish to ArcGIS Server	$6,320.00
Business Analyst Extension	Demographic analysis including demographic and street datasets for Arizona	$6933.00
ESRI's Developers Network (EDN)	Includes all of ESRI's server products and ArcEditor for development and testing purposes	$ 3,020.00
ArcGIS Image Server Extension to ArcGIS server	Simplifies managing large imagery datasets	$10,020.00
ArcGIS Server Standard Enterprise	For publishing data over the Internet for internal or external use for unlimited users on a server with up to 4 cores	$20,020.00
Total		**$55,333.00**

Assumptions: The initial licensing cost for an appropriate complement of ESRI software for a small multiuser environment would run approximately $55,000 with perhaps some 15-20% for ongoing licensing and maintenance in subsequent years. Training should also be budgeted for project personnel and at $490/day for each 2-3 day course at an ESRI facility plus travel expenses, is estimated to be from $10,000-20,000 in the first year depending on initial skill levels and specific skill training required.

Phase 2 Option 3 - Insourced Project to Phase 3 Migration, Evolution, and Sustainability

If the availability of the Broadband Assessment GIS Project proves its worth in the initial operational phase, the State should consider and plan for its ongoing operation, updating, enhancements, and evolution. As part of this strategy, GITA could continue to staff and operate the Broadband Assessment GIS Project or enlist another State agency with core GIS competencies and operations to host and maintain it, freeing GITA from redundant data maintenance and allowing it to focus on telecom data and applications that meet their and broadband stakeholders' unique business requirements.

As AZ3D progresses past the proof of concept phase, securing its permanent base and ongoing budget support, it likely becomes a possible platform to migrate the GITA Broadband Assessment GIS Project datasets and analysis capabilities to. Alternately, it may prove practical and beneficial for the State Land Department, with their core GIS competencies and resources, to provide a home to any ongoing solution, integrating the data sources and query capabilities into their GIS platform and responsibilities.

If the Broadband Assessment GIS Project is able to migrate to another State agency for long term support, unique broadband data sources would still be licensed at appropriate annual fees and some personnel or contractors engaged in survey, telecom provider engagement, unique analysis tasks, and so on. However, costs would be minimized by utilizing existing hardware and software licenses, as well as no longer requiring dedicated GIS support personnel. As an alternative, the State could consider outsourcing ongoing maintenance and evolution to a private non-profit or for-profit organization under contract again at some significant savings to independent internal operation.

Broadband Assessment GIS Project Funding Options:

An excellent recent report from the Massachusetts Institute of Technology titled **Broadband Metrics Best Practices: Review and Assessment Report** lays out the ways in which a broadband assessment project can be funded by one or several sources as follows:

> There are a number of models for funding such data collection efforts.
>
> **First, the data collection may be delegated to one or more state government agencies, and paid for via their general budget, funded through the normal process for funding state government.** This is the way public utility commissions are funded and the approach followed in a number of states like California.
>
> **Second, the broadband data collection costs may be funded from a special fund associated with a legislative broadband initiative directed at promoting broadband and economic development within the state.** This is the approach that was followed in Kentucky and North Carolina, which appropriated special funds for their broadband initiatives. Such funding may be raised via a dedicated bond offering or by earmarking general funds.

Third, the broadband data collection effort may be partially funded by voluntary contributions from interested stakeholders, which includes contributions of data. This is the model that a number of public-private initiatives have turned to support their data collection efforts, including ConnectKentucky. Analogously, the Communication Workers of America (CWA) publish summaries of their data as part of their lobbying efforts to drive additional investment in telecommunication facilities (which benefits their membership) and induces individuals to voluntarily contribute their data (which lowers data collection costs relative to a direct survey) by offering an attractive on-line test tool that is both fun and interesting for end users to use. The CWA encourages other websites that are seeking to sell broadband services or otherwise highlight the state of broadband to link to their tool, which expands its reach.

Fourth, the broadband data collection effort may be partially funded by charging fees for differential access. For example, while access may be free to government agencies or other nonprofits, for-profit entities may be required to pay for access. ConnectKentucky relies on the carrot of better access for those who contribute their data (an implicit fee) as well as annual fees from "steering committee" members who pay $20k a year to influence the organizations direction and to benefit from shared publicity. In the future, it is reasonable to expect that quasi-public/private data centers might sell customized consulting services to recover part of their operating and data collection costs.

Fifth, it is conceivable, although we are unaware of any examples of this currently, to fund data collection efforts through general taxes levied on service providers or end-users. The logic for such a funding approach is to tie the costs of administering the market to those who participate in the market. Better public information about how the market operates might be viewed as a public good that benefits all market participants and hence a legitimate cost of market participation.

The various approaches for funding data collection efforts are generally a collection of all of the above and other novel funding mechanisms are likely to be discovered in the future. Better data on funding approaches is difficult to collect because, first, because the details of funding are often viewed as either not interesting (except to the management and those directly concerned with budgets) or sensitive; and second, because data collection is seldom undertaken as an independent task. Rather, data collection and management is part of the larger agenda of a broadband initiative or an agency mandate and its cost is embedded in the funding for the large program.

From **Broadband Metrics Best Practices: Review and Assessment Report** prepared for Massachusetts Technology Collaborative by William Lehr, Tony Smith-Grieco, and Grace Rusi Woo of the Massachusetts Institute of Technology, February 2008

(http://www.mtpc.org/broadband/docs/BroadbandMetricsBestPracticesSurveyFeb2008.pdf)

Broadband Assessment GIS Project
Usage Scenarios, Opportunities, and Metrics

Broadband Assessment Key Project Goals and Anticipated Outcomes

With a general consensus as to the absence of useful national and regional broadband status and infrastructure data from the Federal Communications Commission (FCC), commercial sources or elsewhere, numerous other states have mounted their own regional broadband assessment and mapping projects. They have consistently been able to use the process and results to inform and refine policy strategies and initiatives to good effect. Government and other stakeholders in Arizona also face the challenge of not clearly knowing where broadband assets and services are deployed and the specifics of unserved and underserved communities especially in rural areas across our diverse geography and dispersed citizenry. The necessary information to perform proper gap analyses and develop appropriate remediation strategies and programs thus remains elusive.

This Broadband Assessment GIS Study, as Phase 1 of the State of Arizona's Broadband Assessment GIS Project, identifies the implementation options, sources, and processes necessary to estimate the location and capacity (current supply), as well as utilization (current demand) of broadband services throughout the State of Arizona tied to Geographic Information System (GIS) coordinates and various area boundaries. The results of subsequent phases of the Broadband Assessment GIS Project are intended to inform stakeholders by identifying and providing access to detailed geographic information and analysis regarding overall broadband availability, yielding specifics regarding 'middle-mile' broadband deficits in rural Arizona and local distribution gaps. The planned GIS implementation could also be used to forecast future projected demand and supply needs for such broadband services as applications and requirements evolve, to insure our ability to meet growing consumer, business, and government demand.

The following sub-section focuses on project deliverables and usage scenarios in various contexts. This is complemented with a description of opportunities for community service and commercial ventures. The section concludes with an outline of potential project metrics (or Key Performance Indicators) regarding how to measure project progress and overall success.

Broadband Assessment Deliverables and Usage Scenarios

The analysis and use of the Broadband Assessment GIS Project's wealth of information would be crucial to broadband gap analysis and informed policy making regarding State initiatives and support mechanisms. Such use by other states is documented in the numerous Other States' Broadband Assessment Case Studies included in this report.

Detailed geographic analysis regarding 'middle-mile' broadband deficits in rural Arizona would lead to specific and effective remediation planning and support the ability to garner grants and attract telecom provider investment. Further, the project's capabilities could be used to model and forecast future supply and projected demand for broadband service in anticipation of advanced services and applications, as well as the ability to meet evolving consumer and business demand. The telecom provider community could more clearly and accurately identify unserved and underserved areas, targeting investment and resources more appropriately and accurately. An expansion on these themes follows:

To Assist Government in Directing Public and Private Funds for Services Wanted/Needed by Various Sectors of the Population

For example, from Executive Director Jane Patterson's 2007 presentation (http://www.calink.ca.gov/summit/ppt.asp), the e-NC Authority in North Carolina was created as a directive from the Legislature. As such it was:

- Established as the primary Internet-planning body for the state
- Mandated to track broadband connectivity levels, by county, across North Carolina
- To advocate and serve as a catalyst for infrastructure build-out in underserved areas

The Arizona Telemedicine Program associated with the University of Arizona is among the many organizations that are associated with Telemedicine programs for rural areas distant from medical services, and it serves a coordinating and facilitating role. For example, see the diagram of many public and private organizations associated with their network: http://www.telemedicine.arizona.edu/network.cfm

> Regardless of the field of medicine, telemedicine can prevent or decrease high travel costs, uncomfortable delays and family separation by bringing high-quality, specialized care to those who need it - regardless of where they reside. Instituting telemedicine into a health provider's practice is fairly simple. The only equipment that is required is a standard PC with a high-speed Internet connection and a web camera.
>
> (http://www.wiredred.com/video-conferencing/video-telemedicine.html)

GAZeL, the Greater Arizona eLearning Association (http://gazel.org/about_gazel) advocates for eLearning, which requires broadband connectivity, and computer equipment for schools in rural communities lacking adequate financial resources. GAZeL is an active association of public school representatives and private entrepreneurs striving to benefit public education. A recent AZ Republic article "Lagging Web Access Puts Arizona Kids Behind" from 8/24/08 by Pat Kossan, examined the plight of AZ schools without adequate Broadband access. GAZeL supports and benefits disadvantaged children with One Laptop Per Child (OLPC) Program (http://laptop.org/), providing <$200 laptops to children in AZ and elsewhere.

Other programs such as No Child Left Offline, used in Kentucky, have benefited more than 200,000 disadvantaged children with computers, printers donated by firms such as Microsoft for Office applications, Lexmark printers, and local organizations. (See ConnectKentucky Case Study for more explanation.)

To Assist Indian Tribes in Arizona

Arizona has among its 24 Native American Tribes several tribal-owned telecom companies, many of which are members of the National Tribal Telecommunications Association (NTTA - http://www.nationaltribaltelecom.org/) including Fort Mojave Telecommunications, Gila River Telecommunications, Hopi Telecommunications, Saddleback Communications (Salt River Pima-Maricopa Indian Community), San Carlos Apache Telecommunications Utility (SCATUI), and the Tohono O'odham Utility Authority.

At the recent Senate Commerce Committee hearing calling for a National Broadband Policy, "Why Broadband Matters", September 16, 2008, Rey Ramsey, CEO of OneEconomy Corp. discussed their work for Oregon Indian Tribes:
(http://commerce.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=9e474249-4555-4df9-bee2-975ea1752d97)

> Government can play a role in stimulating demand, as the tribal government in Warm Springs is doing. Creating public-purpose online media—media that puts vital information and tools directly in the hands of citizens—can demonstrate the value proposition of bringing broadband into their lives and homes. For low-income people, who are often caught in a web of government programs and services, simple and direct online access to those programs can mean the difference between missing a day of work to stand in line at a municipal building and getting help in the comfort of one's home.
>
> In the coming months, we will work with reservation leaders to make broadband a relevant and affordable tool. In addition to lowering the cost of home access and creating public access points, we will use broadband and the applications it makes possible to expand tribal member participation in government, support small business development, preserve native culture, and improve members' digital skills. Young people will be trained in technical and leadership skills so they can become cultural bridges between their community and technology.
>
> http://commerce.senate.gov/public/_files/RamseyTestimony.pdf

Gene Peltola, President of Yukon Kukokim Health Corp. (YHK), a consortium of 58 federally recognized Native American Tribes near Bethel, Alaska gave testimony at the same Hearing. YHK provides healthcare to 28,000 Yup'ik Eskimo people in 50 communities in the Y-K Delta, a roadless region the size of Oregon. Average per capita income of patients is $15,000/yr. They constructed a Broadband Network with assistance from Universal Service Fund Rural Health Care Program and other Federal grants. Private industry put in $50M plus investment for a terrestrial microwave network, DeltaNet, which links the majority of YHK villages. The network is a low latency, high-bandwidth network ideal for medical applications. They are now using 3 Mbps for all clinics, 5 Mbps for sub-regional clinics and 7.5 Mbps link Internet to Anchorage, Alaska. Key benefits of this higher-speed network are found in the areas of tele-psychiatry and tele-radiology for returning Iraqi War Veterans, where high rates of suicide among other medical issues require behavioral diagnostics/treatment.
http://commerce.senate.gov/public/_files/GenePeltolaFullCommerceCommitteeTestimony91608FINAL.pdf

To Assist in Providing Conformance to the Arizona Constitutional Gift Clause

The Arizona Constitutional Gift Clause restricts Arizona public dollars from being given directly to private parties. For example, ownership of public assets can only be transferred to the private sector in a quid-pro-quo process, at times requiring a public bid to assess fair market value. In other circumstances, public money provided to the private sector must be shown to serve a public purpose, as is the case with broadband infrastructure enhancing the public's access to eGovernment, eHealth, eLearning, and so on. A recent opinion by the Arizona Attorney General allowed State grants to private projects because the estimated value of the taxes collected from "economic development" from a particular project exceeded the value of the public monies given to the project. A case by case review is often required for such transactions. See http://www.azag.gov/opinions/2006/I06-003.pdf for more information on the Gift Clause and its interpretations.

To Perform Studies on Adoption of Technological Services

Broadband at different speeds is required by various entities such as Schools, Governmental Offices and e-Government services/websites. This also applies to private enterprise networks using governmental agencies as Anchor Tenants, the large customers who generate the bulk of the recurring revenue for the network operators. (http://www.allconet.org/ and see Maryland Broadband Cooperative Case Study for more details.)

To Find and Provide Applications Needed by Various Sectors of Government Which Can Be Supplied by Private Enterprise

For example, video monitoring and surveillance was used by the Phoenix Police Department in solving such cases as the recent "Baseline Killer" (Phoenix Detective Jensen, W2i Conference, 12/07). Such services information can be located, recorded and provided to other Law Enforcement agencies with GITA's GIS Mapping and Studies.

Another example of inexpensive video conferencing for rural areas includes: "e/pop is an "IP-based" solution that allows anyone with an Internet connection and a Windows PC to join a conference. Video conferencing is provided by off-the-shelf webcams and video devices. It has a full-suite of security features and IT controls, allowing complete flexibility in multi-office, VPN, public/private and wide area networks. e/pop also uses standard URLs, a web-browser and Microsoft Office-style layout." (See link for e-pop datasheet - http://www.wiredred.com/downloads/epop_conferencing_datasheet.pdf)

To Assist Other Government Agencies Perform Their Vital Functions

For instance, AZ3D may need Emergency Communications for Threat Levels in the Red Zone among Police and Fire Officials at State, Local and Federal levels. GITA would have those Agencies designated geographically along with detailed information regarding Communication Facilities such as Video Conferencing/Web Cam capabilities, Patrol Dispatching Contacts, Information Databases available to Patrol Cars/Police Stations to apprehend Terrorist Suspects en route, and so on. (See Virtual Alabama Case Study for more information - http://www.dhs.alabama.gov/virtual_alabama/pdf_files/VirAL_Fact_Sheet.pdf)

Services and activities benefiting from Virtual Alabama's GIS Mapping project include the following, which GITA could provide:

- Common Operational Picture (COP)
- Emergency evacuation routing
- Situational awareness/understanding
- Vehicle and asset tracking
- Critical infrastructure mapping
- Student density
- Identification of assets and vulnerabilities
- Visualization of risks
- Plume modeling and real time sensors feeds
- Implementation of protective measures during events
- Damage assessment

Emergency Medical Services (EMS) coordinated at various Medical Facilities such as hospitals in Rural and Urban areas are currently being used by the City of Tucson and can be expanded to the rest of the State. (Tucson City Engineer, W2i Conference, 12/07)

> Telepsychiatry's true calling may be the link it can provide between urban areas with a high concentration of psychiatrists and rural areas that are in need of specialists who can provide consultations to both other clinicians and directly to patients. Access is the real issue here. Geriatric patients, children, prisoners, military veterans and other groups that have either monetary or geographic barriers to psychiatric treatment could all benefit from adoption of telepsychiatry programs.

Large healthcare systems, such as state prisons, can also take advantage of the remote access provided by telepsychiatry. Many state prisons are located in small towns in very rural areas and as a result, have a difficult time recruiting psychiatrists. Utilizing video conferencing systems from the prison, the inmate population would have direct access to qualified specialists no matter where they are located.

http://www.wiredred.com/video-conferencing/video-telemedicine.html

To Help Direct Investment from Private Sector Service Providers

For example, let Service Providers know where and which Broadband technologies (DSL, Cable) are missing and what applications/services (> 1 Mbps for business, residential customers desire TV/Internet/Phone bundle) are desired from various sectors of the potential residential and business customers.

Availability Mapping

Availability Mapping points out where Broadband Services of various technologies (e.g., cable, DSL) and speeds (e.g., less than 1 Mbps, greater than 1.5 Mbps, and so on) are and are not located geographically in Arizona. Service Providers can determine in which geographic areas they will offer services to customers lacking and desiring services. GITA could provide the data and GIS mapping.

Adoption Studies

Adoption Studies provide information on which demographic and geographic locations have adopted which Broadband Technologies/Speeds. Improvement over time is assumed and expected.

Emergency Response and First Responder Support

The proposed Broadband Assessment GIS Project, if brought to fruition, should document and model telecommunications infrastructure and capabilities which are of great interest and use to state and local government emergency planners, first responders, and other decision makers to help ensure public safety and continuity of government operations in the event of an emergency or disaster.

Broadband Assessment Community Service and Commercial Opportunities

The State of Arizona should serve as an information broker between industry and communities, helping to identify and evaluate broadband expansion opportunities. Telecommunications providers should be invited to submit proposals describing ideas for extending broadband capability to unserved or underserved areas if all state, county and local public assets (from facilities to land, towers, poles, buildings, etc) were made available. In addition, providers should indicate what type of structured agreement they will use: in exchange for access to those assets (they could lease, barter, or come up with another agreement). Such proposals may identify creative, competitively neutral solutions for extending broadband connectivity across multiple jurisdictions that are currently cost prohibitive due to a lack of political coordination or affordable access through traditional rights-of-way processes.

From **Arizona Broadband Initiative Framework Analysis and Report** published by the Arizona Government Information Technology Agency (GITA) and the Arizona Department of Commerce and authored by Center for Digital Government in April 2007

http://www.azcommerce.com/Research/Arizona+Broadband+Initiative+Framework+-+Analysis+and+Report.htm

The Proposed Arizona Blended Approach Combines Major Stakeholders in Arizona Socio-Cultural World Including the Following:

- **Arizona State/GITA Functions as E-Champion**, with GITA and other associated agencies who would coordinate the Stakeholders and Processes, e.g., ADOC / Economic Development and including others:
  - Federal Partners: FCC for data, policies, and so on
  - State Agencies: ADOT, ADE, State Land Department, and so on
  - Crowdsourcing: Arizona residents enter their Internet Speed/location on a custom Website for User Data for Mapping input as a Data Source
- **Counties and Communities**: With close contact to the residents, these Major Stakeholders:
  - Provide much of the Survey Data from and for Residents
  - Determine RFP Requirements for Service Providers
  - Develop technical skills with the TeleCenters and Determine their Strategic Plans for Local Communities
- **Reservations and Indian Communities:** With close contact to the residents, these Major Stakeholders:
  - Provide much of the Survey Data from and for Residents
  - Determine RFP Requirements for Service Providers
  - Develop technical skills with the TeleCenters and Determine their Strategic Plans for skills improvement with Local Communities

- **Service Providers:** Their role is critical with multiple services they perform:
    - Suppliers of Broadband Services/Equipment, Suppliers of their Data on Deployed Equipment/Location with Customer Addresses/Technology-Speeds as Data input
    - Respond to Market Data from Mapping, telling them which locations are under-and-unserved
    - Respond to RFPs from Counties/Communities and Reservations/Communities
    - Data from their continuing deployment is continually fed back as Input Data into the GIS Database

Major Mapping Processes

- Data Sources - Blended Approach:
    - Service Providers Data: obtained Directly (NDAs, "Rules", Other sources) or Indirectly (3rd Party Data from other vendors to whom Service Providers supply their data)
    - Residents/Business Survey Data: Surveys conducted by semi-professionals affiliated with State Expertise Services provided
    - Crowdsourcing: obtained from Residents/ Business voluntarily entering their Internet information on a customized website officiated by the GITA E-Champion - speed, location, price per month, etc.
    - School Districts: Provide valuable student, educational data
- GIS Database and Mapping: Data Sources feed into Databases for GIS continually
- Tracking Progress on Demand: Data from Surveys of Residents/Business
- Tracking Progress on Supply: Data from Deployment of Service Providers

State Facilitates Funding for Programs:

- Expertise for TeleCenters: Teaching technology to residents/business, performing surveys, constructing Strategic Plans for Counties, Communities, helping create RFPs with Counties, Reservations, and Other Economic Development Organizations
- Tracking Progress on Deployment and Demand
- GIS Mapping and Data Sources for Availability/Adoption Maps

Broadband Assessment Key Performance Indicators (KPI) and Metrics

If the Broadband Assessment GIS Project is pursued, the method chosen, data sources employed, target deliverables, and end user community will influence the selection, definition, and measurement criteria for various Key Performance Indicators (KPI). To as great an extent as practical, KPIs should focus on tangible, measurable results and gauge the project's real world impact on policy making and the success of various related initiatives, augmented by surveying of end user perspectives and other less tangible factors. An outline of KPI for consideration, development, and implementation follows:

Key Performance Indicators (KPI) Summary

Key Performance Indicator	Description & Notes
Government Relevance	To be defined within the policy context by real value and impact measured in fact or as perceived by various State and regional government agencies, communities, and end users
Business Relevance	To be defined within the business context primarily for telecom providers who participate in the program by real value and impact measured in fact or as perceived by end users
Stakeholder Engagement	Complementing the Government Relevance and Stakeholder Engagement KPIs, gauge the quality of interaction and level of engagement with all the various stakeholder groups and participants on an ongoing basis
Data Accuracy and Improvement Processes	The use of a blended approach will allow the cross check of various data elements and comparison of source data quality, however all anticipated data sources have limitations and shortcomings that a set of quality metrics and process improvement measurements can and should address
Reportability	The measurement of whether the project, it's standard deliverables, and ad hoc use deliver the right level of information to the end user as needed
Governance and Compliance	The project would utilize an array of varied data sources each with their own rights and obligations defined by agency policies, license terms and conditions, contributors' proprietary concerns, and privacy concerns which should be codified in project policy, tracked in real time, remediated when necessary, and reported on periodically
Performance to Budget and Schedule	Though grant and commercialization opportunities will affect long term opportunities and direction, the initial budget and schedule will be defined and should be readily measurable by standard agency accounting and management practices

See also: W2i Framework for Digital Inclusion Metrics from April 2007 online (free registration required) at http://w2i.com/zones/digital_inclusion.

> **Key Performance Indicators (KPI)** are financial and non-financial metrics used to help an organization define and measure progress toward organizational goals. KPIs are frequently used to "value" difficult to measure activities such as the benefits of leadership development, engagement, service, and satisfaction. KPIs are typically tied to an organization's strategy (as exemplified through techniques such as the Balanced Scorecard). The KPIs differ depending on the nature of the organization and the organization's strategy. They help an organization to measure progress towards their organizational goals, especially toward difficult to quantify knowledge-based processes.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Key_performance_indicator)

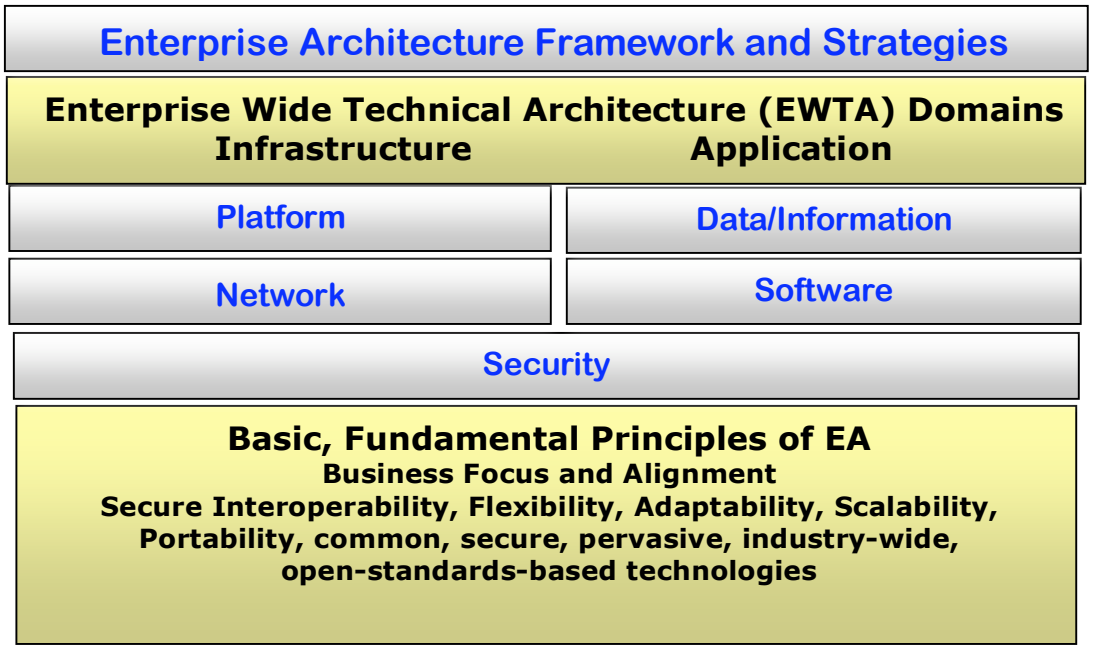
Broadband Assessment GIS Project
Enterprise Architecture Integration

The State of Arizona's Enterprise Architecture (EA):

The State of Arizona already has a mature Enterprise Architecture (EA), serving as a comprehensive framework for the information technology (IT) that supports Arizona State government's strategic plan and operations. Their EA experience and its strategic integration place them in good stead for implementing the recommended Broadband Assessment GIS capabilities.

EA facilitates the application of IT to business initiatives and objectives and aids subsequent change in an orderly, efficient manner by describing a direction for current and future activities, supported by underlying principles, standards, and best practices. Further, EA effectively supports and enhances the business of government and improves the ability to deliver responsive, cost-effective government functions and services. Major motivating factors for the development and implementation of EA include effective utilization of technology to achieve business functions and services, increasing citizen access to those services, sharing information and resources at all levels of government, and maximizing investment in IT resources.

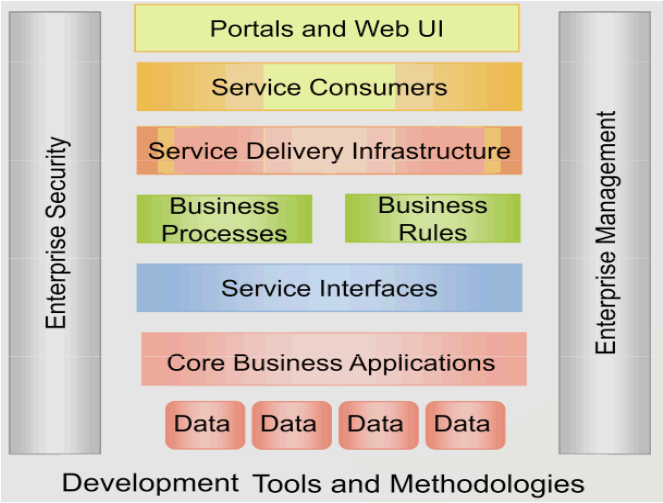
Statewide IT Policies, Standards, and Procedures (PSPs) are the means of applying EA to technology direction and decisions for the State. Adopting Statewide IT PSPs for EA capitalizes on an existing process that is already well defined to enable the orderly innovation, adoption, and implementation of technology throughout the State. The Statewide IT PSPs provide flexibility while at the same time ensuring compatibility across the enterprise. Resulting use of underlying technologies and products adhering to these PSPs enhances government services, promotes e-government solutions, improves productivity and performance, reduces total cost of ownership and optimizes economies of scale through interoperability, portability, scalability, and the sharing of resources. For more details, see the GITA site at http://www.azgita.gov/enterprise_architecture/ and associated documents.



The State of Arizona's approximately 110 State Agencies, Boards and commissions have specific needs, and their IT resources are deployed in a decentralized structure implementing the State's Enterprise Architecture (EA) and lifecycle protocols. Because of the variations of IT applications and infrastructure throughout state government, the state is currently requesting information on SOA software for possible integration and reuse of state services.

> In computing, **Service-Oriented Architecture (SOA)** provides methods for systems development and integration where systems group functionality around business processes and package these as interoperable services. SOA also describes IT infrastructure which allows different applications to exchange data with one another as they participate in business processes. Service-orientation aims at a loose coupling of services with operating systems, programming languages and other technologies which underlie applications. SOA separates functions into distinct units, or services, which developers make accessible over a network in order that users can combine and reuse them in the production of business applications. These services communicate with each other by passing data from one service to another, or by coordinating an activity between two or more services.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Service-Oriented_Architecture)

State of Arizona Service Oriented Architecture (SOA) Vision



Broadband Assessment Architecture, Platform, and Tools:

The recommended information architecture for this endeavor is consistent with Arizona's SOA Vision and is a variant of data warehousing architecture coalescing around the concept of a data mart as a repository of all critical GIS, demographic, and analytic data to accomplish the desired broadband assessment analysis.

> A **data mart** is a subset of an organizational data store, usually oriented to a specific purpose or major data subject, that may be distributed to support business needs. Data marts are analytical data stores designed to focus on specific business functions for a specific community within an organization. Data marts are often derived from subsets of data in a data warehouse, though in the bottom-up data warehouse design methodology the data warehouse is created from the union of organizational data marts.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Data_mart)

Since Arizona's SOA is not yet in existence, we need to focus on a step-wise process called Extract, Transform and Load (ETL). This is a process that is often used in data warehousing applications to prepare and integrate various data sources to the data warehouse or data mart. The data will be extracted or imported from a number of disparate sources, as indicated in the Broadband Assessment GIS Project Architecture diagram visualizing the data sources, management tools, and information flow. Two of these disparate data sources, from the Arizona Department of Revenue (ADoR) and the Arizona Department of Education (ADE), are discussed below as ETL examples. Other data sources are described in more detail elsewhere in this document. Within a GIS architectural platform, the stored data will take on the form of layers or associated support information in a seamless and utilitarian manner.

> **Extract, Transform, and Load (ETL)** is a process in data warehousing that involves: extracting data from outside sources, transforming it to fit business needs (which can include quality levels), and ultimately loading it into the end target, e.g. the data warehouse. ETL is important, as it is the way data actually gets loaded into the warehouse, (however) the term ETL can in fact refer to a process that loads any database. ETL can also be used for the integration with legacy systems. Usually ETL implementations store an audit trail on positive and negative process runs. In almost all designs, this audit trail is not at the level of granularity which would allow one to reproduce the ETL's result if the raw data were not available.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Etl)

GIS data would be derived from a rich variety of available sources including internal State of Arizona agency sources, relevant licensed databases, data obtained through provider cooperation and contributed data, end user surveying, field data gathering, or other means.

> **Spatial Extract, Transform, and Load (ETL)** tools provide the data processing functionality of traditional Extract, Transform, and Load (ETL) software, but with a primary focus on the ability to manage spatial data (which may also be called geographic, map or location data). Spatial data, more than any other, suffers from the problems of data held in different formats (whether proprietary or open) and adhering to different standards. Therefore a key requirement for a Spatial ETL system is that it be capable of handling as many data formats as possible, in a consistent manner. The conversion of spatial data between the source (extract) and destination (load) formats is often referred to as spatial data translation.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Spatial_ETL)

Existing data marts and warehouses are another potential source of input, which have been suggested by the Arizona Department of Education (ADE) and others. User feedback and suggestions would involve multiple reviews of the data gathered and refinements of it. Such suggestions may also feed into the taxonomy and data dictionary definitions of the data.

Data may also be supplied via online submittals. This would normally be the case for systems that are already automated and able to process electronic data input, such as network monitoring systems and remote sensor network data. Another important source of data is the Arizona Telecommunications and Information Council's (ATIC) Arizona Telecom Directory (ATD). Various other external data files may be used to provide input to the system. These would include GIS files, data warehouses, data from proprietary file formats, scanned mapping data, data centers, and numerous other sources.

Interviews and surveys would be periodically undertaken as interactions with providers and users both potential and actual, augmented by "feet on the ground" for field surveying as necessary and appropriate. The State's Broadband Assessment efforts should build from the experience and knowledge of Northern Arizona University (NAU) in community telecommunications and broadband surveying, utilizing their expertise to suggest potential survey approaches, sample questions and criteria, and plans for subsequent development and execution, such as crowdsourcing. The data gathered may be recorded in paper and electronic documents, Excel spreadsheets, voice recordings or other survey instruments. Crowdsourcing has been employed in several broadband assessment initiatives, notably by the Communication Workers of America (CWA) SpeedMatters.org and eCorridors' projects in Virginia and elsewhere as detailed in Appendix D.

> **Crowdsourcing** is a neologism for the act of taking a task traditionally performed by an employee or contractor, and outsourcing it to an undefined, generally large group of people, in the form of an open call. For example, the public may be invited to develop a new technology, carry out a design task, refine an algorithm or help capture, systematize or analyze large amounts of data (see also citizen science).
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Crowd_sourcing)

Once the data has been extracted it needs to be transformed into useful information that will be meaningful to users. This transformation is accomplished through the incorporation of classifications and conceptual representations for broadband communications based on a taxonomy and ontology.

> **Taxonomy** is the practice and science of classification. Taxonomies, or taxonomic schemes, are composed of taxonomic units, or kinds of things that are arranged frequently in a hierarchical structure. Typically they are related by subtype-supertype relationships, also called parent-child relationships. In such a subtype-supertype relationship the subtype kind of thing has by definition the same constraints as the supertype kind of thing plus one or more additional constraints.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Taxonomy)
>
> An **ontology** is a formal representation of a set of concepts within a domain and the relationships between those concepts. It is used to reason about the properties of that domain, and may be used to define the domain. Ontologies are used in artificial intelligence, the Semantic Web, software engineering, biomedical informatics, library science, and information architecture as a form of knowledge representation about the world or some part of it.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Ontology_(information_science))

This transformation can be assisted through the use of administrative and authoring tools to define the taxonomy and ontology. Another facet of this transformation is the manual review and refinement of the data definitions and the application of meta tags that reflect the taxonomy and ontology. The information repository, or warehouse, is a relational database, probably open source, such as MySQL. General queries can be applied against the repository and ultimately these queries can feed the creation of GIS shape files and databases. The queries may also feed another transformation and presentation processes using web applications referred to as mashups to serve specific audiences and needs.

In technology, a **mashup** is a web application that combines data from more than one source into a single integrated tool; an example is the use of cartographic data from **Google Maps** to add location information to real-estate data, thereby creating a new and distinct web service that was not originally provided by either source.

Source: Wikipedia (http://en.wikipedia.org/wiki/Mashup_(web_application_hybrid))

Broadband GIS Extract, Transform, and Load (ETL) Examples:

As noted previously the input sources can be extremely diverse, ranging from transcriptions of oral interviews to external electronic files and databases. As an example of the ETL transformation process as it relates to taxonomies, data dictionaries, and ontologies, consider the following scenario.

Information from the Arizona Department of Revenue (ADoR) is relevant to us because it provides a breakdown of the "assessed value" and "full cash value" for "telecommunications equipment" for a given "taxing authority" such as a "school district" within a "county name." This information is available either in printed form or in electronic text format. In either case human intervention is required to create an appropriate taxonomy, which in this example would include the terms "assessed value," "full cash value," "telecommunications equipment," "taxing authority," "county name" and "school district."

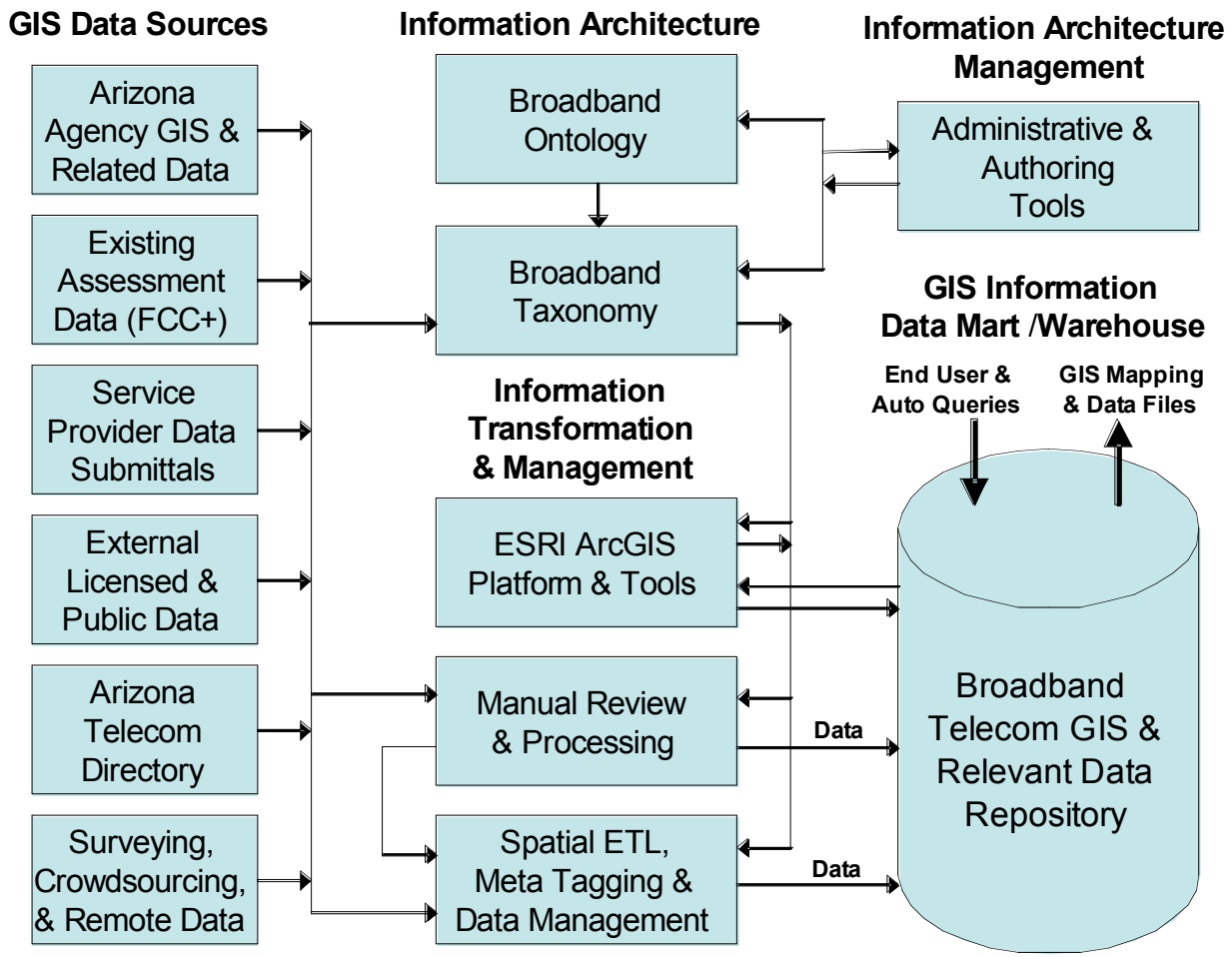
A separate taxonomy needs to be created for the data that is available from the Arizona Department of Education (ADE). The data from the ADE is in spreadsheet form and is derived from an ADE Data Mart that has been aggregated to eliminate the possibility of identifying individuals. It contains taxonomic fields such as "county name," "school district," "school address" and "number of students." Care needs to be taken to ensure that fields appearing in multiple data sources (e.g., county name) are spelled identically or are defined in some way to be identical entities. This is basic data dictionary functionality. This is also where ontologies can play an important role.

Ontologies are usually expressed in a logic-based language, to provide precise detail, accuracy and consistency among data definitions and descriptions. They are especially useful for applications that deal with information from diverse sources and different media. Content specific ontologies deal with data that is not unique to a given type of input source, such as "county name" and "school district." A more elaborate ontology might include definitions for "upscale school district" and "low income school district." Media specific ontologies focus on characteristics of the media containing the data, such as "date of creation" and "number of pages" for printed documents, as an example.

The above transformation and analysis enables us to submit queries against the Broadband Telecom Repository information warehouse that span multiple sources. For example, we can discover how much public money in the form of taxes is being spent on telecommunications infrastructure and support per child in each Arizona school district. In order to represent the results of such a query on a map, we can execute a map generation or mashup display with a GIS database system such as ArcGIS, using the address of the school district.

A more direct example of how to deal with input data is illustrated with the Arizona Geographic Information Council (AGIC) Geospatial Data. Since this information is already in GIS shape file format, the ETL process requires no transformation and the relevant files can be readily downloaded and incorporated as needed.

Broadband Assessment GIS Project Architecture



The above illustration is the primary project architectural representation and thus of significant importance and use in understanding the proposed insourced project approach.

Broadband Assessment GIS Data Collection, Governance, and Lifecycle Maintenance:

The data is collected from a wide range of sources in various formats that may include paper or online surveys, Excel spreadsheets, flat files, databases, GIS maps and shape files, data warehouses, data marts and other sources (e.g., crowdsourcing). The data is subject to a variety of constraints that may vary with each department, organization, or even end-user application. Specifically, the use of various data sources may be limited or regulated by one or more of the following set of constraints:

- Privacy provisions that require the data to have been adequately aggregated to prevent identification of any individual. This is likely to have minimal impact on this project, though special considerations should be given to school and student testing data, health and human services data, and incident reports where individuals may be named or identified. End-user submitted data from surveying and crowdsourcing may require special privacy consideration and handling.
- Confidential data such as salaries, taxes on individuals or businesses, and data declared confidential for general use, but provided under limited use terms.

- Proprietary broadband and infrastructure data especially from telecom providers that may have competitive impact and have to be aggregated or used with some level of anonymity in cooperation with the data sources and likely defined in NDAs or other agreements.
- Sensitive data such as infrastructure details that may be determined to increase exposure to malicious attacks and thus need to be provided with limited accuracy or to select audiences only.
- Data ownership constraints that limit the use of data according to existing interagency agreements such as Federal data utilized by ADOT under specific conditions affecting additional use.
- Licensing terms for commercial licensed sources that may constrain the use of data to a single desktop or server versus unlimited use across the licensing enterprise or made directly accessible to external parties.

The processes involved are similar to those used in Master Data Management.

> **Master data management (MDM)** comprises a set of processes and tools which consistently define and manage the non-transactional data entities of an organization (also called reference data). MDM has the objective of providing processes for collecting, aggregating, matching, consolidating, quality assuring, persisting, and distributing such data throughout an organization in such a way as to ensure consistency and control in the ongoing maintenance and application use of this information.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Master_Data_Management)

An essential part of master data management involves data governance.

> **Data governance** is a quality control discipline for assessing, managing, using, improving, monitoring, maintaining, and protecting organizational information. It is a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Data_governance)

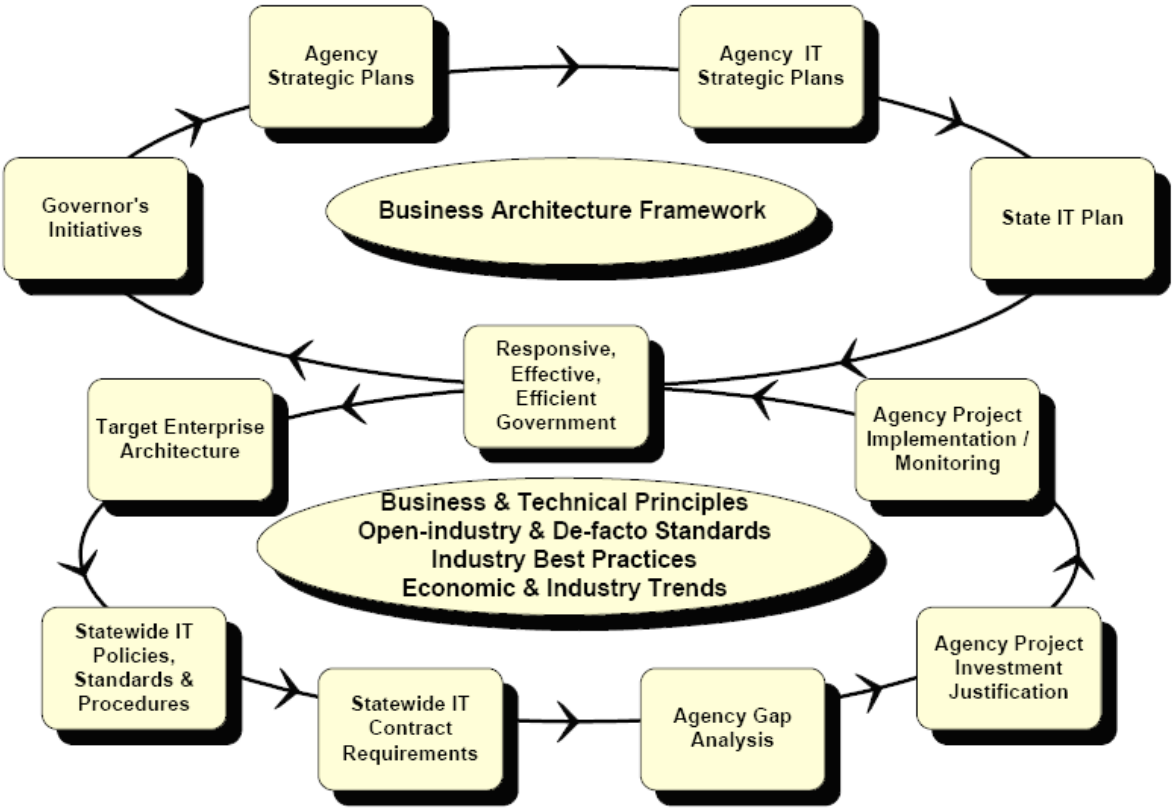
Master data governance deals with organizational issues, people and processes as they apply to master data management. Often this requires the creation of data stewards (or information stewards) who are assigned responsibility for resolving cross-organizational data conflicts. The stewards also help to resolve inter-disciplinary differences. Stewards need to document and track the taxonomy and ontology of the information that is collected. They oversee the regular (e.g., quarterly or annual) collection of data and ensure the currency and accuracy of the stored information over time, whether it comes from Excel tables, FTP transfers or other sources. In our implementation, the information stewards would oversee and enforce the data collection constraints mentioned above. They would also assure conformance to and compliance with the Arizona state Enterprise Architecture, including access control policies and backup/recovery procedures.

The concept of access control is based upon identification of the prospective user, authentication of that user, and degree of authorization that user has to the requested resource. Discretionary access control to the information will be managed at various levels to

ensure the privacy and security of the data. Identification of users requesting access will be defined at the individual or group level. Various levels of granularity of access to the data will be defined through the use of the SQL privilege system for the repository, as well as other file-based access control for other data. Controls will be enforced so that users are authorized to read, modify or add data according to their authorization category. These controls will allow for the secure partitioning of the data and prevent unauthorized access to information. All accesses to the information will be logged to allow for a complete audit trail.

The data/information stewards also need to work closely with the various IT Departments to carry out life cycle management procedures for the technology and software involved in the overall operation. This will be especially important since many different technologies and products, each aging at different rates and at various times, are expected to be involved in the overall implementation. While certain elements of the architecture may be retired over time, other new emerging technologies and products will be incorporated.

Arizona's Enterprise Architecture Lifecycle



An **Enterprise Life Cycle** integrates the management, business, and engineering life cycle processes that span the enterprise to align its business and IT activities. Enterprise Life Cycle refers generally to an organization's approach for managing activities and making decisions during ongoing refreshment of business and technical practices to support its enterprise mission. These activities include investment management, project definition, configuration management, accountability, and guidance for systems development according to a System Development Life Cycle (SDLC). The Enterprise Life Cycle applies to enterprise-wide planning activities and decision making.

Source: Wikipedia (http://en.wikipedia.org/wiki/Enterprise_Life_Cycle)

Broadband Assessment GIS
Project Relevant Data Sources

The consultant team identified and characterized a variety of sources and types of data that would be crucial or useful in the implementation and maintenance of the projected Broadband Assessment GIS Project. This report profiles and qualifies a wide range of primary and secondary data sources, detailing the utility, structure, limitations, constraints, costs, and benefits of each. Selected databases and sources are recommended and prioritized for project acquisition, integration, and use, in many cases representing unique pockets of data essential to a complete view or which may be complementary or even redundant to other sources, but thus allowing cross checking. The relevant data sources can be categorized in brief as:

- Existing broadband assessment data from the FCC and other government agencies
- Broadband-related information sources existing within various State agencies including details on telecom connections in use across the State
- Data from the existing Arizona Telecommunications and Information Council's (ATIC) Arizona Telecom Directory (ATD) augmented and supported by an ongoing linkage to the State's efforts
- Information and data access provided by telecom carriers and industry resources in a cooperative environment with appropriate proprietary and confidentiality management and protection
- External licensed commercial data sources and open sources in readily integrated GIS format with ongoing updates
- Data gathering from end users including traditional surveying and crowdsourcing, as well as SLA and performance data monitoring and remote sensor network data
- Wide range of government, open source, licensed, and other GIS-based data for integration to core data warehouse or external utilization in mash-ups and visualization

Previous projects in other jurisdictions have relied on a limited domain of information sources for a variety of reasons and thus had various limitations and shortcomings. However, Arizona is considering a blended approach utilizing all of the above relevant data sources in a unique, coherent, integrated fashion that would overcome the shortcomings of more limited approach and optimize the accuracy and utility of the broadband assessment capabilities.

> Modern Geographic Information System (GIS) technologies use digital information, for which various digitized data creation methods are used. The most common method of data creation is **digitization**, where a hard copy map or survey plan is transferred into a digital medium through the use of a computer-aided design (CAD) program, and geo-referencing capabilities. With the wide availability of ortho-rectified imagery (both from satellite and aerial sources), heads-up digitizing is becoming the main avenue through which geographic data is extracted. Heads-up digitizing involves the tracing of geographic data directly on top of the aerial imagery instead of through the traditional method of tracing the geographic form on a separate digitizing tablet.
>
> Source: Wikipedia (http://en.wikipedia.org/wiki/Geographic_information_system)

Arizona State Agency Broadband-Related GIS Data Sources:

The Broadband Assessment GIS Study consultant team held over 20 interviews with personnel from a variety of State Executive Branch agencies and other selected State agencies and otherwise surveyed State GIS resources relevant to this project or otherwise of interest. These State of Arizona agencies hold a rich variety of specific and unique graphical information systems (GIS) and database assets of interest and use to the proposed Broadband Assessment GIS Project and other GIS applications and stakeholders.

The primary broadband-related data sources available from State of Arizona governmental entities are summarized in the bullets that follow. These interview results and additional analysis of State agencies' relevant GIS and database resources are further detailed in **Appendix A - State of Arizona Agencies** including dataset particulars, integration details, reference links, and interview notes.

- **Arizona Government Information Technology Agency (GITA)** - Arizona Public Safety Communications Commission (PSCC), telecom provider infrastructure maps
- **Arizona Department of Administration (ADOA) Telecommunications Program Office (TPO)** - State telecom purchasing data for hundreds of agency and other AZNet participant facilities around the state geo-coded by user, carrier, circuit type, cost(s), service level monitoring, and other operating data
- **Arizona State Library, Archives and Public Records (ASLAPR)** - Directory and database of over 300 academic, public, tribal, special, and museum libraries including their location, technology plans, e-rate funding, telecom and broadband information
- **Arizona Department of Education (ADE)** - Annual Technology Survey and Assessment of every school district and charter institution including telecom and broadband purchasing data, School Technology Plans for E-rate support, Arizona Education Data Warehouse (AEDW) with school and district statistics, School Report Card System, Student Accountability Information System (SAIS), and School District Boundaries shape file
- **Arizona State Land Department (SLD) & State Cartographer Office (SCO)** - Arizona Land Resource Information System (ALRIS), Arizona Geographic Information Council (AGIC) with downloadable datasets, Arizona Imagery Server, Arizona GIS Inventory Tool, and public land and city boundary shape files
- **Arizona Corporation Commission (ACC)** - ILEC service areas & LATA boundaries, ILEC and CLEC annual reports, lists of regulated telecom companies, telecom tariffs in dockets, natural gas pipeline and hazardous liquid pipeline maps
- **Arizona Department of Transportation (ADOT)** - Street centerline files with geometry, condition, and additional information on state and federal roadways, traffic management and performance monitoring, commercial vehicle and environmental information, airport and railroad datasets, roadway photo logs
- **Arizona Department of Commerce (ADOC)** - Arizona economic regions shape file, Asset Inventory Project for select regional economic data including telecom survey, population estimates, Arizona Smart Growth Scorecard, Arizona Workforce Informer and Arizona State Data Center programs, Arizona Indicators participant

- **AZ3D** - To provide Common Operating Picture (COP) for decision-makers, emergency responders, and the Arizona Counter Terrorism Information Center (AcTIC) with the Arizona Geospatial Clearinghouse (AGC) to assemble, integrate, develop and distribute geospatial data and services
- **Arizona Health-e Connections (AzHeC)** - Telemedicine and telehealth planning and data, survey of clinicians and practitioners throughout Arizona incorporating broadband questions
- **Arizona Department of Revenue (ADoR)** - Tracks telecom-related categories of taxable assets, Transaction Privilege Tax (TPT) or sales tax, income statistics, bonding
- **Arizona Independent Redistricting Commission** - Congressional District shape file

See **Appendix A - State of Arizona Agencies** for additional sources and details related to above including dataset particulars, integration details, reference links, and interview notes.

Arizona Counties and Municipalities GIS Data Sources:

Additionally, there are GIS data sources associated with each of Arizona's fifteen counties and a number of its municipalities, as well as with various regional economic development groups. These sources vary widely in coverage and depth, often focusing on particular data elements readily accessible to regional government or otherwise focused on specific needs. Certainly these regional GIS sources will prove relevant and useful to specific regional analysis and should be characterized, authorized, and imported to the Broadband Assessment GIS Project on an opportunistic or as needed basis.

See **Appendix B - Arizona Counties and Municipalities** for county, municipal, and economic development group links to Arizona regional GIS resources.

Other Arizona Organizations Broadband-Related GIS Data Sources:

A number of Arizona non-governmental organizations produce or can access additional GIS or database sources that would be of interest and use to any Broadband Assessment GIS Project. In particular,

- **Arizona Telecommunications and Information Council's (ATIC) Arizona Telecom Directory (ATD)** - Both a core data source and potential outlet for data distribution and end user engagement, though in need of funding for maintenance and evolution
- **Arizona Investment Council (AIC)** - Utility infrastructure needs and funding alternatives study, Cooperative relationships with investor owned utilities
- **ASU Morrison Institute for Public Policy** - Arizona Indicators Project data research tool that tracks Arizona's economic, social and environmental trajectory
- **NAU Social Research Laboratory (SRL)** - Strategic partner in end user surveying
- **Arizona's Universities** - Variety of data collection programs and GIS resources

See **Appendix C - Other Arizona Organizations of Interest** for more details on these and other sources of interest.

Broadband Service Providers GIS Data Sources:

A number of regional broadband assessment projects rely primarily on service provider contributed data including ATIC's Arizona Telecom Directory (ATD). Detailed information and data access has in some cases been provided by telecom carriers and industry resources in a cooperative environment with appropriate proprietary and confidentiality management and protection. However, proprietary and competitive concerns often have limited voluntary cooperation with such efforts and keeping data up to date is problematic with the great number of information sources. Non Disclosure Agreements (NDAs) and isolation of data submittals through intermediary organizations have been utilized and should be considered.

Again, the recent Massachusetts Institute of Technology report titled **Broadband Metrics Best Practices: Review and Assessment Report** lays out the issues and solutions to gathering, managing, and sharing broadband service provider data cogently as follows:

> The best data is proprietary (owned by the service providers or consultancies and market research firms) or under non-disclosure constraints imposed as a condition for the data collection, whether collected by a regulatory authority such as the FCC under regulatory fiat or contributed voluntarily as in the case of Connect Kentucky. Such constraints are understandable.
>
> First, creating detailed data sets is expensive. Those who collect the data, including for-profit entities, can be expected to restrict access to enable recovery of data collection costs (and earn a profit).
>
> Second, highly granular data raises privacy and competitive issues. Data on service availability by service providers may be competitively sensitive. More interesting data on adoption rates and usage is even more sensitive, and moreover, is likely to be regarded as private information that end-users may resent being shared. The better the data, the more likely it will threaten privacy or competitive interests, and hence the greater the likelihood its sharing will be limited.
>
> Third, public dissemination of detailed GIS information on the location of essential infrastructure may be regarded as posing a security risk, enabling terrorists or others to better target attacks. As higher-and-higher resolution locational information becomes available (e.g., Google maps), this is posing both an opportunity (better emergency services) and challenge (easier targeting by terrorists) to security agencies and policy-makers more generally.
>
> While access and sharing restrictions on detailed data impose complications and increases the costs of data analysis, such constraints are unavoidable. The appropriate balance between public access and private/limited access will need to be worked out and will require a complex balancing of conflicting objectives (market efficiency vs. privacy, security vs. transparency, etc.).
>
> In addition to limiting who has access to the data (e.g., to those who are willing to pay or to employees of specific government agencies), data access is also limited by the forms in which data is presented. This is a common strategy employed by statistical agencies that report various summary tabulations but not the results on individual survey points. For much analysis, the summary data is all that is needed.

From **Broadband Metrics Best Practices: Review and Assessment Report** prepared for Massachusetts Technology Collaborative by William Lehr, Tony Smith-Grieco, and Grace Rusi Woo of the Massachusetts Institute of Technology, February 2008

(http://www.mtpc.org/broadband/docs/BroadbandMetricsBestPracticesSurveyFeb2008.pdf)

ATIC's ATD project and other regional projects have shown that broadband providers will voluntarily cooperate with appropriate encouragement and consideration and under proper constraints. Public access to broadband availability information can lead to customer leads and sales to both the enterprise and residential marketplaces and can be a strong incentive to telecom provider participation. Specific engagement of Arizona's primary broadband providers should be undertaken at the beginning of Phase II to determine interest, concerns, and appropriate basis for participation.

The primary broadband-related data sources that could be submitted and utilized from broadband service providers are summarized in the bullets that follow:

- **Arizona State Contractors and Subcontractors Data** - GITA and ADOA have public data for the seven approved telecom contractors and their authorized subcontractors by services offered and counties served as well as internal data for telecom procurement and service delivery to hundreds of agency and other AZNet participant facilities around the state geo-coded by user, carrier, circuit type, cost(s), service level monitoring, and other operating data
- **Traditional Telephone Companies** (Includes ILECs and CLECs providing facility-based voice telephony often accompanied by data services and occasionally by video services) - Location of Central Offices (COs) and wire centers with capabilities data (complemented by licensed data source), Contribute coverage areas for various classes of services and broadband data speeds
- **Cable System Operators** - AZ-NM Cable Communications Association profiles and services data by municipality for some 125 cable systems in Arizona owned by approx. 25 companies plus individual company-contributed infrastructure and services updates
- **Cellular Wireless Providers** - Can contribute vertical asset locations and coverage areas for various classes of services and broadband data speeds by individual company (complemented by licensed data source for all) as well as their roadmap to broadband technology and coverage evolution
- **Other Wireless Providers** (Includes fixed, mesh, and mobile wireless data providers such as those utilizing Wi-Fi, WiMAX, microwave, etc.) - Can contribute vertical asset locations and coverage areas for various classes of services (complemented by open lookup sources for publicly accessible Wi-Fi and potentially other wireless nodes)
- **Fiber Infrastructure Providers** - Contribute fiber maps of long haul, middle mile, and last mile connectivity plus geo-coordinates for on-net buildings, For Fiber to the Premises (FTTP) and FTTX services coordinates/addresses of serviceable locations
- **Satellite Data and Services** - Though service delivery is relatively ubiquitous for those with clear views of the southern sky, specific footprints, delivery options, and performance data can be incorporated to complete the broadband availability view

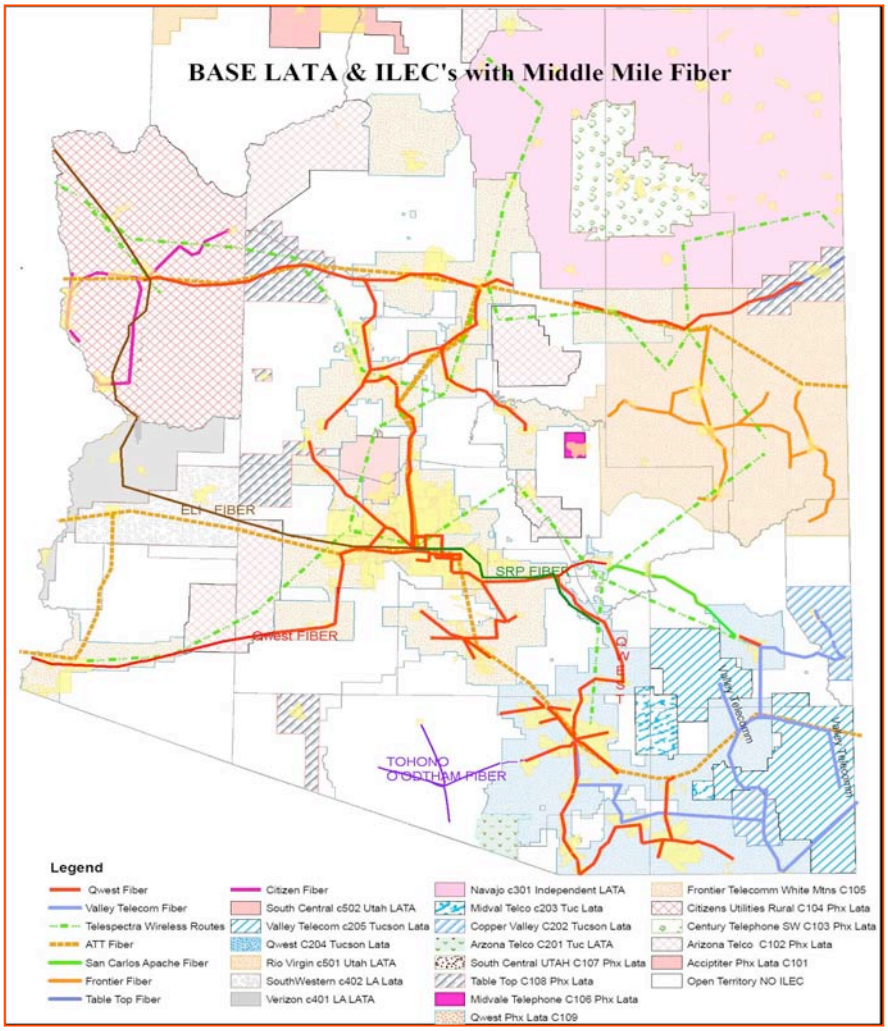
External Broadband Assessment GIS Sources:

Commercial telecom and broadband infrastructure is a complex mixture of fiber, copper, and wireless assets owned by numerous telecom service providers and sometimes complemented by government agency owned wireless or fiber assets. There are no single sources that reflect this breadth of this infrastructure and service provisioning, but rather a patchwork of sources that yield a piece of the puzzle. The consultant team has identified a rich variety of commercial data sources that can be licensed and other open source data that can be accessed to build significant complementary capabilities into a blended Broadband Assessment GIS Project. These relevant GIS and database resources are detailed in **Appendix D - External Broadband Assessment Sources** and are summarized as follows:

- **Central Office (CO) and Wire Center Locations** - Represent primary ILEC points of presence from which DSL service is provisioned and provided, and is available from multiple sources updated regularly at modest $ supporting DSL availability modeling, however DSLAM locations which are fiber fed extension for provisioning DSL are not readily available
- **Cable Provider Service Boundaries** - Geographic boundaries for cable licensees with varying layers for different classes of service including high-speed Internet available from commercial database and complemented by Arizona-New Mexico Cable Communications Association (AZ-NMCXCA) provider directory data
- **Wireless Tower Locations** - Geographic locations for wireless tower structures can be selectively found in the U.S. FCC Antenna Structure Registration (ASR) which can be complemented by licensable wireless antenna facility location data for the physical structures and ownership identifying collocation opportunities
- **Cellular Provider Service Locations** - Could be provided cooperatively in an integratable data format by service providers and is available in licensable database of shape files for all providers by classes of service including 2.5G, 3G, and 4G services
- **Wi-Fi Hotspots** - Geo coordinates of Wi-Fi hotspot locations by SSID and security profile from wardriving sources and open directories of publicly available hotspots by access type, with WiMAX likely to follow suit as deployment and use matures
- **Other Fixed Wireless Broadband** - Location and capabilities of point-to-point, point-to-multipoint, and mesh broadband wireless networks including microwave and WiMAX are not generally available, but may be gathered from frequency licensing, service provider data contributions, and future open directory efforts
- **Satellite Providers and Coverage -** Satellite services provide voice, video, and data services to residential, business, and government end users with footprint data available from industry directories and individual service providers will relative ease
- **Middle Mile & Long Haul Fiber Infrastructure** - Fiber interconnections between population centers and other long distance fiber transport capabilities and infrastructure are generally proprietary, but limited data is available from some public sources including permitting data, as well as service provider data contributions. As **l**icensable data sources have not been identified, this leaves the primary data source to be what the service providers will provide either publicly (e.g. - national backbone maps on their websites or lists of cities served) or provided cooperatively to the Arizona Broadband GIS Assessment Project as maps that can be scanned and imported or preferably in an integratable GIS data format

- **Metro Fiber Infrastructure** - Fiber infrastructure from multiple redundant providers is deployed in major metropolitan population areas and could be provided cooperatively in an integratable data format by providers, complemented by licensable data sources, detailing multiple carriers primarily across the Phoenix and Tucson metro areas
- **Broadband Availability &/or Use Data Collection and Surveys** - U.S. FCC Local Telephone Competition and Broadband Deployment Data by zip code relatively useless but should evolve to better broadband availability tracking that can and should be complemented by various end user surveying and crowdsourcing
- **Data Center Locations** - Location and capabilities of data centers in the major metro areas and elsewhere could be provided cooperatively in an integratable data format by data center operators, and is available in licensable database of carrier-grade collocation facilities
- **Internet Traffic Maps & Monitoring** - Real-time or near real-time visualization of Internet or broadband utilization (traffic &/or weather map style) could be displayed for the state or by region/location from network monitoring service(s) and tools

See **Appendix D - External Broadband Assessment Sources** for more details on these and other relevant sources of interest.



Source: GITA (Aggregated from ACC, Service Providers, and Other Sources)

AZ Regional Maps Available at http://www.azgita.gov/telecom/historical/TISC/RFI/default.htm

Combining Sources for Analysis and GIS Integration:

The wide variety of sources and types of data that would be crucial and/or generally useful in the implementation and maintenance of the projected Broadband Assessment GIS Project have been laid out in the above sections organized by the kind of data source to be utilized.

- Existing broadband assessment data from the FCC and other sources
- Arizona State Agency, County, and Municipal Broadband-Related GIS Data Sources
- Other Arizona Organizations' Broadband-Related GIS Data Sources
- Broadband Service Providers GIS Data Sources
- External Open Source and Licensed GIS Data Sources
- External Broadband Data Gathering (Surveying, Crowdsourcing, Remote Data)
- Specialized GIS Data Sources such as Roadway/Highway and Demographics

Arizona is considering a blended approach utilizing all of the above relevant data sources in a unique, coherent, integrated fashion that would overcome the shortcomings of more limited approaches and optimize the accuracy and utility of the broadband assessment capabilities. Certainly, melding these data sources will yield a complex and rich data environment and can also be examined as the projected GIS layer groups for another view of the source data role.

GIS Layers and Blended Sources Overview

GIS Layer Categories	GIS Layer Sub-Category Sources
Broadband Assessment and Survey Sources	• FCC Service Provider mandated data submittals • S. 1492 Broadband Data Improvement Act data collection • USDA RUS applicants' rural community survey data • USAC Schools & Libraries (e-Rate) & High Cost, DOC NTIA • Connected Nation, BroadbandCensus.com, PIF, Benton • CWA SpeedMatters.org AZ & national crowdsourcing data • Arizona crowdsourcing (like Virginia's eCorridors CBAM) • Arizona Telecommunications & Information Council (ATIC) Arizona Telecom Directory (ATD) database • Arizona Department of Commerce (ADOC) Asset Inventory Project & Smart Growth Scorecard • Arizona Health-e Connections (AzHeC) surveying • NAU Social Research Laboratory (SRL) surveying • ASLAPR and Bill & Melinda Gates Foundation for libraries
State of Arizona & Other Governmental Telecom Circuits	• Arizona Department of Administration (ADOA) Telecommunications Program Office (TPO) for AZNet with vendors Accenture and Calence • Arizona Department of Education (ADE) Annual Technology Survey & Assessment and School Technology Plans • Arizona School Facilities Board (SFB) • Arizona State Library, Archives and Public Records (ASLAPR) for library connectivity and e-rate data • UA Arizona Telemedicine Program (ATP) network, NAUNet

Central Offices (CO) & Wire Centers (WC) (for primary ILEC & CLEC Points of Presence)	• Service Provider submitted data sets and GIS files • Commercial licensed data sources (Tele Atlas, Quentin Sager Consulting, GeoTel Communications, NAVTEQ) • ACC filings, Additional data collections (CCMI, TelcoData) • BroadbandReports.com/DSLReports.com
DSLAM Location Sources (for deep fiber penetration and DSL service origin points)	• Service Provider submitted data sets, maps, and GIS files • Resellers and agents for ILEC & CLEC services • Public & private search tools for DSL site qualification • Telcordia Technologies CLONES (cost & utility issues)
Cable Provider Service Boundary Sources (for Data, Video & Voice)	• Service Provider submitted data sets, maps, and GIS files • Arizona-New Mexico Cable Communications Association (AZ-NMCXCA) membership & deployment data • ESRI Cable Boundary Data &/or MediaPrints data sources • Community cable license submittals and permitting
Wireless Tower Location Sources	• Tower owner &/or user submitted data, maps, and GIS files • U.S. FCC Antenna Structure Registration (ASR) Database • Commercial licensed data sources such as Tower Maps • Community tower approvals and permitting • Field surveying by engineering contractor(s)
Wireless Services Provisioning Sources	• Service Provider public information, regulatory filings, and submitted data sets, maps, and GIS files • FCC frequency licensing data by geography (BTAs/MTAs) • Commercial licensed data sources such as American Roamer's CoverageRight & WiSARD • Wi-Fi and other fixed, mobile and mesh wireless directories • Field surveying by engineering contractor(s) • Wardriving by dedicated efforts &/or crowdsourcing data • Consumer field auto-logging (Navizon & Skyhook Wireless)
Satellite Providers and Coverage	• Service Provider public information &/or submitted data sets, maps, and GIS files plus frequency and slot licensing • Industry and government directories & specialty databases
Middle Mile and Long Haul Fiber Infrastructure	• GITA collection and scanning of Service Provider maps • Fiber infrastructure maps collected from public sources • Service Provider submitted data sets, maps, and GIS files
Metro Fiber Infrastructure	• GITA collection and scanning of Service Provider maps • Fiber infrastructure maps collected from public sources • Service Provider submitted data sets, maps, and GIS files • Commercial licensed data sources (GeoTel/CMC, FiberLocator &/or CFN Services FiberSource)
Other Broadband Assessment Data Sources	• Arizona Corporation Commission (ACC) data and filings • Arizona Department of Revenue (ADoR) taxable telecommunications-related assets by year, location & type • Service Provider public information &/or submitted data

	sets, maps, and GIS files • SLA, Performance data monitoring, Remote sensor data • Additional commercial licensed & public data sources TBD
Roadway and Highway Geographic Data Sources	• Arizona Department of Transportation (ADOT) & Counties • Arizona Geographic Information Council (AGIC) • CANAMEX Smart Corridor and CyberPort Projects • U.S. Department of Transportation (DOT) • Commercial licensed data sources such as ESRI StreetMap Premium, NAVTEQ, DeLorme &/or Tele Atlas • OpenStreetMap (OSM)
K-12 School Demographic Data Sources	• Arizona Department of Education (ADE) Annual Technology Survey and Assessment, School Technology Plans for E-rate support, Arizona Education Data Warehouse (AEDW), School Report Card System, and Student Accountability Information System (SAIS) + U.S. DOE data for Arizona • Arizona School Facilities Board (SFB) • Commercial licensed data sources such as Market Data Retrieval (MDR) &/or Quality Education Data (QED)
Population Demographic Data Sources	• Arizona Department of Commerce (ADOC) Asset Inventory Project, Arizona Smart Growth Scorecard, Arizona Workforce Informer, and Arizona State Data Center programs • Arizona Department of Economic Security (DES) • Arizona Department of Health Services (ADHS) • ASU Morrison Institute for Public Policy, Arizona Indicators Project, ASU CABIT, ASU ISSR, NAU ARPI, NAU CAIED, NAU GRAIL, NAU SRL, UA ATP, UA Eller AZ's Economy • Arizona Prospector (ADOC & APS) • U.S. Census Bureau and TIGER data files • U.S. Department of Labor Bureau of Labor Statistics (BLS) • U.S. Department of Health and Human Services (HHS) • Federal Financial Institutions Examination Council (FFIEC) • Other pertinent federal, international & institutional sources • Commercial licensed data sources such as ESRI Business Analyst, infoUSA.com &/or Demographic Data Center
Other Arizona GIS Sources	• Arizona State Land Department (SLD) • Arizona State Cartographer Office (SCO) ALRIS • Arizona Geographic Information Council (AGIC) • Arizona counties and municipalities GIS data sources • Arizona Geological Survey (AZGS) • AZ3D Common Operating Picture (COP) Project • DPS, Arizona Counter Terrorism Information Center (AcTIC) • ASU ISSR, Connection One & Geographical Sciences • NAU Geospatial Research and Information Laboratory • UA Arizona Electronic Atlas & Regional Image Archive

Other State's Broadband Assessment Case Studies Summary

An extensive study of other States' mapping experience was made by the GBAS team including interviews with numerous primary project participants so as to detail best practices and lessons learned relevant to Arizona's plans and efforts. From these studies has come much data on methodology and approach, time frames, varying scopes of work, impact, overall value proposition, and evolution over time. Budgets or overall costs for respective approaches also have come into focus. These findings have proved useful in analyzing various approaches and informing an Arizona Broadband mapping survey effort regarding alternatives and the processes or procedures which should be included.

The Mapping Tables present a visual summary of the Broadband Survey Mapping Case Studies found in brief following the tables and in detail with attendant resources in Appendix F. Survey Attributes and Qualities are listed in the left column, with an "X") marked in the box under each state's where it's observed that the attribute or quality exists for that State. A brief narrative and description for the table and its various elements is presented here.

Broadband Survey Life Span

Initial, "**Pilot**", Broadband Surveys by many states could be envisioned as performed **"In-house"**, within their state agencies' jurisdiction (e.g., CA, MA, NC) , or "**outsourced**" to entities such as consultants, academics (e.g., CA, KY, TN to the former, IL to the latter) and so on. The time span for Surveys may encompass many years (**"sustained, continuous survey"**), such as KY, TN, after which time the survey may conclude or partially conclude, for one reason or another, as completed ("one-time") , (e.g., KY completed the Mapping and Strategic Planning Dec07, but continues with KY e-Communities planning) or may be perpetuated to present day and foreseeable future(**"ongoing to present time, future"**) to update the preliminary Pilot Survey, e.g., MA, NC. The majority of the Broadband Studies are operating today and into the future.

Broadband Survey Authorization and Date Initiated

State Legislation seems to predominate as the initial spark for State Broadband Surveys, such as Governor Patrick introducing the 2007 bill, signed in Aug. 2008 authorizing the Survey and Bond authorization for $40M, or early legislation for e-NC Authority origins in 2000s with state funding legislation coming later in 2004. Vermont began Broadband studies internally with Vermont Dept. of Public Service during early 2000s, later legislation created and funded the Vermont Telecom Authority in 2007.

Governor Executive Orders were second innovators, whether formal legislation for CA Gov. Arnold Schwarzenegger calling for the CA Broadband Task Force initiation in 2006, or the IL Lt. Gov Quinn requesting the IL Center for Regulatory Policy Studies, Prof. David Loomis, to create the Broadband Survey for IL, with IL Economic Development funding.

Funding

Initial Sources for most Projects are State Legislative Appropriations, followed by Federal Appropriations. Bonds backed by governmental entities seem to hold promise, as MA and VT are pursuing this financing option.

Sustainability of Funding Sources are less developed by States at this time. Federal grants and subsidies may become increasingly important as S .1492 comes into effect. Business Cases that hold promise include the following:

- **Entity-owned** (governmental or private), or managed**, Broadband Infrastructure Assets**, such as ducts for fiber, towers on which wireless providers can collocate, is beneficial for both the owner-entity and the Service Providers. Leasing Infrastructure Assets, such as fiber in ducts, tower (or building) collocation sites, provides a long-term source of revenue to the owner of the assets and likewise decreases the initial costs of deployment for SPs. This concept is utilized by the Maryland Broadband Cooperative, with the Coop of Service Providers, who are constructing the Regional Broadband Infrastructure. The duct-work assets and construction costs paid are for by Federal (DOD, NASA) appropriations. The fiber in the ducts will be leased by the Service Provider Coop members, whose funds will be used to maintain and upgrade the Regional Broadband Infrastructure. Other states, such as VT and MA, are contemplating a similar business case, where the state owns the Infrastructure Assets and leases out fiber and/or tower sites for collocation to Service Providers. Bonds may be their initial funding source.
- **Taxes** on phone bills to fund Broadband Development in CA will be the ongoing business case for the California Broadband Imitative. A penny or two of new tax on every Californian's phone bill pays for supporting their Broadband programs.
- **In-kind donations** of equipment (e.g., computers, printers, software applications) from manufacturers, retailers, and so on are excellent business cases for some programs, such as Kentucky's No Child Left Offline (NCLO) program. Low-income families and children receive computer equipment for home use and schools for e-Learning programs from national or local computer-related firms. In return, companies' membership in NCLO, they benefit from publicity for the programs and access to a potential customer base in the future.

GIS Data Sources for Broadband Service Providers (SPs)

Non-Disclosure Agreement (NDA) signed between two parties, the Service Provider and the entity collecting their data for the Broadband Survey, protects Service Provider data privacy. This format for obtaining data is dichotomous:

- Helpful since more data can often be obtained from Service Providers in this mode
- Hindrance since the data/quality of data obtained and methods used to massage the data are all unknowns.

One sees only the final output, which is often an assimilation of all Broadband providers' data called "Cable Providers" or "DSL" or simply "Broadband Available", without delineating the separate franchise areas, customer addresses', or names of Service Providers.

- On the one hand, the Service Providers have anonymity and competitor advantage maintained
- On the other hand, the observer of that data does not know each Service Providers' territory, or the actual uptake or adoption of services by individual customers. Rough topography may dominate a Service Provider's franchise area,

with only a few customers actually being served, however one never knows that if only the franchise area is demarcated.

The Non-Disclosure Agreement (NDA) methodology has recently presented issues:

- Some states are discovering that service providers, even when presented with the "carrot", an NDA option, service providers are not cooperating and not providing any data at all. Vermont is one case, where they are contemplating legislative action to obtain service providers cooperation.
- Service providers who have used NDAs with KY, TN and CA, for instance, are insisting on using NDAs with other states. Many states would rather not obscure or compromise their data and methods by using NDAs, such as NC.

Not using NDAs for obtaining service providers data is preferred by many states, including e-NC Authority, which has agreements with service providers and issues grants to service providers annually for deploying in rural areas. Maryland Broadband Cooperative is a private organization of service provider members and their data stays internal to the firm.

How can service providers data be obtained by methods other than NDAs? Often Service Providers' plans are not well known, nor are they willing to disclose locations of their equipment or "lines" for competitive reasons. Some other methods for service provider data collection include:

Anecdotal sources of service providers data which can be compiled to provide or impute Service Providers' plans or current coverage:

- **Permits:** Vermont Department of Public Service uses a regulatory method of issuing permits to the land-line telecommunications Service Providers and cable service providers, when service providers submit their data for a project. Massachusetts has the same permitting methods for towns. The Permit records are then available for public inspection and tracking.
- **Government entities internal records**, such as
    - **Dept. of Transportation (DOT) right-of-way (ROW)** information is important, since many service providers use ROW for fiber and wireless deployment. Maryland Broadband Cooperative utilized their ROW for their regional infrastructure "Middle Mile".
    - **Public Utilities Commissions (PUCs)** usually have state telecommunications area records, or Local Area and Transport Area (LATA), on file for public use. Arizona has those records with the Arizona Corporation Commission (ACC), the state's Public Utility Commission (PUC).
    - **School District** records often have telecommunications equipment taxes with codes indicating whether the equipment is a circuit (fiber or copper transmission line carrying the SPs Internet signals) or hardware, such as routers, modems. If one District's total taxes are more than another, one might assume that the District with higher total taxes has more Telco lines or

equipment. Deficiencies in school telecommunications and Internet access can be detected from school district records in this manner. (Galen Updike, discussion, 11/26/08)

- **Crowdsourcing** data can provide actual records of presence and speed of Broadband in an area. Usually a website has the necessary software, such as "Speedmatters.org" from Communication Workers of America, "eCorridors" www.ecorridors.vt.edu/maps/broadbandmap.php from Virginia Tech, and others. Participation in the survey is voluntary. Internet users are directed to the website URL and their broadband speed and other details such as record the location of the user site, type of service, and cost data are recorded on the website.
- **Trade Associations**, such as telecommunications, cable, and wireless industry groups might provide names and addresses for the members or have sharable demographics and data on services.
- **Municipalities** might be asked to name service providers in their locale. Massachusetts had success with this method, while Illinois did not since many service providers did not respond.
- **Media reports**, newspapers, magazines, websites of service providers, and so on, regarding the deployment plans or projects accomplished by service providers. Massachusetts used this successfully to locate service providers' equipment.
- **FCC:** The Federal Government mandates service providers provide data to FCC at least annually. Form 477 is the public record available. However, the service provider data up until March 2008, was essentially useless, since only 1 customer per zip code was required to indicate that zip code had Broadband Availability. Furthermore, the FCC definition of Broadband at 200Kbps was meaningless as well. However, substantial improvements are expected over the next few years with recent congressional action. FCC Tower data, for wireless carriers, has inadequacies as well, though can be augmented by the licensing of commercial data sources.

Industry Data is also available from subscription based third party sources, identified here under as Commercial Data - Service Provider data, which is obtained from public records, from ESRI GIS and other commercial houses. Other forms of data are available such as Towers and Collocation sites, political boundaries GIS maps, landmarks such as water bodies and highways/roads, census data, and much more. Data usage may have limitations based on licensing agreements for, such as restrictions against certain types of publications and Public access to raw data.

Metrics for Mapping Service Provider and Other Data

Common metrics include **Census Block**, often used by Census Bureau for the census data, **Square Mile** common among population statistics (density/sq.mi.), and **Zip Code** usage for many data formats. Recently the Census Block is advocated as the more granular measurement of the 3 common metrics, hence preferable for Demographic data and others. FCC data will now use Census Block metrics for their service provider data, since their March 2008 proclamation.

However, within a complex GIS environment, data may be received and utilized based on any of a wide variety of geographic bounds such as point locations, defined shapes, census tracks, school districts, zip codes, municipalities, counties, legislative districts, economic regions, and so on. The system need be sufficiently flexible to be essentially agnostic to the source characteristics and readily merge and overlay diverse data as needed.

Mapping Implementation Methods

Geographic Information Systems (GIS) has become the preferred Broadband Survey mapping method since it synthesizes the disparate data into a readable, graphic image. ESRI is one of the reputable vendors whose software is widely used for Broadband mapping. Map Info, an early vendor, is still used although perhaps not as much as ESRI. CA, KY, TN, VT are all ESRI-based GIS systems. Maryland is using OSP Insight software for network modeling and spreadsheet data formats, along with the GIS-based software capabilities the package contains. Maryland Broadband Cooperative invoked proprietary rights and would not give our Team access to their data or mapping process. Like ESRI, experts in the OSP Insight software usually operate the application. Non-GIS methods were used in the Massachusetts Pilot Broadband Study, as a less expensive way to see the public response to the Rural Broadband deficits. The public and legislators voted with their wallets and approved a $15M increase in the bond fund for the $40M continuation of the Broadband Study using GIS applications.

Google Enterprise and Google applications such as “Sketch-up” (3-D and 2-D drawings)are the preferred mapping process tools for Virtual Alabama, in the Department of Homeland Security for Alabama State. Broadband is part of the security preparedness mapping for First Responders, crisis alerts, and other DHS functions. Easy to use software, Google Enterprise-wide application is readily useable by untrained personnel in all sectors of Alabama government. Vermont is using both Google Enterprise and ESRI GIS.

Types of Maps Produced for Broadband Surveys

Broadband Supply and Demand are the necessary economic components factored into the mapping process.

- **Supply is measured as “Availability”** or access to broadband offered by service providers in the area and does not take into account whether or not customers subscribe to the service or whether the subscription prices are affordable.
- **Demand is measured as “Adoption”** or customer subscribership is an indication of acceptability of the service providers’ services to customers. Other terms related to adoption are “take-rate” and “penetration.”

There are many useful measures of Availability and Adoption Mapping, indicating qualitative and quantitative values associated with both Supply and Demand. e-NC Authority set the standards early in 2000s as one of the innovators in Broadband Surveys and Mapping. ConnectKentucky used the overall e-NC model to a great degree, but with variations over time. Similarly, Connected Nation, the spin-off from CK that is now the parent organization, has developed a template from CK that they are propagating in other states such as Tennessee and Ohio and others supported by a recent grant from the Bill & Melinda Gates Foundation. Other states use variations of the basic model originally from e-NC Authority.

Economic Development Facilities Tracked

Most states include the enhancement of economic development of their rural regions for global and U.S. competition through increased broadband capacities, and often specify such in their initial legislation, Governor's Executive Orders, and so on. The methods used and degree to which that information is currently tracked varies among states. e-NC, Kentucky, and Tennessee track the various e-programs through telecenters and e-communities programs. Many of the telecenters and e-communities are physically located on maps. facilities such as schools, libraries, government centers, business parks, hospitals/clinics can all be located on maps for tracking:

- U.S. education/schools in general have fallen behind global partners; e-learning is credited with increasing education effectiveness in schools.
- e-Commerce for business, whether commercial business parks or home-based, is deemed as essential for rural competitiveness by most states.
- Governments with e-government websites not only save money internally, but provide services to the public over the Web that provide time-and-money saving benefits for citizens and businesses.
- Telemedicine and e-Health are saving lives, doctors' time and expense, vast amount of driving time/costs for medical facilities, by using Internet-based conferencing and sending medical information (x-rays, diagnostic tests, medical records).
- Tourist information, recreation sites, and other publicity for states' attractions have found new markets over the Internet, saving valuable time and money for both the traveling public and state governments.

Frequency of Updates: Annual, Periodic, None Yet

The extent to which updating is accomplished on the total Broadband Survey or parts of it (SPs data, Census and Political data) varies among states. For some states, the Broadband Survey is a one-time event lasting years in some cases, where mapping is accomplished and the Broadband Survey process has not been continued - yet at least. California and Kentucky continuation is not yet known. e-NC is a continually evolving Broadband Survey and Mapping over time since the early 2000s. Most of the other states are still in the early stages of the Broadband Survey and Mapping as well, such as Massachusetts, Maryland, and Vermont.

Need for Broadband Assessment Capabilities Summary Quote:

Given the importance of the Internet for our society and economy, there is a pressing need to understand how the Internet is evolving and impacting us. Just as we need to know the state of other basic infrastructure such as our roads and transportation networks, power grids, and water supply, we need to know the state of our Internet infrastructure. Broadband access is an essential element of this. Such an understanding is needed to appropriately assess needs, monitor the performance of markets, and to target and evaluate public policies affecting broadband.

From **Broadband Metrics Best Practices: Review and Assessment Report** prepared for Massachusetts Technology Collaborative by William Lehr, Tony Smith-Grieco, and Grace Rusi Woo of the Massachusetts Institute of Technology, February 2008 (http://www.mtpc.org/broadband/docs/BroadbandMetricsBestPracticesSurveyFeb2008.pdf)

Case Studies Scope of Work & Funding Sources Approaches

Survey Qualities	States Case Studies								Special Cases			
	CA	IL	KY	MD	MA	NC	TN	VT	Virtual AL	Bottom-Up	GA Atlas	PA Atlas
Broadband Survey Life Span												
Pilot: Outsourced Contract-"1-Off" (One Time)	X	X	X				X				X	X
Pilot: In-house - Potential "1-Off" (One Time)					X	X						
Sustained, Continuous Broadband Survey					X	X	X	X				
BB Survey: Ongoing to Present Time, Future	X		X	X	X	X	X	X	X			
Survey Authorization												
Governor Executive Order	X	X	X				X		X			
State Legislation Enacts			X	X	X	X	X	X				
Internal Agency, Dept. Function								X	X			
Public-Private Organization Broadband Survey		X	X							X	?	?
Date Survey Initiated												
< 2000				X								X
2000 - 2004				X	X		X		X			
2005 - 2008		X	X		X	X		X		X		
Initial/Startup Funding Sources												
Bonds backed by Government Municipality/State					X			X		X		
Appropriation from Congress		X	X	X						X		
Appropriation from State Legislature			X	X	X		X	X		X		
Other Public Organizations (Regional, County)			X							X		
Public-Private Organizations Funding	X		X			X				X		
In-Kind Donations from Organizations	X		X							X		
FCC/USDA - RUS										X		
Special Tax for Broadband										X		
Sustainability Funding Sources												
Appropriation from Congress				X						X		
Appropriation from State Legislature			X	X		X	X	X		X		
Public-Private Organizations Funding										X		
In-Kind Donations from Organizations										X		
Leasing Infrastructure (Fiber, Towers/Collocate)				X	X			X		X		
Special Tax for Broadband	X									X		

States and Special Cases Table Legend

X State Study is associated
? State Study may be associated

CA California Broadband Task Force
IL Broadband in Illinois, Prof. D.Loomis, ISU
KY Connect Kentucky
MD Maryland Broadband Cooperative
MA Massachusetts Broadband Initiative
NC North Carolina: e-NC Authority
TN ConnectedTennesse
VT Vermont Telecommunications Authority

Special Cases:
Virtual AL: Virtual Alabama
Bottom-Up: Prof. E. Feser, PhD, University of Illinois at Urbana
GA Atlas: Georgia High-Speed Telecom Atlas (defunct)
PA Atlas: Pennsylvania Tech. Investment Map (defunct)

Case Studies GIS Data Sources for Broadband Service Providers (SPs)

Survey Qualities	States Case Studies								Special Cases			
	CA	IL	KY	MD	MA	NC	TN	VT	Virtual AL	Bottom-Up	GA Atlas	PA Atlas
Uses Non-Disclosure Agreement (NDA)/SPs												
Pilot - Probably "1-Off" (One Time)	X		X				X					
Ongoing					X			X				
Does Not Use NDA for SPs Data												
Government Internal Data, e.g., DOT/ROW & PUC				X	X			X	X	X		
Commercial: Licensing Data (Towers, SP, etc)	X	X						X				X
Crowdsourcing: Broadband Testing			X			X	X	X		X		
Permits, other regulated data submission	X				X		X	X		?		
Government mandated: Data Audits (e.g., SPs financial troubles)								X				
Voluntary SPs Participation/ Submittal, Forms		X		X		X		X		X		X
FCC Data: Form 477 Service Providers		X						X		X		
FCC Data: Other, e.g., Towers		X			X			X		X		
Trade Associations provide SPs Name/Location		X								X		
Municipalities provide SPs Names, Data		X			X					X		
Media articles on SPs Deployments, Plans					X					X		
GIS Data Sources for Other Than SPs Data												
Government Internal Data, e.g., School Districts				X		X		X	X	X		
Government Internal Data, e.g., Revenue, Health						X		X		X		
Commercial: Licensing Data (Tower Maps, etc.)	X		X			X	X			X		
Demographics: Census-population, age, income		X	X			X	X	X		X		
Demographics: Density (Household),		X	X			X	X	X		X		
Geospatial Datasets (Roads, Water, Political)			X	X		X	X	X		X	X	
Metrics for Mapping Service Provider Data												
Census Block	?		X			X	X	X				
Square Mile			X				X				X	
Zip Code		X				X						
Mapping Implementation												
ESRI - GIS (Map Info - GIS)	X	X	X	X	X	X	X	X		X	X	
Non-GIS				X	X							
GIS-Based Network Modeling S/W: OSP Insight				X								
Google (Enterprise) GIS, Google Apps								**X**	X	X		

Case Studies Types of Maps & Economic Development Facilities Tracked

Survey Qualities	States Case Studies								Special Cases			
	CA	IL	KY	MD	MA	NC	TN	VT	Virtual AL	Bottom-Up	GA Atlas	PA Atlas
Types of Maps: Supply (Availability) & Demand (Adoption)												
Supply: Service Providers Data	X	X	X	X	X	X	X	X	X	X	X	X
Demand: Survey of Users Internet Usage, Services			X	X	X	X	X			X		
Demand: Adoption Maps of User Locations	X		X		X	X	X	**X**		X		
Demand: Telecenters that Teach Computer Literacy			X			X	X			X		
Demand: e-Communities: Form Tech Plans			X			X	X			X		
Demand: Aggregate User Demand with Website Sign-up Indicate BroadBand Need								X				
Types of Maps: Availability Maps												
Statewide Broadband Inventory: General	X	X	X	X	X	X	X	X	X	X	X	X
Statewide Broadband Inventory: Detailed	X	X	X		X	X	X	X	X	X	X	X
Statewide Density of Unserved Households		X	X		X	X	X	X				
Number of Households Unserved by Broadband		X	X			X	X	X				
Broadband Created in Unserved Areas over Yrs			X			X	X					
Broadband Service Growth Patterns over Years			X	X		X	X					
Redundant Broadband Service Created (>1 SP)		X	X			?	X					
County Broadband, Census, Density		X	X			X	X	X				
Statewide Broadband Speed & %Households	X							X				
Types of Maps: Adoption Maps												
State/County:% Adults/Households w/Home Broadband	X		X	X		X	X					
County: % (Households, Adults) w/ Broadband			X	X		X	X			X		
Broadband Adoption Growth Pattern over Yrs			X			X	X			X		
Types of Maps: Service Provider Location												
State Map: Locate Individual Service Providers			X	X	X		X	X			X	X
Types of Maps: Crowdsourcing Map												
Broadband Tested Sites on State, US Map			X			X	X	X		X		
Economic Development Facilities Tracked												
Education: e-Learning	X		X			X	X			X		
Health Care: Telemedicine, e-Health	X		X			X	X			X		
Business: e-Commerce	X		X			X	X			X		
Government: e-Government	X		X			X	X			X		
Recreation / Tourism: e-Tourism, e-Recreation	X		X			?	X			X		

Case Studies Frequency of Update

Survey Qualities	States Case Studies								Special Cases			
	CA	IL	KY	MD	MA	NC	TN	VT	Virtual AL	Bottom-Up	GA Atlas	PA Atlas
Frequency of Updates: Annual												
Survey - General (All Activities)						X			X			
Mapping						X		X	X			
Service Providers Data						X		X	X			
Census Data						X		X	X			
Political Data (Boundaries)						X		X	X			
Frequency of Updates: Periodic												
Survey - General (All Activities)					X	X				X		
Mapping					X	X				X		
Service Providers Data				X	X	X				X		
Census Data					X	X				X		
Political Data (Boundaries)					X	X				X		
Frequency of Updates: None Yet												
Survey - General (All Activities)	X	X	X	X			X				X	X
Mapping	X	X	X	X							X	X
Service Providers Data	X	X	X								X	X
Census Data											X	X
Political Data (Boundaries)											X	X

A set of case study briefs follow for:

- **Miscellaneous State Broadband Assessment and Deployment Initiatives (AK, CO, ME, MN, NH, NY, VA, WA & WY)**
- **Arizona Telecommunications & Information Council (ATIC) Arizona Telecom Directory (ATD)**
- **e-NC Authority (North Carolina)**
- **Massachusetts Broadband Initiatives**
- **California Broadband Task Force**
- **Pennsylvania Past Mapping Project and Broadband Initiatives**
- **Georgia High-Speed Communications Atlas**
- **Illinois Mapping Project: "Broadband Access in Illinois" Study**
- **ConnectKentucky**
- **Maryland Broadband Cooperative**
- **ConnectedTennessee**
- **Vermont Telecom Authority (VTA)**
- **Virtual Alabama**
- **An Alternative Approach: Broadband Deployment from the Bottom Up**

Note: For further details, extended analysis, and additional resources related to these case studies, see **Appendix C - Other Arizona Organizations of Interest** for coverage of ATIC's ATD and **Appendix F - Other States' Broadband Assessment Case Studies** for all others.

Miscellaneous State Broadband Assessment and Deployment Initiatives: (AK, CO, ME, MN, NH, NY, VA, WA & WY)

Arkansas (AK): The Arkansas Legislature passed Act 604 during its 2007 session, forming Connect Arkansas (http://www.connect-arkansas.org/) as a nonprofit organization to promote education about and deployment of broadband service. A set of questions concerning computer and Internet awareness and usage were included in a more general study of public perceptions and results provide a preliminary look at Internet usage in Arkansas, closely mirroring nationwide surveys. Connect Arkansas has been creating an "E-Communities" plan to educate cities and counties on how to develop digital infrastructure and will present its first map of Arkansas' broadband infrastructure shortly with regular progress updates to follow.

Colorado (CO): Colorado's Office of Information Technology (http://www.colorado.gov/oit/) is seeking revisions to a telecommunications bill passed in 2008 allowing it to seek more state tax money to map the statewide availability of high-speed Internet. Colorado can't finish bidding out the work because the project lacks funding. The 2008 bill linked the mapping project's funding at an estimated cost of $350,000 to $400,000 mainly to private donations and grants making government funding a last resort and limiting access to public funds. So far, $60,000 in private money has been committed and another $100,000 is available from the high-cost service fund generated from telephone bills. Some $300,000 in other state money has been lined up, but first the law would have to be changed. A letter of intent has been signed with a contractor to conduct the study and the mapping is meant to be finished this year so legislators can discuss possible remedies for shortfalls in broadband access in their 2010 session.

Maine (ME): The Maine Legislature approved the operation of the ConnectME Authority (http://www.maine.gov/connectme/) with the goal of expanding broadband access in the most rural, un-served areas of the state that have little prospect of service from a traditional provider. The Authority is to "identify un-served areas of the State; develop proposals for broadband expansion projects, demonstration projects and other initiatives; and administer the process for selecting specific broadband projects and providing funding, resources, and incentives." The Authority will be funded with a 0.25% surcharge on instate retail communications services and will fund proposals through grants, direct investments, or loans made on behalf of, in partnership with, or in support of, one or more communications service providers. The Maine Public Utilities Commission (MPUC - http://www.maine.gov/mpuc/) provides an online Broadband Availability Map searchable by town and service type with downloadable data layers at http://megisims.state.me.us/website/BroadBand2/viewer.htm.

Minnesota (MN): Connect Minnesota has launched a web site for its comprehensive broadband mapping initiative designed to assess current broadband availability across the state, highlighting those areas that are currently unserved by a broadband provider. The web site (http://www.connectmn.org/) allows current broadband subscribers to test the speed of their connections and describe how broadband has impacted their life. Connected Nation, Connect Minnesota's parent company, is working with several states to pursue broadband expansion initiatives. A recent draft bill would have provided a grant from the Commissioner of Commerce to do a statewide inventory of broadband service, but its status is unknown. The Blandin Foundation's Broadband Initiative (http://broadband.blandinfoundation.org/) works to help communities optimize their use of broadband-based technologies to improve their economic competitiveness in a global economy and publishes a Community Guide to Broadband Development (http://transition.blandinfoundation.org/html/public_bb_guide.cfm).

New Hampshire (NH): The New Hampshire Business Resource Center (BRC - http://www.nheconomy.com/) and the International Trade Resource Center (http://www.exportnh.org/) offer resources to enhance the economic activities of the state through business attraction outreach, in-state business expansion efforts, and facilitation of government and international sales. The Division of Economic Development oversees this array of activities working alongside Travel and Tourism, Parks and Recreation, and Forest and Lands in protecting and enhancing the many resources our state offers. NH BRC provides a variety of regional maps available at http://www.nheconomy.com/business-services/regional-map/. The State of New Hampshire Department of Resources and Economic Development (DRED) & The Telecommunications Advisory Board (TAB) produced a Broadband Action Plan (http://www.nheconomy.com/broadband-action-plan.aspx) and implemented surveying a web-based questionnaire for broadband users and a questionnaire for broadband providers.

New York (NY): The New York State Office for Technology (http://www.oft.state.ny.us/) supports a Universal Broadband Initiative to ensure access to affordable, high-speed broadband. This includes a comprehensive and holistic broadband strategy that focuses not only on infrastructure build-out, but also focuses on digital literacy, economic development, and expanded use of online government services. New York State's Office of Cyber Security & Critical Infrastructure Coordination (http://www.cscic.state.ny.us/) has been developing a model for mapping broadband for a single county as an example of what can be done on a larger scale statewide in cooperation with the NYSGIS Clearinghouse and GIS Data Clearinghouse (http://www.nysgis.state.ny.us/gisdata/), New York State Foundation for Science, Technology and Innovation (NYSTAR - http://www.nystar.state.ny.us/), and the New York State Public Service Commission (http://www.dps.state.ny.us/). See also the New York State Universal Broadband Initiative under the State CIO and Office for Technology (OFT) at http://www.oft.state.ny.us/oft/UniversalBroadband/overview.htm and their 1/12/09 RFP for up to $7.5M in broadband project capital grants that increase both broadband access and digital literacy in underserved communities and area of New York.

Virginia (VA): The Virginia General Assembly, through the 2007 Appropriations Act, has committed to expanding rural access to broadband technology. Part of this commitment involves the funding of feasibility studies of best last-mile solutions for rural areas. To this end, the Virginia Department of Housing and Community Development has created the Virginia Rural Broadband Planning Initiative (VRBPI), a comprehensive telecommunications planning effort that will allow communities to identify and develop all elements necessary to create a successful community broadband network. Community telecommunications plans include, at the least: needs assessments and asset inventory; analysis of current and future business and professional uses and applications; assessment of community computer literacy and identification of technology education needs; determination of need for, and nature of, broadband infrastructure; network organization and operation; funding strategies; and the marketing of a network. For more information, see Virginia Department of Housing and Community Development (DHCD) Telecommunications page at http://www.dhcd.virginia.gov/CommunityDevelopmentRevitalization/Telecommunications.htm and the VRBPI Program Design Guide at http://www.dhcd.virginia.gov/CommunityDevelopmentRevitalization/PDFs/RuralBroadband.pdf.

Washington (WA): The State of Washington's Utilities and Transportation Commission (UTC - http://www.wutc.wa.gov/) issued a RFP for a Broadband Survey project in early 2008, as mandated under a proviso contained in the 2007-09 Omnibus Operating Budget and funded through a general fund appropriation. The RFP was to design and conduct a statistically valid survey based on directly collected responses or reliable records and research and interpret the geographic, demographic, cultural, and telecommunication technology information to identify disparities in broadband access, use and the importance thereof. On June 30, 2008 the UTC's consultant CBG Communications, Inc. (http://www.cbgcommunications.com/), completed the Broadband Study Report addressing impediments to broadband availability and use in Washington State. The resultant Report and collateral material can be found at http://www.wutc.wa.gov/webimage.nsf/0/0C107F2AECEC013A8825733800684FCF.

Wyoming (WY): W.S. 9-2-1026.2 established the nine-member Wyoming Telecommunications Council (WTC - http://cio.state.wy.us/TelecomCouncil.aspx), appointed by the Governor with Senate approval. Consistent with the WTC's role to inventory current telecommunications infrastructure, solicit comments and recommendations on needs, identify existing broadband service gaps and service alternatives, the state issued an RFP in early 2005. Since 2005, several reports and presentations have been delivered covering various aspects of the Broadband Gap Study and efforts continue to refine and evolve their efforts. For more information, see http://cio.state.wy.us/telecom/Broadband/TopicIndex.pdf.

Arizona Telecommunications & Information Council (ATIC) Arizona Telecom Directory (ATD - http://www.arizonatele.com/)

Arizona Telecom Directory (ATD) is "...an online portal for locating telecommunication service providers delivering services throughout Arizona. Residential and business users can search for the availability of a wide range of telecom services by location and link to profiles of individual telecom providers, their contact information, and related resources." A Database and Search facility provides Service Providers in Arizona, a description of services, and geographic location in the State by County, Community or Zip Code. The project was launched in 2001 by the Arizona Telecommunications and Information Council (ATIC), which remains responsible for updates to the portal's underlying data and long term evolution. See **Appendix C - Other Arizona Organizations of Interest** for coverage of ATIC's ATD.

e-NC Authority - http://www.e-nc.org/

Background: An early adopter of Broadband economic importance with a Rural Internet Access Authority, North Carolina evolved to the e-NC Broadband Authority, which was created by the state Legislature in 2000. The mandate was to track the broadband connectivity levels, by county, across North Carolina. This was accomplished with a staff of 8 and governed by a Board of 15-members appointed by Governor, House, and Senate. Original financial backing was provided by a private foundation, MCNC, for $30M in 2000 and the state provided funding in 2004.

Mapping and GIS: The ESRI GIS Infrastructure mapping with a SQL Server-based, Windows-based provides the platform. Internet-based feeds are received into a form on their website. Geospatial datasets form the mapping architecture with base layers for context, orientation and landmarks, such as streets, water bodies, political boundaries; business data, such as wireless towers, service areas for DSL and cable; and thematic layers, for example census data, zip code boundaries. Broadband data for mapping is collected using 3 methods:

- Scientific Surveys of Users for Absorption/Demand Data

- Crowdsourcing is performed regionally by the Telecenters
- e-NC provides a special website for Service Providers for data submissions/updates

The Service Provider datasets/forms are updated on the Website periodically, and at least annually, by each provider. No NDA is used. Service Providers understand no harm will come through data disclosure for the website. Individual Service Providers can request special treatment for data usage. (Galen Updike/Jane Patterson conversation, 11/25/08)
The original mapping endeavor cost approximated $1M and a current 3-year budget of nearly $115K total supports ongoing mapping and data collection operations.

Mapping Impact: e-NC awards grants to Service Providers and others annually for building out Broadband-deficient rural areas. Further, Business and Technology Telecenters were established: "The e-NC Authority is the founding organization and primary grantor for seven business and technology telecenters, each located in a rural, economically distressed North Carolina county. Telecenters are technology and entrepreneurship resource centers within their communities. In North Carolina's most rural areas, these telecenters provide free high-speed Internet service to the public and a variety of free and fee-based business and technology services to local nonprofits and businesses. The telecenter system offers employee training, state-of-the-art office space, technology expertise, and business advice." By the end of 2007, the seven Telecenters have provided free Internet access to more than 158,000 citizens. They created 1,490 jobs and provided technical and business support services to more than 22,600 public and private sector clients. They have also leased space to more than 120 organizations and small businesses. More than anything else, the telecenters create local wealth and act as catalysts for economic development in their regions." See http://www.e-nc.org/telecenters.asp.

Future Funding Impact: The North Carolina Legislative budget included an e-NC Authority allocation: "North Carolina's recently signed budget for the 2008-09 fiscal year includes $1.5 million for the e-NC Authority broadband efforts. The funding will be used to increase the availability of residential Internet connectivity in underserved areas of the state. e-NC awards connectivity incentive grants with matching requirements to qualified service providers to expand high-speed access. The authority also provides financial support to rural business and technology telecenters and capital expenditure grants for local governments." (http://www.ssti.org/, July 23, 2008 edition, "Broadband RoundUp: States Expand Efforts to Increase High-speed Internet Access")

Alternative Approach for Mapping: An Alternative Approach for Mapping, constructed by Professor Ed Feser, Ph.D., worked with Jane Patterson and the e-NC Broadband Authority as a Regional Planning Economist with the State. He advocates the bottom-up approach used by e-NC Authority, however for states that lack the financial resources for a mapping endeavor costing approx. $1M, he suggests an alternative. See "An Alternative Approach for Mapping" in the last section of Case Studies.

Elizabeth City State University: ECSU recently worked with Windows on the World e-Community Development Corporation (WOW e-CDC - http://wowe-cdc.org/) to produce a $30,000 study, funded with state money, of 21 northeastern NC counties, surveying residents and checking utility poles and switching stations instead of relying on the data provided by Internet service companies and showing 10-20 percent more households did not have broadband access than were reported by e-NC by service providers. An excerpt of the study for Halifax and Nash Counties is available at http://www.indyweekblogs.com/triangulator/wp-content/uploads/2009/02/wow-e-cdc-broadband-studies-halifax-and-nash-counties.pdf.

Massachusetts Broadband Initiatives - http://masstech.org/broadband/

Background: Forerunner efforts for Broadband were initiated by diverse regional organizations, which were supplanted in 2006 when Governor Deval Patrick was elected and created the Department of Telecommunications & Cable (DTC). Commissioner Sharon Gillett heads the DTC, which created the subsequent initial mapping endeavor for Broadband Availability state-wide. Legislation was introduced in Oct. 2007 by Governor Patrick to create and fund a Massachusetts Broadband Institute; the legislation was signed by the Governor, Aug. 4, 2008, for a $40M Bond. (See Future Funding Impact section for discussion)

Mapping: The Broadband mapping endeavor occurred in 2006-07 and was on a very limited budget of $100K for the Pilot Project. Availability was mapped from data obtained from surveys of residents; much of the service provider information was obtained from public sources, and a voluntary online survey of residents' broadband assets. GIS will be used for the next stages, with MassGIS (http://www.mass.gov/mgis/), a state agency for implementation, although this pioneering phase used manual methods.

Mapping Impact: Broadband awareness increased throughout the state. Many regional broadband organizations were funded for further pilot tests, such as "Open Cape" initiative for wireless backbone infrastructure on the Cape, towns of Orleans for economic local business wireless eCommerce development and Falmouth for wireless hot spots development as well, on Cape Cod. The Western part of the state including Berkshires mountain region with "Berkshire Connect" and "Pioneer Valley Connect" piloted 3 competing wireless technologies in three communities for their economic development stimulation.

Future Prospects: All future mapping will be provided by GIS methods probably in the MassGIS State Agency. Data from Service Providers will be sought through a 3rd Party officiating and an NDA. Cable Strand Maps must be filed with the Towns, for future mapping. With Wire Center locations known, DSL routes can be plotted then substantiated with voluntary surveys on the Internet. New FCC data should prove more valuable since their latest announcement in March 2008 (http://news.cnet.com/8301-10784_3-9898118-7.html) regarding new methods for collecting Broadband data at the Census Tract level instead of Zip Code level, and new standards for Broadband speeds, eliminating the old criteria 200Kbps as "high-speed". Instead higher speed categories will be set as criteria, starting with Basic Broadband, 768Kbps - 1.5Mbps, and higher: 1.5M-2,5Mbps, 2.5-6Mbps, and above 6Mbps. MTC contracted a new MIT study on Mapping and Metrics, authored by Dr. William Lehr, expected for release 4Q08. (Bill Ennen, correspondence, 9/9/08).

Future Funding Impact: Funding for the venture has been secured with the recent passage of the 2007 bill submitted by Governor Patrick and signed Aug.4, 2008. The initial bill (HR 4864) for $25M was increased to $40M, with an amendment by the House. "...Governor Deval Patrick originally unveiled the bill last year to promote private investment in high-speed Internet capacity. The bill would provide $40 million in bond funding to create an incentive fund for public-private broadband partnerships under the Massachusetts Technology Collaborative (MTC). A new body, the Massachusetts Broadband Institute within MTC would have direct oversight over the fund and would conduct further research..." (http://www.ssti.org, July 23, 2008 edition, "Broadband RoundUp: States Expand Efforts to Increase High-speed Internet Access 7/23/08")

California Broadband Task Force (CBTF) - http://www.calink.ca.gov/taskforce/default.asp

Background: An Executive Order from Governor Arnold Schwarzenegger in 2006 created the California Broadband Task Force (CBTF). A diverse team was selected for the CBTF, including Service Providers, Community Leaders, and Business and Academic Leaders. CBTF three goals entail: Ensure ubiquitous and affordable broadband infrastructure. California must drive the creation and use of applications that produce the greatest economic, educational, and social benefits for California's economy and communities...California must construct next-generation broadband infrastructure, positioning California as the global economic leader in a knowledge-based economy. See http://www.calink.ca.gov/pdf/CBTF_FINAL_Report.pdf. The California Emerging Technology Fund (CETF), a non-profit organization was created in 2006 by the California Public Utilities Commission (PUC) with funding from the mergers of Verizon/MCI and SBC/AT&T. To further the development of Broadband, the PUC ordered the merged companies to fund a new CETF with a total of $60M paid over 5 years. These funds would be used to leverage additional private and public funds.

Mapping: Such diversity on the CBTF helped to solidify the participation of all members, including Service Providers whose data is critical to the success of the mapping effort. A neutral third party Contractor was selected to obtain the Service Providers data. Michael Baker Corp. in California, which conducts national/international and military projects with strict confidentiality, worked with the Service Providers using a Non-Disclosure Agreement (NDA). Baker used GIS data collection and mapping. Surveys of Pricing of pricing with Data Speed and Advertised Costs were tabulated into charts; lists of Counties and Communities unserved by Wireline and Wireline and Wireless Availability Maps of Broadband were prepared for the State and 12 Regions.

Mapping Impact for Policy Makers: The California Legislature drafted pending legislation SB 1149 extending an all-end-users tax, which is a subsidy paid to the 4 rural carriers to make rural rates affordable and carries out the CPUC goal of universal service. The rural Service Providers are required to match the subsidy with 60% matching funds. California Legislation SB 1193 established the California Advanced Services Fund to control the collecting and dispersing of the funds: "The purpose of the California Advanced Services Fund program will be to spur deployment of broadband infrastructure in unserved and underserved areas within the state, in both rural and urban areas, stimulate demand for services, ensure affordable access... " See http://www.leginfo.ca.gov/pub/07-08/bill/sen/sb_1151_1200/sb_1193_bill_20080212_introduced.html. California PUC has broadband minimum speeds at 3MB download/ 1MB upload. Unserved areas are defined as those "currently not being served by any level of broadband".

2008 Legislation: "The community service districts, which provide basic infrastructure such as water, sewer, and police services, will help extend broadband access into rural areas of the state that remain underserved. The bill (SB 1191) reflects the recommendations of the California Broadband Task Force, which was created in 2006. This action comes on the heels of a new report from the Public Policy Institute of California and the California Emerging Technology Fund, which finds that the digital divide in the state is growing between key demographics. Rural residents are marginally less likely to have access to a high-speed connection than urban dwellers, but some groups in both urban and rural areas are less likely to have access. Less than half of Hispanics in the state have home computers and only about

a third have access to a broadband connection... About two-thirds of white, black and Asian residents have at-home broadband access. Broadband use has also been decreasing among low-income residents around the state. This suggests that much of the state's digital divide problem could be linked to the high cost of access and a lack of competition.": http://www.ssti.org July 23, 2008 Issue: http://www.leginfo.ca.gov/cgi-bin/postquery?bill_number=sb_1191&sess=CUR&house=B&author=alquist

Pennsylvania Past Mapping Project and Broadband Initiatives:

Pennsylvania Technology Investment Map: Pennsylvania Technology Atlas - http://www.oit.state.pa.us/atlas/ (no longer functioning). The Technology Atlas, the first of its kind, resulted from the efforts of the Documentation of Resources and Technology Transfer Project, which was one of the main projects in Pennsylvania's Link-to-Learn Initiative. A very early discussion in 1999 of ESRI and GIS layers depicting the telecom geospatial attributes is found in an academic paper from University of Pittsburgh. The concept of Availability was depicted with wire centers and fiber optic coverage and Gap Analysis derived geographic areas without coverage. Maps were constructed based show availability by wire centers and fiber for the state. See http://ltl13.exp.sis.pitt.edu/Website/Webresume/ESRIPaper/P147.htm.

The Pennsylvania General Assembly passed Act 183 in 2004 requiring Pennsylvania's incumbent local exchange carriers (ILECs) to develop their networks to deploy broadband services throughout their service territories. Carriers may commit to achieving 100% broadband availability in their service areas in exchange for the opportunity to be regulated under a form of price cap regulation as opposed to the traditional rate base/rate of return regulation, may elect certain options (depending on whether they are considered rural or non-rural carriers) according to which they will commit to meeting certain broadband availability benchmarks by a particular date, and may be required to offer certain programs to promote and facilitate the deployment of broadband service to customers. For more information, see the Pennsylvania Public Utility Commission (PPUC) Broadband Service page at http://www.puc.state.pa.us/telecom/telecom_broadband.aspx, the Pennsylvania Economic Development Department at http://www.eda.gov/Resources/StateEconomicDevelopment.xml, and the Broadband Internet Use in Rural Pennsylvania report from May 2008 available at http://www.ruralpa.org/broadband2008.pdf.

Georgia High-Speed Communications Atlas - http://maps.gis.gatech.edu/telecomweb/index.html

This interactive atlas of fiber routes and access facilities was designed to support state and local efforts to attract high-technology firms, and to support educational and public sector initiatives for Georgia communities. Due to security concerns from telecommunications providers, the Georgia High-Speed Telecommunications Atlas is no longer available.

Georgia High-Speed Telecommunications Atlas: An ArcIMS Implementation, by Steven French and Xudong Jia in 2001 (See http://gis.esri.com/library/userconf/proc01/professional/papers/pap259/p259.htm). "Conclusions: The Georgia High-Speed Telecommunications Atlas is a powerful GIS tool to analyze the relationships between telecommunications infrastructure and economic development. It provides an on-line, interactive inventory of Georgia's high-speed telecommunications infrastructure designed to provide information to economic developers and the commercial real estate industry. This paper discusses how the initial high-speed

telecommunications atlas was extended to incorporate an address based query tool that is useful to firms, realtors and economic developers making location decisions on new buildings, firm headquarters and branch offices. The Atlas provides users with a powerful one-stop shop for telecommunication information for any given location in the Atlanta area. The use of an address-based front end makes this system available to users who are interested in their particular location. This address-based query tool is an important addition to the existing High-Speed Telecommunication Atlas. It can be accessed at http://pansy.gis.gatech.edu/website/telecom_gc/."

Illinois Mapping Project: "Broadband Access in Illinois" Study http://www.irps.ilstu.edu/broadband/broadbandoverview.htm

Background: With the merger of SBC and Ameritech in 1999, the Illinois PUC was able to secure $15M from the merger, of which $11M went toward helping the Telcos in "underserved" areas obtain better broadband access. The Illinois Commerce Commission (http://www.icc.illinois.gov) with Professor Ed Feser, PhD, Interim Head of Urban & Regional Planning at University of Illinois, Urbana-Champagne Campus, produced two GIS maps of gaps in Broadband service in Illinois. Data source was the FCC data on Service Providers Coverage (FCC Form 477).

The Broadband Deployment Council was created by a Gubernatorial Executive Order in 2005 (See http://www.il.gov/Gov/pdfdocs/execorder2005-9.pdf) and Lt. Governor Pat Quinn's office have provided leadership for the expansive Broadband projects in Illinois. (Ryan Croke, conversation, 7/2/08). For GIS mapping purposes, the project by Professor David Loomis, is most extensive in its scope and depth. Other projects are mentioned in this report, however, providing insight into the Broadband mapping process. Professor David G. Loomis, Ph.D. and co-author Dr. J. Lon Carlson, with the Institute for Regulatory Policy Studies in the Dept. of Economics at Illinois State University, conducted a nearly 2-year (June 2006-May2008) "... in-depth study and mapping of broadband access in Illinois. Working in conjunction with Lieutenant Governor Patrick Quinn's Broadband Deployment Council, the Department of Commerce and Economic Opportunity provided funds to Illinois State University..." for the study that is, essentially, testing predictive theory regarding community characteristics and broadband service provider distribution for policy analysis.

Mapping: GIS layers were used with ESRI maps and data collected for this study by Professor Loomis. Census data was incorporated, including population density, % urban population, number of Illinois Broadband Providers per Zip Code, and total number of Broadband Providers in the state. Municipalities were surveyed. The Lt. Governor Patrick Quinn's support and letter head were included with the surveys. Because of proprietary concerns, broadband availability was the main focus of the study, rather than service and pricing options. The Aug. 2007 Part 1 version is found online at http://www.irps.ilstu.edu/broadband/broadbandoverview.htm. Part 2, April 2008 of the study is not yet available online, however a PDF can be obtained from Professor Loomis.

Mapping Impact on Decision Makers: Legislative or other actions may surface after some time. His research is well known in Illinois and broadband circles. (Ryan Croke, phone call, 7/2/08) Professor Loomis can use his study for his Telecom Economics classes at the Illinois State University and research at the Institute for Regulatory Policy Studies in the Dept. of Economics at Illinois State University. Professor Loomis is not aware of any immediate State plans for his study. (Professor Loomis, e-mail, 7/2/08)

ConnectKentucky - http://www.connectkentucky.org/

Background: To accelerate technology growth and computer literacy among adults and children producing greater economic development for Kentucky, Governor Ernie Fletcher started the Prescription for Innovation Program in 2004. At the center was ConnectKentucky, an alliance of business, industry, citizens and government working to development Broadband access in Kentucky. Funding came from numerous sources, including: the State grants, Community and Regional groups grants, partners from the business and high-tech/telecom communities contributing membership fees; targeted financial and in-kind grants to special programs such as No Child Left Offline which provided low income school children with computer equipment.

Mapping: GIS mapping was conducted by the ConnectKentucky organization and now by the Connect Nation organization, which has the centralized facilities for Research, Mapping and Service Provider data collection for all their projects with other states. Mapping layers include census data, political boundaries, water features such as rivers, roads/highways, towers for cell sites, and various layers for Service Providers data. Availability and Inventory Maps at state-wide level were produced for Census Block level of Number of Unserved Households and Statewide Density of Unserved Households, Broadband Growth statewide since 2004, County Broadband compiled from Census and Density Maps for each county, and Adoption maps for Residential level by percentage of adults. Testing one's residential or business broadband speed state-wide is available on the website (called "Crowdsourcing" data), as well as identifying broadband providers in the local area is available on the website.

Mapping Impact on Decision Makers: Leaders of ConnectKentucky appeared numerous times in the U.S. Congress for testimony and influenced several bills introduced in the House and Senate. A new organization, Connected Nation, was spun off from ConnectKentucky to perform the ConnectKentucky model across the nation with other states. Tennessee and Ohio are among their newest states replicating the ConnectKentucky model, with other states showing interest. The extension of ConnectKentucky funding for $2.4M in Kentucky was vetoed by the new Governor Beshear in April 2008. According to ConnectKentucky staff, they are in talks with the Governor's office to renew funding.

ConnectKentucky Controversy: Some opposition is voiced to earlier ConnectKentucky history and practices, by Art Brodsky, Communications Director, at the Public Interest online: http://www.publicknowledge.org/node/1334. However, a rebuttal from Robert D. Atkinson, Ph.D. of Alliance for Public Technology, counters that Brodsky/Public Interest perspective "... sees the Internet's overriding purpose as to liberate individuals from control by or dependence on big organizations." See http://blog.apt.org/my_weblog/2008/01/disconnected-co.html. Brian Mefford, CEO, Connected Nation, refutes the Brodsky article issues in a "Detailed Rebuttal to Public Knowledge, Jan. 15, 2008", obtained from Joe Mefford, however a similar rebuttal, dated Jan. 11, 2008, is located on the website: http://blog.apt.org/my_weblog/2008/01/getting-the-rec.html#comments. Another controversy concerns an ex parte (rule making before the FCC) filed by CK/CN on July 1, 2008, against the FCC proposal for a Federal level Broadband Mapping effort. An ex parte opposing the CK/CN stance was filed with the FCC, July 11, 2008, by the Kentucky Municipal Utilities Assoc. (KMUA), a group of fourteen Kentucky utilities and one Kentucky city. KMUA supports the FCC proposal with comments that CK/CN services, mapping, and organization do not have the veracity than CK/CN claim. CK/CN objected with an ex parte against KMUA, which in turn issued an ex parte against CK/CN. The FCC will be the judge regarding the issues of

concern as documented in the FCC WC Docket No. 07-38, dated August 1, 2008. See http://www.appanet.org/files/PDFs/APPAKMUAFCCCommentsin073807172008.pdf. For the controversies mentioned above, all parties are seeking their own solutions.

Maryland Broadband Cooperative - http://www.mdbc.us/

Background: The formulation of the Fiber Backbone project has been nearly 10-yrs in the works, for Eastern, Southern and Western rural Maryland. (Mike Pennington, phone call, 7/8/08). The Maryland Rural Broadband Task Force was started by the Maryland General Assembly in 2003 and extended to 2006. The Task Force was responsible for the Rural Broadband Communications Services Act (SB 753/HB 1156) that passed the State Legislature in 2006. The legislation put in place funding and an oversight organization (Rural Broadband Coordination Board) to facilitate the creation of a Broadband Authority (Maryland Broadband Cooperative) to own, design, construct and maintain the regional Middle Mile Backbone Infrastructure.

Adesta, LLC, a systems integrator and project management company for communication networks and security systems, today (April 2, 2007) announced that it has been awarded contracts from the Maryland Broadband Cooperative (MDBC) valued at over $8 million to design and build the first 140-miles in the Eastern Shore Area of an open-access telecommunications infrastructure in Maryland's rural communities. The MDBC is a universal access, fiber optic network designed to deliver an advanced, world class broadband access to rural communities in Eastern, Southern and Western Maryland fostering economic development supported by its' members who will provide Last Mile Services.

Members can purchase low-cost access while building their market and customer base. Members can be existing and future competitive local exchange carriers or Internet Service Providers (ISPs); businesses desiring their own internal communications networks; governmental agencies (federal, state and local); and even existing incumbent carriers and cable television companies that desire expanded or improved coverage of their networks via a fiber optic backbone. See http://www.adestagroup.com/adesta/contents/news/Adesta%20MDBC%20release.pdf.

Mapping: Maryland Broadband Cooperative (MDBC), the planning organization for the network, is using OSPInsight (http://ospinsight.com/osp/) software from Advance Fiber Optics, Inc. for GIS and network modeling/display, according to Gary Ruack, IT Services Manager (Gary Ruack, phone call, 6/25/08) OSPInsight can "...store valuable and minutely detailed information about every aspect of your fiber optic, coaxial and copper network quicker and easier than any other GIS based network modeling system. It empowers your entire organization with instant and easy access to specific and cumulative network data retrieved from a relational database and displayed in customizable tabular and graphical formats to fit each individual's needs." See http://ospinsight.com/osp/. For the current network modeling/design, construction, and turn-up stages, the MDBC is using OSP Insight, an ESRI (or MapInfo alternative) GIS-based software that incorporates network design/modeling, network tech specs with spreadsheets superimposed on the GIS base. (Randy Anderson, phone call, 7/11/08) The software can be used for GIS display, network technical detailing, network monitoring of fiber breaks/splicing etc. Distributors of the software locally have contractors who can manage the software and inputting of data, etc. for a company.

ConnectedTennessee - http://www.connectedtennessee.org/

Background: Early Legislation in 2005 set out the formation of a Tennessee Broadband Task Force, which presented their report in 2006 after attempting to determine Availability of Broadband, which failed since the Service Providers voluntary response with their data was unfortunately lacking from more than half of rural Providers. ConnectKentucky staff and other organizations presented at a Tennessee Broadband Task Force meeting and gained the interest of Tennessee. In January 2007, the Task Force recommended using the ConnectKentucky model, using a public-private partnership be formed along with other elements of the ConnectKentucky model, which touted improved outcomes. Now in the second year of operation, ConnectedTennessee began as a model of ConnectKentucky, the neighboring state's predecessor, with some ConnectKentucky executive leadership transferring to the ConnectedTennessee staffing. In 2007, ConnectedTennessee received from Tennessee State a grant of $6M for 3 years or $2.25M/year.

Mapping: Connected Nation (CN - http://www.connectednation.org/), the parent organization for ConnectedTennessee and ConnectKentucky, performs the Mapping, Research, and Service Provider data collection with NDAs. CN considers its operations proprietary at this stage of CN development. CN "lessons learned" and experience from past projects are absorbed into their new projects. GIS with ESRI is the platform. With an NDA, Service Providers' data is submitted in whichever format they use, and data is converted to GIS by the CN team. Providers supply updates to CN. According to the CT staff, providers are more willing to supply customer demand when they see return on investment (ROI); the Availability/Non-Availability Mapping and Demand Studies show them where the gaps in desired services are located geographically and demographically.

Mapping Impacts on Decision Makers: eCommunities: The Connected Nation Research team is involved with some basic survey work. The Communities formulate their Strategy Plan, revolving around: Where are we? Where do we want to go? How will we get there? (e.g., Gap Analysis) "One of the key goals of Connected Tennessee is to establish eCommunity Leadership Teams in every county. Connected Tennessee's technology planning specialists (eCommunity Strategists) will work with these teams to develop comprehensive technology growth plans that involve many sectors of the community including local government, business and industry, education, healthcare, agriculture, libraries, tourism, and community-based organizations. Each eCommunity team will complete a Strategic Technology Plan for their respective county. The reports will provide every Tennessee County with a tactical plan to address its own challenges related to technology growth. Each Tennessee resident stands to benefit from the eCommunity Leadership Teams' hard work." See http://connectedtennessee.org/find_your_county/ecommunity_strategies.php.

Funding for the eCommunities programs is supposed to come from the Communities or other sources located by the community Teams and groups. Community Benchmarking Tool is created for every sector analyzed: Agriculture, Business/Industry, Community-based organizations, education (Higher, K-12), local government (eGovernment), healthcare, libraries, and tourism. For example see Higher Education Benchmarking Tool: http://www.connectedtn.org/_documents/HigherEducation.pdf. The Surveys and Benchmarking Tools are used in Gap Analysis, e.g., where are we in 200X and where do we want to be in 200X+ 2yr. Then: How do we get there? Broadband Deployment may be one the solutions. For example, the Business and Industry Benchmarking Tool: http://www.connectedtn.org/_documents/BusinessandIndustry.pdf. Some ConnectKentucky

eCommunities had issues finding adequate funds, however ConnectedTennessee is perhaps not far enough along to know their issues. All parties are seeking their own solutions.

Vermont Telecom Authority (VTA) - http://www.telecomvt.org/

Background: In the 2002-03, Vermont Council on Rural Development (VCRD) with some communities in Vermont sponsored a study of Internet and Broadband use in Vermont. The rural areas of Vermont, which comprise much of the state and smaller towns noted problems with affordable and accessible high-speed Internet. A Vermont Rural Broadband Project was formed by the VCRD to assist some 40 communities. In 2006, availability of Broadband for 84% of Vermont's population was reported. An expected 90% may be available in 2007 as updated deployment figures. However the 10% that is not covered will not be covered by ILECs anytime soon and smaller Providers lack the resources for prompt action. Further, cellular (wireless) access covers about 85% of the state with serious gaps along the major highways. The Vermont Legislature passed Act 179 in 2007 to extend wireless, broadband coverage to 100% of state by 2010. The Vermont Telecom Authority (VTA), a quasi-governmental agency that works with PUC and the Public sectors, was created in the legislation as well. VTA work began YE07. The short-term goal is coverage by wireless in 2010, while the longer-term goal will entail (fiber) broadband for Internet, television, and telephone services as well as next generation networks coverage of the state.

Mapping: Broadband Mapping was accomplished prior to VTA by the Vermont Department of Public Service (DPS - http://publicservice.vermont.gov/telecom/telecom.html), leading the telecom advocacy services for the state with Vermont Center for Geographic Information (VCGI - http://www.vcgi.org/) performing the GIS mapping per se. VCGI, a non-profit public agency, funded by grants and payments for services from Government Agencies and Private Organizations in Vermont, and maintains a repository of maps and data for the State with a GIS basis. Maps for Service Providers, Census Data, Physical Landmarks, and so on are available. Maps for many Service Providers have been obtained from fortuitous mergers and judicial cases: Adelphia Cable, in financial trouble in early 2000s, was watched by the PUC closely and had to turn in maps, plans to PUC. The Vermont Department of Public Service (DPS) is "...an agency within the executive branch of Vermont state government. Its charge is to represent the public interest in matters regarding energy, telecommunications, water and wastewater." See http://publicservice.vermont.gov/about-dps/about-dps.html.

Mapping Impact on Decision Makers: A Vermont DPS Broadband Availability Map from 2006 provides services coverage, which was instrumental in passing the Act 179 legislation in 2007. One report produced by DPS in 2007 describes the opportunities and barriers to VT Broadband use, "Understanding Broadband Deployment in Vermont", influencing the Act 179 passage and a second report mandated by Act 179 with Recommendations and Goals for Vermont Broadband was "Access for All: Meeting Vermont's Broadband and Wireless Goals." See http://publicservice.vermont.gov/telecom/telecom.html.

The Vermont Telecom Authority (VTA), aware of Broadband issues noted from Maps and Reports, already has produced very pioneering decision making. Innovative solutions are being encouraged and used, such as the following:

- For wireless antenna placements: making deals with communities/utilities to use water towers, utility poles, silos from private sector.

- State Government making deals with Service Providers who will build-out rural areas by offering State Assets (ROW, towers, etc.) at a discounted price or no charge.
- Strict Environmental laws were superseded with new permitting legislation allowing Streamlining Permitting. There is a new permitting process for a network permitting basis, not site by site permitting: "If Vermonters require a network of sites in order to get service, it makes sense to review the environmental impact of such proposals as a network instead of a collection of individual sites. We propose that developers of wireless communications infrastructure (such as the VTA) be given the option to request a permit from the Public Service Board in lieu of local and Act 250 permits, if they are proposing a multi-site development. Such a process should require the Board to weigh relevant...criteria, the requirements of the municipalities involved, as well as the state's need for service. In addition, we recommend the creation of a streamlined review process for wireless facility attachments to existing electric transmission and generation facilities, which are already reviewed by the Public Service Board. To avoid drawn-out litigation, these processes should have statutory clocks for a decision to be rendered. See http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf.
- Use the government capital for infrastructure, which the private sector leases and eventually pays back the $40M bond to the government.
- ROW on government land (state/local) streamlined permitting to facilitate rapid permitting ROW (Source: Jim Robinson, VTA Program Director, discussion, 5/28/08)

The (VTA) authority shall have the following powers, which shall be exercised to further the authority's purpose, and shall have all other powers necessary to carry out the duties imposed on the authority by law:

- to establish partnerships and contracts with providers of telecommunications services and related facilities to serve unserved people and areas of the state; and to provide financial and other assistance to providers who agree in return to provide mobile telecommunications or broadband services to unserved people and areas of the state; and to facilitate directly or indirectly the efforts of other entities to advance the availability of mobile voice and high speed data or broadband services
- to provide financial assistance in the form of loans, grants, guarantees, other financial instruments, or, in accordance with section 8064 of this title, to issue bonds backed by project revenues, the state, or its political subdivisions, or both, for the purpose of building infrastructure capable of delivering mobile telecommunications and broadband services to all Vermonters;
- to consult, contract, or partner with the Vermont economic development authority and the Vermont municipal bond bank to provide financial assistance for purposes authorized by this chapter;
- to coordinate access to and pursue regional and local revolving loan funding and all state, federal, and private funding that is available for telecommunications infrastructure, including financial assistance that may be available to rural economic area partnership (REAP) zones, as designated by the U.S. Department of Agriculture and to contract with financial assistance providers;

- to receive and accept grants, gifts, loans, or contributions from any source subject to the provisions of the VTA has bonding authority."

  See http://www.leg.state.vt.us/docs/legdoc.cfm?URL=/docs/2008/acts/ACT079.HTM (Source: Deborah Shannon, VDPS, edit, 1/21/09)

Virtual Alabama - http://dhs.alabama.gov/virtual_alabama/home.aspx?sm=g_a

Background: In October 2005, the Alabama Department of Homeland Security (AL DHS) initiated a project to access new technologies in 3D visualization. At the request of Governor Bob Riley, AL DHS began exploring and identifying ways to leverage existing state asset imagery and infrastructure data into a visualization tool that is affordable, scalable, maintainable, and capable of employing the power of existing and evolving Internet based applications. As a result, the Virtual Alabama program was created. Virtual Alabama serves a wide user base of state and local officials at various levels of technological proficiency. As an information tool, Virtual Alabama reduces technology gaps in economically challenged areas and levels the information "playing field" throughout the state. Additionally, the program provides the ability to integrate and distribute proprietary data securely across the Internet.

In August 2006, Virtual Alabama reached initial operational capability (IOC). In November 2007, Virtual Alabama had over 1800 online users and the best imagery available from all 67 Alabama counties ingested into the program. Partners include the Alabama Department of Homeland Security, the U.S. Space & Rocket Center, and various federal, state, and local government agencies. See http://www.dhs.alabama.gov/virtual_alabama/pdf_files/VirAL_Fact_Sheet.pdf.

Mapping: Google Earth Enterprise is the platform with aerial photos and many other applications from various agencies and counties. DHS Director Jim Walker indicated that the state purchased the software, hardware and license for Google Earth from the company for $150,000 and distributed it to the state's agencies and governments for free. It has taken about 15 months to compile data from all 67 counties in Alabama, a task that has sometimes bumped up against political and proprietary obstacles. Governor Riley acknowledged that some people will be concerned about state government becoming too intrusive, but said that is not the goal of Virtual Alabama "What we are doing is making government more responsive," he said. A password is necessary to access the information.

Mapping Impacts Decision Makers: Each city, county, governmental agency uploads the data they want to use. Google Earth is very practical for mobile organizations, such as patrol cars, which upload Google Earth in the patrol cars in real time and upload buildings for fires, for example. Alabama DHS sets the permissions, for example, who can view the cameras in schools. (David Hartin, phone call, 7/23/08) See http://www.ci.tuscaloosa.al.us/index.asp?NID=55. Real time activities associated with Virtual Alabama:

- Common operational picture
- Emergency evacuation routing
- Situational awareness/understanding
- Vehicle and asset tracking
- Critical infrastructure mapping
- Student density
- Identification of assets and vulnerabilities
- Visualization of risks
- Plume modeling and real-time sensors feeds
- Implementation of protective measures during events
- Damage assessment

An Alternative Approach: Broadband Deployment from the Bottom Up

Background: Professor Ed Feser, Ph.D., Interim Head of Urban and Regional Planning at the University of Illinois, Urbana-Champagne Campus, worked with Jane Patterson and e-NC Authority project in prior years, as a Regional Planning Economist with the State. He paid the highest compliments to Jane Patterson as very knowledgeable in the subject matter and her ability to work with people throughout the state and country. He suggests many aspects of the e-NC Model can be utilized, but without the expensive and exhaustive state mapping process and service provider data problems. Programs and grants or funding is more important than mapping project per se. "TechSupport Centers" and local support are more critical to the success of a program.

His article in 2007 "Encouraging Broadband Deployment from the Bottom Up" in the Journal of Regional Analysis & Policy, 2007, discusses the problems with the "Rational-Comprehensive Approach", which is the intensive GIS mapping endeavor by e-NC and others. In retrospect, for states with fewer financial and other resources (e.g., e-NC original GIS mapping cost $1M and not many states have that funding), he suggests another approach that is less costly for a State and places the initiative with the local, county organizations in the Broadband process.
(See http://www.jrap-journal.org/pastvolumes/2000/v37/F37-1-feser.pdf)

Top Down vs. Bottom Up Approaches Summary: “Given the complexity of the technological, regulatory and market environment in which broadband is developing, states should avoid attempts to design and implement high cost, top down, comprehensive strategies aimed at closing all infrastructure gaps. Instead, they should look to design and implement flexible programs to incentivize and assist locally-driven efforts to improve provisioning and encourage demand. While that will require building a capability to truly catalyze local efforts, preferably housed in a single small organization or authority with the necessary expertise, it need not require massive expansion in government programs or the creation of a large bureaucracy.” The creation of an up-to-date map or catalog of a state’s information technology infrastructure is extraordinarily difficult for a variety of reasons:

- Because providers are loath to release information on their networks,
- Because the infrastructure is evolving rapidly,
- Maps are out-of-date shortly after they are created, and
- The rational-comprehensive approach also implies that the state could successfully direct the closure of gaps even when no local initiatives are driving the intervention.

Arizona Government Information Technology Agency
Broadband Assessment GIS Study

Appendices

Appendix A - State of Arizona Agencies

Appendix B - Arizona Counties and Municipalities

Appendix C - Other Arizona Organizations of Interest

Appendix D - External Broadband Assessment GIS Sources

Appendix E - GIS Platforms, Tools, and Resources

Appendix F - Other States' Broadband Assessment Case Studies

Arizona Government Information Technology Agency
Broadband Assessment GIS Study

Appendix A - State of Arizona Agencies

State of Arizona Agencies

- Arizona Government Information Technology Agency (GITA)
- AZ3D (GITA, DHS, DPS, SLD, ADOT and Others)
- Arizona Department of Administration (ADOA)
  - Telecommunications Program Office (TPO) and Accenture/Calence
- Arizona Department of Commerce (ADOC)
  - Arizona Workforce Informer/State Data Center Program
- Arizona Department of Economic Security (DES)
- Arizona State Land Department (SLD)
- State Cartographer Office (SCO)
  - Arizona Geographic Information Council (AGIC)
- Arizona Geological Survey (AZGS)
- Arizona Department of Public Safety (DPS)
- Arizona Department of Homeland Security (DHS)
- Arizona Division of Emergency Management (DEM)
- Arizona Department of Education (ADE)
- Arizona School Facilities Board (SFB)
- Arizona State Library, Archives and Public Records (ASLAPR)
- Arizona Corporation Commission (ACC)
- Arizona Department of Transportation (ADOT)
- Arizona Department of Revenue (ADoR)
- Arizona Department of Real Estate (ADRE)
- Arizona Department of Health Services (DHS)
- Arizona Health-e Connections (AzHeC)
- Arizona Department of Environmental Quality (ADEQ)
- Arizona Independent Redistricting Commission

Appendix A - State of Arizona Agencies

Arizona Government Information Technology Agency (GITA)

GITA Home Page - http://www.azgita.gov/

GITA Description & Links:

The **Arizona Government Information Technology Agency (GITA)** serves as the strategic planning and coordination agency for information technology for the State of Arizona. The GITA director also serves as **State Chief Information Officer (CIO)**. Today, GITA serves as the official state agency for: IT Coordination & Planning, IT Project Review & Monitoring, E-Government, Statewide Information Security & Privacy Office, and Strategic Initiatives Unit. GITA also serves on several Councils and Committees and provides resources for state agency Chief Information Officers (CIOs) and private vendors.

Enterprise Architecture (EA) - http://azgita.gov/enterprise_architecture/

Telecommunications - http://azgita.gov/telecom/

RFI Resource Information with Community Telecom Assessment (CTA) Reports and Regional Fiber Maps (2005) - http://www.azgita.gov/telecom/historical/TISC/RFI/default.htm

Web Links - http://www.azgita.gov/telecom/links.htm

Arizona Public Safety Communications Commission (PSCC) - http://www.azgita.gov/pscc/ (formerly http://www.azdps.gov/pscc/default.asp)

PSCC Conceptual Design Report - http://www.azgita.gov/pscc/conceptualdesignreport.htm

Statewide Communications Interoperability Plan (SCIP) - http://www.azgita.gov/pscc/ARIZONASCIP20071129FINAL.pdf

Rural Health Information Technology Adoption (RHITA) Grant Program - http://azgita.gov/ehealth/rhita/

GITA Contacts:

Chris Cummiskey, GITA Director & State CIO, Office: 602-364-4770, E-Mail: ccummiskey@azgita.gov

Margaret Mueller, Executive Assistant, Office: 602-364-4799, E-Mail: mmueller@azgita.gov

Galen Updike, Telecommunications Development Manager, Office: 602-364-4794, Mobile: 602-614-3831, E-Mail: gupdike@azgita.gov

Brian Sherman, Strategic Initiatives Manager, Office: 602-364-4775, E-Mail: bsherman@azgita.gov

David Vandernaalt, Chief Information Security Officer, Office: 602-364-0535, E-Mail: dvandernaalt@azgita.gov

Mary Beth Joublanc, Chief Privacy Officer, Office: 602-364-4537, E-Mail: mbjoublanc@azgita.gov

DJ Harper, Communication Manager, Office: 602-364-4772, E-Mail: djharper@azgita.gov

Barbara Nicholson, CFO, Office: 602-364-4800, E-Mail: bnicholson@azgita.gov

Arizona Government Information Technology Agency (GITA) (Continued)

GITA Interviews:

Ongoing involvement of Galen Updike and Brian Sherman throughout the course of the project. Brian Sherman interviewed regarding AZ3D on 7/14/08.

GITA GIS Experience/Use:

GITA has a single desktop license for ESRI ArcView. Galen Updike has received some training and ArcView is occasionally used in telecom data aggregation and analysis, as well as the exploration of capabilities and necessary resources for the projected Broadband Assessment GIS Project.

GITA Database & GIS Sources:

Some submitted and scanned representation of individual carriers' networks or network elements focusing on middle mile and long haul fiber infrastructure. Such data may be considered proprietary by the carriers and only usable for approved purposes and use. A number of such Arizona regional maps are available at http://www.azgita.gov/telecom/historical/TISC/RFI/default.htm.

GITA as the strategic planning and coordination agency for information technology for the State of Arizona has particular insight and relations with other State agencies which hold a variety of specific and unique GIS and database assets of interest and use to the proposed Broadband Assessment GIS Project. Those assets have been investigated and detailed in the course of this study and provide core elements for the projected capabilities when complemented by external licensed data sources and selective surveying.

GITA has a shared interest and responsibility with the Arizona Department of Administration (ADOA) and their Telecommunications Program Office (TPO) to ensure that the State of Arizona has a cost effective, efficient, and consolidated shared telecommunications infrastructure namely Arizona Network (AZNet). A wealth of telecom infrastructure data can be gleaned from AZNet procurement, operation, management, and maintenance of the State's telecommunications voice and wide area network (WAN) assets and services through cooperation with Accenture as well as Calence and Black Box.

GITA has had a strong and fruitful involvement along with the Arizona Department of Commerce in driving telecom deployment in the economic development environment arena and driving state broadband policy in cooperation with the Arizona Telecommunications & Information Council (ATIC) and GCIT's CIAC. This has yielded relationships and cooperation with most of the major telecom providers who can and should be encouraged to participate in the Broadband Assessment GIS Project contributing their deployment and infrastructure data as practical within appropriate proprietary constraints. A previous Community Telecommunications Assessment (CTA) program yielded extensive community profiles and could be revived and expanded going forward (see http://www.azgita.gov/telecom/historical/TISC/RFI/default.htm).

Arizona Government Information Technology Agency (GITA) (Continued)

GITA Database & GIS Sources (Continued):

The Arizona Public Safety Communications Advisory Commission (PSCC) is the state commission responsible to enable real-time, interoperable communications between local, county, state, tribal, and federal public safety organizations in the State of Arizona to effectively protect lives and property, promotes the development and adoption of user based, standards-based systems, and capitalizes on opportunities to share resources and leverage existing infrastructure. PSCC has operated under DPS in the past, but is being transferred to GITA between 7/1/08 and 9/26/08 to take advantage of GITA's extensive experience in managing strategic initiatives, partnering with subject matter experts to build coalitions and delivering complex information technology projects.

GITA Broadband Assessment Project Interest:

GITA is the primary proponent and organizing force behind the proposed Broadband Assessment GIS Project which will utilize a variety of sources and processes to estimate the location and capacity (current supply), as well as utilization (current demand) of broadband service throughout the State of Arizona tied to Geographic Information System (GIS) coordinates and various area boundaries.

The analysis and use of this information would be crucial to broadband gap analysis and informed policy making regarding State initiatives and support mechanisms. Detailed geographic analysis regarding ‘middle-mile’ broadband deficits in rural Arizona would lead to specific and precise remediation planning. Such concrete information and situational awareness should prove useful to regional and local government and NGOs in a variety of ways for planning and building local awareness and involvement in solutions.

GITA’s Broadband Assessment GIS Project can be used to model and forecast future supply and projected demand for broadband service in anticipation of advanced services and applications, as well as the ability to meet evolving consumer and business demand. The telecom provider community could more clearly and accurately identify unserved and underserved areas, targeting investment and resources more appropriately and accurately.

In any sort of regional or statewide emergency, communications capabilities are critical to first responders, as well as for the operational continuity of a variety of government entities, and certainly to the citizens whose lives are impacted. The projected capabilities of the Broadband Assessment GIS Project to identify and analyze communications pathways and capabilities in real time could provide crucial assistance in times of crisis to agencies such as DPS, OHS, DHS, DEM, AZ3D, and others in restoring critical communications capabilities and accelerating special deployments as needed.

AZ3D

AZ3D Description & Links:

The **Arizona Government Information Technology Agency (GITA)**, in collaboration with the Arizona Departments of Homeland Security, Transportation, State Land, Public Safety, and other agencies, is creating an enterprise system to integrate imagery and other geospatial data into a common operating picture for decision-makers and emergency responders.

This system would integrate imagery and numerous datasets with geo-based attributes into a non-technical Internet-based viewing environment that can be shared and utilized by state and local government emergency planners, first responders, and other decision makers to help ensure public safety and continuity of government operations in the event of an emergency or disaster.

Commencing in Fall, 2008 supported by an anticipated U.S. DHS grant, these agencies will begin developing AZ3D proof of concept focused on border security. The AZ3D software visualization tool and virtual, three-dimensional globe will include the creation of the **Arizona Geospatial Clearinghouse (AGC)**, an infrastructure to assemble, integrate, develop, and distribute geospatial data and services with appropriate data management and security capabilities.

AZ3D Contact:

Brian Sherman, Strategic Initiatives Manager, GITA, Office: 602-364-4775, E-Mail: bsherman@azgita.gov

AZ3D Interview:

Brian Sherman interviewed on AZ3D on 7/14/08 and backup documentation provided.

AZ3D GIS Experience/Use:

The proposed AZ3D project will likely utilize an ESRI GIS platform and leverage existing investments across the State in geospatial data, GIS, and IT infrastructure, drawing on a variety of State agencies' specialized datasets, knowledge, and needs.

AZ3D Database & GIS Sources:

A task force of state geospatial professionals determined that creating and maintaining a statewide enterprise visualization application requires a centralized repository of core statewide geospatial datasets, and a program with professional and technical staff dedicated to outreach, hosting, security, data integration and application development. Therefore, AZ3D will be implemented with three primary objectives; 1) leverage existing investments across the State in geospatial data, GIS, and IT infrastructure, 2) create a simple to use application interface of visualization tools from which authorized non-GIS professionals may access a common operating picture for improved situational awareness and enhanced decision-making capabilities, and 3) create the Arizona Geospatial Clearinghouse (AGC), an infrastructure to assemble, integrate, develop and distribute geospatial data and services, to support AZ3D,

AZ3D (Continued)

AZ3D Database & GIS Sources (Continued):

Arizona Border and Homeland Security, and other authorized state and local geospatial data providers and consumers.

For Arizona government, AZ3D will provide unprecedented flexibility for geospatial data integration by accommodating common proprietary and open GIS data formats, datums, and projections, as well as standard metadata formats established by the Federal Geographic Data Consortium (FGDC). The application will comply with the security standards in the State's Technology Infrastructure Standards Assessment (TISA), and fully support the federal data exchange standards for the Homeland Security Infrastructure Program (HSIP), and ICAV, a federal Department of Homeland Security geospatial intelligence analytic tool. Project governance for the initial phase will be under the Governor's Emergency Planning Oversight Committee (EPOC).

State agencies who are stewards of specialized data can rely on the AGC to create and maintain core spatial datasets like surface imagery, elevation, transportation and utility networks, geodetic control for positional accuracy, and other critical infrastructure. Free from redundant data maintenance, other agencies instead may focus on data and applications that meet their unique business requirements.

AZ3D Broadband Assessment Project Interest:

GITA's work in developing a Broadband Assessment GIS Project has uncovered and documented numerous existing GIS capabilities, datasets, and resources across many State agencies that should prove invaluable in the planning and implementation of the AZ3D project.

GITA's Broadband Assessment GIS Project, if brought to fruition, would document and model telecommunications infrastructure and capabilities which when integrated to AZ3D would be of great interest and use to state and local government emergency planners, first responders, and other decision makers to help ensure public safety and continuity of government operations in the event of an emergency or disaster.

Assuming AZ3D progresses past the proof of concept phase, as it secures its permanent base and ongoing budget support, it would become a possible platform to migrate the GITA Broadband Assessment GIS Project datasets and analysis capabilities to, freeing GITA from redundant data maintenance and allowing it to focus on telecom data and applications that meet their unique business requirements.

Arizona Department of Administration (ADOA)

ADOA Home Page - http://www.azdoa.gov/

Telecommunications Program Office (TPO) - http://tpo.az.gov/

ADOA TPO Description & Links:

Arizona Department of Administration (ADOA) established a **Telecommunications Program Office (TPO)** within ADOA to ensure that the State of Arizona has a cost effective, efficient, and consolidated shared telecommunications infrastructure to meet the needs of government agencies, their employees, and the public and for the oversight of a single statewide telecommunications network called the **Arizona Network (AZNet)**. Offices, departments, and agencies of the State enter into a contract through the TPO for their telecommunication needs, including the installation and the maintenance of telecommunications systems. The TPO is also charged with ensuring that its contractor acts as the State's agent for all carrier services to the offices, departments and agencies within AZNet.

Arizona Network (AZNet) scope is to: Operate, manage and maintain state telecommunications voice and wide area network (WAN) assets and services, acquire, operate and maintain new assets and services, as needed, to meet the State's service level requirements, and transition and support all **Arizona Telecommunications Systems (ATS)** customers and all state government agencies. The initial AZNet Contract was awarded on January 21, 2005 to **Accenture** whose team includes **Calence** and **Black Box** (formerly Nextira One). It was for an initial five-year term with two optional 2-year extensions and was extended in January 2006 for two years. The total Contract value, including carrier costs, is approximately $200M over the initial five-year term. Additionally, the TPO awarded the **Carrier Services Contract** in January 2006. An annual survey of participating agencies is conducted and FY08 report results are due in September. An ongoing Savings Scorecard and SLA Incident and Severity data are produced and available. AZNet site, carrier, circuit, cost, and operational data would be of significant interest to GITA as a geo-coded picture of State telecom use and broadband availability to incorporate accordingly.

Telecommunications Program Office (TPO) Organizational Chart (PDF) - http://tpo.az.gov/UserFiles/File/TPO%20Org%20Chart%2003%2008%20Public.pdf

AZNet Accenture Team Organization Chart (PDF) - http://tpo.az.gov/UserFiles/File/AZNet%20Team%20Org%20Chart%2005-08.pdf

Reports - http://tpo.az.gov/reports.asp

Publications - http://tpo.az.gov/publications.asp

Online Services - http://www.azdoa.gov/online-services

Arizona Network (AZNet) Services 6/07 (PDF) - http://tpo.az.gov/UserFiles/File/TPOAZNetServicesProvided06-07.pdf

Arizona Network (AZNet) Overview Presentation 10/07 (PDF) - http://tpo.az.gov/UserFiles/File/AZNetIntroduction10-07FINAL.pdf

Plus review of AZNet Steering Committee Meeting Presentation from 7/16/08

Arizona Department of Administration (ADOA) TPO (Continued)

ADOA TPO Contacts:

Pat Mah, TPO Director, Office: 602-364-0558, E-Mail: pat.mah@azdoa.gov

Yvette Medina, Executive Assistant, E-Mail: yvette.medina@azdoa.gov

Tim McKeen, Statewide Network Architecture Manager, Office: 602-364-1176, E-Mail: tim.mckeen@azdoa.gov

David Wang, Statewide Network Architecture Manager, Office: 602-364-1142, E-Mail: david.wang@azdoa.gov

Accenture and Calence Contacts:

John Rodi, AZNet Deputy Program Manager & Operations Manager, Accenture, Office: 602-364-2071, E-Mail: john.w.rodi@accenture.com

Ed Martin, Engineering, AOP & IIC Projects, Accenture, Office: 602-364-0247, E-Mail: edwin.martin@accenture.com

ADOA TPO Interview:

Pat Mah, Tim McKeen, David Wang, and Jack Kriegh (formerly with ADOA TPO) interviewed on 4/25/08.

Calence Telecom Purchasing Data:

Calence should be able to provide aggregations of state telecom purchasing in geo-coded form by user, circuit type, carrier, and possibly cost for various agencies' facilities and possibly other AZNet participants including the Supreme Court and some libraries.

ADOA TPO GIS Experience/Use:

ADOA TPO has no internal GIS or mapping capabilities currently.

Accenture and Calence GIS or mapping capabilities unknown at this time.

ADOA TPO Database & GIS Sources:

Circuit orders are placed by TPO to Accenture and in turn to Calence, who should be able to provide aggregations of state telecom purchasing in geo-coded form by user, circuit type, carrier, and possibly cost for various agencies' facilities and possibly other AZNet participants.

MAGnet I and II includes 7 tier 1 sites and a number of buildings with various telecom provider fiber assets or leased circuits. Some information is available, especially as a list of "on net" buildings and network topology drawings.

BillPort billing information and limited network status and metrics such as network security monitoring, SLA compliance, traffic volume, and circuit use are selectively captured/reported and might be utilizable for GITA's needs.

ADOA TPO Broadband Assessment Project Interest:

ADOA TPO can foresee being an end-user of the GITA Broadband Assessment GIS Project once operational in determining provider and circuit availability and general broadband capabilities across its geographically diverse responsibilities.

Arizona Department of Administration (ADOA) TPO (Continued)

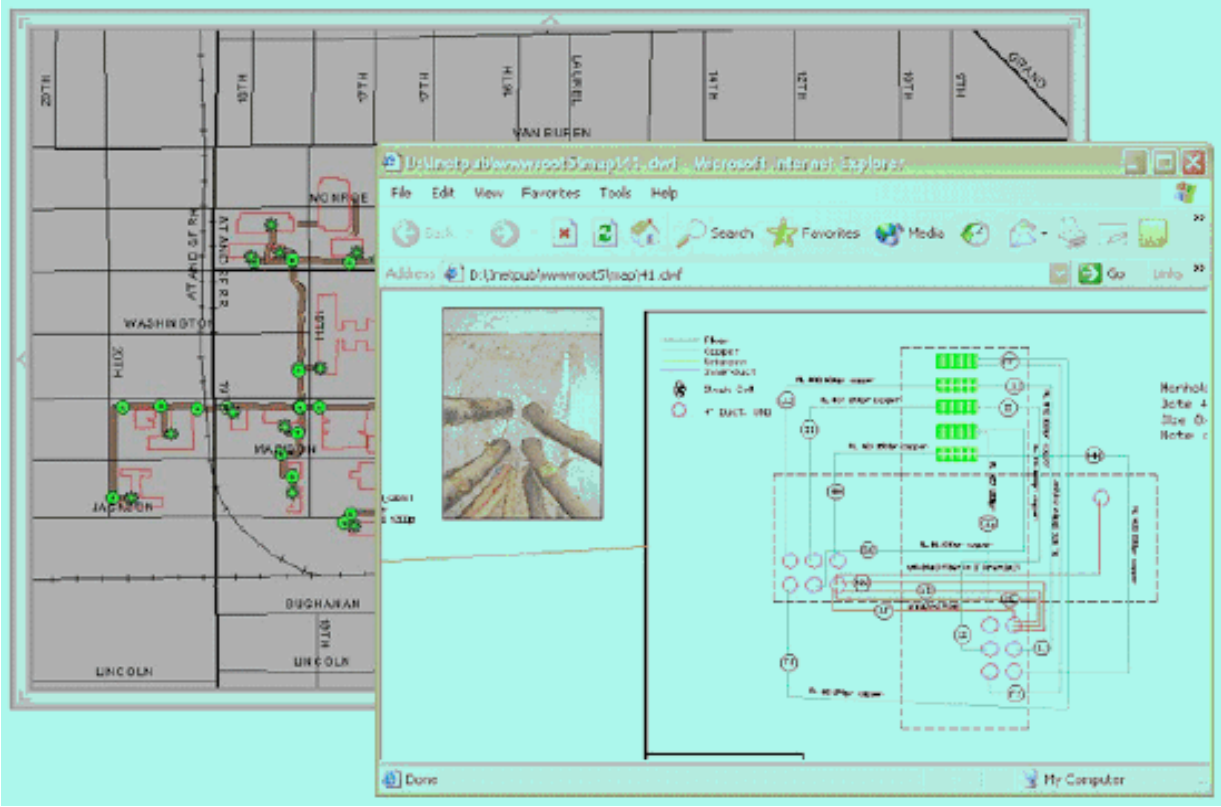
ADOA TPO MAGnet Engineering and Mapping by Fiber Specialists Inc.:

Conference Presentation - Telecommunications GIS for the State of Arizona and the City of Phoenix by Michael Ralph Maier from Proceedings of the Twenty-Third Annual ESRI User Conference, 2003

Abstract: Since 1988 FSI (Fiber Specialists Inc.) has been building and maintaining the Telecommunications structure for the Arizona State Mall Complex, drafting this onto large paper sheets. Up until 2002 the State was still relying on those paper as-builds. In 2001 FSI made an investment in GIS technology. Bringing on an experienced GIS manager with a strong background in survey and field data collection, FSI set out to develop a method to accurately and efficiently create GIS data that represents the real world telecommunications infrastructure that exists at The Arizona State Mall Complex. The entire Out Side Plant Telecommunication for the City of Phoenix is being mapped and as-built. These data are being put into an ESRI ArcMap Telcordia GIS. FSI uses telecommunication professionals that build networks to create data for the GIS. The tools being utilized in the field are ArcPAD, PenMap, Trimble DGPS, and Total Stations. If you collect good data, it will show connectivity and flow in fiber and copper networks. All Inside Plant Telecommunication and Data wiring is being inventoried for the City of Phoenix. This data is being fed into an accounting program (SAP) to become the main facilities management system. This data is being collected with ArcPad and uses a geographic component. The geographic component is stored in SAP and will be fed into ArcMap Telecordia Network Engineer.

Abstract on ESRI Site - http://training.esri.com/campus/library/Bibliography/RecordDetail.cfm?ID=29322

Paper (PDF) on ESRI Site - http://gis.esri.com/library/userconf/proc03/p1207.pdf



Arizona Department of Commerce (ADOC)

ADOC Home Page - http://www.azcommerce.com/

ADOC Description & Links:

Arizona Department of Commerce (ADOC) mission is to create vibrant communities and a globally competitive Arizona economy through leadership and collaborative partnerships. Workforce and Business Development supports entrepreneurs, small businesses, minority and women-owned enterprises and industry sectors. The **Office of Innovation and Technology** supports technology-oriented businesses, and links them with resources and ideas from innovative leaders throughout Arizona. **Marketing and Business Attraction** promotes Arizona as a premier location for business expansion and location including foreign trade offices in Asia, Europe and Mexico.

Strategic Investment and Research serves as the State's clearinghouse for economic information and strategic research related to Arizona's economy. **Community Development** focuses on local capacity-building by providing technical and financial assistance to cities, towns, counties, and tribal communities on land use planning, economic development, downtown revitalization, public involvement, smart growth best practices, military land use compatibility, and the complexities of zoning. **The Rural Economic Development Initiative (REDI)** program and **Arizona Main Street** program assist Arizona's rural communities in achieving sustainable economies and foster economic development and revitalization in historic downtown areas. The **Arizona Office of Smart Growth** manages an **Arizona Smart Growth Scorecard** program and administers funding to assist communities with meeting state mandated planning requirements through **Growing Smarter Planning Grants**.

Previously part of the **Department of Economic Security (DES)**, both the **Arizona Workforce Informer** and **Research Administration** moved to the Department of Commerce in December 2007 to provide more efficient research data and information to Arizona communities, businesses, planners, lawmakers, economists and others. ADOC has recently hired a State Demographer to better collect and analyze data regarding the State's population.

ADOC Contacts:

Bill Bolin, Director, Rural Development Office, Community Development Division, Office: 602-771-1232, E-Mail: billb@azcommerce.com

Rosalind (Roz) Boxer, Special Projects Director. Office: 602-771-1185, E-Mail: rosalynb@azcommerce.com

Jon (En Teh) Fan, Senior GIS Analyst (formerly with DES), Office: 602-771-1177, E-Mail: johnf@azcommerce.com

Rafael Tapia, Community and Business Development Department Tribal Manager, Office: 602-316-7750, E-Mail: rafaelt@azcommerce.com

ADOC Interviews:

Bill Bolin interviewed on 4/24/08 and John Fan interviewed on 5/19/08.

Arizona Department of Commerce (ADOC) (Continued)

ADOC GIS Experience/Use:

ADOC operates an ESRI ArcGIS server environment including ArcIMS, ArcEditor, ArcView, Maplex, ArcGIS Publisher, and third-party Centrus (for geo-coding functionality). ESRI's Business Analyst (for demographics) will probably be added sometime next year. John Fan is only GIS practitioner at ADOC.

ADOC Database & GIS Sources:

The **Asset Inventory Project** provides the basics on the most critical data used in regional economic analysis and provides a framework for managing the community's data and determining the research techniques to use. So far about 54 communities have been profiled out of the approximately 225 in Arizona.

Community Profile Elements: Natural resources, Man-made resources, Demographics, Economic trends, Land use, Community development, Economic development, and Workforce development.

Site Selector Criteria: Social-economic profiles, Education-workforce and general population, Infrastructure, Transportation and market access, Regulatory climate, Sites (Industrial, Commercial, Residential), Support services, Quality of life (augmented with crime rate and telecom), Natural resources, and Hospitality industry.

Asset Inventory Process: Create Vision with Goals and Objectives, Collaborate with government & business, Develop a Base Analysis best fit for businesses, Form the Economic Development Foundation, Do a SWOT, Examine a Site Selector's criteria, and Determine Resources (ADOC, USDA, AZ-RDC, EDA, others).

Community Information Form (CIF): Spreadsheet is filled out for each target community including a Telecommunications Survey section. See extract of telecom survey questions below. A Prospect Information Form (PIF) is also utilized.

Map Room - http://www.azcommerce.com/SiteSel/MapRoom/

Maps & Data Links - http://www.azcommerce.com/SmartGrowth/Maps/

Community Profiles - http://www.azcommerce.com/SiteSel/Profiles/

ADOC is primary source for shape file delineating 11 economic regions.

Gets Census Designated Place (CDP) shape files from AGIC.

Performs population estimates from 2006-2055 based on previous five years data, which are used by the School Facilities Board (SFB) and other agencies.

Tracks over 100 energy-related companies in collaboration with the Energy Office in Excel spreadsheet with street addresses converted to geo-coding.

Utilizes census and demographics data from the U.S. Census Department's American Community Survey (ACS - http://www.census.gov/acs/www/index.html).

ADOC participates in the Arizona Indicators site at http://www.arizonaindicators.org/ which provides a one-stop data research tool that tracks Arizona's economic, social and environmental trajectory

Arizona Department of Commerce (ADOC) (Continued)

Arizona Workforce Informer - http://www.workforce.az.gov/

The **Arizona State Data Center** program provides efficient access to **U.S. Census Bureau** data and data products, provides training and technical assistance to data users, and provides a mechanism for feedback to the Census Bureau on data usability, state and local government data needs, and operational issues.

Labor Market Information Tour - http://www.workforce.az.gov/cgi/sitetour/databrowsing/

BLS Data - http://www.workforce.az.gov/?PAGEID=67&SUBID=160

NAICS Industry Definitions - http://www.census.gov/epcd/www/naics.html

Related Sites - http://www.workforce.az.gov/?PAGEID=67&SUBID=182

Arizona Smart Growth Scorecard - http://www.azcommerce.com/SmartGrowth/Scorecards

In response to Executive Order 2007-05, the **Growth Cabinet** has developed an **Arizona Smart Growth Scorecard** to provide communities, counties, and regions, whether small or large, rural or urban, with a simple, clear, usable means of evaluating how well prepared they are for the pressures of growth and to help spur action on local and regional approaches to growth and development issues. The Scorecard is designed to strengthen the ability of local officials to plan for future growth and development and to adopt comprehensive strategies that address growth related pressures for specific communities and counties. However, the Scorecard has only one of fifty questions dealing with broadband communications, and while it will provide valuable community economic development information, its broadband assessment value is limited.

Arizona Smart Growth Scorecard Handout - http://www.azcommerce.com/doclib/smartgrowth/smart_growth_handout.pdf

Arizona Smart Growth Scorecard Overview - http://www.azcommerce.com/doclib/smartgrowth/scorecard/smartgrowthscorecard.pdf

Smart Growth Links - http://www.azcommerce.com/SmartGrowth/Resources/Smart+Growth+Links.htm

U.S. EPA Smart Growth Site - http://www.epa.gov/smartgrowth/

Smart Growth Links - http://www.epa.gov/smartgrowth/links.htm

Deb Sydenham, AICP, Assistant Deputy Director, Community Development, Office: 602 771-1127, E-Mail: debs@azcommerce.com

Kristen Keener-Busby, AICP, Director, Office of Smart Growth, Office: 602-771-1132, E-Mail: kristenk@azcommerce.com

Arizona Department of Commerce (ADOC) (Continued)

Arizona Community Economic Base Studies - http://www.azcommerce.com/Research/BaseStudies/Economic+Base+Studies.htm

Arizona Workforce and Labor Market Information - http://www.azcommerce.com/EconInfo/Labor/

Arizona Population & Demographics - http://www.azcommerce.com/EconInfo/Demographics/

Arizona Economic Development Directory - http://www.azcommerce.com/webapps/aedd/Default.aspx

Arizona Business Directories - http://www.azcommerce.com/BusAsst/Directories/

ADOC links to **Arizona Prospector** in cooperation with APS at http://www.azprospector.com/ that allows users to identify available commercial property and provides data including workforce demographics, business information, and interactive maps. See profile in Appendix C.

ADOC Broadband Assessment Project Interest:

ADOC serves a variety of customers within government, research institutes, and from industry with various projections and analysis for which the Broadband Assessment GIS Project's resources and capabilities should prove quite useful.

In particular, GADA sometimes wants information related to planned community projects including loan analysis and impact.

Additionally, ADOC should plan a future round of Community Telecom Assessments (CTA's) for which this project would provide valuable baseline data and significant synergies.

Arizona Smart Growth Scorecard Survey:

Arizona Smart Growth Scorecard Broadband Question 50:

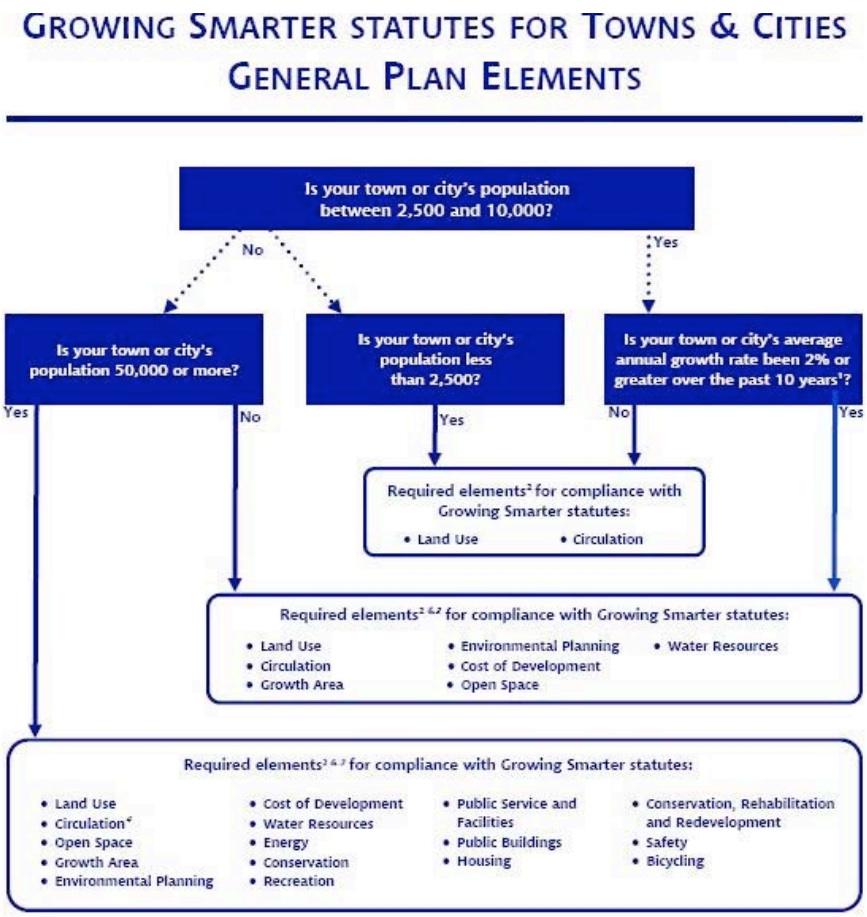
The Arizona Smart Growth Scorecard single question regarding community communications and broadband as follows:

Question 50: Does your community have communication/broadband services or plans to acquire them? (Select one only.)

We have broad band or a plan in place for how to acquire it that includes diverse community involvement (e.g. local businesses, emergency responders, community colleges, school districts, libraries, etc). (3 points towards a possible score of 150)

We are developing broad band access or have identified steps to provide these services. (2 point towards a possible score of 150)

We are thinking about developing a plan for broad band access and have discussed it with our elected officials. (1 point towards a possible score of 150)



ADOC Asset Inventory Project Telecommunications Survey Questions:

Section 1 - Telecommunications Infrastructure

1. Are there long-haul fiber optic lines going through or near the community? If Yes, which company or companies own the fiber?
2. Does the community have access to the fiber? If No, explain.
3. Which company provides access to the fiber?
4. Is the community's telecommunications infrastructure connected to other communities?
   If Yes, is the connection: Copper Wire, Microwave, Fiber Optic, Wireless &/or Satellite?
5. Who is the Internet service provider or providers?
6. What is the common way to connect to the Internet in the community?
   (Leased Line, Dial up connection via phone, Cable modem, Don't know, Other)
7. Do you know what the service rates of the phone/cable line are? If Yes, what are the rates?
8. What speed is your connection?
   (64 Kbps or slower, 128 Kbps, 512 Kbps, T1 or faster, Don't know, Other)
9. What telecommunication services would you want that are not currently available?
   (Dedicated line, Faster connection, Wireless, Satellite, Other)
10. Will business and the community grow without broadband telecommunications? If No, what are the priorities to improve the situation?

11. Have orders been placed for broadband communications? If, Yes, what is the implementation time and cost?

12. List any specific telecommunication services you have purchased or would like to purchase, other than fiber.

13. Is the community lacking essential telecommunications equipment? If Yes, describe what is missing.

14. Is the community participating in any regional telecommunications effort? If Yes, describe.

15. Is the community aware of any Broadband Projects within the State Government?

16. Is the community aware of any Grant programs (e.g. USDA RUS) that could help?

Section 2. Telecommunication Businesses

1. How many businesses in the community are telecommunications businesses employing more than 10 people? (Less than 10, 10 - 15, 16 - 20, more than 20)

2. Estimate the number of employees in the community working in businesses that require telecommunications infrastructure

3. Is there an organization that is recommending telecommunication upgrades?

4. Have there been missed business opportunities due to the lack of telecomm? If Yes, how many and what financial impact (estimate)?

5. Are there facilities with telecommunications infrastructure underutilized?

6. Are there facilities currently used exclusively for telecommunications? If Yes, describe and provide location.

7. Are there facilities that are "telecomm ready"?

8. Are there industrial or commercial business parks in the community? If Yes, how many and where and are they telecomm ready?

Section 3 - Workforce Training

1. Is there a local trained workforce if new telecomm businesses were to need employees? If Yes, describe the training and by whom the training is available.

2. How is training in telecom skills provided in the community? (Private training facilities, High schools, Local nonprofit organizations, Community College, 4-year college or university, Other)

3. Does the community support distance learning?

4. Is there a center for distance learning in the community?

5. What is the business climate as it relates to broadband telecommunications?

   (Excellent, Good, Indifferent, Negative)

6. Does the community support recruiting telecomm businesses?

7. Is the community setup to support telecomm businesses?

8. Are there planning/zoning issues affecting telecommunication infrastructure?

9. Are there specific building permit issues affecting telecommunication infrastructure?

10. Is there a map showing power, gas, water highways, airport, ports in close proximity to proposed telecommunication infrastructure?

11. Identify the community's primary technical education curriculum that can be applied to training for telecomm industries.

Arizona Department of Economic Security (DES)

DES Home Page - http://www.azdes.gov/

DES Description & Links:

The **Department of Economic Security (DES)** promotes the safety, well-being, and self sufficiency of children, adults, and families. DES was established by the State Legislature in July 1972 by combining the Employment Security Commission, the State Department of Public Welfare, the Division of Vocational Rehabilitation, the State Office of Economic Opportunity, the Apprenticeship Council, and the State Office of Manpower Planning, adding State Department of Mental Retardation in 1974.

Services Provided by DES Booklet (PDF) - https://egov.azdes.gov/CMSInternet/uploadedFiles/services_by_des.pdf#Services_Provided_by_DES_-_English_Version

DES Reports - https://egov.azdes.gov/cmsinternet/appreports.aspx

AZ Links (Aging and Disability Resource Center - ADRC) - https://egov.azdes.gov/CMSInternet/main.aspx?menu=8&id=46&ekmensel=15074e5e_10_0_46_2

Arizona Dictionary and Taxonomy of Human Services SFY2008 - https://egov.azdes.gov/CMS400Min/InternetFiles/Reports/pdf/HPZ-034-PD.pdf

DES Contacts:

Susan Christensen, Technology Services, Office: 602-271-0099, E-Mail: schristensen@azdes.gov

Lucas Murray, GIS Programmer Analyst, Office: 602-542-8681, E-Mail: lucasmurray@azdes.gov

DES Interview:

Lucas Murray interviewed on 6/23/08.

DES GIS Experience/Use:

Previously part of DES, both **Arizona Workforce Informer** and **Research Administration** moved to the **Department of Commerce** in December 2007 to provide more efficient research data and information to Arizona communities, businesses, planners, lawmakers, economists and others. See ADOC section above and http://www.workforce.az.gov/.

Other DES GIS activities are just over a year old as the result of a previous pilot. There is a single ESRI ArcInfo desktop license supporting the determination of new facility locations based on case load data, foster home recruitment based on available foster parents, and supporting high level decision-making.

Arizona Department of Economic Security (DES) (Continued)

DES Database & GIS Sources:

Tracks over 200 DES facilities with about half in Maricopa County including square footage and employee base that could be shared. DES IT/Networking could possibly identify telecom circuits utilized, but perhaps best gotten from ADOA TPO and Calence.

Case load data could be aggregated by geography and provided as it was previously to Valley Metro for light rail analysis.

Unemployment insurance data is tightly controlled by the **U.S. Department of Labor's Bureau of Labor Statistics (BLS)** and has significant privacy sensitivity mandated by federal standards and practices.

Title 1 disbursement data is tracked by school district and can be provided.

Disbursements of program dollars for food stamps, child care, etc. can be aggregated in geo-tagged form (census track/block, school district, zip code).

Job training programs program participant demographic info could be provided.

Many of DES's approx. 11,000 employees participate in a Virtual Office Program managed by Joe Tansill and might provide anecdotal broadband data.

DES is looking to identify populations at risk (Adult Protective Services, Child Protective Service, and Developmentally Disabled) for DHS to support emergency planning and management including buffer zone and other nexus analysis.

DES data remains largely in silos and it is difficult to share even between programs. Consolidation efforts under consideration.

Indian Reservations are treated separately from the 6 DES Districts depending on individual program design and requirements.

DES obtains population statistics and estimates from ADOC.

DES likely obtains Census Designated Place (CDP) data from ADOC.

DES Broadband Assessment Project Interest:

DES internally performs various projections and analysis for which the Broadband Assessment GIS Project's resources and capabilities should prove quite useful in analysis, projections, and informing decision makers.

The Broadband Assessment GIS Project's resources and capabilities should also be quite useful in aiding the Virtual Office Project for modeling the need and availability of remote broadband connections.

DES considering forward looking modeling for which some of the Broadband Assessment GIS Project's data sources and capabilities might be able to assist.

Note: As follow up, Lucas Murray identified that current list of DES facilities is outdated and will eventually be updated, that GITA already receives project status reports on the DES Virtual office program, that DES does not participate or define designation of any Census Designated Places (CDP), and that Todd Bright would identify a DES staffer to coordinate network infrastructure data.

Arizona State Land Department (SLD)

SLD Home Page - http://www.land.state.az.us/

SLD Description & Links:

The **State Land Department (SLD)** mission is to manage **State Trust** lands and resources to enhance value and optimize economic return for the Trust beneficiaries, consistent with sound stewardship, conservation, and business management principles supporting socioeconomic goals for citizens here today and generations to come, as well as to manage and provide support for resource conservation programs for the well-being of the public and the State's natural environment.

State Land Department Maps - http://www.land.state.az.us/maps.htm

Viewing On-Line Maps - http://www.land.state.az.us/maps/server_help_swsmr/online_maps.htm

Surface Management Responsibility Maps - http://www.land.state.az.us/maps/paper_maps_surface.htm

Arizona Land Resources Information System (ALRIS) - http://www.land.state.az.us/alris/index.html

Parcel and Land Mapping System (PALMS)

Right of Way Program - http://www.land.state.az.us/programs/realestate/sections/row.htm

SLD Contact:

Gary Irish, GIS Manager, Office: 602-542-2605, E-Mail: girish@land.az.gov

SLD Interview:

Gary Irish interviewed on 4/29/08.

SLD GIS Experience/Use:

SLD utilizes and supports extensive GIS competencies and capabilities based on the ESRI ArcView platform.

SLD Database & GIS Sources:

Arizona Land Resource Information System (ALRIS) - http://www.land.state.az.us/alris/index.html

ALRIS Data Overview - http://www.land.state.az.us/alris/data.html

ALRIS GIS Data Layers - http://www.land.state.az.us/alris/layers.html

ALRIS Data Distribution and Use Policies - http://www.land.state.az.us/alris/use.html

Maps - http://www.land.state.az.us/maps/server_help_swsmr/online_maps.htm

SLD maintains Public Land Database(s) including shape files of land use.

SLD manages and supports the efforts of the **Arizona Geographic Information Council (AGIC)** at http://agic.az.gov/ and described in further detail below.

Arizona State Land Department (SLD) (Continued)

Digital aerial photo quads come from AGIC and are cooperative data in the public domain. Some additional aerial photography is purchased as needed. Engineering services may be utilized for generating detailed contours.

Incorporated cities (approx. 97) boundary shape file available.

School district boundaries are obtained from the Arizona Department of Education.

There are significant data encumbrances with certain data sets for privacy and other reasons. **Cultural Resource Sites** and **Endangered Species** have special considerations for protection. Generally, contract law for licensed sources supersedes state law in restricting use.

UTM NAD83 (HARN) defines various file extensions and attributes.

SLD Broadband Assessment Project Interest:

SLD performs a wide range of analysis and reporting for which the Broadband Assessment GIS Project's resources and capabilities may prove quite useful once implemented.

Arizona State Cartographer Office (SCO)

SCO Home Page - http://sco.az.gov/

SCO Description & Links:

The **State Cartographer's Office (SCO)** was established in State statute in 1988 and was funded by the **Arizona State Land Department** in 1995. The SCO was created in large part due to the efforts of the **Arizona Geographic Information Council (AGIC)** whose Strategic Plan clarifies the relationship of AGIC, as a policy board, **Arizona Land Resource Information System (ALRIS)** as the State GIS data base developer, and the SCO as the standards and data base coordinator. The **State Cartographer** is responsible for developing and managing a long term program for collecting, updating, and disseminating statewide information about GIS data resources in an Arizona GIS clearinghouse as well as exploring alternative funding sources for the development and maintenance of GIS data, which includes examining legal issues related to the access, cost recovery, and sharing of that data.

SCO Contact:

Gene Trobia, State Cartographer, Office: 602-542-3190, E-Mail: gtrobia@land.az.gov

SCO Interview:

Gene Trobia interviewed on 5/14/08.

SCO GIS Experience/Use:

The SCO utilizes and supports extensive GIS competencies and capabilities based on the ESRI ArcView platform.

SCO Database & GIS Sources:

The Arizona Geographic Information Council (AGIC - http://agic.az.gov/) provides most of the data developed or utilized by the SCO and is described in further detail below. GITA is not currently a member, but can be appointed by Governor's Executive Order.

Arizona Imagery Server - http://sco.az.gov/imagery.htm

Arizona GIS Inventory Tool (Ramona) - http://www.az.gisinventory.net/

The SCO is working with the Arizona Attorney General's office to change the statutes with respect to using government data for quasi-commercial use, but details can not be discussed due to non-disclosure constraints. Use of such data in the future may be able to generate a revenue stream for the Broadband Assessment GIS Project through statutory exclusions or packaging as services.

Electric distribution grid mapping may be available from commercial sources and is also of interest to State Forest Department and DEMA who need power line info for remote fire fighting purposes.

Pipeline information is difficult to acquire as it is controlled federally and sensitive due to anti-terrorism concerns. Arizona Counter-Terrorism Information Center (ACTIC) and Sharon Nickelson have information on data sources.

Arizona State Cartographer Office (SCO) (Continued)

Department of Revenue has taxing district information, but they only care about taxable parcels. Most of that information comes from the County Assessors, but only about a third have boundaries associated with them.

Complicating factors for mapping include land leasing, ownership, ROW, and easements. DES and DEQ may have some data, but largely inaccessible.

A 3-D terrain model should prove useful for wireless line of sight analysis. There is apparently already a database of peaks that have radio towers.

SCO Broadband Assessment Project Interest:

The SCO performs a wide range of analysis and reporting for which the Broadband Assessment GIS Project's resources and capabilities may prove quite useful once implemented.

Arizona Geographic Information Council (AGIC)

AGIC Home Page - http://agic.az.gov/

AGIC Description & Links:

The **Arizona Geographic Information Council (AGIC)** was established as Arizona's primary forum and oversight group for geographic information and geographic information technology issues and coordination efforts. AGIC identifies standards, development, and implementation strategies to provide a framework in order to optimize the State's investment in geographic data and technology. Through cooperation and partnerships, AGIC facilitates the acquisition, exchange, and management of geographic information and technology to benefit state agencies and the Arizona GIS community. AGIC meets on a regular basis and conducts an Annual GIS Conference to address and coordinate statewide geographic information and technology issues, requirements and solutions.

Arizona Geodata Portal - http://agic.az.gov/portal/main.do

Geospatial Standards - http://agic.az.gov/portal/standards.do

Geospatial Data - http://agic.az.gov/portal/dataList.do?sort=theme&dataset=0

Other GIS Data Providers for Arizona - http://agic.az.gov/portal/links.do

Geospatial Data Tools - http://agic.az.gov/portal/tools.do

The Arizona Map - http://agic.az.gov/portal/arizonamap.do

Internet Map Services - http://agic.az.gov/portal/imsList.do

Arizona Land Resource Information System (ALRIS) Layer Names

ALRIS Index - Half Degree Tile Index
American Indian Tribal Subdivisions
API - Eligible areas - Buffered
Arizona Boundary
Arizona Cities - Cities and Towns (point data)
Blocks - Census Blocks
Cities - City Boundaries
Congress - US Congressional Districts 2006
Contours - Contours Available in 50' 100' 250' and 500'
Counties - Arizona Counties
DEM 30M - 30M original DEM (not lattice or grid)
DRG - 1:24000, 1:100,000, 1:250,000 available.
Faults
Geology
GFVeg - Natural Vegetation
Grazing Allotments
Groups - Census block groups
Hillshade - Built from 10M DEM's
HUCS - Hydrologic Unit Codes
Interstates - Interstate Highways
Irrigation 1960's Metadata Image
10M DEM - Merged Grid's (Lattice)
30M DEM - Merged Grid's (Lattice)
Lakes - Hydrographic Polygon Features
Legislative - State Legislative Districts 2006
Lmpolys - Census landmarks
Mines
Natveg - SW Biotic Communities
Orthophotos - 2005/6 Aerial Imagery
Ownership - Land Ownership
Places - Census populated places
Quadgrid - USGS 7.5' quad boundaries
Riparian - Riparian vegetation
School Districts - Elementary, Secondary, or Unified
Springs
Streams
Streets
Tigcounty - County boundaries from TIGER
Tigpower - Power lines from TIGER
Tigrails - Railroads from TIGER
TR - Townships and ranges
Tracts - Census tracts
TRS - Township range and sections
Urban Area - Urbanized areas
Urbbuff - Buffered urban areas Image
Voting - Voting districts
Wilderness - Wilderness areas

Arizona Geographic Information Council (AGIC) Geospatial Data

- Arizona Cities (Points)
- Boundaries
  - American Indian Tribal Subdivision (ATIS) 2007 - (TIGER/Line)
  - Arizona Boundary
  - Census 2000 Urbanized Areas in Arizona Cities
  - County Boundaries
  - County Boundaries (Census 2000 TIGER/Line Files)
  - Grazing Allotments
  - Land Ownership
  - Urban Buffers
  - Wilderness Areas
  - Political
    - Arizona Legislative Districts 2006
    - Census 2000 Voting Districts
    - U.S. Congressional Districts 2006
- School
  - Census 2000 Elementary School Districts
  - Census 2000 Secondary School Districts
  - Census 2000 Unified School Districts
- Census
  - Census 2000 Tracts
  - Census 2000 Block Groups
  - Census 2000 Census Designated Places
  - Census 2000 Consolidated Metropolitan Statistical Areas
  - Census 2000 Key Geographic Locations
  - Census 2000 Landmark Points
  - Census 2000 Landmark Polygons
  - Blocks by County (15)
- Hydrography
  - Grants 319(h)
  - Hydro Polygon Features
  - Hydrologic Unit Code Areas
  - Impaired Lakes (2004)
  - Irrigated Areas in Arizona - 1960's
  - Spring Locations
  - Streams
    - Impaired Streams (2004)
    - Perennial Streams
    - Streams - Ephemeral and Perennial
    - Streams - Level 1
    - Streams - Levels 1-2
    - Streams - Levels 1-3
    - Streams - Levels 1-4
- Imagery and Rasters
  - Digital Raster Graphics(DRG), 1:24,000
  - Index for Arizona Digital Orthophoto Quad Images (DOQQs)
- Indexes
  - 7.5 minute quadrangle boundaries for Arizona
  - ALRIS Tile Index for the State of Arizona
  - Index for AZ 1-meter Digital Orthophotos (2005-2006)
  - Township and Range Grid Lines
  - Township, Range, and Section Grid Lines
  - USGS 1:100,000 Quad Reference Grid
  - USGS 1:250,000 Quad Reference Grid
- Mining
  - Mineral Favorability
  - Mines (US Bureau of Mines)
- Natural Features
  - Riparian Vegetation
  - Biological
    - Biotic Communities of the Southwest
    - Game and Fish Department Natural Vegetation
  - Geological
    - Geologic Fault Formations
    - Geologic Formations
    - State Soil Geographic (STATSGO) data base
- Transportation
  - County Streets
    - Apache County Roads
    - Cochise County Roads
    - Coconino County Roads
    - Gila County Roads
    - Graham County Roads
    - Greenlee County Roads
    - La Paz County Roads
    - Maricopa County Roads
    - Mohave County Roads
    - Navajo County Roads
    - Pima County Roads
    - Pinal County Roads
    - Santa Cruz County Roads
    - Yavapai County Roads
    - Yuma County Roads
  - Highways
    - Interstates
  - Other
    - Census 2000 Traffic Analysis Zones

Arizona Geological Survey (AZGS)

AZGS Home Page - http://www.azgs.az.gov/

AZGS Description & Links:

Arizona Geological Survey (AZGS) maps and describes the bedrock and surficial geology of Arizona with emphasis on the densely populated Phoenix-Tucson urban corridor, providing the results to those local, state, and federal governmental agencies responsible for prudently managing Arizona's land, water, mineral, and energy resources.

AZGS Contact:

M. Lee Allison, Director and State Geologist, Office: 520-770-3500, E-Mail: lee.allison@azgs.az.gov

AZGS Database & GIS Sources:

AZGS Maps & Publications - http://www.azgs.az.gov/publications.htm

Publication List 1 including Digital Information (DI) Series, Bulletins, Circulars & Reports - http://www.azgs.az.gov/publist_1.shtml

Publication List 2 including Formal Maps, Digital Geologic Maps, Contributed Maps & Miscellaneous Maps - http://www.azgs.az.gov/publist_2.shtml

Publication List Open File Reports - http://www.azgs.az.gov/openfilereports.shtml

OFR 97-5: Data Structure for Arizona Geological Survey Digital Geologic Maps from 1997 available for $2.00

Digital Geologic Database Model V1.0 7/14/98 (PDF) - http://www.azgs.az.gov/GeoData_model.pdf

Data Structure for the Arizona Geological Survey Geologic Information System: Basic Geologic Map Data from Digital Mapping Techniques 2001 Workshop Proceedings, U.S. Geological Survey Open-File Report 01-223 - http://pubs.usgs.gov/of/2001/of01-223/richard2.html

AZGS' Digital Information (DI) series includes digital data files released after 10/1/93 provided on floppy discs or optical media with a version number which allows these products to be updated while keeping the same DI-number. Significant revisions are announced in the new-publications section of Arizona Geology, AZGS' quarterly newsletter. Digital Information products cover:

Geologic spatial data for selected regions (1:100,000 or 1:24,000 scale)

Digital surficial geologic maps for selected regions

Oil and gas wells in the State of Arizona

Database for Mineral Districts in the State of Arizona

Arizona Geological Survey (AZGS) (Continued)

Components of Arizona Geological Survey Information System

Component Name	Function	Status (2001)
MetaData	Stores basic information about people, projects, organizations, the DataSet catalog, system development metadata	implemented
Arizona Rock Unit Lexicon	Stores definition and default descriptions of rock units used for geologic mapping in Arizona. Based on USGS geologic name lexicon and AZGS AzStrat [R. A. Trapp, unpublished]	Designed, implemented, not populated
Arizona Geologic Bibliography	Stores bibliography of published literature concerning Arizona geology [Trapp et al., 1996]	Implemented, populated, in maintenance
Geologic Map	Stores map legend definitions, and map view definitions. This component may have multiple instances specific to particular geologic data sets or projects.	Default map visualization implemented and in use.
Cartography Infrastructure	Stores definitions and descriptions of graphical elements used to construct geologic maps, along with default legend for symbolizing standard map units and features.	Implemented, partially populated
Rock Samples	Stores information locating and describing rock samples collected in the field for geochronology, geochemistry, representative lithology, etc.	Implemented, partially populated
Geochronology	Stores detailed analytical information for isotopic age dates.	Implemented, populated based on Reynolds et al. [1986], data structure not finalized
Geochemistry	Stores analytical data for whole rock, trace element, and isotopic analyses of rocks.	Planned
Geoscience Infrastructure	Stores basic geoscience terminology Classification Concepts, definitions and descriptions of standard mineral and lithology terms, and the standard geologic time scale used by AZGS (GSA, DNAG, Palmer, 1983). Data in this component database is not specific to a location, and applies to all geologic data sets.	Designed and implemented, some tables partially populated
Geoscience Descriptions	Set of table templates for description of geologic features specific to individual geologic datasets.	Designed, implemented, not populated

Arizona Department of Public Safety (DPS)

DPS Home Page - http://www.azdps.gov/

DPS Description & Links:

The **Arizona Department of Public Safety (DPS)** mission is to protect human life and property by enforcing state laws, deterring criminal activity, ensuring highway and public safety, and providing vital scientific, technical, and operational support to other criminal justice agencies.

Arizona Counter Terrorism Information Center (AcTIC) - http://cid.dps.state.az.us/

AcTIC's mission is to protect the citizens and critical infrastructures of Arizona by enhancing intelligence and domestic preparedness operations for all local, state, and federal law enforcement agencies by the development and sharing of information between participants to the fullest extent as is permitted by law or agency policy. AcTIC is a "fusion" center, establishing and maintaining an "all-crimes approach" to terrorism prevention with true cross-jurisdictional partnerships, integrating local, state, and federal law enforcement, as well as first responders, emergency management and, when appropriate, the private sector. Includes complete integration of the Federal Bureau of Investigation's (FBI) Joint Terrorism Task Force (JTTF). AcTIC is an active partner with GITA in the AZ3D project described above.

National Counterterrorism Center (NCTC) - http://www.nctc.gov/

Arizona Public Safety Communications Commission (PSCC) - http://www.azgita.gov/pscc/ (formerly http://www.azdps.gov/pscc/default.asp)

PSCC has operated under DPS in the past, but was recently transferred to GITA to take advantage of their extensive experience in managing strategic initiatives, partnering with subject matter experts to build coalitions, and delivering complex IT projects.

Arizona Amber Alert - http://www.azdps.gov/safety/amber/default.asp or http://azamberalert.org/

DPS Contacts:

Roger Vanderpool, Director, Main: 602-223-2000

David Felix, Deputy Director & PSCC Chair, Office: 602-223-2359, E-Mail: dfelix@azdps.gov

Curt Knight, PSCC Executive Director, Office: 602-271-7400, E-Mail: cknight@azdps.gov

Arizona Department of Homeland Security (DHS)

DHS Home Page - http://www.homelandsecurity.az.gov/

DHS Description & Links:

The **Arizona Department of Homeland Security (DHS)** homeland security priorities are: Enhance Arizona's information sharing and systems to expand and maintain assessment and detection capabilities, Further enhance prevention and regional collaboration in sustaining homeland security programs, Bolster border security by strengthening partnerships with federal, state, tribal, local, and international stakeholders, Bolster emergency preparedness, response, and recovery planning capabilities while protecting first responders, and Support national strategy for homeland security and National Preparedness Goal

DHS Contacts:

Leesa Berens Morrison, Director, Office: 602-542-7013

Arizona Division of Emergency Management (ADEM)

ADEM Home Page - http://www.dem.azdema.gov/

ADEM Description & Links:

Arizona Division of Emergency Management (ADEM) helps prepare Arizona citizens for emergencies, protecting their lives and property, and coordinating the State's emergency preparedness, mitigation, response, and recovery efforts when disaster strikes. ADEM maintains a fully operational state emergency operations center and one fully operational alternate state EOC. Additionally, ADEM maintains a fleet of Command, Control and Communications vehicles that function as field EOCs. ADEM also has a separate Joint Information Center for media operations and coordination

Arizona Emergency Response Commission (AZSERC) - http://www.azserc.org/

ADEM's Logistics Section Communications Unit - http://www.dem.azdema.gov/logistics/comm/comm.html

Arizona Emergency Operations Center (EOC) Network & Radio Network - http://www.dem.azdema.gov/logistics/comm/radiosys.html

ADEM Contacts:

Louis (Lou) Trammell, ADEM Director & AZSERC Chair, Office: 602-231-6203, E-Mail: director@azdema.gov

Mark Howard, AZSERC Executive Director, Office: 602-231-6346, E-Mail: mark.howard@azdema.gov

Ronald R. Ridgway, Threat Analyst, Office: 602-231-6211, E-Mail: Ronald.Ridgway@azdema.gov

ADEM Database & GIS Sources:

EOC Radio Network vertical asset locations and characteristics as available.

Other telecom and utility infrastructure data and status as appropriate to share.

Arizona Department of Education (ADE)

ADE Home Page - http://www.azed.gov/ or http://www.ade.state.az.us/

ADE Description & Links:

The **Arizona Department of Education (ADE)** operates under the direction of the **Superintendent of Public Instruction** to provide direct services to approximately 2,107 schools in 238 locally governed school districts and 457 charter schools. These schools serve over 1,000,000 students from kindergarten through twelfth grade. The agency executes the policies of the **State Board of Education** and the **State Board of Vocational and Technological Education**, implementing state academic standards, administering statewide assessments, disseminating information, administering and allocating federal and state funds, and providing program improvement assistance to schools and districts.

Educational Technology - http://www.ade.az.gov/technology/

Education Resources - http://www.ade.az.gov/technology/resources.asp

School Funding Opportunities - http://www.ade.az.gov/technology/fundingopps.asp

Student Accountability Information System (SAIS) - http://www.ade.state.az.us/sais/

E-Rate - http://www.ade.az.gov/erate/

Universal Service Administrative Company (USAC) School and Libraries Division (SLD) - http://www.sl.universalservice.org/

School District Web Sites - http://www.ade.state.az.us/schools/schools/districts.asp

Public School Search - http://www.ade.state.az.us/edd/

School Report Card System - http://www10.ade.az.gov/ReportCard/Default.aspx

Assessment Section (AIMS) - http://www.ade.state.az.us/standards/

AIMS Report Wizard - http://www.ade.state.az.us/profile/publicview/

School Annotated Technology Plan (PDF) - http://www.ade.az.gov/technology/downloads/TechPlanTemplateComments.pdf

School Sample Technology Plan (PDF) - http://www.ade.az.gov/technology/downloads/SAMPLE_TechPlanTemplate.pdf

National Center for Education Statistics - http://nces.ed.gov/

ADE Contact:

Donald Houde, Deputy Associate Superintendent for Information Technology and CIO, Office: 602-364-1368, E-Mail: donald.houde@azed.gov

ADE Interview:

Donald Houde interviewed on 5/7/08.

Arizona Department of Education (ADE) (Continued)

ADE GIS Experience/Use: ADE has only recently purchased ESRI capabilities through special educational rates. ADE will self generate mapping of school district boundaries over the next year or so to supplant/augment use of TIGER files. SAIS and School Report Card data will be overlaid to mapping for presentation and analysis over time.

Within ADE, IT has become an enterprise-wide service organization organized around various functional areas. Overall, ADE has a wealth of unique data sources currently used for reporting and analysis, but is just beginning to deploy GIS capabilities. Specific data sources of interest to GITA's broadband assessment and modeling can be readily provided from ADE's data repository under a data mart relationship with Information Technology Infrastructure Library (ITIL) support, however at some modest cost at ADE for building and maintaining the necessary capabilities.

ADE Database & GIS Sources:

School District Boundaries: The State School Board establishes School District Boundaries of which there are approximately 225 today with no sub-district boundaries. TIGER files are used for current mapping. Arizona is an open enrollment state so parents choose their children's schools. The Bureau of Indian Education (BIE) operates under the Bureau of Indian Affairs (BIA) with Department of Education guidance and most Arizona Native schools choose to be state schools.

Student Accountability Information System (SAIS): ADE collects detailed data regarding student attendance and absences to support a variety of reporting, accounting, and compliance mandates. Such data in appropriate aggregate form (e.g. not personally identifiable) could be provided to GITA on request to support ongoing capabilities or special analysis as needed.

School Report Card System: ADE creates report cards for districts and individual schools based largely on the AIMS test results accompanied by some demographic data. The public can view school and district report cards remotely built on a data warehouse and augmented with Google Maps for visualizations. ADE supplied data streams must be processed to insure no personally identifiable information is present. Special codes are used for Ethnicity and Race per federal mandate as well as for Special Education and English Language Learners (ELL).

ADE Technology Survey and Assessment: Every district/charter in Arizona must complete the ADE Technology Survey on an annual basis in compliance with E-rate and NCLB Enhancing Education Through Technology (Title IID). To the extent that this information is complete and accurate, it should prove a valuable resource for GIS use in analyzing and modeling some facets of broadband delivery. Other ADE surveys may touch on technology. External MDR and QED sources of school data are not being used and ADE would like to be the master source. See the Infrastructure-Related Questions from the ADE Technology Survey 2007-08 listed below.

Arizona Department of Education (ADE) (Continued)

School Technology Plans: Schools and districts develop and maintain technology plans for E-rate support and other reasons that provide further insight into their technology infrastructure and outlook. It seems unlikely to roll up this data for any comparison or metadata purposes, but it may prove useful in examining specific areas or questions.

Arizona Education Data Warehouse (AEDW): Ongoing project with state and federal support to cleanse and bring together Student data from one system with Achievement data that resides in an entirely separate system data.

Other ADE Data Sources: ADE also does some tracking of additional data that might prove of eventual interest including Poverty Levels for which it is the primary collector and certifier along with DES, Special Education who through assistive technology could drive broadband needs, and safety incidents.

ADE Broadband Assessment Project Interest:

ADE sees tremendous value in the GITA Broadband Assessment GIS Project to be able to anticipate and insure broadband connectivity to all schools and assist in the identification and use of specific telecom infrastructure and offerings.

ADE is doing more and more online work with schools all the time and could model bandwidth for example in examining centralized vs. federated data structures. This would have an impact on IT architecture and allow adaption to multiple bandwidth models and realities.

The Technical Assistance Program (TAPB1) could specifically make use of the projected Broadband Assessment GIS Project's capabilities to assist and serve ADE stakeholders.

Overall, with mandated data collection requirements, the growth of online interactive school content and applications, evolving student and staff expectations, as well as the advent of e-learning, broadband capabilities are critical and growth inevitable, so tools to understand and anticipate would be most useful.

ADE Technology Survey Infrastructure-Related Questions 2007-08:

Student to computer ratio (only computers that students have access to) from 1:1 to 10:1.

What percentage of the schools in your district have classrooms connected to a local area network?

What percentage of the schools in your district are connected via a wide area network?

What percentage of the schools have access to the Internet?

What percentage of the schools have a dial up modem connection?

What percentage of the schools use the connection for administrative use?

What percentage of the schools use the connection for instructional use?

What percentage of the schools provide portable computing devices for their students?

What percentage of the schools provide portable computing devices for their teachers?

What percentage of your overall computer inventory are portable computing devices?

What is the Internet connection speed (Bandwidth) to the district or charter school and between the buildings in tiers for 8 tiers from 0-1.54 Mbps to 1 Gbps+?

Who is the district or charter school Internet Service Provider (ISP)?

How many T1 lines does your district or charter school have?

Which locations in your district or charter school have access to the Internet (Administrative Offices, Computer Lab, Teacher/Staff Lounge, Guidance Offices, Library/Media Centers, Classrooms, Other)?

How many classrooms are connected to the Internet?

Average number of network drops per classroom?

Number of Multimedia and Internet capable computers for each location?

Number of computers using the following operating systems (Windows 98, Windows 2000, Windows NT, Windows XP, Mac OS 9+, Mac OS X+, Linux, Total)?

Number of portable computing devices supplied by the district or charter school (AlphaSmart, Dana, Dana Wireless, Neo, Neo2, The Writer, The Writer Fusion, None)?

Other types of portable computing devices not listed above and amounts?

Number of Portable Digital Assistants (PDA's) supplied by the district or charter school for students, teachers, administrators, and support by operating system (Palm-based, Windows-based)?

How is technology funded for your district or charter school (Regular operating budget, Capital outlay funds, Grants, Bonding authority, Vendor or service provider contributions, Loans from financial institutions, Other)?

Arizona School Facilities Board (SFB)

SFB Home Page - http://www.azsfb.gov/

SFB Description & Links:

The **School Facilities Board (SFB)** administers **Students' FIRST (Fair and Immediate Resources for Students Today)**, a capital finance program funded by appropriations from the **State General Fund** and is charged with administration of three capital funds: Building Renewal, Deficiencies Corrections, and New School Facilities.

SFB District Access Online - http://www.azsfb.gov/sfb/sfbscr/sfbda/dahome.asp

21st Century Schools Report - http://www.azsfb.gov/sfb/sfbweb/sfbaays/formDoc.asp?theType=0&section=10&Go=Go

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Jim Chang, Demographer, Office: 602-542-6145, E-Mail: jchang@azsfb.gov

SFB Interview:

John Arnold, Ron Passarelli, Kerry Campbell, and Jim Chang interviewed on 5/9/08.

SFB GIS Experience/Use:

Participating in an Interagency Committee for Smart Growth lead by ADOC and coordinating GIS information relating to Smart Growth

John Cheng, Demographer, utilizes a single ESRI ArcView desktop license as a tool on the front end to get and manage relevant data to inform new construction and land acquisition including:

- Housing data from MAG and other sources where housing completions per quarter support analysis of recent growth
- School District shape files as supplied by the State Land Department (SLD) and fairly accurate (uncertain if initial sourcing is from ADE or U.S. TIGER files), though there remain some issues for internal use and minor corrections are made at SFB
- School District demographic data from U.S. Census Bureau and National Center for Educational Statistics (NCES - http://nces.ed.gov/)
- Student enrollment data as provided by ADE

Arizona School Facilities Board (SFB) (Continued)

SFB GIS Experience/Use (Continued):

Limited direct interaction and data sourcing with School Districts, cities, and counties which occurs mostly between School Districts and local planning boards

No telecom asset inventory is collected or held other than some historical Qwest data from 2000-2003 which is dated and of unknown availability

SFB Database & GIS Sources:

Corrections made to School District shape files as provided by SLD may be of interest/use, though single accurate master source would be preferred

Projects Under Construction: List of projects currently under construction, sorted by district. Includes information on location, architect, contractor, size of school, and expected opening date.

ADM Projections by Project: List of all New Construction projects that are Board approved, under construction, or on hold along with the most recent ADM projections. Sorted by project status, this excel file may be saved to sort by a different category.

New Construction Approvals to Date: List of all new construction projects awarded by the SFB since 1999. Sorted by district, this excel file may be saved to sort by a different category or import to other applications.

Conceptually Approved Schools: List of schools conceptually approved to date. Conceptual projects are for planning purposes only and have no funding associated with them.

Qwest Telecom Asset Inventory Data: Historical data from 2000-2003 of K-12district and school connectivity project.

SFB Broadband Assessment Project Interest:

When School Districts seek to acquire land for new facilities siting, SFB needs to know what telecom capabilities exist to aid in site evaluation

With a goal of providing broadband to every school, this system would help identify availability and quantify cost for planning and legislative budget support

Arizona State Library, Archives and Public Records (ASLAPR)

ASLAPR Home Page - http://www.lib.az.us/

ASLAPR Description & Links:

Arizona State Library, Archives and Public Records (ASLAPR) serves the **Arizona Legislature** and Arizonans, providing public access to public information, fostering historical/cultural collaborative research, information projects, and ensuring that Arizona's history is documented and preserved. ASLAPR provides access to: Archives of historical records in Arizona, Library extension assistance to public libraries, Library for the visually and physically disabled, Museums on state government history and people of the State, Public records management program, and Research and law library including Federal Regional Depository. State and federal grants for public libraries and other authorized services are administered and monitored. Economic Development Information Centers (EDIC) for local small business support have been supplanted by statewide access to licensed database products.

Arizona Library Directory - http://www.lib.az.us/LibDir/

Law and Research Library Division - http://www.lib.az.us/is/

Law and Research Library Online Resources - http://www.lib.az.us/is/databases/index.cfm

Map Collection - http://www.lib.az.us/is/maps.cfm

Maps, Geographical and Geological Resources on the Web - http://www.lib.az.us/is/gr/mapsgeo.cfm

Accessing Arizona Public Records - http://www.lib.az.us/records/access.htm

Catalogs, Databases, Indexes, Guides - http://www.lib.az.us/index.cfm?CollectionsPrograms/DatabasesEtc

Statewide Access to Databases - http://www.lib.az.us/extension/statewidedb.cfm

Arizona Memory Project - http://azmemory.lib.az.us/

E-Rate - http://www.lib.az.us/erate/index.cfm

Pew Internet Project: How Libraries Can Survive in the New Media Ecosystem Presentation 1/14/09 - http://www.pewinternet.org/PPF/r/257/presentation_display.asp

ASLAPR Contacts:

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ASLAPR Interview:

Malavika Muralidharan interviewed on 6/23/08.

ASLAPR GIS Experience/Use:

The **Law and Research Library Division's Map Collection** in the Capitol Building (http://www.lib.az.us/is/maps.cfm) makes some use of GIS software, though generally the Map Collection is in hard copy format and not digitized.

Arizona State Library, Archives and Public Records (ASLAPR) (Continued)

ASLAPR Database & GIS Sources:

The Arizona Library Directory (http://www.lib.az.us/LibDir/) indexes over 300 academic, public, tribal, special, and museum libraries around the State. An annual print directory is issued, but the electronic online version is updated constantly. Access to the underlying SQL database could be provided to GITA with the street locations converted to GIS coordinates for mapping purposes and the Technology Team can pull additional information together as needed.

There is an e-rate database in Excel spreadsheet format containing information on participating libraries and their Priority 1 (telecom & Internet) and Priority 2 (equipment & maintenance) funding including some information about bandwidth or circuit type, provider, and cost. Current e-rate database spreadsheet was provided to GITA for review. Also, ASLAPR provides access to TechAtlas, online software used nationally by libraries to standardize the format for the creation of Library Technology Plans. This is widely used by those applying for E-rate Priority 2 activities and is likely to have some telecom circuit information, though not in a structured way.

The Map Collection is generally not digitized and focuses primarily on Arizona, from the earliest territorial period to the present including historic and contemporary topographic maps, government maps of the territory and state, and a wide variety of county and city maps from the territorial era to the present. The Map Collection is strong in maps showing the irrigation and urban development of the Salt River Valley and Phoenix from the 1890's to the present and irrigation along the Colorado River as well as maps of mining districts and detailed maps of railroad right-of-ways. The Map Collection is also the regional federal map collection for Arizona and receives topographic maps for all 50 states, nautical and aeronautical charts for the entire world, a wide variety of federal mapping showing national forests, wilderness areas and public lands throughout the U.S. and CIA maps for all countries of the world.

A current survey is being conducted on database buying practices to uncover redundant purchasing practices and optimization opportunities. ASLAPR could incorporate additional telecom related questions in a forthcoming survey and share the results with GITA. The Bill & Melinda Gates Foundation surveyed 191 Arizona libraries in 2006 and recently awarded $6.9 million in grants to Connected Nation and the American Library Association (ALA) to help public libraries in 7 states secure faster Internet connections. ASLAPR will coordinate an Arizona application for the next phase of the program.

ASLAPR Broadband Assessment Project Interest:

ASLAPR would find the project as described quite useful for broadband availability and status analysis as well as for assisting in local buying decisions informed by better price awareness. Additionally, it would be useful in pointing patrons to locations where various government information is available.

The information could be used to identify libraries or specific locations to be used by mobile bookmobiles appropriate for remote training in technology. It would also provide insight into connectivity in rural areas and help collaborative opportunities become evident, such as between libraries and schools.

Arizona Corporation Commission (ACC)

ACC Home Page - http://www.cc.state.az.us/

ACC Description & Links:

The **Arizona Corporation Commission (ACC)** is an independent regulatory body created by the Arizona Constitution, and thus a fourth branch of State government. The ACC provides traditional public utilities regulation of electric, gas, telecommunications, and water, as well as facilitating the incorporation of businesses and organizations, performing securities regulation, and insuring the safe operations of railroads and gas pipelines in Arizona.

ACC Organization Chart - http://www.azcc.gov/divisions/administration/org_chart/main_org_chart_3-23-07.pdf

Information Technology Division - http://www.cc.state.az.us/divisions/IT/

Utilities Division - http://www.cc.state.az.us/Divisions/Utilities/

Telephone - http://www.cc.state.az.us/divisions/utilities/telecom.asp

Telecommunications Industry Page - http://www.cc.state.az.us/divisions/utilities/telecom/industry.asp

ILEC Service Areas & LATA Boundaries Map - http://www.cc.state.az.us/divisions/utilities/telecom/latamap.pdf

Arizona Universal Service Fund - http://www.cc.state.az.us/divisions/utilities/telecom/ausf-faqs.asp

Telephone Terminology - http://www.cc.state.az.us/divisions/utilities/telecom/terms.asp

Link Index - http://www.cc.state.az.us/divisions/administration/links.asp

National Association of Regulatory Utility Commissioners (NARUC) - http://www.naruc.org/

ACC Contacts:

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Arizona Corporation Commission (ACC) (Continued)

ACC Interview:

Terri Ford, Kimberly Battista, Clark Lathrum, Alexander Shivers, and Armando Fimbres interviewed 5/14/08

ACC GIS Experience/Use:

Currently converting legacy GIS holdings from AutoCAD to ESRI format. Most existing maps have been converted or are in process including ILEC Service Areas & LATA Boundaries, Electric Service Territories, Natural Gas Service Territories, and Water Company Service Territories.

ACC Database & GIS Sources:

Utilities Division Lists of Regulated Companies (including main office addresses) - http://www.cc.state.az.us/divisions/utilities/UTILITYLIST.asp

- Alternative Operator Services (AOS)
- Coin Operated Pay Telephone (COPT)
- Competitive Local Exchange Companies (CLEC)
- Incumbent Long Distance (ILD)
- Inter-Exchange Carrier (IXC)
- Incumbent Local Exchange Carriers (ILEC)
- Reseller Local Exchange Competitive (RLEC)
- Reseller of Long Distance (RLD)

GIS Maps of ILEC Service Areas & LATA Boundaries (limited for Native-Owned telecom areas), Electric Service Territories, Natural Gas Service Territories, Water Company Service Territories, and Railroad Lines in use and abandoned

Natural Gas Pipeline and Hazardous Liquid Pipeline Maps are digitized

Telecom tariffs contained in dockets representing average rates across service areas are embedded, unorganized, and not readily extracted or aggregated.

ILEC and CLEC annual reports including subscriber numbers and other data points are not public information and considered proprietary.

ACC Broadband Assessment Project Interest:

Broadband assessment data of significant general interest depending on questions Commissioners and staff may ask over time

ACC could use such information for analysis of planned development communities

In considering and moving to VoIP services, broadband availability and capacity would be of interest and use in planning and strategy

Arizona Department of Transportation (ADOT)

ADOT Home Page - http://www.dot.state.az.us/

ADOT Description & Links:

The **Arizona Department of Transportation (ADOT)** builds and repairs the roads for the citizens of Arizona, operates the **Motor Vehicles Division (MVD)**, and publishes **Arizona Highways** magazine. ADOT Divisions include the Transportation Services Group, Communications & Community Partnerships, Office of the Inspector General, Policy and Governmental Affairs, Aeronautics Division, Intermodal Transportation Division, Motor Vehicle Division, and the Multimodal Planning Division, which is home to the Geographic Information Systems for Transportation (GIS-T) Section of most relevance to this project.

ADOT Organization Chart - http://www.azdot.gov/Org_Charts/ADOT/ADOT_OrgChart.asp

Multimodal Planning Division (MPD) - http://mpd.azdot.gov/

MPD, formerly the Transportation Planning Division (TPD), identifies current significant transportation issues in Arizona as well as improves existing systems, while researching and planning the development of supporting strategies needed to optimize investment to preserve and expand the State's transportation infrastructure.

Geographic Information Systems for Transportation (GIS-T) Section - http://mpd.azdot.gov/gis/index.php

GIS-T Projects - http://mpd.azdot.gov/gis/projects/index.php

Maps - http://mpd.azdot.gov/gis/maps/index.php

Interactive Maps - http://tpd.az.gov/website/mapping.htm

Base Map Viewer - http://tpd.azdot.gov/website/basemap/viewer.htm

Map Book 2007 (11MB PDF) - http://mpd.azdot.gov/gis/maps/pdf/2007%20Mapbook.pdf

Arizona State Highway System - http://mpd.azdot.gov/gis/maps/pdf/SHS.pdf

MPD Traffic Data - http://mpd.azdot.gov/data/

Traffic Counts - http://mpd.azdot.gov/data/aadt.php

ADOT Freeway Management System (AZ511) - http://www.az511.com/

Roadway Conditions - http://www.az511.com/RoadwayConditions/index.php

Camera Images - http://www.az511.com/CameraImages/index.php

Arizona's Airports - http://www.azdot.gov/aviation/airports/airports.asp

Arizona Transportation Research Center (ATRC) - http://www.azdot.gov/TPD/ATRC/

Motor Vehicles Division (MVD) - http://www.azdot.gov/MVD/

Building a Quality Arizona (bqAZ) - http://www.bqaz.gov/

Arizona Department of Transportation (ADOT) (Continued)

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ADOT Interviews (3):

Jami Garrison and Mike Cseri interviewed on 5/9/08. Suzan Tasvibi-Tanha and Sabra Mousavi interviewed on 6/12/08. Suzan Tasvibi-Tanha, Scott Nodes, and Darrell Bingham interviewed on 6/24/08.

ADOT GIS Experience/Use:

ADOT's Transportation Planning Division has significant investment in GIS capabilities on ESRI ArcView platform and is active in the Arizona Geographic Information Council (AGIC). GIS is used extensively for primary data sets, analysis, and planning purposes.

ADOT Databases & GIS Sources:

ADOT's GIS concentration is on the geometry and condition of state and federal roadways. They build and maintain street centerline files in a geodatabase which is updated continually. A limited amount of local streets and roads are included and generally ADOT's data would need to be complemented by commercial road map data such as NAVTEQ to obtain a relatively complete view.

Updated street centerline files could be provided to GITA quarterly on DVD, but no commercial use or re-providing of the data is allowed. GITA completion of a data release form (including indemnity statement and disclaimer clause) is required to use the data for Agency purposes only.

Some specific additional information tracked includes rest areas, turnouts, frontage roads, historical markers, maintenance yards, speed limit data, and crash information (stripped of personally identifiable information).

ADOT utilizes 185 separate sites, 132 of which are considered campuses and a few of which are shared with DPS or federal agencies, however none are connected by ADOT fiber, but rather utilize leased circuits from commercial telecom carriers. AZNet manages telecom purchasing and has migrated most sites to MPLS circuits. ADOT is concerned that IP addresses would not tracked by GITA or others or ever made public for network security purposes.

Arizona Department of Transportation (ADOT) (Continued)

ADOT Databases & GIS Sources (Continued):

Available GIS mapping resources and datasets include:

- ATIS Roads GIS Coverage (street centerline file)
- Arizona State Highway System
- Arizona Milepost System
- National Highway System (NHS) in Arizona
- Transportation Board Districts
- Engineering and Maintenance Districts
- ADOT Facilities
- Arizona Rest Areas
- Arizona's Airports
- Statewide Boundaries
- Metropolitan Areas

ADOT's Advanced Traffic Management Systems (ATMS) collects, utilizes, and disseminates real-time data on congestion on arterial streets and expressways, and will alert motorists of alternate routes. Components of an ATMS include CCTV monitoring, ramp metering, traffic signal control, vehicle detection, and communications.

ADOT's HCRS (Highway Condition Reporting System) is ADOT-developed application software which provides continuous updates on roadway conditions including restrictions and closures to authorized clients. The information resides on a server and automatically feeds to other systems such as the Internet and AZ511.

ADOT's Highway Performance Monitoring System (HPMS) gathers traffic data from sensing loops in the roads to log files with the primary metric is Average Daily Traffic (ADT) for various points along the roadways. HPMS Field Manual is online at http://www.fhwa.dot.gov/ohim/hpmsmanl/hpms.htm. Use of runaway truck ramps sensed in real time and generates alerts over telecom connections

ADOT's Freeway Management System (AZ511) provides the public and other interested parties access to real time traffic patterns, roadway conditions, and camera Images.

ADOT's Commercial Vehicle Information Systems and Networks (CVISN) is envisioned to link existing disparate and cumbersome information systems and databases (currently used by regulators to obtain compliance information) and enable the electronic exchange of information. CVISN consists of four components: safety information exchange, credentials administration, electronic screening, and freight and fleet management.

ADOT gathers environmental information on natural resources, vegetation, wild game road crossings, and natural bridges for wildfires, as well as on archeologically sensitive locations.

City boundary data is obtained from the Arizona Department of Revenue.

ADOT's airport dataset is maintained by the Aeronautics Division as centroid shapes and includes civilian, military, and FAA registered sites.

Arizona Department of Transportation (ADOT) (Continued)

ADOT Databases & GIS Sources (Continued):

ADOT's PhotoLog system is supported by employees that travel the State's highways once a year, generally from March to September, taking photos from a specially equipped vehicle approximately every three seconds (less than tenth mile increments) with a camera mounted in the center of the windshield having a driver's view of the roadway. The JPEG photos are metatagged with time and date stamps, GPS coordinates, camera direction, etc. Any wireless towers or other features on the roadside, would need to be visible from the driver's viewpoint in order to be used for data collection. Complete photographic datasets could be provided to GITA for telecom analysis and use (e.g. wireless towers and siting, geographical landscape), but public access or release of the photos may present a variety of issues.

ADOT's initial railroad dataset is obtained as TIGER line files and augmented by the overlay of satellite photos and spatially corrected. This primary railroad data set plus railroad crossings data and separate datasets for abandoned rail lines from 1950-1979 and 1980-2007 may prove useful in potential ROW identification and analysis for telecom purposes.

U.S. Department of Transportation (DOT) - http://www.dot.gov/

Bureau of Transportation Statistics Geographic Information Services - http://www.bts.gov/programs/geographic_information_services/

National Transportation Atlas Database (NTAD) - http://www.bts.gov/publications/national_transportation_atlas_database/

National Pipeline Mapping System (NPMS) - http://www.npms.phmsa.dot.gov/

ADOT Broadband Assessment Project and ROW Utilization Interest:

GITA Broadband Assessment capabilities would be of significant interest and use for transportation modeling, network analysis, MVD dynamic routing, and traffic monitoring. It should also prove quite useful in identifying telecom connectivity and options for remote facilities and enable competitive choices.

ADOT's Utilities Accommodation Policy and condemnation authority allow for the creation of ROW utility corridors. ADOT has information for each highway project regarding where ROW was purchased and what rights or limitations may be attached, but it is not in any unified dataset. This information is primarily held in the project files and ROW plans. When ADOT has an easement across public land, it is for highway use only. Where federal highways are involved, the Federal Highway Administration must approve all non-transportation use. With respect to Qwest and other private companies, ADOT sometimes exchanges in-kind rights, but again the information is project specific and often held at a district level. ADOT pays the appraised value for the rights acquired from a private owner and the State Land Department. There is currently no cost for a highway easement over federal lands. However, there may be a cost for environmental mitigation. Overlaying land use mapping with highway maps would give some indications of ROW ownership and use, but incomplete and at times misleading.

Arizona Department of Transportation (ADOT) (Continued)

ADOT Broadband Assessment Project and ROW Utilization Interest (Continued):

Virtually all of ADOT's owned telecom assets and fiber are in Maricopa County and utilized for ITS across the Valley, though there is also some minor assets in Tucson used primarily for cameras. ADOT does know where the fiber pathways are and the number of fibers, usage, and constraints, but based on the limited deployments in major metro markets, alternate usage is problematic and not particularly useful for solving underserved areas' broadband issues.

ADOT had a Shared ROW project back in 2000-2001, approved by the Attorney General's office and resulting in an issued RFP, but unfulfilled due to market conditions at the time. It would have allowed long haul fiber deployment across major transportation corridors from East to West and North to South across the state by commercial carriers who would provide in kind access to ADOT of empty conduit from the build, anticipating one conduit being reserved for ADOT ITS applications and the other supporting regional connectivity and economic development.

The Arizona State Transportation Board has allocated resources for a statewide collaborative process called "Building a Quality Arizona, or bqAZ" to quantify transportation needs statewide and identify the full range of options to address those needs. Working in collaboration with regional transportation planning entities, transit organizations, tribal governments, land management agencies, conservation groups, business and community leaders, and the Governor's office, ADOT and local/regional leaders from across the state are embarking on the development of a Statewide Transportation Planning Framework that links multimodal transportation alternatives with land use and economic planning and development.

ADOT Arizona Transportation Information System (ATIS) Field Descriptions:

ONROAD - 32 character roadway identifier (called ROUTE in a00rte), Also see other supporting document 'ATIS Nomenclature" for definitions of Characters 1-2 NC (national crime information clearinghouse) County Code for nonstate roadways or Spaces (null) for state highways, Characters 3-4 Directional Prefix for non-state roadways or Route Prefix for state highways, Characters 5-24 Route Name for non-state roadways or Route Number for state highways, Characters 25-28 Suffix for non-state roadways, Characters 29-30 Directional Suffix for non-state roadways, Character 31 CarriageWay, and Character 32 Road Qualifier

STATION - refers to Engineering station on roadway construction plans - not always populated and may be dated data.

ELEVATION - elevation above sea level - based on vehicle GPS data corrected to sea level - est. accuracy 90% +/- 10 ft. of true

RETIRED_DA - date segment retired or turned back to local jurisdiction for maintenance & ownership

SOURCE - not currently used - all MP locations are based on drive-by GPS readings and estimated to 90% +/- 50 ft. of true position

Arizona Department of Transportation (ADOT) (Continued)

ADOT Arizona Transportation Information System (ATIS) Field Descriptions (Continued):

X_RTE_ID - internal number for MP used in .int and .lut tables - number will not be consistent from version to version

TEMP - not used

ROUTE - marker plate value as a character field

RTE_ID - internal number for ONROAD value - number will not be consistent from version to version

CARD - cardinal direction is defined as direction of increasing MP values - 'Y' would be a two way roadway or the 'card' segment of a divided roadway (that is EB I-10, or NB I-17), 'N' would be the non-card of a divided road (that is SB I-17 or WB I-10), ' ' would be a ramp or retired route.

RTE_TYPE - mainline roadway, frontage, or ramp

MPTYPE - 'M' or 'K' (kilometer values as well as MP values exist on I-19)

MP5, MP10, MP20 - use to select for map annotation

MPNUM - milepost value as a numeric value (not character value)

ROUTE - 32 character roadway identifier (same as ONROAD in a00m)

RTE_ID - internal number for route used in .int and .lut tables - number will not be consistent from version to version

DATE_O - est. date open for future routes

DATE_C - date closed for retired or turn-back routes

RTE_TYPE - 'I' Interstate, 'U' US route, 'S' State route, 'L' local road (some tables and county level files will have additional values for various boundaries or other features)

NAME - descriptive name or name with spaces removed on local roads

FONT - applicable only in special custom older applications

CARD - cardinal direction is defined as direction of increasing MP values - 'Y' would be a two way roadway or the 'card' segment of a divided roadway (that is EB I-10, or NB I-17), 'N' would be the non-card of a divided road (that is SB I-17 or WB I-10), ' ' would be a ramp or retired route.

MAIN - main, ramp, or crossing for highway routes, blank for local roads

Arizona Department of Revenue (ADoR)

ADoR Home Page - http://www.azdor.gov/ or http://www.revenue.state.az.us/

ADoR Description & Links:

The **Arizona Department of Revenue (ADoR)** mission is to administer tax laws fairly and efficiently for the people of Arizona primarily in the areas of income, transaction privilege (sales), use, luxury, withholding, property, estate, fiduciary, bingo, and severance taxes.

ADoR Organizational Chart (PDF) - http://www.revenue.state.az.us/Contact/AgencyOverview.pdf

Research & Statistics - http://www.revenue.state.az.us/ResearchStats/Researchmainmenu.asp

Cities in Arizona - http://az.gov/webapp/portal/alpha.jsp?name=city

Individual Income Tax Statistics (County and City Detail) - http://www.azdor.gov/ResearchStats/individualstatistics.asp

AZTaxes.gov - https://www.aztaxes.gov/

Business Tax Description Codes (NAICS) - https://www.aztaxes.gov/PDF/NAICS.pdf

Utilities and Telecommunication Publication - http://www.azdor.gov/brochure/618.pdf

ADoR Contacts:

Susan Silberisen, Assistant Director & CIO, Office: 602-716-6955, E-Mail: ssilberisen@azdor.gov

Kurt Mueller, Information Technology Manager, Office: 602-716-6294, E-Mail: kmueller@azdor.gov

Jim Yahnke, Application Services, Information Technology Division, E-Mail: jyahnke@azdor.gov

ADoR Interview:

Kurt Mueller interviewed on 7/11/08.

ADoR GIS Experience/Use:

Kurt Mueller indicated there was no ADoR GIS application usage at this time to the best of his knowledge and that he would check and confirm.

ADoR Database & GIS Sources:

Income statistics are aggregated by residential vs. business across geographic partitions and could likely be made available to GITA for demographic analysis.

Transaction Privilege Tax (TPT) or sales tax is an indicator of retail sales by area and could likely be made available to GITA for demographic analysis.

Specific taxes are collected for various special economic development districts and are geo-coded by the cities managing the specific programs.

Some specific data regarding public bonding and related collections might be aggregated in a useful form, but would take further investigation to confirm.

Arizona Department of Revenue (ADoR) (Continued)

ADoR Database & GIS Sources (Continued):

There are several telecom-related categories of taxable assets which might prove useful in analyzing telecom infrastructure investments, but would only be available in aggregate by geographic area, not by corporate tax ID or identity. Unknown if such data is tracked relative to company main office in Arizona, point of equipment delivery or point of deployment and use. TAS is an Oracle database also know as BRITS (Business Reengineering Integrated Tax System) that Paul Wix of GITA has worked on.

ADoR Broadband Assessment Project Interest:

ADoR is likely to have limited interest in GITA Broadband Assessment capabilities, as they primarily rely on data from tax collections and submittals.

Note: As follow up, Kurt Mueller to investigate data availability, geocoding, and permissible uses with ADoR management and security personnel and report to GITA.

Arizona Department of Real Estate (ADRE)

ADRE Home Page - http://www.azre.gov/

ADRE Description & Links:

The **Arizona Department of Real Estate (ADRE)** regulates real estate, cemetery and membership camping brokers and salespersons. ADRE approves and monitors pre-licensing instruction and testing and continuing education courses as well as maintains oversight of approved schools to ensure the quality content of their courses, the competence of their instructors, and the quality and timeliness of the materials being taught. ADRE oversees the activities of licensees, investigates complaints against licensees and land developers, and participates in administrative hearings pertaining to their conduct. ADRE also regulates the sale of subdivisions, unsubdivided lands, timeshares, condominiums, membership campgrounds and cemeteries.

Public Information - http://www.azre.gov/PUBLIC_INFO/PUBLIC_INFO.html

Online Services - http://www.azre.gov/ONLINE_SERVICES.html

Public Database - http://159.87.254.2/publicdatabase/

Download Lists - http://159.87.254.2/publicdatabase/DownloadLists.aspx

Several different record types: Individuals' real estate, cemetery and membership camping licenses, Brokerage licenses, Real estate schools, courses and instructors approved to teach the courses, Development public reports, and Disciplinary actions against license holders

School District Attendance Boundaries - http://www.re.state.az.us/PUBLIC_INFO/Documents/School_District_Attendance_Boundaries.html

Real Estate Related Links - http://www.azre.gov/RELATED_LINKS/RELATED_LINKS.html

ADRE Contact:

Sam Wercinski, Commissioner, Office: 602-771-7760, E-Mail: sam@azre.gov

Arizona Department of Health Services (ADHS)

ADHS Home Page - http://www.azdhs.gov/

ADHS Description & Links:

The **Arizona Department of Health Services (ADHS)** is responsible for public health, behavioral health - including the Arizona State Hospital, emergency medical services, the State laboratory, public health data and statistics, vital records, disease control, and licensing and certification of health and child care facilities.

Bureau of Public Health Statistics - http://www.azdhs.gov/plan/index.htm

Definitions - http://www.azdhs.gov/plan/menu/info/definitions.pdf

Sources of Data - http://www.azdhs.gov/plan/menu/info/sources.htm

Related Links - http://www.azdhs.gov/plan/menu/info/rel_links.htm

The Arizona Health Status and Vital Statistics report examines trends in natalilty, mortality and morbidity towards established health objectives. Additional reports and studies include Differences in Health Status by Race/Ethnic Group, Advance Vital Statistics by County of Residence, Mortality from Alzheimer's Disease, Injury Mortality among Arizona Residents, (accidents, suicides, homicides, legal intervention, firearm-related fatalities, drug-related deaths, drowning deaths), Community Vital Statistics, Teenage Pregnancy, Selected Characteristics of Newborns by Census Tract in Maricopa County, Pima County and South Phoenix Area, Comparison of Selected Vital Statistics by year, Health Status Profile of American Indians in Arizona, Obesity in Arizona: Prevalence, Hospital Care Utilization, Mortality, Deaths from Exposure to Excessive Natural Heat Occurring in Arizona and Marital Status and Health.

Statistics are available by Census tract, Community, County, Gender, Month, and Race/ethnicity

Arizona Primary Care Area Program Maps - http://www.azdhs.gov/hsd/profiles/maps.htm

Arizona Community Health Analysis Areas (CHAAs) - http://www.azdhs.gov/phs/azchaa/

Telemedicine Program - http://www.azdhs.gov/hsd/telemedicine.htm

DHS Contacts:

January Contreras, Acting Director, Office: 602-542-1025

Arizona Health-e Connections (AzHeC)

AzHeC Home Page - http://www.azhec.org/

AzHeC Description & Links:

Arizona Health-e Connections (AzHeC) is a not-for-profit organization whose mission is to lead Arizona's establishment of health information exchange (HIE) capabilities and adoption of health information technology (HIT) directed by a very diverse, private-public partnership to refine recommendations and facilitate implementation in concert with consumers, insurers, and providers.

Arizona Health-e Connection Roadmap (4/06 by GITA) - http://www.azgita.gov/tech_news/2006/Arizona%20Health-e%20Connection%20Roadmap.pdf

Arizona Initiatives - http://www.azhec.org/arizonaInitiatives.jsp

Health Information Exchange (HIE) in Arizona - http://www.azhec.org/healthInformationAZ.jsp

Electronic Health Records (EHRs) & Electronic Medical Records (EMRs) in Arizona - http://www.azhec.org/electronicMedicalResourcesAZ.jsp

Personal Health Records (PHRs) in Arizona - http://www.azhec.org/personalHealthResourcesAZ.jsp

Electronic Prescribing (e-Prescribing) in Arizona - http://www.azhec.org/ePrescribingAZ.jsp

Privacy & Security in Arizona - http://www.azhec.org/privacySecurityAZ.jsp

Rural Health Information Technology Adoption (RHITA) Grant Program (at GITA) - http://azgita.gov/ehealth/rhita/

AzHeC Contact:

Brad Tritle, Executive Director, Office: 602-288-5130, E-Mail: brad.tritle@azhec.org

AzHeC Interview:

Brad Tritle interviewed on 6/24/08.

AzHeC GIS Experience/Use:

AzHeC currently employs no GIS applications though clearly recognizes its utility and sees some potential future use.

AzHeC Database & GIS Sources:

AzHeC is planning a survey of clinicians and practitioners throughout Arizona, similar to one used by AHCCCS for physicians at the time of license renewal, but incorporating additional broadband questions yet to be determined. The survey will utilize a sample of over 3000 with an anticipated response of over 1200, including significant rural representation endorsed by a number of physician, physician assistant, and nursing associations. A contract is expected to be let shortly, with survey responses to be received and analyzed by December, and a report issued in early 2009. Results will be anonymous due to privacy and compliance concerns, though aggregated by geo-groupings, and available to GITA for analysis and use.

Arizona Health-e Connections (AzHeC) (Continued)

AzHeC Broadband Assessment Project Interest:

Various telemedicine initiatives, many grant funded, and potential eHealth programs substantially depend on broadband access. GITA Broadband Assessment capabilities would support centralized vs. federated architecture analysis and planning for Regional Health Information Organizations (RHIOs) and designation of regional ASP hosts where necessary.

AzHeC with specific rural gap data access and additional analysis could generate and support strategies for remediation, becoming a strong advocate and supporter of broadband policy initiatives. AzHeC could also help specific rural facilities and programs in finding available broadband options.

Arizona Department of Environmental Quality (ADEQ)

ADEQ Home Page - http://www.azdeq.gov/

ADEQ Description & Links:

The Arizona Department of Environmental Quality's mission is to protect and enhance public health, welfare and the environment in Arizona administering a variety of programs to improve the health and welfare of our citizens and ensure the quality of Arizona's air, land and water resources meets healthful, regulatory standards.

ADEQ Public Records - http://www.azdeq.gov/function/assistance/records.html

GIS eMaps - http://gisweb.azdeq.gov/website/emaps/aqd/nonattain/

ADEQ Contacts:

Stephen A. Owens, Director, Office: 602-771-2203, E-Mail: owens.stephen@azdeq.gov

Arizona Independent Redistricting Commission

Home Page - http://www.azredistricting.org/

Arizona Independent Redistricting Commission Description & Links:

The Arizona Independent Redistricting Commission's mission is to administer the fair and balanced redistricting of the Congressional and Legislative districts for the State of Arizona.

Arizona Independent Redistricting Commission Database & GIS Sources:

Final Congressional District Map - http://www.azredistricting.org/?page=finalcong

Interactive Map - http://159.87.126.6/mapping/default2.asp?finalcong=on&tname=Final.Congressional.Map&service=ircmaps&init=true

Statewide 11” x 17” Map (PDF) - http://www.azredistricting.org/final/CongFinal_state_lgr.pdf

ArcView GIS Shape File - http://www.azredistricting.org/final/congfinal_shp.zip

Arizona Government Information Technology Agency

Broadband Assessment GIS Study

Appendix B - Arizona Counties and Municipalities

There are GIS data sources associated with each of Arizona's fifteen counties and a number of its municipalities, as well as with various regional economic development groups. These sources vary widely in coverage and depth, often focusing on particular data elements readily accessible to regional government or otherwise focused on specific needs. These regional GIS sources will prove relevant and useful to specific regional analysis and should be characterized, authorized, and imported to the Broadband Assessment GIS Project on an opportunistic or as needed basis.

Apache County - http://www.co.apache.az.us/

Geographical Information System (GIS) - http://www.co.apache.az.us/Departments/GIS/GIS.htm

Emergency Management Page - http://www.co.apache.az.us/Departments/EmergencyRisk/Emergency.htm

Cochise County - http://www.co.cochise.az.us/

Information Technologies Department - http://cochise.az.gov/cochise_information_technologies.aspx?id=282

Coconino County Geographic Information Systems (CCGIS) - http://coconino.az.gov/gis.aspx?id=12520

Coconino County - http://www.coconino.az.gov/

Information Technology Department - http://www.coconino.az.gov/it.aspx?id=377

Coconino County Geographic Information Systems (CCGIS) - http://www.coconino.az.gov/gis.aspx?id=12520

Interactive Mapping Application - http://gis-map.coconino.az.gov/ccgis/

City of Flagstaff - http://www.flagstaff.az.gov/

Management Services Department (including IT) - http://www.flagstaff.az.gov/Directory.asp?DID=72

Regional Plan & Maps - http://www.flagstaff.az.gov/index.asp?nid=754

Greater Flagstaff Economic Council (GFEC) - http://www.gfec.org/

Gila County - http://www.co.gila.az.us/

Gila County GIS Page - http://www.co.gila.az.us/publicworks/engineering/gis.html

Gila County GIS Maps - http://maps.gilacountyaz.gov/

Graham County - http://www.graham.az.gov/

Information Technology Department - http://www.graham.az.gov/Graham_CMS/display.aspx?id=942

GIS Maps - http://www.graham.az.gov/Graham_CMS/display.aspx?id=1420

Appendix B - Arizona Counties and Municipalities (Continued)

Greenlee County - http://www.co.greenlee.az.us/

Information Systems - http://www.co.greenlee.az.us/ITIS/ITISHomePage.aspx

La Paz County - http://www.co.la-paz.az.us/

Department of Community Development (including GIS) - http://www.co.la-paz.az.us/County_Departments/Dept_Comm_Dev/commdev.htm

Maricopa County - http://www.maricopa.gov/

Maricopa County GIS Portal - http://www.maricopa.gov/assessor/gisPortal/gis_portal.asp

Assessor's Office GIS Interactive Maps - http://www.maricopa.gov/assessor/Maps.aspx

GIS Links - http://www.maricopa.gov/assessor/GISLinks.aspx

Maricopa Association of Government (MAG) - http://www.mag.maricopa.gov/

Maps & Data - http://www.mag.maricopa.gov/maps.cms

Greater Phoenix Economic Council (GPEC) - http://www.gpec.org/

City of Phoenix - http://phoenix.gov/

Information Technology Services - http://phoenix.gov/itd/index.html

Phoenix Maps Online - http://phoenix.gov/webpmo.html

Mohave County - http://www.co.mohave.az.us/

Information Technology Department - http://www.co.mohave.az.us/ContentPage.aspx?id=121

Mohave County Geographic Information Systems (GIS) - http://gis.co.mohave.az.us/ or http://www.co.mohave.az.us/ContentPage.aspx?id=121&cid=39

Mohave County Interactive Map Viewer - http://mcimv.co.mohave.az.us/imf/sites/moh/jsp/launch.jsp

Navajo County - http://www.navajocountyaz.gov/

Navajo County Internet Mapping Service (IMS) - http://navcogis.co.navajo.az.us/website/NavajoCountyGIS.htm

LCR MOM Information Assessment - http://www.navajocountyaz.gov/pubworks/lcrmom.aspx

Pima County - http://www.co.pima.az.us/

Information Technology Department - http://www.pima.gov/isd/index.html

Department of Transportation (DOT) Geographic Information Services Division - http://www.dot.pima.gov/gis/

Pima County GIS Data FTP Server - http://www.dot.pima.gov/gis/ftp/

Geographic Data Library - http://www.dot.pima.gov/gis/data/

Appendix B - Arizona Counties and Municipalities (Continued)

Pima County - http://www.co.pima.az.us/ (Continued)

Pima Association of Government (PAG) - http://www.pagnet.org/

Maps - http://www.pagnet.org/RegionalData/Maps/tabid/102/Default.aspx

City of Tucson - http://www.tucsonaz.gov/index.php

Information Technology Department - http://www.ci.tucson.az.us/it/

Tucson Area GIS Cooperative - http://www.tucsonaz.gov/gis/index.html

Pinal County - http://www.co.pinal.az.us/

Information Technology Department - http://pinalcountyaz.gov/Departments/InformationTechnology/Pages/Home.aspx

Pinal/Gila Community Telecom Assessment (CTA) - http://pinalcountyaz.gov/Departments/InformationTechnology/Pages/CommunityTelecomAssessment.aspx

Pinal County Regional Wi-Fi Partnership - http://pinalcountyaz.gov/Departments/InformationTechnology/Pages/RegionalWi-FiPartnership(PCRWFP).aspx

County Assessor Geographic Information Systems Department - http://pinalcountyaz.gov/Departments/Assessor/Pages/GIS.aspx

Santa Cruz County - http://www.co.santa-cruz.az.us/

Management Information Services (MIS including GIS) - http://www.co.santa-cruz.az.us/admin_services/mis.html

Santa Cruz County Assessor Parcel Search - http://www.sccaz-assessor.org/SCCAssessorPropertySearch/

Yavapai County - http://www.co.yavapai.az.us/

Management Information Systems (MIS) Department - http://www.co.yavapai.az.us/MIS.aspx

Yavapai County Geographic Information Systems (YAVGIS) Division - http://www.co.yavapai.az.us/gis.aspx

GIS Mapping Applications - http://www.co.yavapai.az.us/GISMapping.aspx

Yuma County - http://www.co.yuma.az.us/

Information Technology Services Department - http://www.co.yuma.az.us/its/index.htm

Department of Development Services Geographic Information System (GIS) Division - http://www.co.yuma.az.us/dds/GIS.htm

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Appendix C - Other Arizona Organizations of Interest

Other Arizona Organizations of Interest

- Arizona Telecommunications & Information Council (ATIC)
- Arizona's Universities
  - Arizona Board of Regents (ABOR)
  - Arizona State University (ASU)
  - Northern Arizona University (NAU)
  - University of Arizona (UA)
- Other Arizona Organizations and Resources of Interest
  - Arizona Investment Council (AIC)
  - Arizona Association for Economic Development (AAED)
  - The League of Arizona Cities and Towns
  - Arizona City/County Management Association (ACMA)
  - CANAMEX Smart Corridor & CyberPort Projects
  - Arizona Prospector (APS & ADOC)
  - Arizona Indicators Project
  - Arizona Association of Public-Safety Communications Officials International (APCO)/National Emergency Number Association (NENA)
    - Arizona Regional Review Committee (ARRC)
  - Amateur Radio Council of Arizona (ARCA)

Appendix C - Other Arizona Organizations of Interest

Arizona Telecommunications & Information Council (ATIC)

ATIC Home Page - http://www.arizonatele.com/atic/

ATIC Description & Links:

The **Arizona Telecommunications & Information Council (ATIC)** is an economic development foundation functioning as Arizona's recognized and authoritative organization guiding technology policy development, serving as a leading source of information and expertise on telecommunications and information technology matters. ATIC develops, promotes and supports initiatives and guides adoption of effective public policies that encourages wide-scale deployment and availability of telecommunication services and information technologies to insure economic prosperity for the Arizona community, expand the region's global competitive advantage, enable continued educational advancement, and support an enhanced quality of life.

ATIC Contacts:

Ron Schott, ATIC Chair, Office: 602-343-8324 x109, E-Mail: rschott@aztechcouncil.org

Oris Friesen, ATIC Vice Chair, Office: 602-992-4504, E-Mail: oris@cox.net

Mark Goldstein, ATIC Secretary, Office: 602-470-0389, E-Mail: markg@researchedge.com

Arizona Telecom Directory (ATD) Description & Links

ATIC ATD Home Page - http://www.arizonatele.com/

ATIC's **Arizona Telecom Directory (ATD)** is an online portal for locating telecommunication service providers delivering services throughout Arizona. Residential and business users can search for the availability of a wide range of telecom services by location and link to profiles of individual telecom providers, their contact information, and related resources. Supported by a wide-range of industry and economic development organizations, the Arizona Telecom Directory is a unique resource for identifying telecommunications service options and driving economic development activity.

The data used in creating this directory was taken from surveys with the telecom providers and represents a best effort estimation of their service categories and coverage. ATIC and the directory producer, International Research Center, remain committed to adding additional vendors and updating and correcting existing records over time to keep this resource as accurate and current as practical.

About ATD - http://www.arizonatele.com/about.html

Mapping/GIS Resources - http://www.arizonatele.com/mapping.html

ATIC Launches the Arizona Telecommunications Directory Portal Press Release (9/27/01) - http://www.researchedge.com/news/pr092701.html

Arizona Telecommunications & Information Council (ATIC)

ATIC ATD Database & GIS Sources:

The ATD utilizes some 55 classes of telecom services for each included telecom carrier in the following categories: Voice Telephony Services, Wireline Data, Mobile Wireless Data, Fixed Wireless Data, Satellite Data, Miscellaneous Data Transport Services, Video Services, Other Facilities or Services, and State of Arizona Carrier Services (See Table).

The ATD currently geocodes the State by county (15), named community (approximately 340), and 5 digit zip codes (543), thus triple location references. ATD is considering adding school districts (>220) as a quadruple location reference category for possible future use.

The ATD's SQL database provides various outputs such as lists of available providers according to type of service provided and according to geography, community-based provider service profiles, and relevant contact information. It delivers pointers to extensive resources (directories, maps, etc.) on other sites and provides extensive information on telecom infrastructure and resources in general. A variety of reference resources and pointers are incorporated into the database to help serve the need to determine available service to specific areas/locations and to provide appropriate points of contact and web links for learning more. An example of the home page and end user query form follows.

ATIC Broadband Assessment Project Interest:

ATIC strongly supports GITA's Broadband Assessment GIS Project and would like to play a supportive role as detailed in the Statement of Interest from 10/12/07 that follows.

ATIC could provide the existing Arizona Telecom Directory (ATD) database as a form of in-kind support for the project. GITA could be given real-time read only access privileges to the online database or occasional file transfers as needed. It would also be possible for the entire ATD portal and underlying data to integrate to the new GITA Broadband Assessment GIS Project to the benefit of both.

GITA's Broadband Assessment GIS Project could be implemented in such a manner as that the results of any survey or new data sources could contribute to bringing the ATD up to date and maintaining its currency.

ATIC Board Members and Associates have the necessary expertise to contribute to the development and implementation of any survey GITA might develop and could help with outreach and stakeholder engagement. Additionally, the ATIC Vendor Advisory Committee, which is being reformulated, is positioned to play a role as intermediary on behalf of the project.

ATIC could play a role as the conduit for any external private or grant fund management, since ATIC has dealt with public-private funds in the past, as with the Homeland Security WiFi Grant in Santa Cruz County and any ATIC role played in private funds management could complement the role GITA would play in public funds management.

Voice / Fax: (602) 254-5887
atic@researchedge.com
PO Box 1119 Tempe, AZ 85280
www.arizonatele.com/atic

ARIZONA TELECOMMUNICATIONS AND INFORMATION COUNCIL

October 12, 2007

GITA Broadband Assessment Project Statement of Interest

At the Board Meeting of the Arizona Telecommunications and Information Council (ATIC) on Wednesday, October 10, ATIC, which is a 501c6 non-profit organization, discussed the possibility of participating in the activity to assist in realizing the statewide broadband survey that has been deemed necessary for Arizona to assess its overall broadband communications needs and requirements. Oris Friesen, ATIC Vice Chair, was charged with assembling the recommendations from the Board members regarding the role ATIC might play. ATIC plans to issue a statement of support identifying details, within the next several weeks, after getting input from its members.

In the meantime, based upon the discussions held yesterday, but recognizing that these are not commitments until we can secure formal approval from the Board members, I believe that the following activities are certainly within the general scope of interest for ATIC:

1. **ATIC could provide the existing Arizona Telecom Directory (ATD) as a base resource of in-kind support for the survey.**
    a. **Note that the ATD was originally funded in part by CEDC funds as well as contributions from the private sector, especially the telcos.**
    b. **The results of the survey would contribute to bringing the ATD up to date and maintaining its currency.**
    c. **Initial sponsors from the private sector could be provided with early access to the survey results as a return on their contributions.**
2. **ATIC members have the necessary expertise to contribute to the development and implementation of the survey.**
3. **ATIC could play a role as the conduit for fund management, since**
    a. **The major Arizona Telcos are ATIC members.**
    b. **The role played by ATIC in private funds management complements the role GITA plays in public funds management.**
    c. **ATIC has dealt with public-private funds in the past, as with the Homeland Security WiFi Grant in Santa Cruz County.**
    d. **The ATIC Vendor Advisory Committee, which is being reformulated, is positioned to play a role as intermediary.**

Dr. Oris Friesen, ATIC Vice Chair

ATIC Home | About ATIC | ATIC Board | ATIC Meetings | ATIC Committees | ATIC Calendar

ArizonaTele.com

Arizona Telecom Directory (ATD)

Arizona Telecommunications & Information Council (ATIC)

ATD Search | About ATD | Telecom Resources | Mapping/GIS Resources | Arizona Telecom Orgs

This is the Arizona Telecommunications and Information Council (ATIC) site for the **Arizona Telecom Directory (ATD)**, an online portal for locating telecommunication service providers delivering services throughout Arizona. Residential and business users can search for the availability of a wide range of telecom services by location and link to profiles of individual telecom providers, their contact information, and related resources.

Search for Telecom Providers by Name

List All Providers — in the ATD database

Find telecom providers — that contain the keywords:

Find telecom providers — that start with the letter ...

Search for Telecom Providers by Location & Type of Service

(1a) Select Location To Locate Telecom Availbility

Anywhere in Arizona | County: Select a county... | Community: Select a community... | 5 digit Zip

(1b) Please tell us where you are located (optional)

My 5 digit Zip (this information will only be used for web site usage reporting)

(2) Select Service Categories

Select All Service Categories | Select All High-Speed Data | Search | Clear

Voice Telephony Services
- Wireline Residential
- Wireline Business (individual circuits)
- Wireline Business (multi-line circuits)
- Wireline Business (Centrex services)
- Fixed Wireless (Wireless Local Loop)
- Mobile Wireless (Cellular/PCS/IDEN/Satellite)
- Long Distance Services

Video Services
- Wireline Video Providers (Cable HFC & VDSL)
- Fixed Wireless Broadband Video (LMDS/MMDS)
- Direct Broadcast Satellite (DBS)

Other Facilities or Services:
- Data Centers (collocation facilities)
- Internet Service Providers (ISP) Services
- Public Teleconference Facilities
- Telecom Contractors - Facilities
- Telecom Contractors - Outside Plant
- Not Elsewhere Classified -- NEC

State of Arizona ATS Carrier Services (CS)
- CS Category 1 - Dedicated Voice & Data Circuits
- CS Category 2 - Packet-Based & Cell-Based Serrvices
- CS Category 3 - Broadband Last-Mile Services
- CS Category 4 - Voice Value-Added Services
- CS Category 5 - Video Value-Added Services
- CS Category 6 - Internet Service Provider Services
- CS Category 7 - Technology Management Services
- CS Category 8 - Administrative Management Services

Miscellaneous Data Transport Services
- Frame Relay
- ISDN
- xDSL
- Cable Modem
- OC-x (provisioned fiber)
- Asynchronous Transfer Mode (ATM)
- Fiber Capacity (leased lambda or dark fiber)
- Fiber to the Home (FTTH - future availability)

Wireline Data
- (<= 3Mbps, includes T-1/DS-1)
- (>3Mbps, <= 50Mbps, includes T-3/DS-3)
- (> 50Mbps, <1Gbps, includes OC-x/100BaseEthernet)
- (>=1Gbps, includes OC-x/GigEthernet)

Mobile Wireless Data
- Paging & Short Messaging (terrestrial or satellite)
- Data (<= 100 Kbps, terrestrial)
- Data (> 100 Kbps, <= 1Mbps, terrestrial)
- Data (> 1Mbps, terrestrial)

Fixed Wireless Data
- (<= 3Mbps)
- (>3Mbps, <= 50Mbps)
- (> 50Mbps, <1Gbps)
- (>=1Gbps)

Satellite Data
- Mobile
- Fixed (<= 50Mbps)
- Fixed (>50Mbps)

Major Sponsors

AT&T [ATD Profile] | Cox Business Services [ATD Profile] | Salt River Project [ATD Profile] | Qwest [ATD Profile]

Intel Corporation | Phoenix Business Journal

Additional Sponsors

Arizona Department of Commerce | City of Mesa | City of Tucson | City of Phoenix

International Research Center | Greater Yuma Economic Development Corp. | Tempe Tech Oasis | University of Arizona

Precision Pros | Government Information Technology Agency | WinStar Telecommunications

Arizona Telecom Directory (ATD) Classes of Service:

Voice Telephony Services:

Wireline Residential
Wireline Business (individual circuits)
Wireline Business (multi-line circuits)
Wireline Business (Centrex-type services)
Fixed Wireless (Wireless Local Loop)
Mobile Wireless
(Cellular/PCS/IDEN/Satellite)
Long Distance Services
Voice over Internet Protocol (VoIP)

Video Services:

Wireline Video Providers
(Cable HFC & VDSL)
Fixed Wireless Broadband Video
(LMDS/MMDS)
Direct Broadcast Satellite (DBS)

Other Facilities or Services:

Data Centers (collocation facilities)
Internet Service Providers (ISP) Services
Managed Services
Public Teleconference Facilities
Telecom Contractors - Facilities
Telecom Contractors - Outside Plant
Telecom Equipment Manufacturers
Telecom Equipment Distributors/Dealers
Telecom Equipment Retailers
Telecom Services Resellers
Not Elsewhere Classified - NEC

State of Arizona Carrier Services:

Carrier Services Category 1 - Primary
Carrier Services Category 2 - Primary
Carrier Services Category 3 - Primary
Carrier Services Category 1 - Subcontractor
Carrier Services Category 2 - Subcontractor
Carrier Services Category 3 - Subcontractor

Miscellaneous Data Transport Services:

Frame Relay
ISDN
xDSL
Cable Modem
OC-x (provisioned fiber)
Ethernet
Wi-Fi
WiMAX
Asynchronous Transfer Mode (ATM)
Fiber Capacity (leased lambda or dark fiber)
Fiber to the Home (FTTH)

Wireline Data:

<= 3Mbps (includes T-1/DS-1)
>3Mbps, <= 50Mbps (includes T-3/DS-3)
> 50Mbps, <1Gbps (includes OC-x/100BaseEthernet)
>=1Gbps (includes OC-x/GigEthernet)

Mobile Wireless Data:

Paging & Short Messaging
(terrestrial or satellite)
Data (<= 100 Kbps, terrestrial)
Data (> 100 Kbps, <= 1Mbps, terrestrial)
Data (> 1Mbps, <= 10Mbps, terrestrial)
Data (> 10Mbps, terrestrial)

Fixed Wireless Data:

<= 3Mbps
>3Mbps, <= 50Mbps
> 50Mbps, <1Gbps
>=1Gbps

Satellite Data:

Mobile
Fixed (<= 50Mbps)
Fixed (>50Mbps)

Arizona Telecom Directory (ATD) Database Refresh Priorities:

ATIC's categorization of ATD update work to be done listed below, roughly in priority order:

1) Arizona State Contractors and Subcontractors Data: Update for current 7 approved contracts and 3 classes of services on a county-wide basis. Quick fix for the 8 classes of services originally. Will have to be revised. Type 1 and Type 2 services. Consider subcontractor inclusion as well, but as a lower priority.

2) Major Providers: The 7 state contractors, any and all ILECS, and other major players need to be swept for profile data and services by geography (e.g., Cox, Qwest, AT&T, Frontier, Citizens). Big job but high priority.

3) Other New Players: Add new profiles for major providers who should be there but are not (e.g., WI-VOD, Frontier, STC)

4) Cellular Providers: There were some 20 or 30 companies in the past, but with mergers and acquisitions, there are now are only about 8 of them. Zero out the geographical data for those that have vanished & identify when they vanished and how, identify who bought them out, etc. resulting in a skeletal profile for historical and cross reference purposes. Work with current providers to determine voice and high-speed data coverage by geography.

5) Cable Companies & Coverage: AZ-NM Cable Communications Association (http://www.azcable.org/) identifies some 125 cable systems in Arizona that are owned by approximately 25 companies. Susan Bitter-Smith will provide a membership directory shortly which should prove useful for updating profile and geo-service data. We need to work through a wholesale database refresh in concert with the Association. They have also provided info to GITA that could potentially be mined to complement the current membership directory to update ATD if needed.

6) Companies (Other Than Cellular) Who are Obsolete or Never Came into Being: There are maybe 50 companies falling into this category. Update profile and zero out services by geography.

7) Smaller Companies That Have Existing Records but Need to be Updated: Such as WI-VOD, CommSpeed, and numerous others

Future ATD Updates and Extensions Under Consideration:

ATD Log Page for tracking site and profile/services by geography updates

Refresh telecom services definitions & external resource links

Tune query entry & output views to end user characteristics
    Audiences: customer, provider, economic development)

Online form for user and provider input (errors, add, updates, comments, etc.)

Provider submittal via form of profile/services by geography updates for review and intake

Mapping visualization for query output (GIS shape files or Google Maps/AJAX mashup)

Visual navigation of maps to build queries

Query linkage to off site resources/databases

Arizona's Universities:

Arizona Board of Regents (ABOR)

Home Page - http://www.abor.asu.edu/

Description & Links:

The **Arizona Board of Regents (ABOR)** provides leadership and a unifying voice on key higher education issues and influences public policy through advocacy and initiatives founded upon evidence-based research. Synergies from a unified higher education system provide access and the highest quality education to Arizona's citizens.

Reports/Factbook - http://www.azregents.edu/1_the_regents/reports_factbook/reports_factbook.html

ABOR Statistics: Eligibility Study, Enrollment History, Fall Enrollment, Financial Aid Awarded, History of Degrees Awarded, History of Tuition and Fees, Peer Institutions, Tuition and Fees

Arizona Universities Network (AZUN) - http://www.azun.net/

Arizona Universities Network (AZUN), formerly Arizona Regents University, is a system wide effort to expand and coordinate university education opportunities that can benefit time-bound and place-bound students.

Contact:

Art Ashton, Assistant Executive Director for Information Technology, Office: 602-229-2524, E-Mail: art.ashton@azregents.edu

Arizona State University (ASU)

Home Page - http://www.asu.edu/

Description & Links:

Arizona State University (ASU) is a comprehensive public metropolitan research university enrolling more than 60,000 undergraduate, graduate, and professional students on four differentiated campuses. ASU is a vanguard knowledge and discovery enterprise advancing transdisciplinary teaching and research focused on the major questions of our time and the most pressing challenges that confront global society while leveraging its competitive advantage through strategic global engagement.

Contact:

Michael Crow, President, Office: 480-965-8972, E-Mail: Michael.Crow@asu.edu

Deirdre Meldrum, Dean, Ira A. Fulton School of Engineering, Office: 480-965-2147, E-Mail: Deirdre.Meldrum@asu.edu

Connection One - http://www.connectionone.org/

Connection One is a National Science Foundation (NSF) Industry/University research center working closely with private industry and the federal government on various projects in RF and wireless communications systems, networks, remote sensing, and homeland security.

ASU Morrison Institute for Public Policy - http://asu.edu/copp/morrison/

Morrison Institute for Public Policy is a unit within the School of Public Affairs, College of Public Programs at ASU that bridges the gap between academic scholarship and public policy through services to public and private sector clients and independent research. Driven by a mission to conduct timely, applied analysis that informs, advises, and assists Arizona's state and community leaders, Morrison Institute researches public policies that impact greater Phoenix, the State of Arizona, and the nation. Through publications and forums, Morrison Institute's research serves the public officials, private sector leaders, and community members who shape public policy.

Publications - http://asu.edu/copp/morrison/publications.htm

Arizona Indicators - http://www.arizonaindicators.org/

Nancy Welch, Associate Director, Office: 602-496-0201,
E-Mail: nancy.welch@asu.edu

ASU Institute for Social Science Research (ISSR) - http://issrweb.asu.edu/

GIS Services - http://issrweb.asu.edu/services/gis/

GIS Data Repository - http://issrweb.asu.edu/services/gis/data-repository.html

ISSR GIS Services is experienced in working with GIS and remote sensing software including ESRI, IDRISI, ERDAS, and ENVI, as well as with Google Maps and Google Earth. They have extensive expertise working with large network datasets, Internet interactive mapping, 3D visualization, modeling in both raster and vector environments, geostatistics, database management, data development for utilities and land cover/land use, as well as cartographic skills. GIS Services is an active participant in the Arizona Geographic Information Council (AGIC). Available currently in the ISSR GIS Data Repository are:

- Administrative Boundaries such as city, county, school district, legislative districts, etc.
- Generalized Census data for ethnicity, education, age, and income
- Cultural Features such as parks, hospitals, airports and more
- Elevation (both 10M and 30M elevation for the State)
- Historic Land Use for Maricopa County (generalized)
- Hydrology including drainage, lakes, watershed boundaries, and more
- Aerial Photography (DOQQs and Kenny Aerials)
- Indices for Township/Range/Section (24K, 150K and 250K USGS quads)
- Digital Raster Graphics (scanned topographic maps)
- Transportation including geocodable roads
- Parcel Data for Maricopa County (2003 and 2004)

ASU School of Geographical Sciences - http://geography.asu.edu/

Geosimulation (Dr. Paul M. Torrens) - http://geosimulation.org/

Wi-Fi geographies - http://www.geosimulation.org/wifi/

Arizona Geographic Alliance (AZGA) - http://alliance.la.asu.edu/azga/

School of Geographical Sciences and Urban Planning in ASU College of Liberal Arts - Proposed in pending reorganization subject to ABOR approval

Northern Arizona University (NAU)

NAU Home Page - http://www.nau.edu/

NAU Description & Links:

Northern Arizona University (NAU), a doctoral, research-intensive university, serves more than 21,352 at its main campus in Flagstaff and at more than 35 sites across the State.

NAU Contacts:

John Haeger, President, Office: 928-523-3232, E-Mail: John.Haeger@nau.edu

Fred Solop, Director & Professor, Social Research Laboratory (SRL) and Political Science, Main: 928-523-1515, Office: 928-523-3135, E-Mail: Fred.Solop@nau.edu, http://fredsolop.googlepages.com/

Social Research Laboratory (SRL) - http://www.socialresearchlab.com/

Project Categories - http://www.socialresearchlab.com/ProjectCategories.aspx

Arizona Department of Commerce Data User Study 12/1/06 - http://www.socialresearchlab.com/ProjectDetail.aspx?ProjectID=6629b6cf-2ae8-494c-847d-b62acb77af15

Arizona Board of Regents (ABOR) Survey 6/1/07 - http://www.socialresearchlab.com/ProjectDetail.aspx?ProjectID=d3922b80-acfb-4256-956f-ddf7e9b42ecc

City of Flagstaff Citizen Survey 2006 - http://www.socialresearchlab.com/DocumentDetail.aspx?DocumentID=c9ec099a-354d-4599-9697-028e150eb906

Coconino County Citizen Survey 2007 - http://www.socialresearchlab.com/DocumentDetail.aspx?DocumentID=517adb32-1e63-4df1-9d64-f38278e080cc

Telecommunications related questions included: How often do you use the Internet? Do you pay bills on the Internet? Do you have a computer at home? Do you have Internet access at home? How do you connect to the Internet at home?

Geospatial Research and Information Laboratory (GRAIL) - http://www.grail.nau.edu/

Spatial Data on GRAIL Geodatabases (Biology, Boundary, Climatology, Geology, Hydrology, Land Use/Land Cover, Public Land Records, Topographic, Transportation) - http://www.grail.nau.edu/spatial_data.html

The W. A. Franke College of Business Arizona Rural Policy Institute (ARPI) - http://www.cba.nau.edu/rpi/

The W. A. Franke College of Business Center for American Indian Economic Development (CAIED) - http://www.franke.nau.edu/businessoutreach/caied/

NAU Television Services & Distance Learning (NAUNet) - http://distance.nau.edu/tvs/

Satellite Downlinks and Uplinks - http://distance.nau.edu/tvs/ourservicesuplinksanddownlinks.aspx

University of Arizona (UA)

Home Page - http://www.arizona.edu/

Description & Links:

The **University of Arizona (UA)** is a premier, student-centered research institution established in 1885 as the first university in the Arizona Territory and the state's only land grant institution. The UA embraces its threefold mission of excellence in teaching, research and public service with world-class faculty in fields as diverse as astronomy, plant science, biomedical science, business, law, music, and dance. The UA has become one of the nation's top 20 public research institutions producing more than $530 million in annual research and the state's only member of the prestigious Association of American Universities.

University Information Technology Services (UITS) - http://ccit.web.arizona.edu/

Arizona Telemedicine Program (ATP) (http://www.telemedicine.arizona.edu/) is a large, multidisciplinary, university-based program that provides telemedicine services, distance learning, informatics training, and telemedicine technology assessment capabilities to communities throughout Arizona. ATP has succeeded in creating partnerships among a wide variety of not-for-profit and profit healthcare organizations, and has created new interagency relationships within the state government. ATP is recognized as one of the premier programs at the University of Arizona College of Medicine, and has received numerous awards at the national level for its research and innovations.

ATP Network Description - http://www.telemedicine.arizona.edu/program/Network%20Description.html

ATP Network Services - http://www.telemedicine.arizona.edu/program/Network%20Membership%20Services.html

ATP Network Map - http://www.telemedicine.arizona.edu/program/ATPNetwork20060413gbytVis2002.pdf

Arizona Telemedicine Council - http://www.telemedicine.arizona.edu/people/council.html

Related Web Resources - http://www.telemedicine.arizona.edu/resources/

Arizona Electronic Atlas - http://atlas.library.arizona.edu/

The Geographic Literate Student: The Arizona Electronic Atlas Experiment from the 4th Annual ESRI Education User Conference 2004

Abstract on ESRI Site - http://training.esri.com/campus/library/Bibliography/RecordDetail.cfm?ID=58433

Paper (PDF) on ESRI Site - http://downloads2.esri.com/campus/uploads/library/pdfs/58433.pdf

Arizona Regional Image Archive - http://aria.arid.arizona.edu/

University of Arizona (UA) (Continued)

Eller College of Management Economic & Business Research Center - http://ebr.eller.arizona.edu/

Arizona Regional Economic Analysis Project - http://www.pnreap.org/arizona/

Current Economic Indicators - http://ebr.eller.arizona.edu/indicators/

Economic Forecasts - http://ebr.eller.arizona.edu/forecasts/

Arizona's Economy Quarterly - http://ebr.eller.arizona.edu/azeconomy/

UA Contacts:

Robert N. Shelton, President, Office: 520-621-5511, E-Mail: Robert.shelton@arizona.edu

Mike Holcomb, Associate Director, Network Architecture, Arizona Telemedicine Program, Office: 520-626-4496, E-Mail: Holcomb@email.arizona.edu

UA Telemedicine Interview:

Mike Holcomb interviewed on UA Telemedicine 6/20/08.

UA Telemedicine GIS Experience/Use:

The Arizona Telemedicine Program (ATP) currently has no GIS capacity.

UA Telemedicine Database & GIS Sources:

The Arizona Telemedicine Program (ATP) network is comprised of leased except for connectivity across the campus environment and includes a dedicated DS-3 circuit from Tucson to Phoenix and on to Flagstaff. The ATP network is currently migrating from legacy ATM to IP and MPLS so as to accommodate future evolution and the demands of advanced applications. ATP is carrier agnostic and utilizes Qwest, AT&T, NCI, Integra, Network Solutions, and others as appropriate.

Network database of circuits, providers, and sites could be provided to GITA for analysis and GIS overlay purposes. It would provide complementary data points to the State agency connectivity data available through Accenture/Calence.

UA Telemedicine Broadband Assessment Project Interest:

UA Telemedicine has significant challenges identifying rural broadband options in concert with its consortium partners and would find the planned GITA Broadband Assessment capabilities of significant value in assisting in network planning. Some specific high-bandwidth requirements occur in the Teletrauma Program, with the Arizona Burn Center, and the Community Health Centers, 18 of which have videoconferencing.

Today it is often deferred to resellers to determine and offer site specific options, plans, and pricing. GITA's planned capabilities would be useful to crosscheck and compare reseller offerings and to identify other options.

Note: As follow up, Mike Holcomb to provide an updated network map, a list of sites and associated services, and a list of community health centers and their locations.

Other Arizona Organizations and Resources of Interest:

Arizona Professional Land Surveyors (APLS)

APLS Home Page - http://www.azpls.org/

APLS Description & Links:

Arizona Professional Land Surveyors (APLS) represents over 800 members throughout the State of Arizona, and is recognized as the unified voice of the Arizona surveying profession. APLS is comprised of 7 regional affiliated organizations, and is an affiliate of the National Society of Professional Surveyors. Headquartered in Phoenix, the primary focus of APLS is to foster the establishment and maintenance of uniform high professional standards of work and ethics in the practice of the profession of land surveying; to promote and enhance the profession through educating the public about the role and responsibilities of the professional surveyor; and to provide quality professional development opportunities to the land surveying community, ultimately ensuring the health, safety, and welfare of the public.

Arizona Spatial Data Accuracy and Georeferencing Standards V2.2 (6/28/08) - http://www.azpls.org/associations/1444/files/AZ%20Spatial%20Data%20Standards_FINAL_v2.2.pdf

Links of Interest - http://www.azpls.org/displaycommon.cfm?an=3

Geospatial Solutions - Arizona Surveyors Forge Standards Article 8/29/08 - http://gismap.geospatial-solutions.com/gssgismap/article/articleDetail.jsp?id=546719

Arizona Investment Council (AIC)

AIC Home Page - http://www.arizonaic.org/

AIC Description & Links:

The **Arizona Investment Council (AIC)**, formerly the Arizona Utility Investors Association (AUIA), maximizes the influence of utility investors on public policies and governmental actions that may have an impact the well-being of investors and their utility investments and supports infrastructure development in the State of Arizona.

Infrastructure Needs and Funding Alternatives for Arizona 2008-2032: Water, Energy, Communications and Transportation Report 5/08

Recently completed utility infrastructure assessment project with ASU assistance, but minimal telecommunications infrastructure breadth and depth. Add details and observations about the telecom data and sources as relevant.

Executive Summary - http://www.arizonaic.org/images/stories/pdf/AIC_Executive_Summary_Final.pdf

Full Report - http://www.arizonaic.org/images/stories/pdf/AIC_FINAL_report.pdf

AIC Contact:

Gary Yaquinto, President, Office: 602-257-9200, E-Mail: gyaquinto@arizonaic.org

Arizona Association for Economic Development (AAED)

AAED Home Page - http://www.aaed.com/

AAED Description & Links:

The **Arizona Association for Economic Development (AAED)** promotes economic development in the State of Arizona through an interchange of information and educational opportunities among its members, acts as a liaison with outside groups having the same objectives to influence legislation affecting economic development, and acts to continually improve working relationships among its diverse membership.

Resources - http://www.aaed.com/resources.asp

Arizona Economic Development Directory - http://www.ecodevdirectory.com/arizona.htm

AAED Contact:

Bruce Coomer, Executive Director, Office: 602-240-2233

The League of Arizona Cities and Towns

League Home Page - http://www.azleague.org/

League Description & Links:

Promotes local self-government, municipal independence, and provide professional and high quality assistance to the municipal governments in the State of Arizona

Resource Library - http://www.azleague.org/library/index.cfm?area=library.search

Additional Resources - http://www.azleague.org/index.cfm?fuseaction=addl_res.main

League Contact:

Ken Strobeck, Executive Director, Office: 602-258-5786, E-Mail: kstrobeck@azleague.org

Tom Belshe, Deputy Director, Office: 602-258-5786, E-Mail: tbelshe@azleague.org

Arizona City/County Management Association (ACMA)

ACMA Home Page - http://www.azmanagement.org/

ACMA Description & Links:

Non-profit, professional organization dedicated to increasing the knowledge and ability of city, town, and county managers, as well as other local government administrators and to strengthening the quality of local government in the State of Arizona through professional management, education, training, and the mutual exchange of information.

ACMA Contact:

Office: 602-258-5786, E-Mail: info@azmanagement.org

CANAMEX Smart Corridor & CyberPort Projects

Home Page - http://www.canamex.org/

Contact:

Marisa Paula Walker, Executive Director,
Office: 602-771-1111, E-Mail: marisaw@azcommerce.com

Arizona Prospector

Home Page - http://www.azprospector.com/

Description & Links:

Arizona Prospector from Arizona Public Service (APS) in cooperation with the Arizona Department of Commerce (ADOC) allows users to identify available commercial property and provides data including workforce demographics, business information, and interactive maps. The data is created and displayed using a Geographic Information System (GIS) that combines layers of information in order to better understand comprehensive details about a specific location and is powered by GIS Planning's (http://www.gisplanning.com/) ZoomProspector software.

Any commercial broker, property owner, developer, or similar real estate entity can list available commercial or industrial property at no cost and website visitors can contact the respective brokers directly about specific properties. Thus, Arizona Prospector promotes the properties listed by real estate professionals and also provides critical business data giving enormous exposure to listed properties and real estate brokerage firms.

Search by Commercial Property Type and Size - http://www.azprospector.com/ed.asp?bhcp=1

Community Profiles - http://www.azprospector.com/ed.asp?cmd=startdemo&bhcp=1

Maps - http://www.azprospector.com/ed.asp?cmd=startmap&bhcp=1

Arizona Indicators Project

Home Page - http://www.arizonaindicators.org/

Description & Links:

The **Arizona Indicators Project** provides a one-stop data research tool that tracks Arizona's economic, social and environmental trajectory. In 2007, Arizona State University (ASU) began an initiative in partnership with the Arizona Department of Commerce (http://www.azcommerce.com/), the Arizona Community Foundation (http://www.azfoundation.org/), and The Arizona Republic (http://www.arizonarepublic.com/) to produce community indicators as the first steps toward producing a comprehensive set of indicators maintained and updated on an ongoing basis, with a second phase focusing on innovation indicators. New data is uploaded to the site on an ongoing basis. The project is transitioning to the ASU Morrison Institute for management going forward.

Interactive Maps - http://www.arizonaindicators.org/pages/maps/index.html

Contact:

E-Mail: indicators@asu.edu or joshua.connolly@asu.edu

Arizona Association of Public-Safety Communications Officials International (APCO)/National Emergency Number Association (NENA)

Home Page - http://www.az-apco-nena.org/index.html

Description & Links:

The **Arizona Association of Public-Safety Communications Officials International (APCO)/National Emergency Number Association (NENA)** is a joint state chapter for public safety communications stakeholders.

Association of Public-Safety Communications Officials International (APCO) - http://www.apcointl.org/index.html

Automated Frequency Coordination (AFC) - http://www.apcointl.org/frequency/

Communications Center & 9-1-1 Services - http://www.apcointl.org/new/commcenter911/

Resource Library - http://www.apcointl.org/new/commcenter911/resource.html

National Emergency Number Association (NENA) - http://www.nena.org/

USDOT & NENA Wireless E9-1-1 Information Clearinghouse & County-by-County Deployment Maps - http://www.nena.org/pages/ContentList.asp?CTID=6

Reference, Resources and Links - http://www.nena.org/pages/ContentList.asp?CTID=21

Arizona Regional Review Committee (ARRC) - http://www.az-apco-nena.org/ARRC/arrc.htm

ARRC is responsible for coordinating public sector use of wireless frequencies assigned by the FCC to public sector entities within the State of Arizona

ARRC Regional Review Committee 800 MHz Regional Plan - http://www.az-apco-nena.org/ARRC/Reg3Rev5_070814.pdf

Larry Sayers, ARRC Regional Chairman & Pima County Wireless Services Manager, Office: 520-884-5367, E-Mail: Larry.Sayers@pima.gov

Amateur Radio Council of Arizona (ARCA)

Home Page - http://www.arca-az.org/arca/

Description & Links:

The **Amateur Radio Council of Arizona, Inc. (ARCA)** is a statewide organization comprised of Amateur Radio Clubs from all parts of Arizona, working for the betterment of Amateur Radio statewide.

Arizona Repeater Owners Frequency Coordination Committee - http://www.azfreqcoord.org/

ARRL Southwestern Division Convention (AzHamCom) - http://www.azhamcom.org/

Contact:

Voice Mail: 602-881-2722

Arizona Government Information Technology Agency

Broadband Assessment GIS Study

Appendix D - External Broadband Assessment GIS Sources

Broadband Assessment and Survey Sources

Central Office and Wire Center Location Sources

Cable Provider Service Boundary Sources

Wireless Tower Location Sources

Wireless Services Provisioning Sources

Metro Fiber Infrastructure

Other External Broadband Assessment Data Sources

Roadway and Highway Geographic Data Sources

K-12 School Demographic Data Sources

Population Demographic Data Sources

Appendix D - External Broadband Assessment GIS Sources (Continued)

Broadband Assessment and Survey Sources:

U.S. Federal Communications Commission (FCC) Broadband Surveying:

OET Mapping Resources - http://www.fcc.gov/oet/info/maps/

FCC License Areas - http://www.fcc.gov/oet/info/maps/areas/

Broadband Strategic Goal Home - http://www.fcc.gov/broadband/

Wireline Competition Bureau (WCB) - http://www.fcc.gov/wcb/

WCB develops and recommends policy goals, objectives, programs and plans for the Commission on matters concerning wireline telecommunications with overall objectives including: ensuring choice, opportunity, and fairness in the development of wireline telecommunications services and markets; developing deregulatory initiatives; promoting economically efficient investment in wireline telecommunications infrastructure; promoting the development and widespread availability of wireline telecommunications services; and fostering economic growth

Form 477 Reporting Requirements & Deployment Data - http://www.fcc.gov/broadband/data.html

Form 499-A Data Search - http://fjallfoss.fcc.gov/cgb/form499/499a.cfm

Local Telephone Competition and Broadband Deployment Data - http://www.fcc.gov/wcb/iatd/comp.html

FCC Expands, Improves Broadband Data Collection 3/19/08

News Release (Word) - http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-280909A1.doc

News Release (Acrobat) - http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-280909A1.pdf

WCB Open Meeting Presentation - http://www.fcc.gov/WCB_031908_open_meeting_slides.pdf

New Speed Tiers:

1st Generation Data - 200 kbps to 768 kbps
Basic Broadband Tier 1 - 768 kbps to 1.5 Mbps
Broadband Tier 2 - 1.5 Mbps to 3 Mbps
Broadband Tier 3 - 3 Mbps to 6 Mbps
Broadband Tier 4 - 6 Mbps to 10 Mbps
Broadband Tier 5 - 10 Mbps to 25 Mbps
Broadband Tier 6 - 25 Mbps to 100 Mbps
Broadband Tier 7 - Greater than 100 Mbps

Benton Foundation: Improving FCC Broadband Data Collection 3/19/08 - http://www.benton.org/node/10234

Congress recently passed the **Broadband Data Improvement Act (S. 1492)** which was signed into law by President George W. Bush on 10/10/08 and directed the **FCC** to conduct inquiries into the deployment of advanced telecommunications services

annually, the **Census Bureau** to include a question in its American Community Survey that assesses levels of residential computer use and dial-up versus broadband Internet subscribership, and the **GAO** to develop broadband metrics that may be used to provide consumers with broadband connection cost and capability information. S. 1492 also establishes a program that would provide matching grants to State non-profit, public-private partnerships in support of efforts to more accurately identify barriers to broadband adoption throughout the participating States. The anticipated Stimulus Package from President Barack Obama and Congress are likely to fund the implementation of these mandates, as well as support State assessment initiatives.

Universal Service Administrative Company (USAC - http://www.usac.org/):

Universal Service Fund (USF) - http://www.usac.org/about/universal-service/

High Cost Program - http://www.usac.org/hc/

Incumbent Local Exchange Carriers (ILECs) - http://www.usac.org/hc/incumbent-carriers/

Competitive Local Exchange Carriers (CLECs) - http://www.usac.org/hc/competitive-carriers/

Wire Center - UNE Zone Mapping - http://www.usac.org/hc/tools/wctozone/IASWCToZoneSearch.aspx

Low Income - http://www.usac.org/li/

State Commissions - http://www.usac.org/li/low-income/contact-commission/default.aspx

Rural Health Care - http://www.usac.org/rhc/

Rural Health Care Search Tools - http://www.usac.org/rhc/tools/rhc-search-tools.aspx

Schools and Libraries Program (e-Rate) - http://www.usac.org/sl/

Search Tools - http://www.usac.org/sl/tools/search-tools/

Technology Planning - http://www.usac.org/sl/applicants/step02/technology-planning/

USAC Resource Room - http://www.usac.org/about/resource-room/

United States Department of Commerce (DOC) - http://www.doc.gov/

National Telecommunications and Information Administration (NTIA) - http://www.ntia.doc.gov/

The NTIA is expected to administer a Broadband Deployment Grants program, as well as a national broadband mapping initiative, as part of the anticipated broadband components of the pending federal stimulus package.

Office of Policy Analysis and Development - http://www.ntia.doc.gov/opadhome/opadhome.html

Office of Telecommunications and Information Applications (OTIA) Grants - http://www.ntia.doc.gov/otiahome/otiahome.html

Reports & Filings - http://www.ntia.doc.gov/reports.html

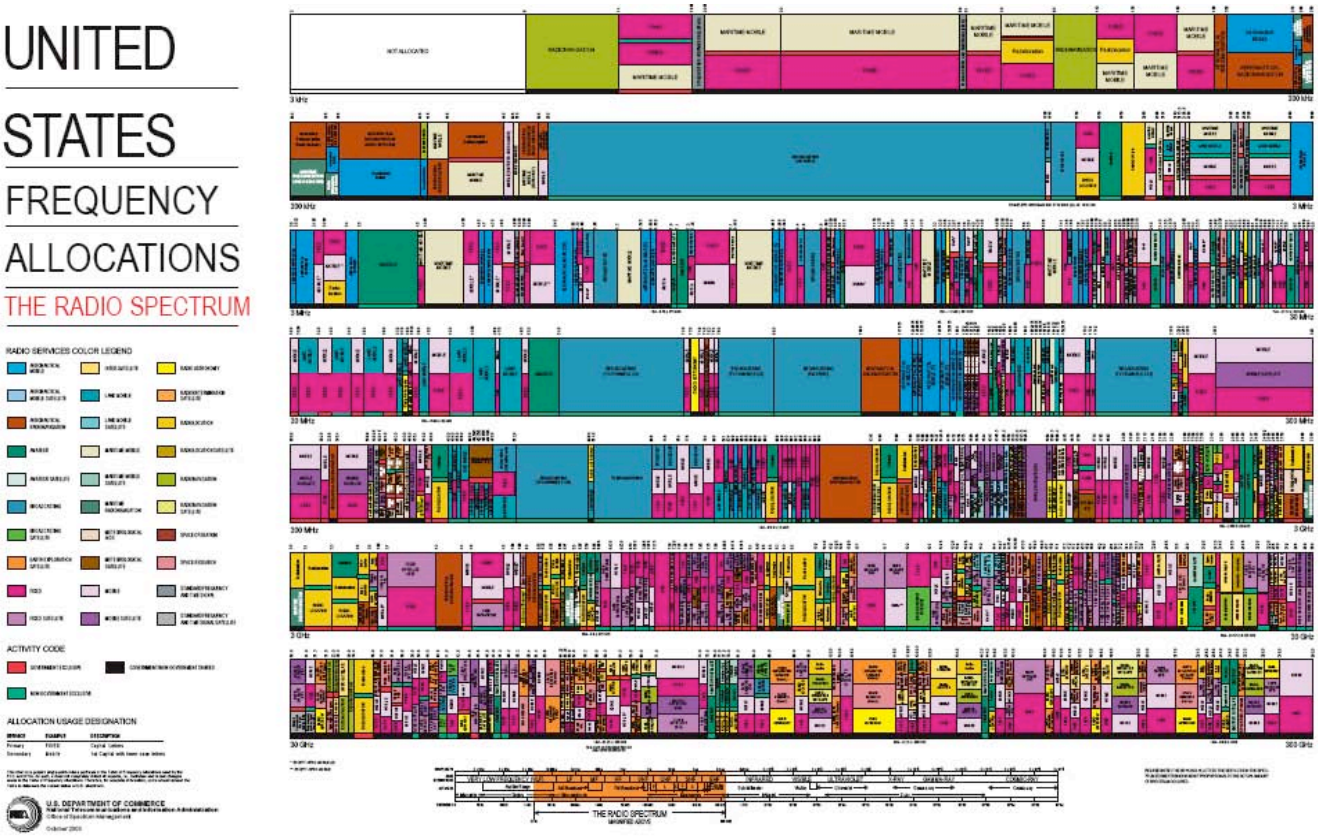
Networked Nation: Broadband in American 2007 - http://www.ntia.doc.gov/reports/2008/NetworkedNation.html

Institute for Telecommunication Sciences (ITS) - http://www.its.bldrdoc.gov/

Online Publications - http://www.its.bldrdoc.gov/pub/pubs.php

Office of Spectrum Management (OSM) - http://www.ntia.doc.gov/osmhome/Osmhome.html

U.S. Frequency Allocation Chart (as of October 2003) - http://www.ntia.doc.gov/osmhome/allochrt.html and Text Version - http://www.ntia.doc.gov/osmhome/Chp04Chart.pdf



National Institute of Standards and Technology (NIST) - http://www.nist.gov/

United States Measurement System (USMS) - http://usms.nist.gov/

Metrology Challenges for Broadband Communications Workshops - http://usms.nist.gov/workshops/BroadbandTelecomm.htm

Information Technology Laboratory - http://www.itl.nist.gov/

Advanced Network Technologies Division (ANTD) - http://w3.antd.nist.gov/

Technology Innovation Program (TIP) - http://www.nist.gov/tip/

National Science Foundation (NSF) - http://www.nsf.gov/

Division of Science Resources Statistics (SRS) - http://www.nsf.gov/statistics/

Advancing Measures of Innovation - http://www.nsf.gov/statistics/nsf07306/content.cfm?pub_id=3763&id=4

United States Department of Agriculture (USDA):

USDA Rural Utility Services (RUS) - http://www.usda.gov/rus/

Rural Development Telecommunications Program - http://www.usda.gov/rus/telecom/index.htm

Rural Development Broadband Loan and Loan Guarantee Program - http://www.usda.gov/rus/telecom/broadband.htm

Harry M. Hutson (For AZ, CA & NV in USDA RUS SW Area)
Office: 623-535-5450, E-Mail: hhutson@rus.usda.gov

Telecommunications Staff Directory - http://www.usda.gov/rus/telecom/staff/index_staff.htm

Broadband Community Search Tool - http://broadbandsearch.sc.egov.usda.gov/

Rural Broadband Access Loans and Loan Guarantees Websites - http://www.usda.gov/rus/telecom/telecom_websites.htm

Distance Learning and Telemedicine Program - http://www.usda.gov/rus/telecom/dlt/dlt.htm

Telecom Act and Universal Services - http://www.usda.gov/rus/telecom/telecomact/act.htm

Advanced Telecommunications in Rural America Report 4/00 (PDF) - http://www.usda.gov/rus/telecom/telecomact/pdf_files/ntia-rusbroad.pdf

BroadbandCensus.com - http://www.broadbandcensus.com/

BroadbandCensus.com invites end users to take their online Broadband Census. The information provided helps other Internet users, the Pew Internet & American Life Project, and other researchers to improve our nation's understanding of the true state of broadband in America. The Broadband Census currently surveys regarding broadband competition and availability, but aims to add information about broadband speeds and broadband prices going forward. Their goal is nothing less than to track high-speed Internet services everywhere.

Census Form - http://broadbandcensus.com/census/form

Beset by Large Rural Areas, Arizona Aims to Blend Broadband Data Sources Article by Drew Bennett & William G. Korver 10/15/08 - http://broadbandcensus.com/blog/?p=858

Internet Innovation Alliance - http://www.internetinnovation.org/

Broadband Fact Book - http://www.internetinnovation.org/factbook/

Collection of Broadband facts and links in various Research Areas including: Broadband Adoption, Broadband Traffic, Economy, Education, Energy, Environment, Health Care, Network Infrastructure, Other, Poverty, Telework

National Broadband Strategy - http://www.internetinnovation.org/library/broadband/

The Call for a National Broadband Policy (4/08) - http://www.internetinnovation.org/files/special-reports/IIA_National_Broadband_Policy_042908.pdf

Communications Workers of America (CWA) - http://www.cwa-union.org/

SpeedMatters.org - http://www.speedmatters.org/

SpeedMatters.org creates Public-Private Partnerships to track high-speed deployment, identify underserved communities, and address gaps in investment and consumer demand. End users around the U.S. contribute data through running the online Internet speed test in a survey process called crowdsourcing. Arizona's Broadband Assessment Project should explore direct data exchange arrangements with SpeedMatters.org once underway.

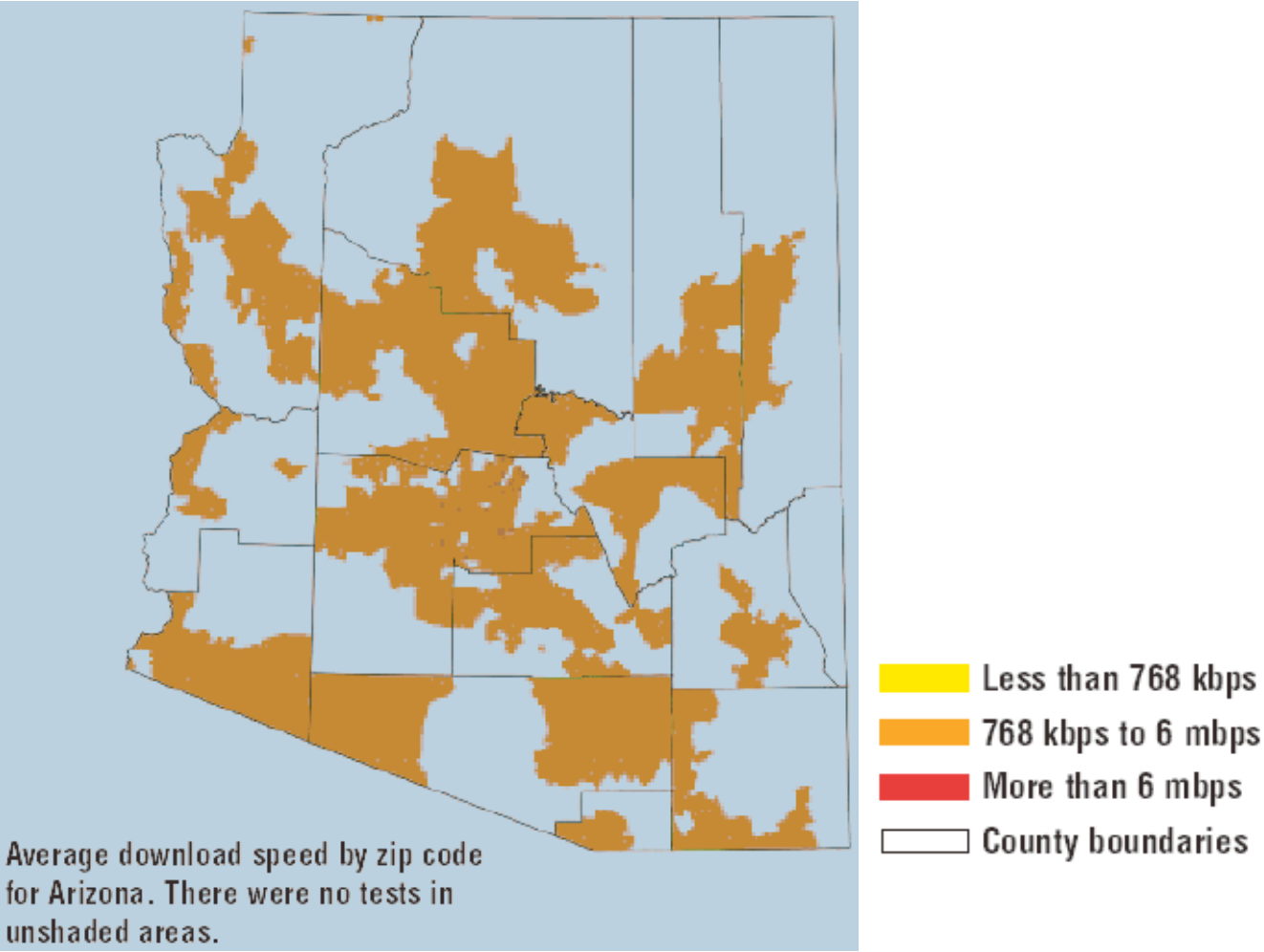
SpeedMatters Brochure - http://files.cwa-union.org/speedmatters/SpeedMattersBrochure.pdf

SpeedMatters Position Paper (10/06) - http://files.cwa-union.org/speedmatters/SpeedMattersCWAPositionPaper.pdf

SpeedMatters Report on Internet Speeds in All 50 States 2008 (5.1MB PDF) - http://www.speedmatters.org/document-library/sourcematerials/cwa_report_on_internet_speeds_2008.pdf

Internet Speed Test - http://www.speedmatters.org/speed-test/?src=dropdown

Arizona SpeedMatters Internet Speed Test Results



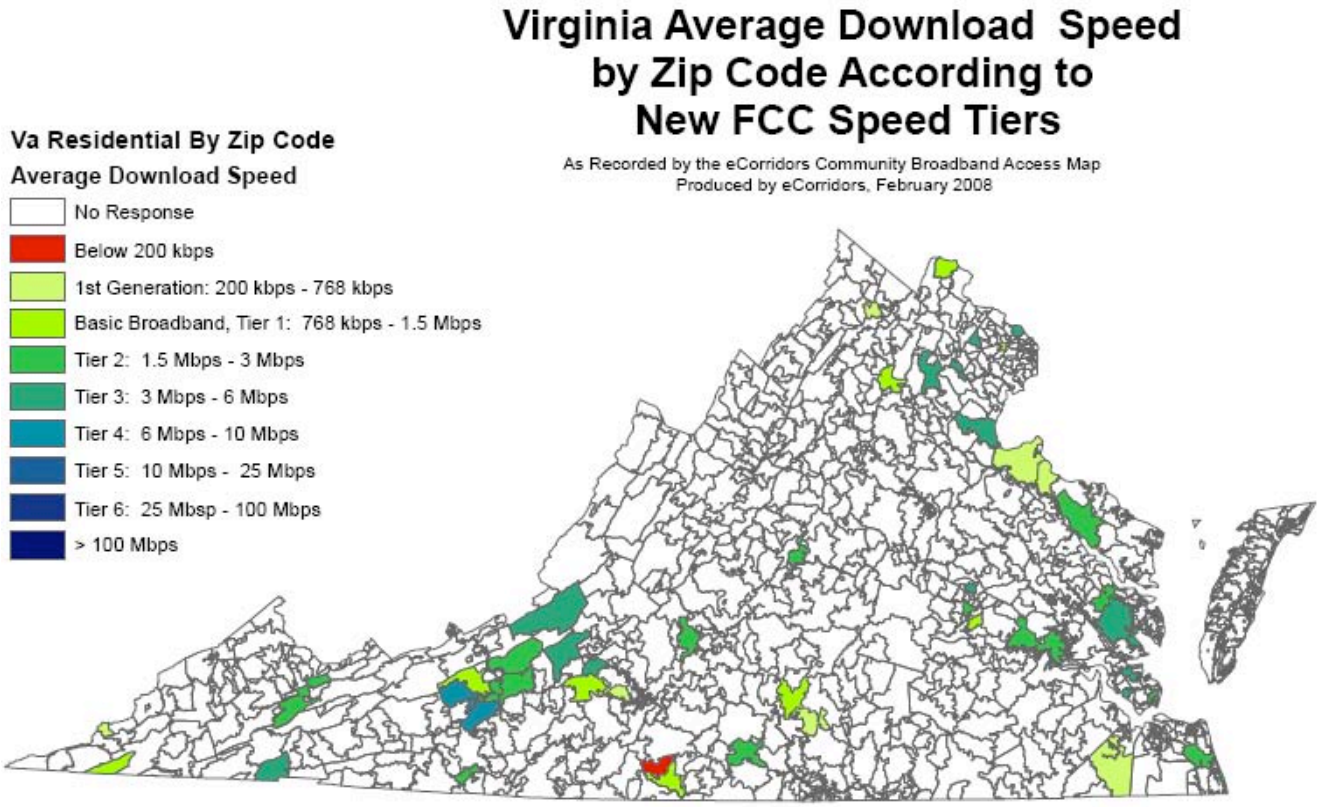
Average download speed by zip code for Arizona. There were no tests in unshaded areas.

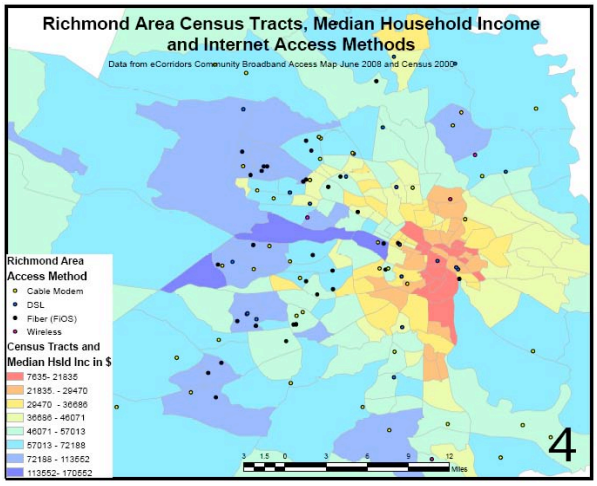
eCorridors - http://www.ecorridors.vt.edu/

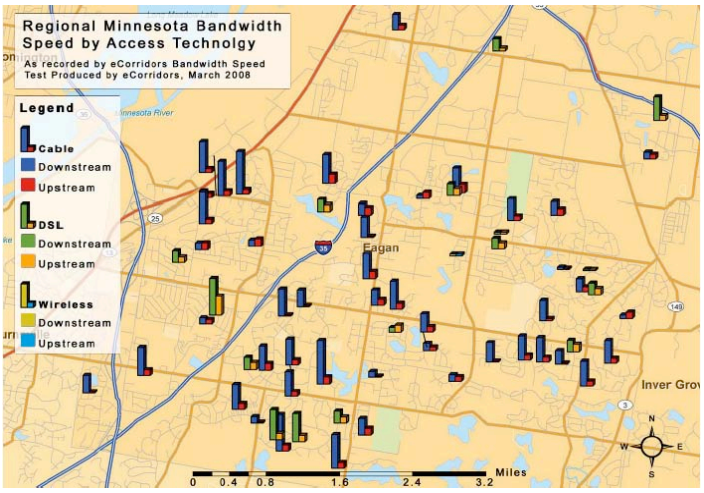
Virginia's Center for Innovative Technology (CIT) provides the eCorridors Community Broadband Access Map (CBAM) which has been collecting connectivity data since August 2006. End user contributors ran the speed test from their home or small business Internet connections and added relevant parameters and markers. To ensure depiction of only current data, the map displays only the most recent 12 months speed tests, with older data archived and available upon request. Cooperative arrangements with other States have been established and the program could be utilized as currently implemented or replicated.

eCorridors Overview PDF - http://www.ecorridors.vt.edu/research/papers/pdf/eCorridors_broadband_03-20-08.pdf

eCorridors Research - http://www.ecorridors.vt.edu/research/







Marigold Technologies - http://www.marigoldtech.com/

Broadband America Database - http://www.marigoldtech.com/bba.htm

An over 31 million record consumer database of people who use broadband, with information on both the broadband provider and the type of connection (DSL, cable, etc.) with active names updated and cleansed by subscription

Pew Internet & American Life Project - http://www.pewinternet.org/

Internet Evolution - http://www.pewinternet.org/PPF/c/3/topics.asp

The Future of the Internet III 12/14/08 - http://www.pewinternet.org/PPF/r/270/report_display.asp

Demographics - http://www.pewinternet.org/PPF/c/2/topics.asp

Benton Foundation - http://www.benton.org/

Broadband Benefits - http://www.benton.org/initiatives/broadband_benefits

Virtual Library - http://www.benton.org/library/

Benton Foundation: Improving FCC Broadband Data Collection 3/19/08 - http://www.benton.org/node/10234

MuniWireless - http://www.muniwireless.com/

City & County WiFi Networks - http://www.muniwireless.com/city-county-wifi-networks-page/

Municipal Wireless Case Studies - http://www.muniwireless.com/resources-page/case-studies/

Wi-FI & WiMAX Maps - http://www.muniwireless.com/maps/

Resources - http://www.muniwireless.com/resources-page/

Bill & Melinda Gates Foundation - http://www.gatesfoundation.org/

On 12/18/08 the Bill & Melinda Gates Foundation awarded $6.9 million in grants to Connected Nation (http://www.connectednation.com/), a non-profit broadband Internet advocacy group, and the American Library Association's (ALA - http://www.ala.org/) Office for Information Technology Policy (OITP) to help public libraries in seven states (Arkansas, California, Kansas, Massachusetts, New York, Texas, and Virginia) secure faster Internet connections so more people can access a full range of online applications and opportunities. To inform the pilot grant program, the foundation commissioned research on the quality and type of Internet connections provided in the nation's public libraries, encompassing all 50 states, which will be available to the library field for advocacy and planning purposes. ASLAPR will coordinate an Arizona application for the next phase of the program.

Press Release 12/8/08 - http://www.gatesfoundation.org/press-releases/Pages/faster-internet-connections-in-libraries-081218.aspx

Libraries Are the Lone Source of Free Computer and Internet Access in Most Communities (1/15/07) - http://www.gatesfoundation.org/learning/Pages/2007-libraries-lone-source-free-public-computer-Internet-access.aspx

Connected Nation (http://www.connectednation.org/) builds coalitions of private sector broadband providers who agree to share their deployment data for the greater communal and public sector benefit, creating an inventory of existing services while providing a detailed picture of where broadband gaps need to be addressed. Their Research and Mapping Services (http://www.connectednation.org/mapping/) previous Broadband Landscape projects have been completed in KY, OH, TN, and WV.

Central Office and Wire Center Location Sources:

Tele Atlas - http://www.esri.com/

Tele Atlas offers a range of relevant telecom data sources including **Wirecenter Premium** (incumbent wire center boundaries and all commercial switch points with associated NXX ranges), **Rate Center Boundaries** (regulatory boundaries for uniform rates for various types of local exchange services), **Area Code (NPA) Boundaries** (Numbering Plan Areas), **LATA Boundaries** (Local Access Transport Areas), **ILEC Boundaries** (Incumbent Local Exchange Carrier) and **Points of Presence (POP)** (telecom provider switch locations). A single state version for Arizona is separately available and may be licensed from ESRI.

Tele Atlas Telecommunications Products Users Guide 2008 - http://www.teleatlas.com/stellent/groups/public/documents/content/ta_d_022263.pdf

Quentin Sager Consulting Inc. - http://www.quentinsagerconsulting.com/

North American Area Code and Local Exchange NPA NXX Data Products - http://www.npanxxsource.com/

Database Comparisons - http://www.npanxxsource.com/npanxx.htm

Licensing Overview - http://www.npanxxsource.com/licenseoverview.htm

Workstation, Corporate, and Distribution Licenses with most complete Wire Center Edition with least constrained Distribution License costing $2,799.95 per year

GeoTel Communications, Inc. - http://www.geo-tel.com/

CMC International (Distributor) - http://www.cmcus.com/

GeoTel Central Office Locations for the US - http://www.cmcus.com/Products/Vendors/geotel/geotelcentralofficelocations.asp

GeoTel Wire Center Boundaries - http://www.cmcus.com/Products/Vendors/geotel/geotelwirecenterboundaries.asp

Center for Communications Management Information (CCMI) - http://www.ccmi.com/

Free Telecom Tools (NPA-NXX Lookup, Area Code/State/LATA Lookup) plus Licensed Sources (TelView tariffs/prices, Carrier Access Rate File, QTEL Telecom Database Suite)

NAVTEQ NavMart - http://www.navmart.com/

Licensed Central Office Locations, Wire Centers, Area Codes, Rate Center and LATAs data

TelcoData.us - http://www.telcodata.us/

Collects data on telecom companies, wire centers, and switches from various sources including NANPA and the CNAC, as well as various regulatory information pages, CLEC notifications posted on ILEC websites, and user submissions. Low cost subscription access to download various data files from $45-275 per year.

DSL Reports Central Office Information - http://www.dslreports.com/coinfo

Marigold Technologies Central Office Lookup Tool - http://www.marigoldtech.com/lists/co.php

CTG3 Telco Links (Qwest) - http://telcolinks.ctg3.com/filelibrary/ShowTelcolinksTablePage.aspx

Arizona Telephone Central Offices - http://www.thecentraloffice.com/AZ/AZindex.htm

Cable Provider Service Boundary Sources:

Arizona-New Mexico Cable Communications Association (AZ-NMCXCA) - http://www.azcable.org/

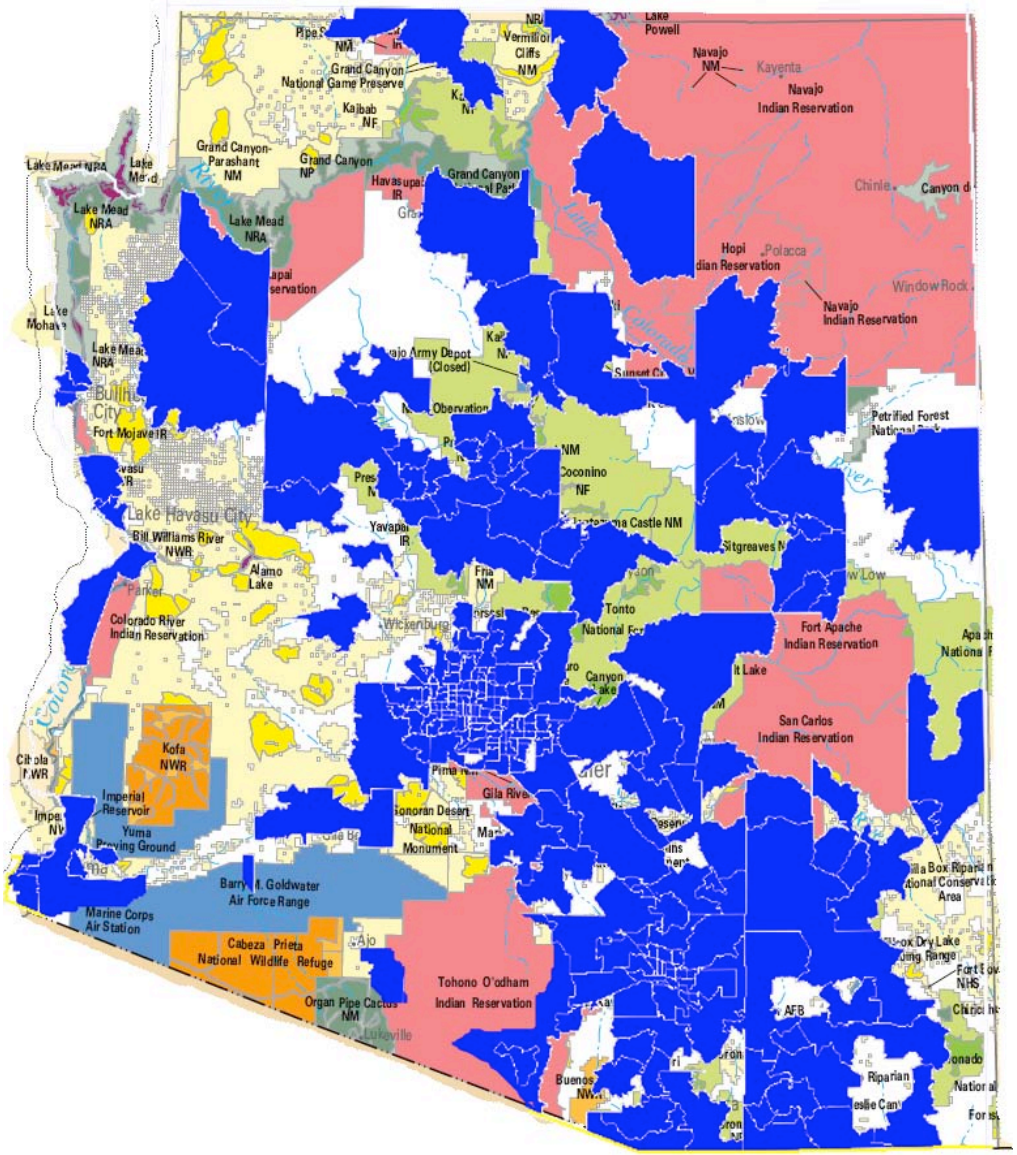
Annual Membership Directory details members, cable systems owned, and municipalities served with the most recent version covering 2006-2007. AZ-NMCXCA analysis estimates 96.6% cable Internet service coverage for Arizona's population as illustrated in the map below. A report provided to GITA in 2008 may augment Membership Directory specific system coverages and broadband statistics, but is yet to be fully analyzed.

Cable Providers - http://www.azcable.org/providers.htm (Under Construction)

Links - http://www.azcable.org/links.htm

Susan Bitter Smith, Executive Director, Office: 602-945-4505,
E-Mail: susan@azcable.org

AZ-NMCXCA Arizona Cable Provider Internet Service Map



ESRI - http://www.esri.com/

ESRI Data - http://www.esri.com/data/

Cable Boundary Data - http://www.esri.com/data/esri_data/cable-boundary.html

MediaPrints geographic boundary file shows the location of all cable TV systems in the U.S. from EMSi/The Janus Group and Warren Communications News including: cable service areas that are matched with data from Warren Communications News' Television & Cable Factbook, Digital Service Areas, High-Speed Internet Access areas, Cable Overbuilders, and wireless cable systems. A sample run for Arizona below indicates some 91% of the population is served by Multiple System Operators (MSOs) with cable modem availability.

MediaPrints is sourced in part from Warren Communications' comprehensive, detailed and continuously updated database of the TV and cable industries is fully searchable online organized into four logical sections: Cable Systems, TV Stations, Media Ownership and Media Services. The Cable Systems database contains comprehensive listings for all 7,500+ operating U.S. cable systems reported according to Warren's ICARUS system (for IntegratedCAble AReas - U.S.), which has served for decades as the de facto industry standard. This database is discussed here for reference only, as the ESRI Cable Boundary Data incorporates other sources and is ready for GIS integration and use. (See http://warren.365media.com/warren/index.aspx)

MediaPrints (http://www.mediaprints.com/) is developed by Direct Group (http://www.directgroup.net/) in conjunction with Warren Communications News, MediaPrints features data from the industry standard Television & Cable Factbook, and includes Digital Service Areas, High Speed Internet Access areas, with Cable Overbuilds and Wireless systems represented as separate mapping layers among other cable industry data. MediaPrints is up to date, with data releases each quarter, and is an authorized ESRI ArcData Publisher.

Licensable from ESRI as **MediaPrints Complete for Arizona** (1 User - $1850, 3 User - $2405). Also resold by MapInfo (http://www.mapinfo.com/).

MediaPrints Data Dictionary (Selected elements of interest shown below) - http://www.mediaprints.com/download_new/MediaPrints_Data_Dictionary.xls

MediaPrints Selected Cable Provider Data Elements

Integrated Cable Area (ICA)	Basic Subscribers	Internet Available
Principal Community	Digital Tier	Internet Start Date
DMA Rank	Total Pay Units	Internet Subscribers
Local Company Name	Channel Capacity	Internet Monthly Fee
Primary Owner	Channels Not in Use	Internet Installation Fee
Zip Code Data Files	Two-Way Capable	ISP Name
Homes Passed	Operating Two-Way	Telephony Service Analog
Addressable Homes	Miles of Plant (Fiber)	Telephony Service Digital
Local Add Insert	Miles of Plant (Coax)	Telephony Service VoIP

Arizona Cable Provider Internet Service Mapping

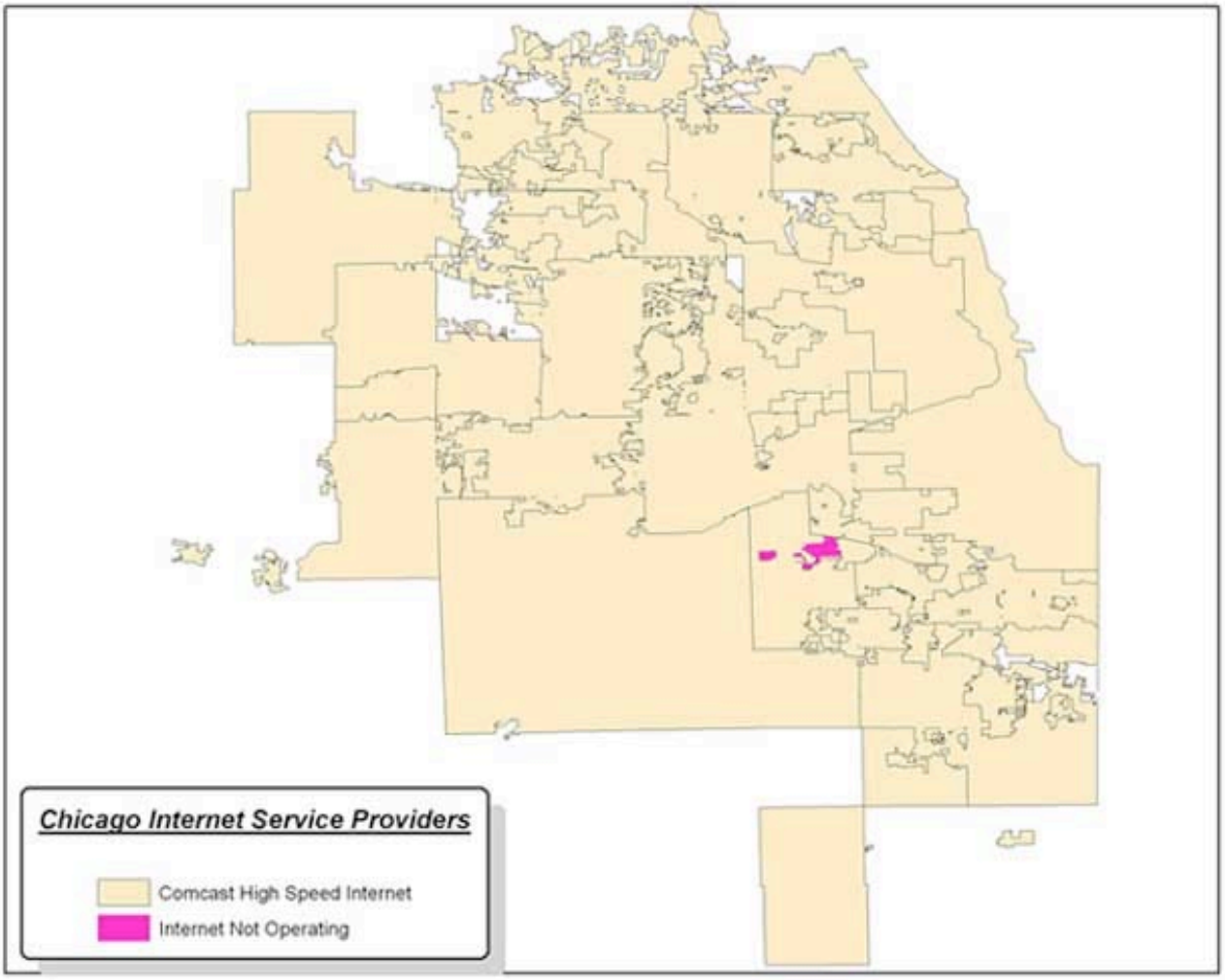
No MSO
(Est. 7% of Population)

MSO with No Internet
(Est. 2% of Population)

MSO with Internet
(Est. 91% of Population)

Source: ESRI MediaPrints Examples of Arizona MSO Maps (Preliminary)

Chicago Area Comcast Internet via Cable Modem Availability



Source: ESRI MediaPrints Example

Wireless Tower Location Sources:

U.S. FCC Antenna Structure Registration (ASR) Database - http://wireless.fcc.gov/antenna/index.htm?job=home

Wireless Telecommunications Bureau (WTB) - http://wireless.fcc.gov/

The WTB handles nearly all FCC domestic wireless telecommunications programs, policies, and outreach initiatives

The FCC requires owners to register certain antenna structures (generally those more than 60.96 meters (200 feet) in height or located near an airport) with the Antenna Structure Registration (ASR) database, however only a fairly limited number of towers are identified and detailed due to the rules

About ASR - http://wireless.fcc.gov/antenna/index.htm?job=about

Universal Licensing System (ULS) Database Downloads - http://wireless.fcc.gov/antenna/index.htm?job=uls_transaction&page=weekly

ASR Online Systems - http://wireless.fcc.gov/antenna/index.htm?job=systems

ASR Registration Search - http://wireless2.fcc.gov/UlsApp/AsrSearch/asrRegistrationSearch.jsp

Universal Licensing System (ULS) database downloads for specific wireless radio services are available as zip files and are updated weekly - http://wireless.fcc.gov/uls/index.htm?job=transaction&page=weekly

Tower Maps - http://www.towermaps.com/ or http://www.cmcus.com/Products/Vendors/towermaps/towermaps.asp

Tower Maps Product Summary - http://www.towermaps.com/product_summary.htm

Wireless Antenna Facility Location Data with Tower, Rooftop and Billboard Sites for Co-location Lease throughout North America

Find readily-leased wireless facilities (towers, rooftops, water tanks, raw land) to deploy or fill-in cellular, PCS, paging, LMDS, MMDS and other wireless coverage including over 250,000 sites compiled from over 600 facility owners and managers

Database Contents: Site Name, Latitude, Longitude (D-M-S and decimal degrees), AGL Height, AMSL Height, Ground Elevation, Site ID, Owner/Manager Name, Leasing Agent Telephone, Type of Structure, Street Address

Data Formats: ArcGIS and ArcView (shape files), Maptitude (.cdf), MapPoint (.ptm) and PocketStreets (for PDA's), MS Excel (.xls), MS Access databases (.mdb) and MapInfo (.mif and .mid) formats

Tower Maps Single-User License Pricing - http://www.towermaps.com/price.htm

AntennaSearch - http://www.antennasearch.com/

Free detailed information on over 1.9 million existing and pending towers and antennas in the U.S. and its territories.

Cell Tower Info.com - http://www.celltowerinfo.com/

Informational site on cell towers by Steel in the Air and TowerAmerica

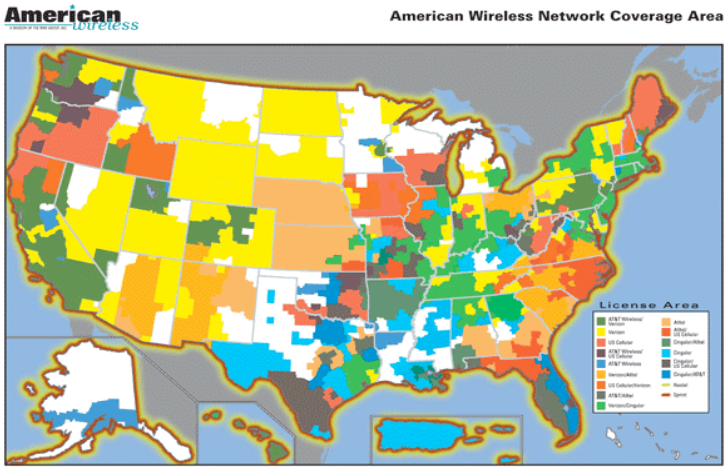
Wireless Services Provisioning Sources:

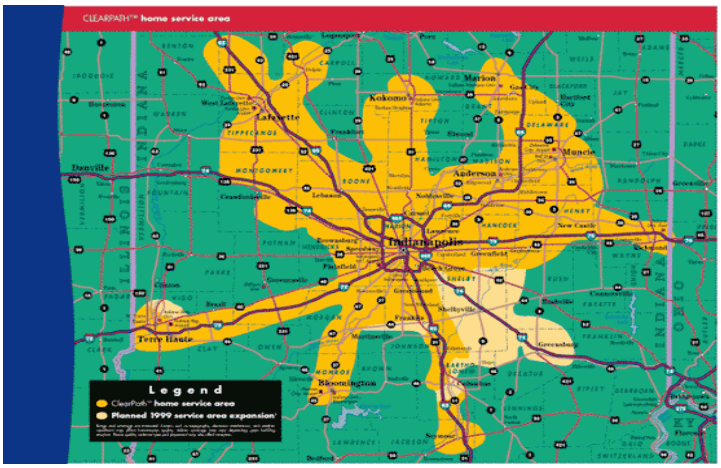
American Roamer - http://www.americanroamer.com/

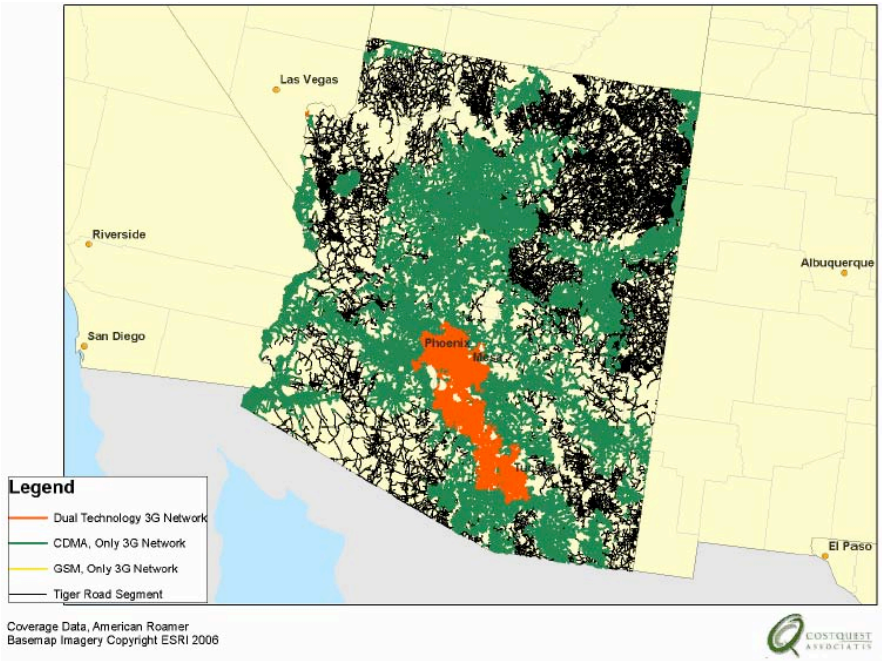
CoverageRight - http://www.americanroamer.com/giscoveragerigh t.php

CoverageRight is a unique map database that includes the coverage patterns for all available consumer mobile voice and data services for each wireless carrier. Each carrier is represented with its own file and includes data of protocols in use. Licensable from ESRI as All Carriers Wireless for Arizona (1 User - $3450, 3 User - $4485).

Wireless Industry Search And Retrieve Database (WiSARD) - http://www.americanroamer.com/wisard.php







Source: U.S. Ubiquitous Mobility Study: State Map Book of 3G Mobile Broadband Coverage by CostQuest Associates (http://www.costquest.com/) 3/08 with American Roamer Data

ARCChart Ltd. - http://www.arcchart.com/

Americas Wireless Landscape Wall Chart & Excel Database - http://www.arcchart.com/wallcharts/wls_americas.asp

Wireless Radar (WiDAR) - http://www.arcchart.com/widar/default.asp

JiWire - http://www.jiwire.com/

JiWire is a Wi-Fi advertising network, delivering location-driven Ads for Access at premier Wi-Fi locations, built upon its worldwide registry of over 200,000 verified public hotspots and municipal networks. Over 400 Wireless ISPs around the globe keep this information complete and up-to-date. For example, Wi-Fi Finder details 96 Wi-Fi locations near Center of Phoenix, AZ. JiWire's Wi-Fi Directory can be licensed to add unique Wi-Fi hotspot search to websites, software applications or mobile devices.

JiWire Wi-Fi Finder Search - http://www.jiwire.com/search-hotspot-locations.htm

JiWire Wi-Fi Directory Database - http://images.jiwire.com/images/v3/jiwire/business/hotspotdb/database.pdf

Internet.com (Jupitermedia Corp.) - http://www.internet.com/

Wi-Fi Planet - http://www.wi-fiplanet.com/

Wi-Fi Mobility Research - http://www.jupiterresearch.com/bin/item.pl/research:service/625/

WiMAX - http://www.wi-fiplanet.com/wimax/

Wi-Fi Hotspot List - http://www.wi-fihotspotlist.com/

The List: Broadband - http://broadband.thelist.com/

VoIP Planet - http://www.voipplanet.com/

Ultawideband Planet - http://www.ultrawidebandplanet.com/

DevX Wireless Zone - http://www.devx.com/wireless/

Navizon Network (Owned by Mexens LLC) - http://www.navizon.com/

Positioning system combining Wi-Fi and Cellular signal triangulation algorithms and a database of known access points, offering accuracy close to a real GPS in urban or suburban settings. The Application Programming Interface (API) makes the positioning engine available allowing other applications to use its dynamic geo-positioning network. (See http://www.navizon.com/releases/navizon_api_now_available.htm)

Skyhook Wireless, Inc. - http://www.skyhookwireless.com/

Skyhoook's Wi-Fi Positioning System (WPS) is a location platform that uses the native 802.11 in mobile devices to deliver accurate positioning across the U.S. and major cities worldwide. Skyhook repeatedly re-calibrates its reference database to maintain the same level of performance over time, as the WPS location client fixes and expands the coverage area as users calculate their own location yielding a unique "self-healing" mechanism that addresses the continuously changing nature of the coverage network

WPS Architecture - http://www.skyhookwireless.com/howitworks/architecture.php

Deployment Models - http://www.skyhookwireless.com/devices/deploymentmodels.php

MuniWireless - http://www.muniwireless.com/

City & County WiFi Networks - http://www.muniwireless.com/city-county-wifi-networks-page/

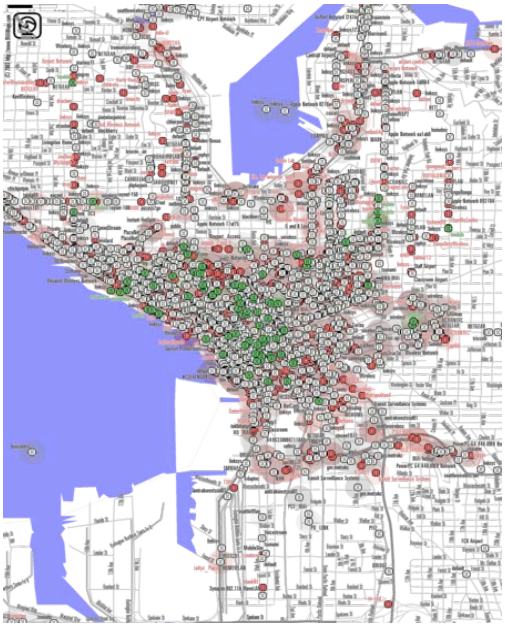
Wi-FI & WiMAX Maps - http://www.muniwireless.com/maps/

Wardriving

Wardriving is the act of searching for Wi-Fi wireless networks by a person in a moving vehicle, using a portable computer or PDA. Software for wardriving is freely available on the Internet, notably NetStumbler for Windows, Kismet or SWScanner for Linux, FreeBSD, NetBSD, OpenBSD, DragonFly BSD, and Solaris, and KisMac for Macintosh. Many wardrivers use GPS devices to measure the location of the network and log it on a website to form maps of the network neighborhood.

Source: Wikipedia (http://en.wikipedia.org/wiki/War_driving)

Seattle Wi-Fi Map with Data from Wardriving Students (2004)



Wi-Fi Signal Cloud Enveloping Central Salt Lake City, UT ASU School of Geographical Sciences (Wi-Fi Geosimulation)

Metro Fiber Infrastructure:

GeoTel Communications, Inc. - http://www.geo-tel.com/

CMC International (Distributor) - http://www.cmcus.com/ & available from ESRI

GeoTel MetroFiber - http://www.geo-tel.com/products_metrofiber.cfm & http://www.cmcus.com/Products/Vendors/geotel/metrofiber.asp

Dataset contains metro fiber routes for cities in the United States and can be layered on street files for enhanced study including over 300 carriers in more than 250 MSAs with additional markets added semi-annually

Coverage Map - http://www.geo-tel.com/map_main.html

GeoTel Connect - http://www.geo-tel.com/products_lit.cfm & http://www.cmcus.com/Products/Vendors/geotel/geotelconnect.asp

Dataset of fiber "lit" buildings showing which carriers have a fiber presence or optical switches connected to a fiber loop inside over 80,000 fiber lit buildings in U.S. Markets with 12 attributes per building including Bandwidth (Amount of data transport capacity)

FiberLocator - http://www.fiberlocator.com/

NEF has developed one of the most comprehensive asset-based telecommunications databases in the industry encompassing over 40 facility-based carriers in over 100 metro areas all over the country

Solutions - http://www.fiberlocator.com/solutions

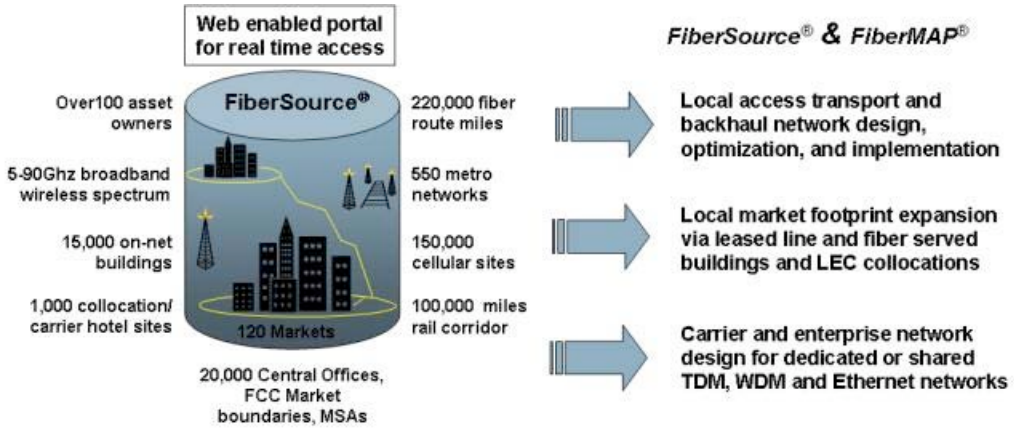
BuildingLocator - http://www.fiberlocator.com/building-locator

FindADataCenter.com - http://www.findadatacenter.com/

CFN Services - http://www.cfnservices.com/

FiberSource - http://www.cfnservices.com/fibersource.html

FiberSource, the industry's best and most comprehensive telecom infrastructure knowledge-base delivers a proprietary nationwide base of deployed fiber and facilities across more than 150 asset owners covering more than 350,000 route miles of fiber, 550 metro networks, 200,000 wireless sites, 35,000 fiber served buildings, and more across 120 markets



Other External Broadband Assessment Data Sources:

Telcordia Technologies (formerly Bell Communications Research, Inc. or Bellcore) - http://www.telcordia.com/

Telcordia offers products and services in the area of network planning and engineering, service assurance, delivery, fulfillment and data management and operations support. However, CLONES high cost ($55K per year) and as yet undetermined value in broadband assessment, limits interest in use of the product and it is not expected to be of immediate project use.

Cheryl E Whitehead, Client Account Director at Telcordia Technologies, E-Mail cwhitehe@telcordia.com

Allen Seidman, Vice President, Telcordia CLONES Environment, Office: 908-217-2438, E-Mail aseidman@telcordia.com

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Corporate headquarters: One Telcordia Dr., Piscataway, NJ 08854-4151

General Information/Inquiries: 732-699-2000

Sales and Product Inquiries: 800-521-2673

CLONES Systems and Tools - https://codecenter.commonlanguage.com/systems.asp?#clones

The CLONES System provides a world-wide repository for COMMON LANGUAGE Location Codes (CLLI Codes). CLONES is an online transaction processing tool for CLLI code and other associated data. It is used by Telcordia CLLI codeset Subject Matter Experts and licensed COMMON LANGUAGE Products client companies.

The CLONES system is a Transaction Processing and data entry system that operates upon an existing database/repository that has been developed and is maintained by Telcordia. Licensed users can use the CLONES system and its repository.

The data is stored as Common Language Location Identifier (CLLI) codes - also referred to as "silly" codes, which are in the form of 11-character strings. The codes can be translated to geospatial coordinates. Attributes such as address, lat/long, etc. are stored in the system and made available to licensed users.

It includes vast amounts of data that have already been created by service providers around the globe. Common Language already contains over 8 million registered locations. Common Language provides an information infrastructure for the industry. This infrastructure allows our customers to identify critical network resources (in this case locations) and to share a single view of this information across their enterprise and with trading partners. This equipment registry contains over 450,000 pieces of equipment from approx. 1,000 network equipment brands.

The Location codes do not know what equipment (e.g., DSLAM) is at a location, but they do specify the general function of a location. It is the Equipment Identifier or CLEI code which will identify the function of a device.

The LocateIt System is a nationwide (50 states and Puerto Rico) and Canadian reference Geographic Information System (GIS) that uses unique analysis and search algorithms to provide precise information for addresses, intersections and geopolitical

boundaries. It overlays the commercial GIS data with wire center information (e.g., CLLI Code) to produce comprehensive and precise data that would be difficult to obtain manually. Using the LocateIt System to raise the quality and consistency of address data across all business operations can be an effective way to improve the bottom line. The LocateIt System is available as an Application Programming Interface, as an interactive Web-base service, a batch reconciliation facility, and as a turnkey information system.

The eCoder System allows standard-level licensees to access information pertaining to CLCI MSG Codes, CLCI S/S Codes, CLEI Codes, CLFI Codes, CLLI Codes, FID Specifications, General Codes, NC/NCI Codes, USOC codes, as well as LS2 information. In some cases, you may also use eCoder to interact with our SMEs to request new codes and/or to resolve issues.

The CLEI InQuiry tool is a Web-based query facility for examining the information associated with COMMON LANGUAGE Equipment codes. CLEI InQuiry is particularly helpful for understanding CPR, ECN and FRC codes.

The CLEI Master Extract is a package of XML formatted archives containing the information associated with COMMON LANGUAGE Equipment codes. The CLEI Master Extract provides clients with the power to implement the automated functionality of CLEI InQuiry within their own systems.

The Customer Contacts tool provides an online query capability to obtain COMMON LANGUAGE customer contact information.

Telcordia also offers a network planning and engineering solution, Telcordia Network Engineer, which is a GIS-based system (in partnership with ESRI) used by the communications service providers themselves for architecting their broadband and narrowband networks. Additional information, including a demo and podcast on the topic, can be found at http://www.telcordia.com/products/network_eng/index.html.

CLONES Licensing Overview:

An annual license for CLLI/Clones costs $55,000 with annual renewals available for the same amount. Additionally there is a monthly access fee of $100 per month for querying the database. Licensees have full access to the data with no levels of granularity for data access.

Common Language Location Codes (CLLI) Codes Technical Description - http://www.commonlanguage.com/resources/commonlang/productshowroom/product/clli_tech/index.html

COMMON LANGUAGE Location Codes (CLLI Codes) are used worldwide to identify and describe three types of locations:

Network sites: These include such network locations as central office buildings, business and commercial offices, microwave radio structures and earth stations.

Network support sites: These include such locations as international boundaries or crossing points, end points, fiber nodes, cable and facility junctions, manholes, poles and repeaters.

Customers sites: These include customer locations and associated circuit terminations, facilities or equipment for each specific customer.

Each CLLI code conforms to one of three basic formats (Network Entity, Network Support Site and Customer Site). Each format, in turn, determines how these six coding elements are used:

Geographical Codes (Example: DNVR = Denver) - Typically assigned to cities, towns, suburbs, villages, hamlets, military installations and international airports, geographical codes can also be mapped to mountains, bodies of water and satellites in fixed-earth orbit.

Geopolitical Codes (Example: CO = Colorado) - Typically assigned to countries, states and provinces, geopolitical and geographical codes can be combined to form a location identifier that is unique worldwide.

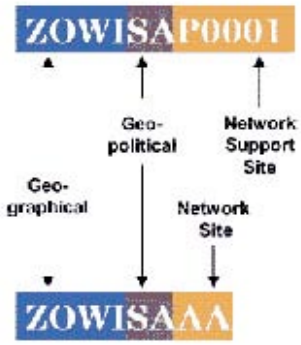
Network-Site Codes (Example: 56 = A central office on Main Street) - This element is used with geographical and geopolitical codes to represent buildings, structures, enclosures or other locations at which there is a need to identify and describe one or more functional entities. This category includes central office buildings, business and commercial offices, certain microwave-radio relay buildings and earth stations, universities, hospitals, military bases and other government complexes, garages, sheds and small buildings, phone centers and controlled environmental vaults.

Network-Entity Codes (Example: DS0 = A digital switch) - This element can be used with geographical, geopolitical and network-site codes to identify and describe functional categories of equipment, administrative groups or maintenance centers involved in the operations taking place at a given location.

Network Support-Site Codes (Example: P1234 = A telephone pole) - This element can be used with geographical and geopolitical codes to identify and describe the location of international boundaries or crossing points, end points, fiber nodes, cable and facility junctions, manholes, poles, radio-equipment sites, repeaters and toll stations.

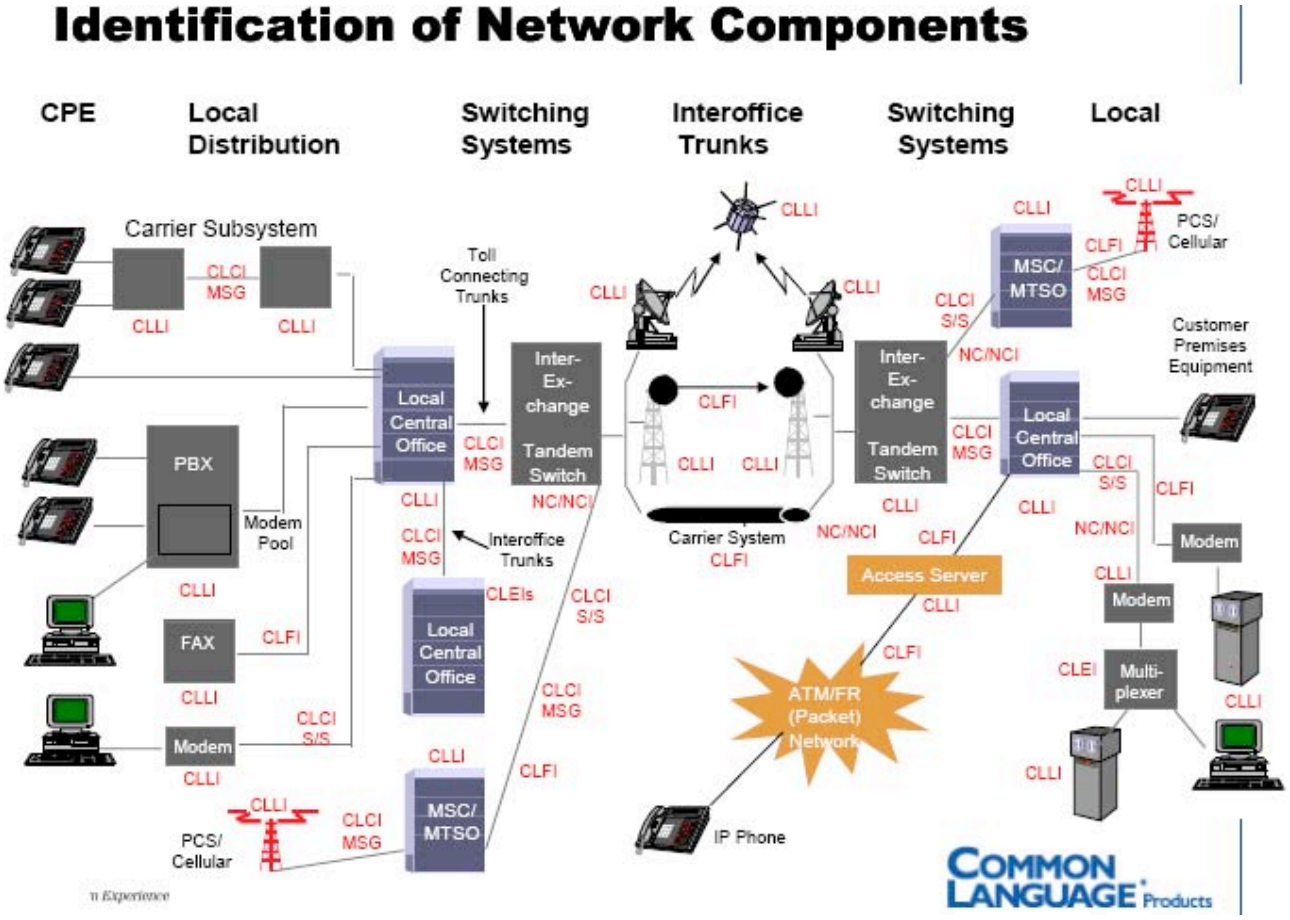
Customer Site Codes (Example: 1A101 = A customer) - This element can be used with geographical and geopolitical codes to identify and describe customer locations associated with switched-service networks, Centrex installations; trunk forecasting, cable, carrier or fiber terminations, NCTE, CPE and PBX equipment, military installations, shopping malls, universities and hospitals.

CLLI Code Examples



11-character Network Support Site format for a telephone pole located .5 miles south of HWY 33 & Green Bay Rd. on Zoowie Island, Saskatchewan, Canada

8-character Network Site format for a building located .5 miles south of HWY 33 & Green Bay Rd. on Zoowie Island, Saskatchewan, Canada



Source: Telcordia COMMON LANGUAGE Network Components Diagram

http://www.commonlanguage.com/resources/commonlang/overview/net_op_views/networkdiagram.pdf

BroadbandReports.com/DSLReports.com - http://www.dslreports.com/

Broadband Prequalification Process - http://www.dslreports.com/prequal (Closed)

CO Distance - http://www.dslreports.com/prequal/distance (Closed)

Find Service - http://www.dslreports.com/search

ISP & Broadband Power Search - http://www.dslreports.com/psearch

Wireless & Local ISPs searchable by Zip code

Where's My CO? - http://www.dslreports.com/coinfo

Broadband Tests and Tools - http://dslreports.com/tools

GeoCommunity - http://www.geocomm.com/

GIS Data Depot - http://data.geocomm.com/

GeoCommunity Data Store - http://store.geocomm.com/data/index.html

Arizona State Bundles - http://store.geocomm.com/viewcat.phtml?catid=38

2006 SE TIGER/Line Files - http://store.geocomm.com/viewproduct.phtml?catid=25&productid=1862

GeoCommunity Software - http://software.geocomm.com/

Point-Topic - http://www.point-topic.com/

Broadband Analysis - http://www.point-topic.com/home/press/dslanalysis.asp

Global Broadband Statistics (GBS) Database - http://www.point-topic.com/home/gbs/

The List of Internet Service Providers (ISP) - http://www.thelist.com/

Search by Area Code - http://www.thelist.com/areacode.html

Internet Service Provider (ISP) Directory - http://www.findanisp.com/

Lists Internet Service Providers who offer dialup and other Internet access services in the United States, organized by local phone calling areas

TeleGeography Research (PriMetrica) - http://www.telegeography.com/

Research Products - http://www.telegeography.com/products/index.php

Collocation Database - http://www.telegeography.com/products/colo/index.php

Comprehensive database of more than 1,400 carrier-grade collocation facilities in 58 of the world's most important telecom markets including 18 entries for Phoenix and 2 entries for Tucson available as a single-user license ($3995) or an enterprise-wide license ($12,995)

Collocation operator profiles provide: Address, Contact details, Gross and available floor space, Power availability, Power backup redundancy, UPS Redundancy, Meet-me room availability, Bandwidth providers available

Sample Collocation Profile - http://www.telegeography.com/products/colo/pdf/Colo08_SwitchData_Dallas.pdf

U.S. Networks Research Service (Long Haul Network Info) - http://www.telegeography.com/products/us_networks/index.php

Free Resources - http://www.telegeography.com/resources/index.php

Internet Exchange Points Directory - http://www.telegeography.com/products/ix/index.php

Searchable database of public Internet exchange information by geographic location or IX name with exchange-by-exchange profiles covering more than 150 Internet exchanges in 53 countries

Ball State University Office of Wireless Research and Mapping (OWRM) - http://www.bsu.edu/owrm/

OWRM utilizes the vast knowledge of afterimage GIS experts and unique Cellular Experts System RF mapping software to provide wireless spatial analysis using advanced Geographic Information System (GIS) software

Afterimage GIS - http://www.afterimagegis.com/

Cellular Experts System - http://www.cellular-expert.com/

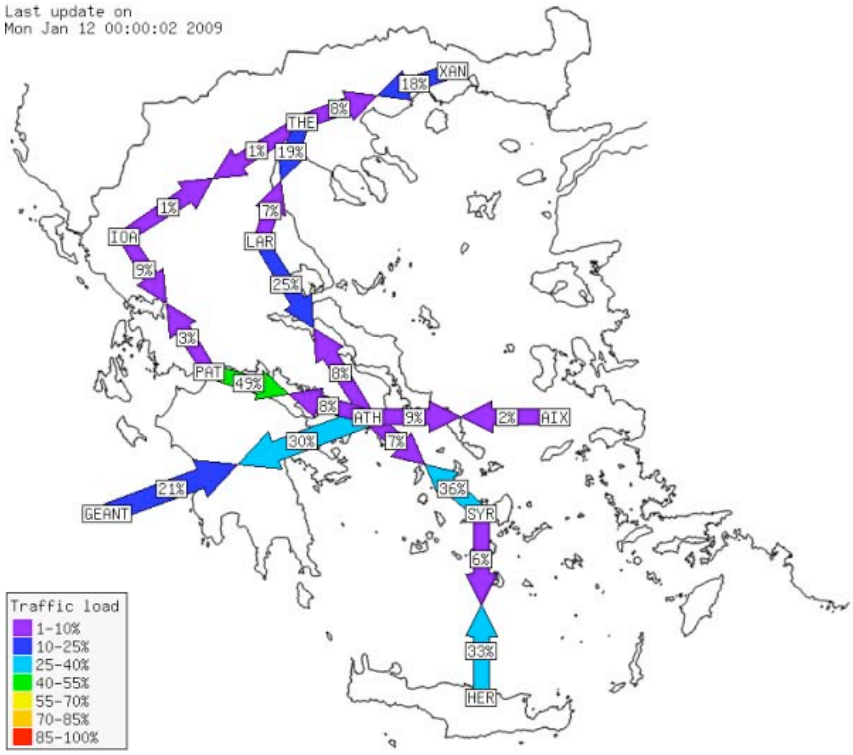
Wireless telecom network planning, optimization, and data management

Digital Middletown Project - http://www.bsu.edu/digitalmiddletown/

Network Weathermap - http://netmon.grnet.gr/weathermap/

Network Weathermap is a Perl tool that displays in a visual way the utilization of the network links of any network at no charge under the terms of the GNU General Public License. The required data are acquired from graphs created by the MRTG package and are displayed as two ways colored arrows on a map representing the logical topology of the network. The resulted image is presented in a web page using extra DHTML and JavaScript code for web-over pop-ups, based on the OverLib JavaScript library. Arizona could mount and run a version for various network segments and operation data for real-time monitoring and data logging.

Greek Research & Technology Network (GRNET) Weathermap Example



Mapnet - http://www.caida.org/tools/visualization/mapnet/

Mapnet is a tool for visualizing the geographic topology of multiple network providers' backbones and infrastructure simultaneously and is made available as a web-based Java applet at no charge by Cooperative Association for Internet Data Analysis (CAIDA - http://www.caida.org/). Each backbone infrastructure is divided into a group of nodes (POPs) and pipes between these nodes, drawing them based on their geographical location on a map.

Mapnet Backbone Data File Format - http://www.caida.org/tools/visualization/mapnet/Data/

SNL Interactive (SNLi) - http://www.snl.com/quick_tour/snli1.asp

SNL Energy Mapping - Licensable data source for mapping power plants, pipelines, transmission lines, electric and gas service territories. Search by geography or type of data. Add energy-specific layers such as NERC regions, ISO/RTO Areas, Transmission Lines, Receipt and Delivery Points. Analyze Power Plant proximity or region potential. An extensive variety of market and industry data is also available.

Akamai Technologies - http://www.akamai.com/

Akamai State of the Internet - http://www.akamai.com/stateoftheinternet/

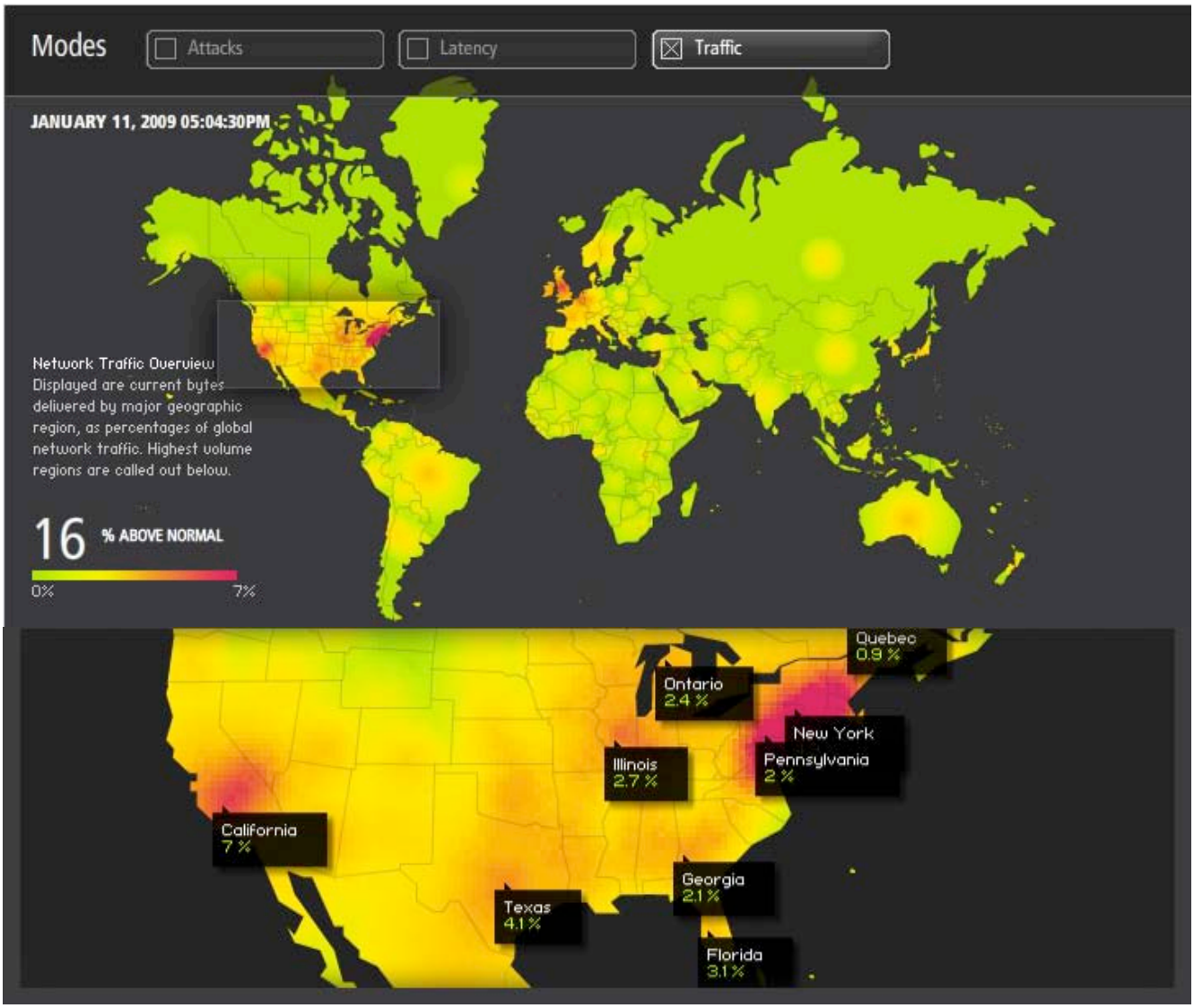
Akamai publishes a quarterly "State of the Internet" report including data gathered across their global server network about broadband adoption and attack traffic, as well as trends seen over time. Akamai also aggregate publicly available news and information about notable events throughout the quarter, including Denial of Service attacks, web site hacks, and network events, including outages and new connections.

Akamai State of the Internet Report Q3 2008 (PDF) - http://www.akamai.com/dl/whitepapers/akamai_state_of_the_internet_q3_2008.pdf

Visualizing the Internet - http://www.akamai.com/html/technology/visualizing_akamai.html

Methodology and Data Collection - http://www.akamai.com/html/technology/realtime_web_methodology.html

Akamai Real-Time Web Monitor Snapshot



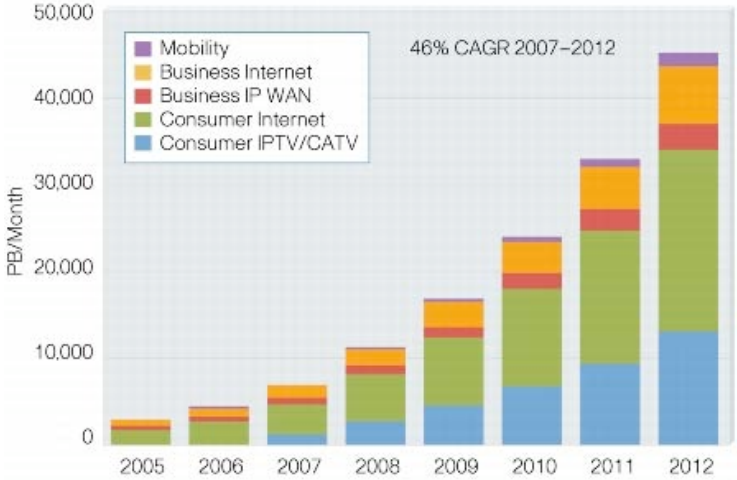
Cisco Visual Networking Index - http://www.cisco.com/en/US/netsol/ns827/networking_solutions_sub_solution.html

Cisco Systems, Inc. has developed a model for the estimation of future global IP traffic growth. The worldwide leader in networking technology for the Internet, Cisco has a unique ability to gather and interpret IP network data as a result of its broad experience with customers and global reach. Today networks are an essential part of business, education, government, and home communications. Many consumer and business IP networking trends are being driven largely by video and social networking and collaboration (e.g., Web 2.0 technologies), which combined are termed "visual networking." The Cisco Visual Network Index is the company's ongoing effort to forecast the growth and use of IP networking worldwide, and it is based on Cisco analysis and independent analysts' forecasts.

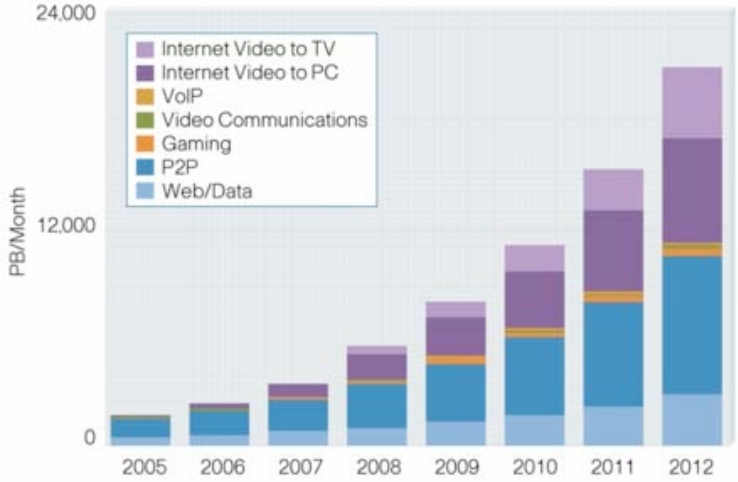
Cisco Visual Networking Index - Forecast and Methodology 2007-2012 (6/16/08) - http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360_ns827_Networking_Solutions_White_Paper.html

Approaching the Zettabyte Era White Paper (6/16/08) - http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481374_ns827_Networking_Solutions_White_Paper.html

Cisco Forecasts 44 Exabytes per Month of IP Traffic in 2012



Cisco's Global Consumer Internet Traffic Forecast by Application



Wireless Internet Institute (W2i) - http://www.w2i.com/

W2i Framework for Digital Inclusion Metrics from April 2007 (free registration required) - http://w2i.com/zones/digital_inclusion.

The W2i Framework for Digital Inclusion Metrics is based on the findings of the Digital Inclusion Roundtable at the W2i Digital Cities Convention; in particular, the meetings in Philadelphia (December 2006) and Tempe, Arizona (February 2007). It provides a flexible set of parameters for municipalities evaluating digital-inclusion initiatives consisting of Macro-Metrics assessing factors affecting both Supply and Demand, as well as project-specific metrics based on the variety of stakeholders, activities, and progress. The metrics are modular and should be tailored to reflect the unique goals and challenges of each project.

W2i Case Study Database - http://w2i.com/resource_center/case_study

Macro-Metrics: Supply Side Examples

- **Availability**
  - Connectivity/POPs available by ZIP code
    - GIS-based service provider coverage map
    - Include census data on populations
  - Hardware vendors by ZIP code
    - Broadband-capable devices (PCs or alternative devices)
- **Affordability**
  - Average cost of connectivity by speed
    - dial up
    - 500K
    - 500-1M
    - 1.5-2M
    - 5M
    - 10M
  - Average cost of Hardware (includes CPU, display device, input device, assistive devices)
  - Average cost of broadband-capable alternative devices
  - $/capita funding for digital inclusion initiatives
  - ROI

(All metrics should be reported in aggregate and also reported as correlated by HH income quartiles (at a minimum))

- **Accessibility**
  - Presence of ICT Accessibility policies or regulations
  - Scope of ICT Accessibility policies or regulations
  - Process for administration/enforcement of ICT accessibility
- **Applicability/Efficacy:**
  - Number and types of Public services available online e.g.,
    - Taxes
    - Vehicle registration
    - DL renewal
    - Certifications
    - Education
    - Healthcare
    - Emergency/public safety
  - Number and types of private-sector services available online, e.g.,
    - Banking
    - Retail
    - Travel
    - Communications
    - Education/Training
    - Employment opportunities
    - Tele-work

Macro-Metrics: Supply Side Examples

- **Availability**:
  - Bandwidth: Number of Households on line by bandwidth
    - dial up
    - 500K
    - 500-1M
    - 1.5-2M
    - 5M
    - 10M
  - Usage:
    - Number of DHCP leases per day
  - Hardware: Number of devices present in the population per person
    - Working PCs
    - Cell phones
    - Broadband-capable alternative devices
- **Applicability/Efficacy:**
  - Number and types of online services used
    - Measure the progression from Digital novice, to fully functioning digital household, to digital profession and digital innovator
  - User Training: Number of people trained to use
    - Computers
    - The Internet
    - Internet-based applications
- **Accessibility**
  - % of population with disabilities
  - % of population exceeding age 65
  - % of population that who speak English as a second language or do not speak English at all
  - % of population with low or no literacy
- **Affordability**
  - Average annual hardware expenditure per person as % of HH income
    - Working PCs
    - Cell phones
    - Broadband-capable alternative devices
  - Average cost of monthly connectivity per person as % of HH income

(All metrics should be reported in aggregate and also reported as correlated by HH income quartiles (at a minimum))

LECG Connectivity Scorecard - http://www.connectivityscorecard.org/

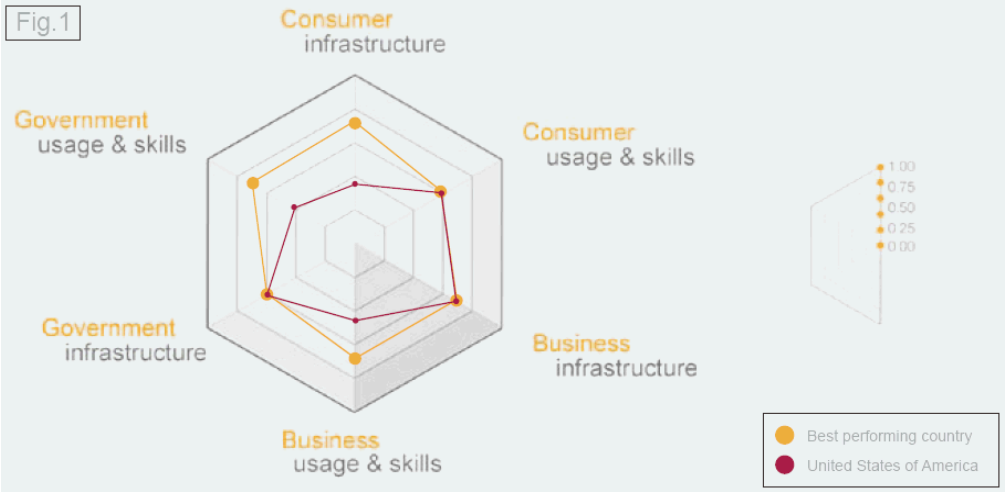
The Connectivity Scorecard is a groundbreaking new global Information and Communications Technology (ICT) measure that ranks countries on the approximately 30 indicators of connectivity including broadband, fixed-line, mobile, and computing technologies that contribute to the enhancement of a country's social and economic prosperity. The Scorecard was created by Leonard Waverman, Professor of Economics at London Business School, conducted by economic consulting firm LECG (http://www.lecg.com/), and commissioned by Nokia Siemens Networks (http://www.nokiasiemensnetworks.com/) to examine the contribution of connectivity to economic growth and positive social outcomes, and to draw conclusions from how individual countries score on the Index.

The U.S. is the leading performer on the Connectivity Scorecard, with a score of 6.97, slightly ahead of Sweden and Japan with 6.83 and 6.68 respectively. The U.S. scores well on most measures, particularly in terms of business infrastructure, which given its high weighting, accounts in large part for the U.S.'s high overall score and the U.S.' more flexible business environment and its superior record of both technological and organizational innovation results in an environment that is more conducive to realizing the full benefits of ICT.

Innovation driven economies	Connectivity score
United States	6.97
Sweden	6.83
Japan	6.68
Canada	6.56
UK	6.13
Finland	6.10
Australia	5.90
Germany	5.52
France	5.07
Korea	4.73
Hong Kong SAR	4.46
Italy	3.85
Spain	3.56
Hungary	3.18
Czech Republic	3.10
Poland	2.33

Efficiency and resource driven economies	Connectivity score
Malaysia	7.59
Russia	6.60
Mexico	5.54
Brazil	5.28
South Africa	5.26
China	4.45
Philippines	3.00
India	1.83
Nigeria	1.07

U.S. Connectivity Performance by Scorecard Component



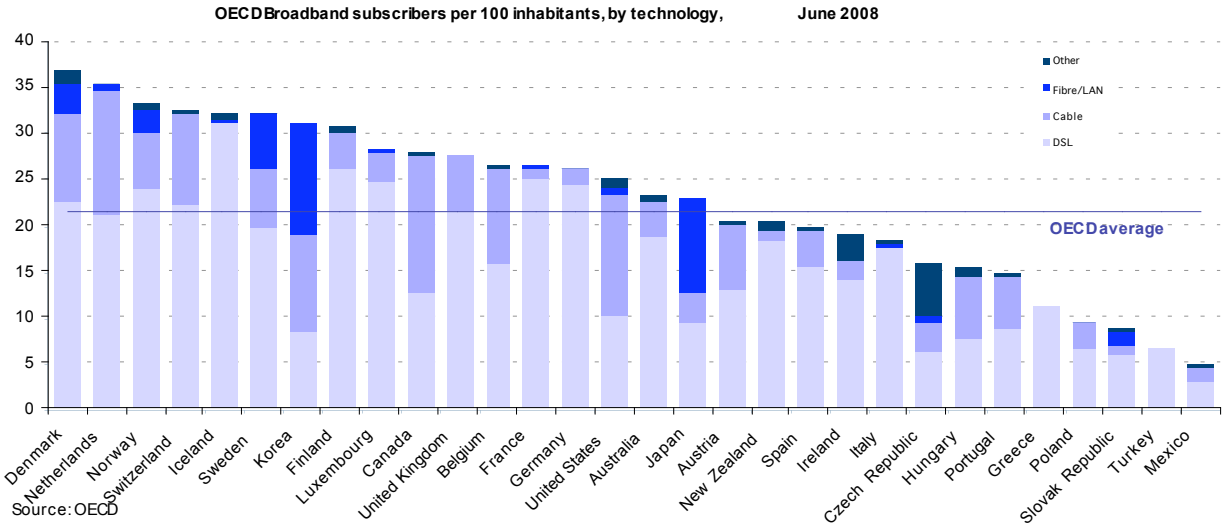
OECD Information and Communication Technologies (ICTs) - http://www.oecd.org/topic/0,3373,en_2649_37441_1_1_1_1_37441,00.html

Organisaton for Economic Co-operation and Development (OECD) promotes the growth and development of information and communication technologies (ICTs), leading to their wide diffusion and application, thus increasing their economic and social impact. The OECD undertakes a wide range of activities aimed at improving our understanding of how ICTs contribute to sustainable economic growth and social well-being and their role in the shift toward knowledge-based societies. The OECD broadband portal provides access to a range of broadband-related statistics.

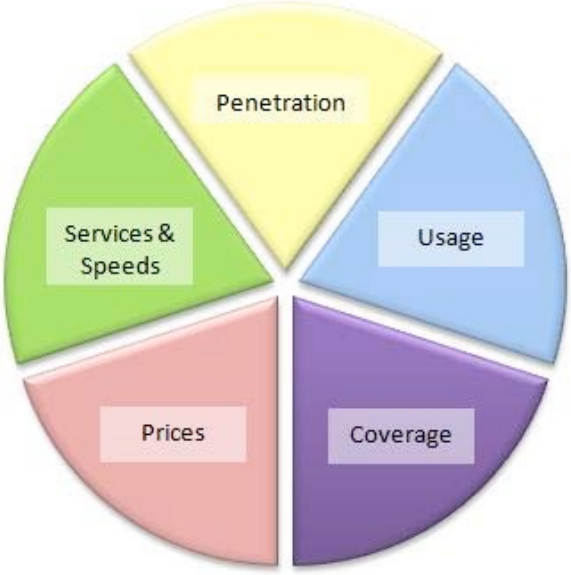
OECD Key ICT Indicators - http://www.oecd.org/document/23/0,3343,en_2649_34449_33987543_1_1_1_37441,00.html

OECD ICT Broadband Portal - http://www.oecd.org/sti/ict/broadband **or** http://www.oecd.org/document/54/0,3343,en_2649_34225_38690102_1_1_1_1,00.html

OECD World Forum on Statistics, Knowledge and Policy Istanbul Declaration 6/30/07 - http://www.oecd.org/dataoecd/23/54/39558011.pdf



Key ICT Indicator Categories



Roadway and Highway Geographic Data Sources:

U.S. Department of Transportation (DOT) - http://www.dot.gov/

Bureau of Transportation Statistics (BTS) Geographic Information Services - http://www.bts.gov/programs/geographic_information_services/

National Transportation Atlas Database (NTAD) - http://www.bts.gov/publications/national_transportation_atlas_database/

National Pipeline Mapping System (NPMS) - http://www.npms.phmsa.dot.gov/

Committee on Geographic Information Science & Applications - http://www.abj60.org/

ESRI StreetMap Premium - http://www.esri.com/data/streetmap/index.html

Enhanced street dataset provide routing, geocoding, and high-quality cartographic display for the entire U.S. through ArcGIS Desktop's StreetMap routing and find toolbar. Also optimized to work with the ArcGIS Network Analyst extension with most recent quarterly commercial street data from Tele Atlas or NAVTEQ to achieve high address geocoding match rates and generate routes and driving directions. $8-16K for Arizona dataset depending on number of users and extended Points of Interest (POI).

NAVTEQ - http://www.navteq.com/

Commercial source for value added road mapping data driving many in-vehicle navigation systems sold in the U.S. and Europe, as well as used in various mapping applications and products from a broad array of providers. Many federal, state, county, and local government agencies use NAVTEQ digital map data to help manage their planning and operations. NAVTEQ can also deliver robust, nationwide real-time traffic coverage including traffic flow conditions with speed values, unplanned incidents such as accidents and stalled vehicles, and planned incidents such as road construction and closures data designed for seamless integration with digital map content.

Tele Atlas - http://www.teleatlas.com/index.htm

Tele Atlas data powers many navigation and location-based services (LBS) solutions, with an extensive network of industry partners in the portable navigation, automotive, and Internet/wireless markets. Also works with enterprise and government partners who deliver applications for emergency response, business, fleet, and infrastructure.

DeLorme - http://www.delorme.com/default.aspx

Street Atlas USA 2009 Plus DVD and Network Versions (Search & map over 120 million U.S. and Canadian business and residential phone listings)

XMap 5.2 GIS Enterprise Suite for Energy & Telecom - http://www.delorme.com/byUse/energytelecom/energytelecom.aspx

OpenStreetMap (OSM) - http://www.openstreetmap.org/

OpenStreetMap (OSM) is a collaborative project to create a free editable map of the world by using data from portable GPS devices, aerial photography, and other free sources. Both rendered images and the vector dataset are available for download under a Creative Commons Attribution-ShareAlike 2.0 license.

OSM Wiki - http://wiki.openstreetmap.org/wiki/Main_Page

OSM on Wikipedia - http://en.wikipedia.org/wiki/OpenStreetMap

OpenAerialMap - http://openaerialmap.org/ & Wiki - http://wiki.openaerialmap.org/Main_Page

K-12 School Demographic Data Sources:

U.S. Department of Education - http://www.ed.gov/

Research & Statistics - http://www.ed.gov/rschstat/landing.jhtml?src=rt

National Center for Education Statistics (NCES) - http://nces.ed.gov/

Market Data Retrieval (MDR, a D&B Company) - http://www.schooldata.com/

MDR School Directories - http://www.schooldata.com/mdrdir.asp

Newly updated technology data

District & School Technologies: Specific technologies being used for student instruction including the number of computers with High-Speed Internet connection types includes T1, T3, Cable and Satellite.

Computer Brands and Quantities: The sum of instructional-use computers by brand in all schools in the district is provided. When the quantity of a brand is not available, the brand is listed to indicate usage. Computer codes are as follows: M = Apple/Mac, P = PC.

Tech Sophistication Index (TSI): Identifies a school by its overall technology infrastructure relative to the number of students at that school. Many variables are included, such as instructional computers, multimedia computers and the speed of Internet access.

Complete district and school names, addresses, phone and fax numbers

Names and job titles of district administrators, principals, librarians, media specialists, and technology coordinators

District and school enrollments

Instructional spending and Title I, special education, and bilingual education funding data

New schools being built or expanding

District URL addresses

Number of teachers in each district

Free and reduced-price lunch program data

College-bound student percentage

Student ethnic and poverty percentages

Site-based information

Number of classrooms within school and much more

MarketView - http://www.schooldata.com/mdrmarketview.asp

Industry Links - http://www.schooldata.com/mdrindustrylinks.asp

Quality Education Data (QED) - http://www.qeddata.com/

State School Guides & Data - http://www.qeddata.com/MarketKno/SchoolGuides/SchoolGuides.aspx

QED Education Data Guide - http://www.qeddata.com/Catalogcounts/catalog.asp

Population Demographic Data Sources:

U.S. Census Bureau - http://www.census.gov/

State and Metropolitan Area Data Book 2006 - http://www.census.gov/compendia/smadb/

State Data Tables - http://www.census.gov/compendia/smadb/SMADBstate.html

Metropolitan & Micropolitan Area Data Tables - http://www.census.gov/compendia/smadb/SMADBmetro.html

Ranking Tables - http://www.census.gov/compendia/smadb/SMADBrank.html

Statistical Abstract of the United States - http://www.census.gov/compendia/statab/

USA Counties - http://censtats.census.gov/usa/usa.shtml

County and City Data Book - http://www.census.gov/statab/www/ccdb.html

Sections PDFs - http://www.census.gov/prod/www/ccdb.html

State & County QuickFacts - http://quickfacts.census.gov/qfd/

Population Estimates (States & Counties) - http://www.census.gov/popest/estimates.php

MapStats - http://www.fedstats.gov/qf/

U.S. Department of Labor - http://www.dol.gov/

Bureau of Labor Statistics (BLS) - http://www.bls.gov/

Databases, Tables & Calculators by Subject - http://www.bls.gov/data/

U.S. Department of Education - http://www.ed.gov/

Research & Statistics - http://www.ed.gov/rschstat/landing.jhtml?src=rt

National Center for Education Statistics (NCES) - http://nces.ed.gov/

U.S. Department of Health and Human Services (HHS) - http://www.hhs.gov/

National Center for Health Statistics (NCHS) - http://www.cdc.gov/nchs/

Reference Collections (including Statistics) - http://www.hhs.gov/reference/index.html

U.S. Postal Service (USPS) - http://www.usps.gov/

Address Information System (AIS) - http://www.usps.com/ncsc/addressinfo/addressinfomenu.htm

Federal Financial Institutions Examination Council (FFIEC) - http://www.ffiec.gov/

FFIEC is a formal interagency body empowered to prescribe uniform principles, standards, and report forms for the federal examination of financial institution and to facilitate public access to data that depository institutions must disclose by census tract, for each metropolitan statistical area (MSA).

FFIEC Census Reports - http://www.ffiec.gov/webcensus/default.aspx

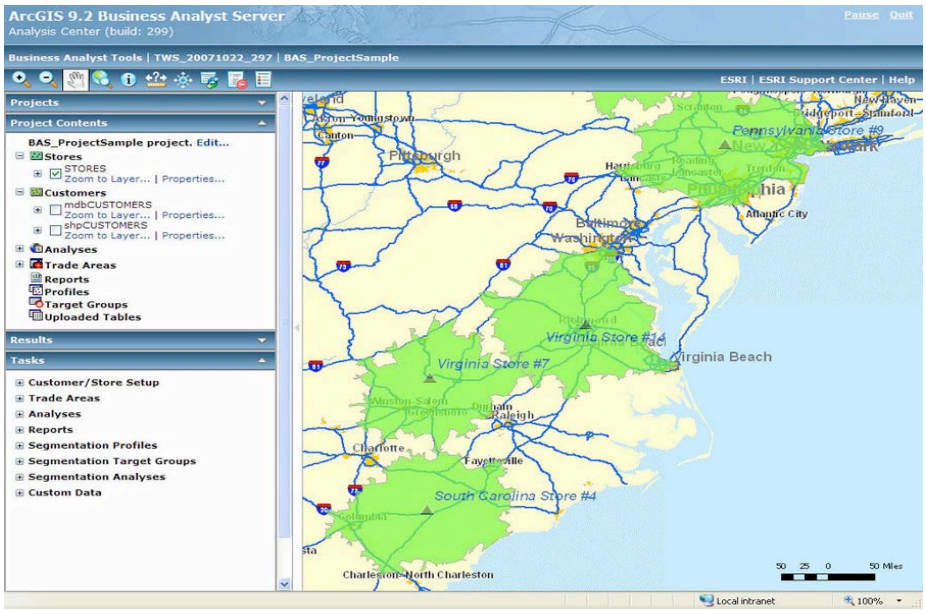
Census Data Products - http://www.ffiec.gov/hmda/censusproducts.htm

Census Demographic Information Sheet - http://www.ffiec.gov/webcensus/censusInfo.aspx

ESRI - http://www.esri.com/

ESRI Business Analyst - http://www.esri.com/getting_started/business/business_analyst.html

Business Analyst is an affordable and scalable family of products comprised of server, desktop, and Web-based applications that can easily be deployed throughout organizations for improved collaboration and knowledge sharing. ArcGIS Business Analyst Server combines GIS server technology with extensive business, demographic, and consumer spending data and provides a complete business GeoIntelligence solution. It includes out-of-the-box Web applications and services to help you solve complex business problems, including business continuity planning, site selection analysis, and customer analytics.



What's New in ArcGIS Business Analyst 9.3 2008 (2.4MB PDF) - http://www.esri.com/library/whitepapers/pdfs/whats-new-agba93.pdf

ESRI Demographic Data - http://www.esri.com/data/community_data/demographic/index.html

Community Sourcebooks - http://www.esri.com/data/community_data/community-sourcebooks/index.html

Geolytics - http://www.censuscd.com/cdmaps/Products.asp

Census Zip+4 2008 Online - http://geolytics.com/USCensus,OnLine,Categories.asp

2008 Estimates & 2013 Projections plus expanded demographic variables

Variables - http://geolytics.com/USCensus,Estimates-Projections,Data,Variables,Products.asp

infoUSA.com - http://www.infousa.com/

U.S. & Canadian Businesses, Executives and Professionals, U.S. Consumers Data

Demographic Data Center - http://www.usa-demographics.com/

U.S. Population Demographic Estimates & Projections plus Business Data

Easy Analytic Software Inc. (EASI) - http://www.easidemographics.com/

Arizona Government Information Technology Agency

Broadband Assessment GIS Study

Appendix E - GIS Platforms, Tools, and Resources

ESRI - http://www.esri.com/

ESRI is a software development and services company providing Geographic Information System (GIS) software and geodatabase management applications. The headquarters of ESRI is in Redlands, California. ESRI was founded as Environmental Systems Research Institute in 1969 as a land-use consulting firm. ESRI products (particularly ArcGIS Desktop) have a one-third of the global market share, and are used by nearly 80 percent of GIS users worldwide from all professions. ESRI uses the name ArcGIS to refer to its suite of GIS software products, which operate on desktop, server, and mobile platforms. ArcGIS also includes developer products and web services.

Source: Wikipedia (http://en.wikipedia.org/wiki/Esri)

Ali Fain, Regional Sales Representative, ESRI, Office: 303-449-7779 x8220, Mobile: 303-898-8426, E-Mail: afain@esri.com

Randy Frantz, Manager, Telecom Industry Solutions (Redlands, CA), ESRI, Office: 909-793-2853 x2958, Mobile: 951-532-5435, E-Mail: rfrantz@esri.com

ESRI GIS and Mapping Software Library - http://www.esri.com/library/

Enterprise GIS for Local Government White Paper 2007 (1.1MB PDF) - http://www.esri.com/library/whitepapers/pdfs/enterprise-gis-localgov.pdf

ESRI Geospatial Portal Technology White Paper (.4MB PDF) - http://www.esri.com/library/whitepapers/pdfs/geospatial-portal-technology.pdf

ESRI System Design Strategies, Revision 1 (15.7MB PDF) - http://www.esri.com/library/whitepapers/pdfs/sysdesig.pdf

Geospatial Service-Oriented Architecture (SOA) 2007 (4.6MB PDF) - http://www.esri.com/library/whitepapers/pdfs/geospatial-soa.pdf

ArcGIS - http://www.esri.com/software/arcgis/index.html

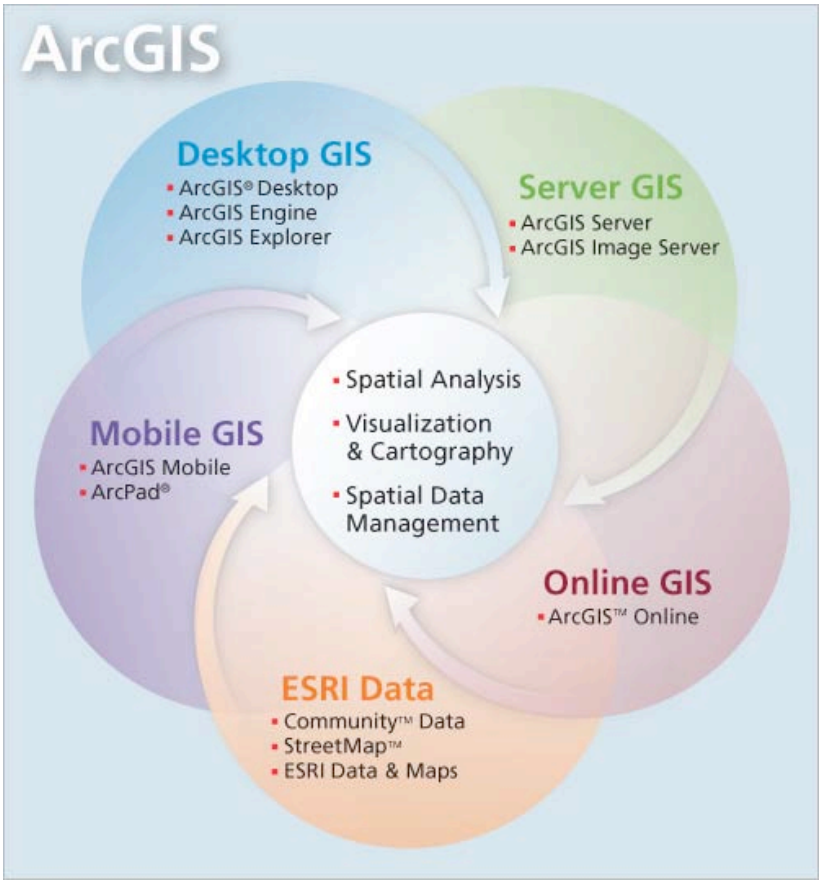
Complete system for authoring, serving, and using geographic information as an integrated collection of GIS software products for building and deploying complete GIS on desktops, servers or custom applications, over the Web or in the field to perform spatial analysis, manage large amounts of spatial data or producing cartographically appealing maps to aid in decision-making over one common platform

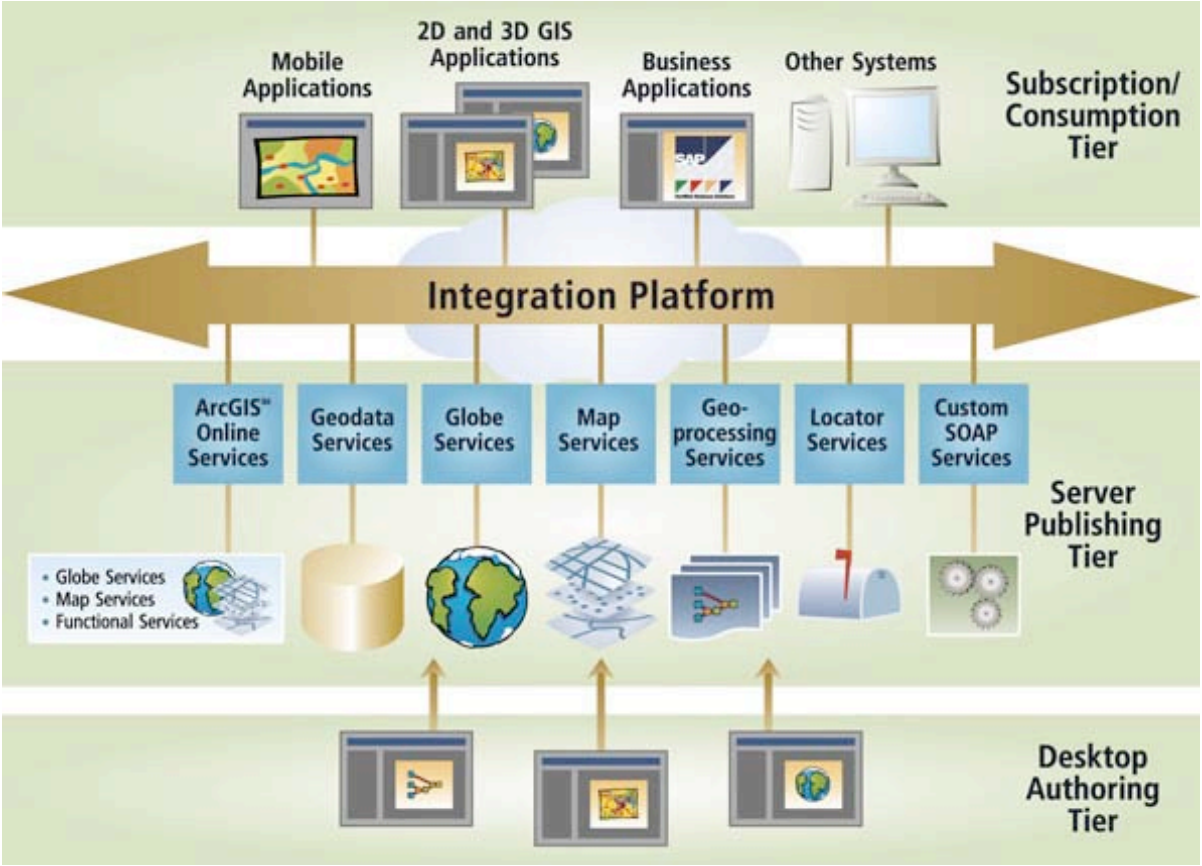
ArcGIS Brochure (4.3MB PDF) - http://www.esri.com/library/brochures/pdfs/arcgis.pdf

ArcGIS Literature - http://www.esri.com/software/arcgis/about/desktop_literature.html

What Is ArcGIS 9.3? 2008 (2.4MB PDF) - http://www.esri.com/library/brochures/pdfs/arcgis-93-whatsnew.pdf

What's Coming in ArcGIS 9.3 2008 - http://www.esri.com/software/arcgis/about/whats-coming.html


ArcGIS
Desktop GIS
ArcGIS® Desktop
ArcGIS Engine
ArcGIS Explorer
Server GIS
ArcGIS Server
ArcGIS Image Server
Spatial Analysis
Visualization & Cartography
Spatial Data Management
Mobile GIS
ArcGIS Mobile
ArcPad®
Online GIS
ArcGIS™ Online
ESRI Data
Community™ Data
StreetMap™
ESRI Data & Maps


Mobile Applications
2D and 3D GIS Applications
Business Applications
Other Systems
Subscription/ Consumption Tier
Integration Platform
ArcGIS™ Online Services
Geodata Services
Globe Services
Map Services
Geo-processing Services
Locator Services
Custom SOAP Services
Server Publishing Tier
Globe Services
Map Services
Functional Services
Desktop Authoring Tier

ArcGIS Server - http://www.esri.com/software/arcgis/arcgisserver/index.html

Complete and integrated server-based GIS with out-of-the-box, end user applications and services for spatial data management, visualization, and spatial analysis

Lower cost of ownership through centrally managed, focused GIS applications that can scale to support many users

Browser-based access to GIS

Integration with other enterprise systems such as customer relationship management (CRM) or enterprise resource planning (ERP) systems using industry-standard software. ArcGIS Server provides the foundation for geospatially enabling a service-oriented architecture (SOA)

Support for interoperability standards in both the GIS domain (Open Geospatial Consortium) as well as the broader information technology (IT) domain (W3C)

Ability to create custom applications using .NET or Java

Technology Trends in GIS - http://www.esri.com/technology_trends/index.html

Server GIS - http://www.esri.com/software/arcgis/about/server_gis.html

Server GIS Trends - http://www.esri.com/technology_trends/server_gis/index.html

Technology Trends in GIS Cartography - http://www.esri.com/technology_trends/cartography/index.html

City of Mesa Case Study - http://www.esri.com/library/fliers/pdfs/cs-city-of-mesa.pdf

GIS Standards and IT Interoperability - http://www.esri.com/software/standards/index.html

Geographic Data Portals - http://www.esri.com/data/resources/geographic-data.html

ArcGIS Desktop - http://www.esri.com/software/arcgis/about/desktop_gis.html

Software that allows you to discover patterns, relationships, and trends in your data that are not readily apparent in databases, spreadsheets, or statistical packages with the power to manage and integrate data, perform advanced analysis, model and automate operational processes, and display results on professional-quality maps

ArcGIS Data Appliance - http://www.esri.com/software/arcgis/arcgisonline/about/data-appliance.html

Provides terabytes of pre-rendered U.S. nationwide and worldwide data that you can host on your ArcGIS Server consisting of 2D maps and 3D globes that are optimized for publishing with ArcGIS Server including worldwide imagery, street map, shaded relief, and elevation data

Leverage existing data by combining it with content from ArcGIS Data Appliance and sharing analysis and visualization results with others in your organization

Add user tasks from your own secure servers and fuse them with content from ArcGIS Data Appliance to conduct visibility modeling, proximity searches, or demographic analysis

Provide a common information architecture for your integration solutions that allows decision makers to view data in a local or global context

ESRI Data Summary (Details in Appendix D) - http://www.esri.com/data/

ESRI Business Analyst - http://www.esri.com/getting_started/business/business_analyst.html

Business Analyst is an affordable and scalable family of products comprised of server, desktop, and Web-based applications that can easily be deployed throughout organizations for improved collaboration and knowledge sharing. ArcGIS Business Analyst Server combines GIS server technology with extensive business, demographic, and consumer spending data and provides a complete business GeoIntelligence solution including out-of-the-box Web applications and services to help solve complex business problems, including business continuity planning, site selection analysis, and customer analytics.

ESRI Demographic Data - http://www.esri.com/data/community_data/demographic/index.html

Community Sourcebooks - http://www.esri.com/data/community_data/community-sourcebooks/index.html

ESRI StreetMap Premium - http://www.esri.com/data/streetmap/index.html

Tele Atlas - http://www.esri.com/

Wirecenter Premium, Rate Center Boundaries, Area Code (NPA) Boundaries, LATA Boundaries, ILEC Boundaries and Points of Presence (POP)

Cable Boundary Data - http://www.esri.com/data/community_data/cable-boundary/index.html

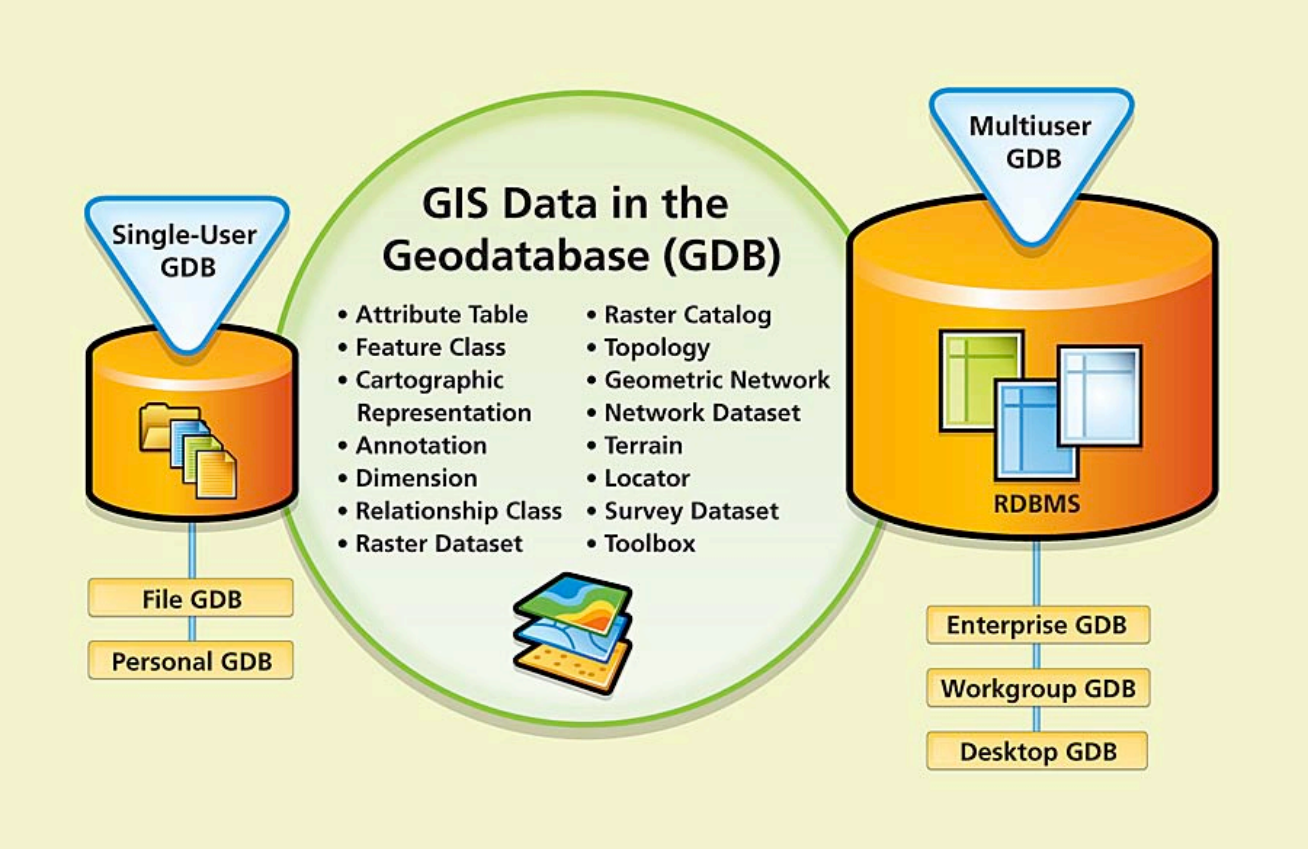
MediaPrints geographic boundary file that shows the location of all cable TV systems including: cable service areas, digital service areas, high-speed Internet access areas, cable overbuilders, and wireless cable systems

GeoTel MetroFiber & GeoTel Connect - http://www.geo-tel.com/products_lit.cfm

American Roamer - http://www.americanroamer.com/

CoverageRight & Wireless Industry Search And Retrieve Database (WiSARD)

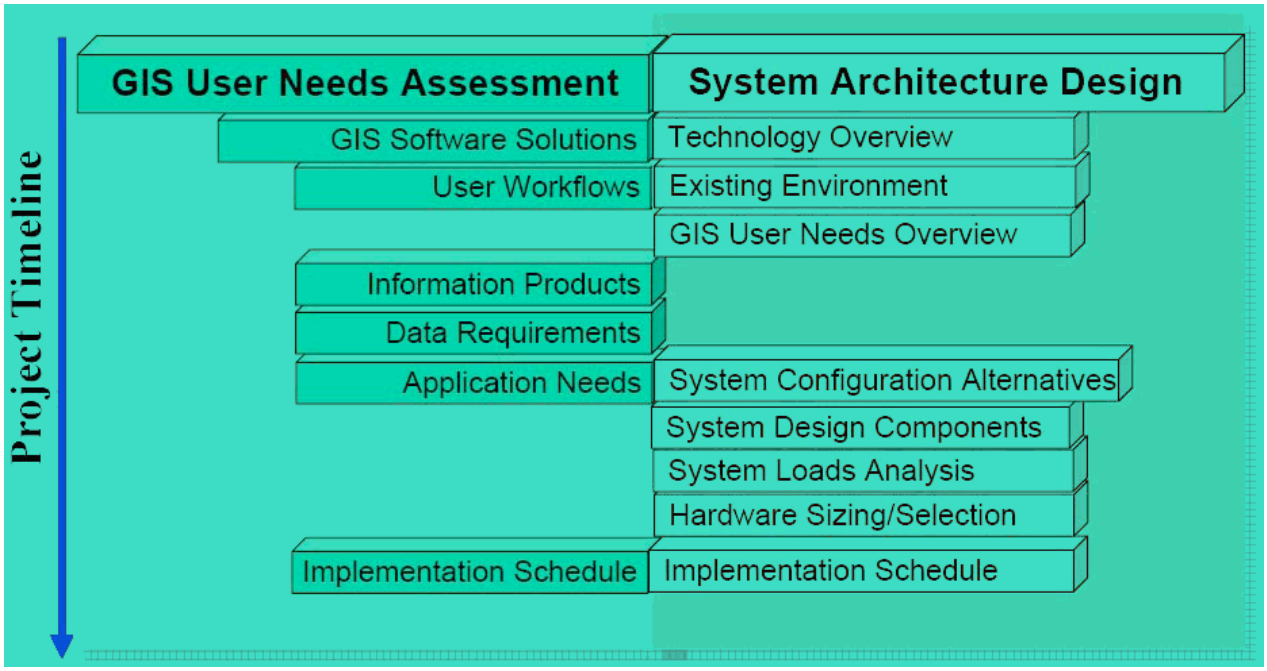
ESRI Geodatabase: Modeling and Managing Spatial Data



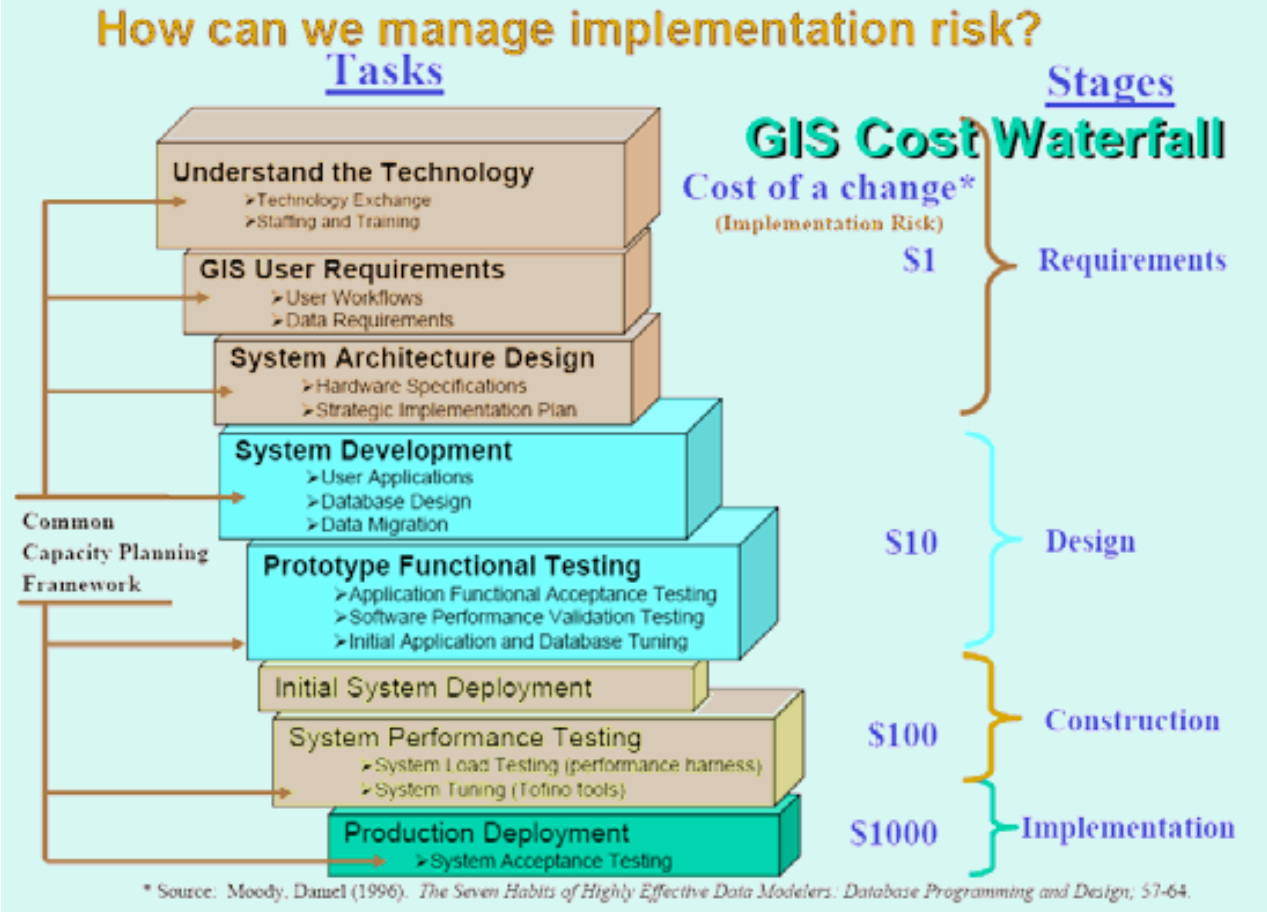
GIS Data	Geodatabase Dataset
Coverage	Feature dataset containing feature classes
Shapefile	Feature class
Raster data (e.g., satellite images, air photos, scanned maps, and digital pictures)	Raster dataset and/or raster catalog
CAD data	Feature dataset containing feature classes
Surface modeling or 3D data	Terrain
Utility network data (e.g., water systems, gas pipelines, and telecommunication networks)	Geometric network
Transportation network data (e.g., street networks)	Network dataset
GPS coordinates	Table of x,y coordinates that can be generated into a feature class
Survey measurements	Cadastral fabric

Source: ESRI ArcNews Winter 2008 (http://www.esri.com/news/arcnews/arcnews.html)

ESRI User Needs Assessment and System Architecture Design



ESRI Project Tasks and Implementation Risk Overview



Miscellaneous GIS Organizations and Resources:

Federal Geographic Data Committee (FGDC) - http://www.fgdc.gov/

FGDC Library - http://www.fgdc.gov/library

Geospatial Metadata Standards - http://www.fgdc.gov/metadata/geospatial-metadata-standards

National Geospatial Advisory Committee (NGAC) - http://www.fgdc.gov/ngac

Federal Advisory Committee sponsored by the Department of the Interior under the Federal Advisory Committee Act reporting to the Chair of the FGDC

NGAC Report: The Changing Geospatial Landscape 2009 (4.5MB PDF) - http://www.fgdc.gov/ngac/NGAC%20Report%20-%20The%20Changing%20Geospatial%20Landscape.pdf

National Spatial Data Infrastructure (NSDI) - http://www.fgdc.gov/nsdi/nsdi.html

National Association of State Chief Information Officers (NASCIO) - http://www.nascio.org/

Enterprise Architecture Program Toolkit & Resources - http://www.nascio.org/resources/EAresources.cfm

Governance of Geospatial Resources: "Where's the Data? Show Me" - Maximizing the Investment in State Geospatial Resources (7/08) - http://www.nascio.org/committees/EA/download.cfm?id=103

National Conference of State Legislatures (NCSL) - http://www.ncsl.org/

Telecommunications & Information Technology - http://www.ncsl.org/programs/lis/cip/ciphome.htm

Open Geospatial Consortium, Inc. (OGC) - http://www.opengeospatial.org/

Non-profit, international, voluntary consensus standards organization that is leading the development of standards for geospatial and location based services

OpenGIS Standards and Specifications - http://www.opengeospatial.org/standards

OpenGIS Geography Markup Language (GML) - http://www.opengeospatial.org/standards/gml

Digital Rights Management Reference Model (GeoDRM RM) - http://www.opengeospatial.org/standards/as/geodrmrm

ACM SIGSPATIAL Special Interest Group - http://www.sigspatial.org/

ACM SIGSPATIAL addresses issues related to the acquisition, management, and processing of spatially-related information with a focus on algorithmic, geometric, and visual considerations. The scope includes, but is not limited to GIS.

Geospatial Solutions Magazine (Questex Media Group) - http://www.geospatial-solutions.com/

Geospatial Solutions Buyers Guide - http://www.geospatial-solutions.com/geospatialsolutions/static/staticHtml.jsp?id=389995

GPS World Magazine (Questex Media Group) - http://www.gpsworld.com/

Utilities & Communications Sectors - http://uc.gpsworld.com/gpsuc/

GPS World Buyers Guide - http://cp.gpsworld.com/gpscp/static/staticHtml.jsp?id=434742

Miscellaneous GIS Organizations and Resources (Continued):

Google Maps API - http://code.google.com/apis/maps/index.html

MapNow.com - http://mapnow.com/

Arizona PC-compatible Maps (including GIS data) - http://mapnow.com/az.htm

Intermap Technologies - http://www.intermap.com/

NEXTMap TerrainOnDemand Data Store - http://www.terrainondemand.com/

Safe Software - http://www.safe.com/

Spatial ETL solution to translate, transform, integrate, and distribute spatial data

PYXIS Innovation Inc. - http://www.pyxisinnovation.com/

WorldView - http://www.pyxisinnovation.com/Products/worldview.html

Desktop peer-to-peer application to use, analyze, and share spatial data

A New Earth Reference Model - http://www.pyxisinnovation.com/pyxwiki/index.php?title=A_New_Earth_Reference

LizardTech, Inc. - http://www.lizardtech.com/

GeoExpress - http://www.lizardtech.com/products/geo/

Advanced geospatial imaging software to encode and publish imagery

TerraGo Technologies - http://www.terragotech.com/

GeoPDF (Geospatial data distribution & collaboration) - http://www.terragotech.com/geopdf/

Melissa Data Corp. - http://www.melissadata.com/

GeoCoder Suite - http://www.melissadata.com/dqt/geocoder-suite.htm

Validates addresses to the ZIP+4 level & appends lat/long coordinates

Common Sense - http://citizensensing.org/

Mobile environmental sensing platforms to support community action & citizen science

Vodafone Receiver (#21) Article: The Rise of the Sensor Citizen - Community Mapping Projects and Locative Media (2008) - http://www.receiver.vodafone.com/the-rise-of-the-sensor-citizen

Urban and Regional Information Systems Association (URISA) - http://www.urisa.org/

GIS.com (ESRI GIS Resource Portal) - http://www.gis.com/

A Proposal for National Economic Recovery: An Investment in Geospatial Information Infrastructure Building a National GIS (2008) - http://www.gis.com/gisnation/pdfs/national_economic_recovery.pdf

Geography of the Information Economy - http://faculty.washington.edu/krumme/550/resources.html

Broadband Metrics Best Practices: Review and Assessment Report prepared for Massachusetts Technology Collaborative by William Lehr, Tony Smith-Grieco, and Grace Rusi Woo of the Massachusetts Institute of Technology, February 2008 (http://www.mtpc.org/broadband/docs/BroadbandMetricsBestPracticesSurveyFeb2008.pdf)

Arizona Government Information Technology Agency

Broadband Assessment GIS Study

Appendix F - Other States' Broadband Assessment Case Studies

Other States' Broadband Assessment Case Studies

Arizona Telecommunications & Information Council (ATIC) Arizona Telecom Directory (ATD)

See Appendix C - Other Arizona Organizations of Interest

e-NC Authority (North Carolina)

Massachusetts Broadband Initiatives

California Broadband Task Force

Pennsylvania Mapping Project (No Longer Functional) and Current Broadband Initiatives

Georgia Mapping Project (No Longer Functional)

Illinois Mapping Project

ConnectKentucky

Maryland Mapping Project

ConnectTennessee

Vermont Telecom Authority

Virtual Alabama

Alternative Mapping Approach: Broadband Deployment from Bottom Up

e-NC Authority (North Carolina) http://www.e-nc.org/

e-NC Authority Project Description

Mission: The e-NC Authority is dedicated to ensuring that all North Carolina citizens, businesses and communities are aware of, know how to use and have access to high-speed Internet services at affordable prices, creating local opportunities for technology-based economic development and job creation. (Source: Jane Patterson e-NC Presentation, CA, 2007)
http://www.calink.ca.gov/summit/ppt.asp

Contacts e-NC

Executive Director	Jane Smith Patterson	919-250-4314 919-225-2363 M	jpatterson@e-nc.org
Senior Program Director for Intelligence, Communications & Outreach	Joanna Wright	866-627-8725	jwright@e-nc.org
North Carolina Center for Geographic Information & Analysis	Jeffrey Brown, Project Manager	(919) 715-0712	Jeffrey.P.Brown@ncmail.net

Project Background

Primary Legislative Mandate-Connectivity (Source: Jane Patterson Paper, CA, 07)
http://www.calink.ca.gov/summit/ppt.asp

- Created by the N.C. General Assembly in 2000, formerly the Rural Internet Access Authority
- Mandated to track broadband connectivity levels, by county, across North Carolina
- Established as primary Internet-planning body for the state
- Advocate and serve as catalyst for infrastructure build-out in underserved areas
- Received $30 million in private foundation funding from MCNC in 2000
- 8 staff members (3 are part-time)
- Governed by 15-member board appointed by House, Senate and Governor
- Created by the state, but did not receive state funding until 2004

Project Architecture, Implementation and Resources

Architecture and Platform: SQL Server-based, Windows-based, Internet-based feeds. SQL database on a Windows 2000 Advanced Server. Data is received via a form on their website. (Source: Joanna Wright, e-mail, 5/19/08) GIS Infrastructure Map: e-NC Authority (Source: Jeff Brown, Project Manager, CGAI, e-mail, 5/7/08)
Architecture: (Source: Jeff Brown, PM, CGAI, e-mail, 5/08)

Telecom Inventory RFP: An RFP for the Telecommunications Inventory was issued in 2001. A partial version of the RFP is included here (Source: 2001 RFP for North Carolina Telecommunications Infrastructure Inventory, Jane Patterson e-mail/Galen Updike, 12/12/08):

"RURAL INTERNET ACCESS AUTHORITY REQUEST FOR PROPOSALS RFP # 279-RIAA01

TITLE: North Carolina Telecommunications Infrastructure Inventory

USING AGENCY: Rural Internet Access Authority (RIAA)

ISSUE DATE: May 20, 2001

ISSUING AGENCY: Rural Internet Access Authority

4021 Carya Drive

Raleigh, North Carolina 27610

INTRODUCTION

The North Carolina General Assembly in its 2000 session approved the creation of the Rural Internet Access Authority (RIAA) to oversee efforts to provide rural areas with high-speed broadband Internet access. The authority's main goals are ambitious: to provide dial-up local Internet access from every telephone exchange in North Carolina within one year; and to provide high-speed Internet access at a competitive price to all North Carolinians within three years.

The authority is governed by a 21- member commission, which includes members of state government, business and education, members of Microelectronics Center of North Carolina (MCNC) and representatives from the state telecommunications companies, including Internet service providers, rural telephone cooperatives, local telephone exchange and independent telephone companies.

Other goals of the Rural Internet Access Authority include:

1. Increasing the ownership of computers, related Web devices, and Internet subscriptions throughout the state
2. Providing two model Telework Centers to be established by January 2002 (Only one-fourth of the state's telephone central offices are located in the most economically distressed areas.)
3. Providing accurate and current information via the Internet to state residents concerning t**he availability of telecommunications and Internet services. Also providing updates on** future telecommunications and Internet services.
4. Developing Internet services for government agencies that will make receiving Internet services easier and more convenient. These applications cal also facilitate the delivery of more government programs, including training, education, and health care.
5. Employing open-technology approaches that encourage all potential providers to participate in the implementation of high- speed Internet access.
6. Coordinating activities, conducting and sponsoring research, and recommending and advocating actions, including regulatory and legislative actions, to achieve the authority's goals and objectives

One of the requirements of Senate Bill 1343 is to provide accurate, current, and complete information provided through the Internet to citizens about the availability of present telecommunications and Internet services with periodic updates on the future deployment of new telecommunications and Internet services.

The purpose of this Request for Proposal is to secure the services of a qualified company to, via a statewide inventory, provide this required information.

Background

The RIAA Statute (Senate Bill 1343) references the Inventory as below with the Economic Development Partnerships and with the NC Rural Economic Development Center to:

1. Study the information technology infrastructure and information technology needs of each county.
2. Study will include an inventory of existing information technology infrastructure
3. inventory of information technology needs.
4. Analysis of how the information technology needs affect industrial and business recruitment.
5. Recommendations that address the information technology needs of the region.

In addition, the Statute requires an accounting of the increases in ownership of computers, related web devices and Internet subscriptions promoted in NC.

Development of government Internet applications to make citizens interactions with governmental agencies and services easier and more convenient and to facilitate the delivery of more comprehensive programs, including training, education and health care.

Open technology approaches are to be employed to encourage all potential providers to be involved in implementation of high-speed Internet access.

The RIAA is to coordinate activities, conduct and sponsor research and recommend and advocate actions including regulatory and legislative actions to achieve its goals and objectives.

Inventory Goal

The inventory will assist the RIAA in development of strategies to bring about faster deployment of broadband networks and to enhance the preparation of local citizens and private industry and public and private institutions to fully participate in the digital economy.

The RIAA will make every effort to use the private sector to reach the citizens of North Carolina with affordable broadband.

This study of information infrastructure, applications and services will be critical to public and private leaders in industry, government and education to make certain that effective decisions around deployment of telecommunications services will enhance our economy as well as our quality of life.

Information Required

Technical Data Layer:

1. Cable television networks, cellular systems, fixed wireless systems, satellite facilities, telephony and data networks, ITFS services, data centers, and public television networks infrastructures
2. ISPs and their capacity in terms of Internet gateway bandwidth, In-state services and offerings, and points of presence.
3. Status of local broadcasting companies to effectively deploy digital information via digital television channels including plans to utilize all aspects of digital signal.
4. Network information about federal networks that are available to the public for shared purposes.
5. Nonsecure information about military networks.

Other data layers:

Training and education resources available to train the workforce to service the information and communication technologies industries and make recommendations for substantive changes.

Scope of Work

Tasks

- To gather all data stated in the infrastructure and services section
- To develop a web-based query to access the collected data
- To provide recommendations as stated in the recommendations section

Infrastructure

Infrastructure elements must be pinpointed to a degree of accuracy that is suitable for GIS Mapping.

1. Fiber Optic Routes wire center to wire center, wire center to POP, POP to POP, wire center to industrial parks.
2. Cellular communications towers and fixed wireless antenna locations will also be identified and included in the inventory.

3. Locations and ownership of Interexchange Carrier (IXC) Points of Presence (POPs) facilities.
4. Transmitter locations of public and private radio and television broadcasting companies will be identified and also any non-secure military network elements. Transmitters of both state and local governments are to be identified also.
5. All public and private fiber located with the state not identified above

Services

Identify the coverage area of services provided by the service providers in a format that can integrate with the Corporate Geographic Database of NC and complies with open GIs data standards. Reflect the percentage difference in pricing of the same services in urban areas versus rural areas. By identifying base areas for pricing and showing the percentage differences for other areas.

1. Using wire centers, and their Geographic Location Code (GLC) where applicable, as the focal point, identify all services that are supported by the wire centers as they extend outward into the communities that they serve. Inventoried services must include, but not be limited to, ATM, Frame Relay, various instantiations of DSL, Native Mode LAN connectivity, Multiple Protocol Label Switching (MPLS), Dense Wave Division Multiplexing (DWDM) and Passive Optical Networks (PON), TI, T3, PRI, BRI.
2. Identify Cable Television companies and their central distribution locations. identify the penetration into the communities that they serve end the services offered. Identified services should include voice, video and data. Information should also be gathered on upstream and downstream data rate capabilities and franchise renewal dates. Document plans for enhanced services.
3. Identify all cellular companies operating in the state and identify their coverage areas as well as the services (voice and data) offered. Identify the Access Method (AMPS, TDMA COMA or GSM) deployed by each. Document plans for enhanced services such as 3G wireless.
4. Identify all ITFS license holders with services and coverage areas (See Assessment section.)
5. Identify all fixed wireless services and coverage with QOS rating offered within the State. Include the transmission frequency and bandwidth used and whether it is licensed or unlicensed. Document bandwidth of services offered.
6. Identify the capability to transmit digital data signals by radio and television broadcasting companies and areas of coverage operating within the state and future planned services.
7. Identify all companies that provide interactive services via satellite and broadcast. Define the services and the method(s) used for interactivity. Confirm that services are statewide.
8. Identify all federal (including military), state or local government networks and/or political applications that can be made available for shared use.

Data Format for Replying

Develop the query process along with the relational databases so they can be displayed via GIS framework within 15 ft of accuracy and to a 1" inch = 200 ft map scale that can be interactively queried by the user. Identify all readily and identify where lacking and where available with digital map data showing the infrastructure as described.

1. The location of telecommunications services, applications, prices and other appropriate data must be GIS mapped, detailed down to the local level, and organized by regional partnership boundaries.

2. The applications that are available to users must he coordinated with GIS mapping.

3. GIS maps, the inventory applications, end the menu of services should be updated annually to maintain the effectiveness of 4 these tools for economic development purposes.

4. A list of best practices related to infrastructure, applications, and services must identify areas of strength and opportunities for improvement at the local level.

5. An analysis of newer technologies like wireless and satellite communications should be provided on the web site.

Recommendations formulated by inventory project:

1. Recommendations for strategies to develop broadband access in rural areas.
2. Recommendations for correcting any information infrastructure deficiencies.
3. Recommendations for changes in laws affecting faster deployment to assist persons in rural and urban areas with to receive sufficient resources to participate in accessing networks. For example, access charges and access devices
4. Develop an analysis of the most cost effective way to deploy broadband after reviewing collected data
5. Develop recommendations for volume or aggregated purchasing formulas for broadband deployment within economic development regions (seven regional partnerships)
6. Recommend best way to update and keep evergreen these databases of information and communication technologies.

Assessments formulated by inventory project:

1. Assessment of present use and potential use of existing infrastructure.
2. An assessment of capability of networks to provide critical public services (such as healthcare, disaster management, legal and judicial systems, education and training, e-government) and to also look at key sectors of the economy such as travel/tourism, banking, manufacturing as small and medium-sized enterprises (sme).
3. Assessment of local government and state government use in order to evaluate shared use of existing infrastructure as schools.
4. Assessment on cost to deliver ITFS services for public sites that have ITFS licenses. Evaluate ITFS license holders at universities, public schools and community colleges and what agreements may have been made with the private sector companies to purchase unused spectrum licenses. Provide an analysis of best use of these spectrums and a resale price for the unused spectrum. Determine what valuations should be placed on the ownership of these licenses. This information should be collected in order to display some of the information on a GIS map.
5. Assessment tools that will evaluate the readiness of areas for deployment of electronic commerce as well as e-learning, e- health, and e-government.
6. Assessment of future forecasting of networked infrastructure.

Process Required During Project

1. All consultants must begin their work within two weeks of award.
2. The consultant will be asked to use Microsoft's Project to manage the project.
3. Problems or issues that may impact deliverables of the project should be brought to the attention of the RIAA staff by August 15.
4. Weekly briefings lasting between 1 to 2 hours are expected during the project with an extended meeting once a month throughout the project.
5. Consultant will be asked to provide a listing of individuals who will work on the project and provide a resume of their current and past activities as well as educational and business and technical backgrounds.
6. Consultant will have to show an indication of their ability to carry out this project by citing similar projects that have had this scope and complexity.
7. Consultants will need to provide references that could be called for validation of their past work experience.
8. List company and contact person name and phone number for information collected, in particular, for database information for this RFP. This would make your working papers open to us.

Users of nonproprietary information: All institutions, both public and private, within North Carolina as well as citizens and private industry,

Certain data collected that is considered proprietary will only be available to "need to know" personnel (who sign a nondisclosure agreement) such as RIAA technical staff, IRMC Technical Staff, Utilities Commissioners, Public Staff of the Commission, ***ITS*** Senior Personnel (determined by North Carolina CIO) and other individuals cleared by the LLR committee of the RIAA. The successor owner of RIAA information will take decisions about fond-term access to proprietary data under advisement and transfer such information to a secure authority. “

Geospatial Datasets:

Business data - features unique to this purpose

- Telecommunication towers
- Public schools and libraries
- Wireless tower service areas
- Cable modem service areas
- DSL service areas
- Central offices
- Telecommunication boundaries (area codes, LATA)

Base layers for context, orientation, landmarks:

- Streets and highways
- Rail and airports
- Rivers and Streams
- Political boundaries - county, city, voting

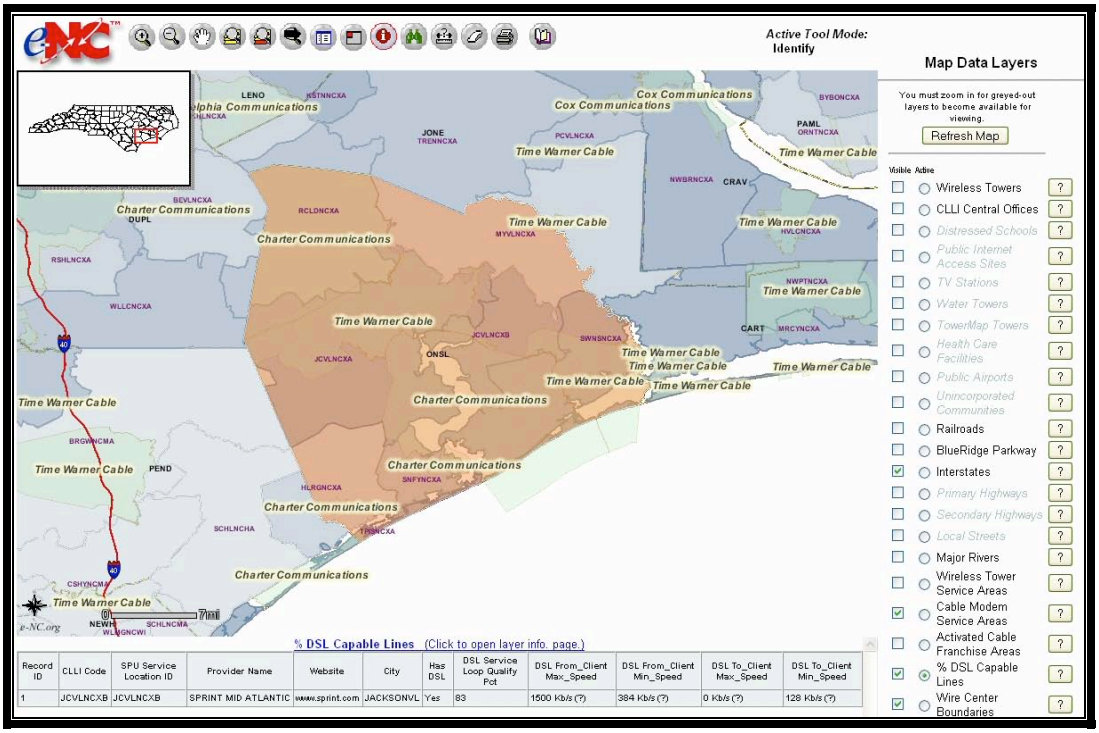
Thematic layers for context

- Census (household density)
- Regional boundaries
- Zip code boundaries

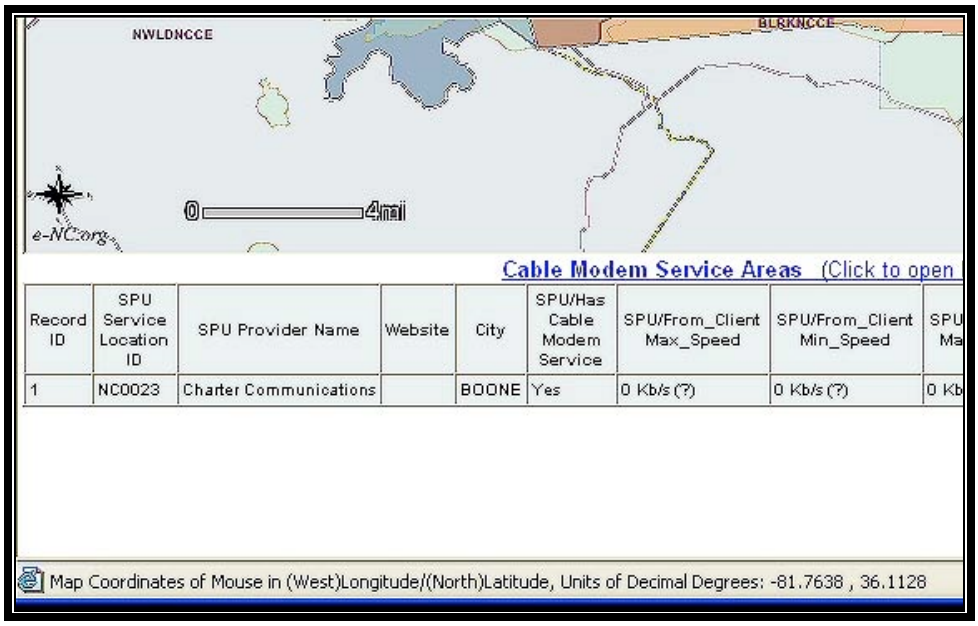
Data Constraints:

- Public records and other public uses for the datasets
- Licensed datasets and their restrictions
- Service Provider Update information and joining to map features
- Maintenance Quality”

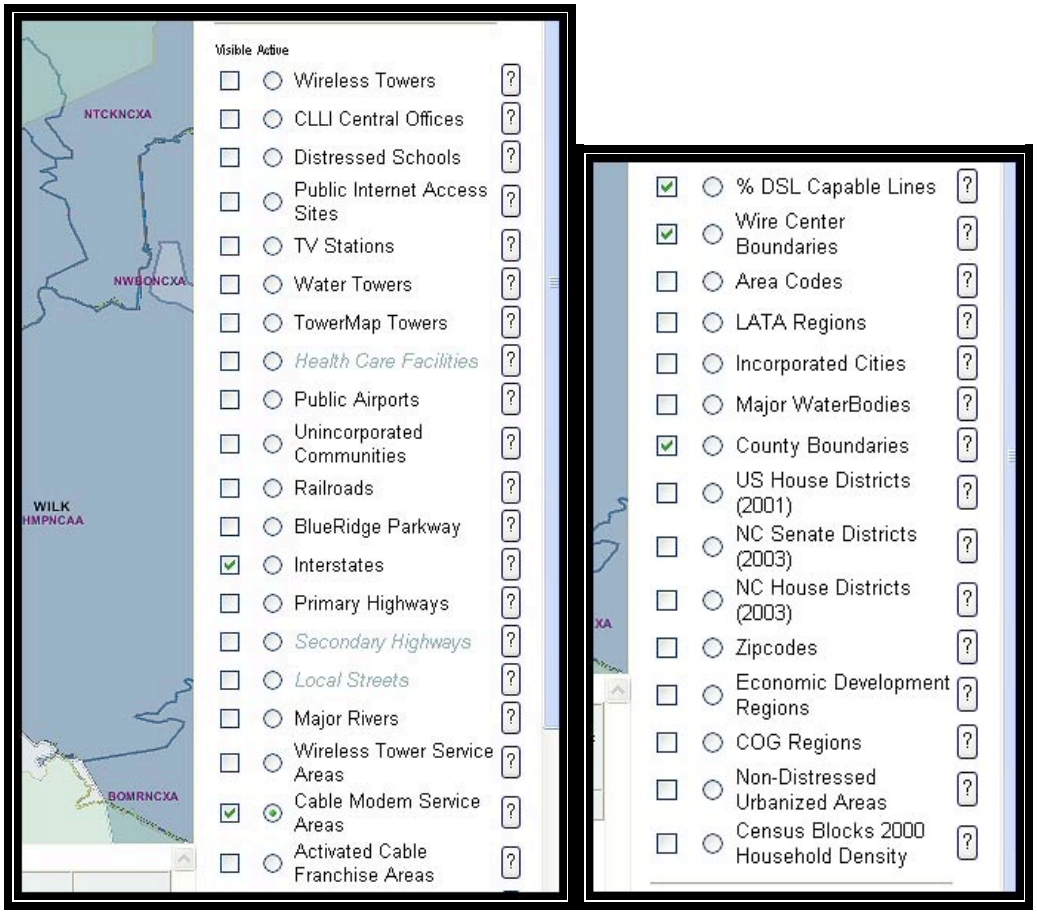
GIS Mapping Examples from e-NC Authority Showing Data Layers



GIS Mapping Examples from e-NC Authority Showing Data Layers



GIS Mapping Example from e-NC Authority Showing Data Layers



List of Layers Prototype

List of Layers and Their Scale Dependent Availability Thresholds: County Boundaries and Data Fields, sources (Jeff Brown, 5/6/08 e-mail)

Record ID	
FIPS	
CoNameL	
Rural_Urb	
Pop2000	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
PopEst2005	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
PopChg%00-05	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
NPopMig95-00	http://demog.state.nc.us/demog/cert05pa.xls
NPopMig%95-00	http://demog.state.nc.us/demog/cert05pa.xls
PopDen1990	
PopDen2000	
White%00	pull from NCONEMAP
Black%00	pull from NCONEMAP
Hispanic%00	pull from NCONEMAP
MedAge00	pull from NCONEMAP
MHHI90	
MHHI00	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
MHHI%Chg90-00	
PerCapInc00	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
Unemployment%_Dec2005	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
PovRate00	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
PctHSGrad00	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
%Bachelor's degree 2000	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
Ave SAT 2005	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
TotOccHU00	pull from NCONEMAP
OwnerHU%00	pull from NCONEMAP
MobileHU%00	pull from NCONEMAP
MVH 2000	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
Population/Physician ratio	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
Tier_2005	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
COG_Reg	
COGName	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
REDPartnership	http://cmedis.commerce.state.nc.us/countyprofiles/default.cfm
CompAcres	

Implementation

GIS and Tutorials
e-NC GIS Basics Tutorial -
http://204.211.239.208/enc-telco-maps/eNC_GISTutorial.htm

Data Sources, Acquisition, Processes
The chart attached below (Black Lettering) is provided by Mark Goldstein, GBAS, with Blue Lettering indicating e-NC data: quoted from Jeff Brown, Project Mgr., CGIA, e-NC (Jeff Brown, e-mail, 5/6/08)

Primary Data Criteria and Sources Table

Notes from North Carolina, Jeff Brown, Project Mgr., CGIA, entered in blue font.

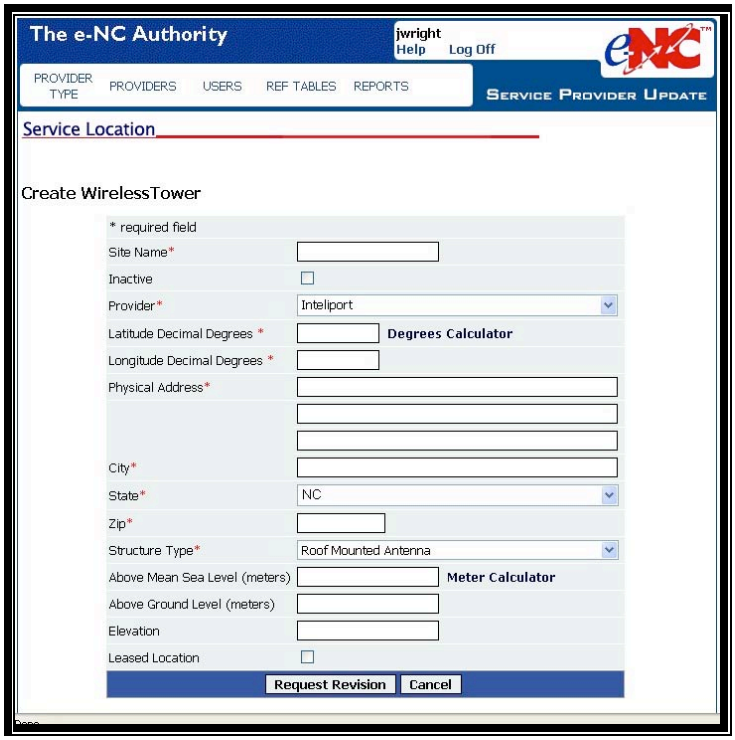
Data Criteria	Description	Sources, Issues & Notes
Central Office (CO) &/or Wire Center Locations	Primary ILEC points of presence with assigned Local Exchange NPA NXX	Available from multiple sources updated regularly at $ e-NC began with a dataset licensed by MapInfo
ILEC & CLEC DSLAM Locations	Deep fiber extensions to DSLAMs for DSL service at significant distance from COs, Data availability would support DSL availability modeling	No known commercial database or source, generally considered provider proprietary, information may be contributed with defined value proposition though use may be constrained These data are not available to e-NC
Cable Provider Service Boundaries	Geographic boundaries for cable licensees	ESRI GIS database e-NC began with a dataset of franchise and cable modem service areas licensed by MapInfo
Cable Provider Service Offerings	Availability of voice, video & data by provider and market allowing estimations of homes passed and possibly homes served	Arizona-New Mexico Cable Communications Association (AZ-NMCXCA) provider directory & cooperatively provided data e-NC attempts to verify and update service offerings by location with Cable Service providers have not met expectations.
Wireless Tower Locations	Geographic locations for wireless tower structures	U.S. FCC Antenna Structure Registration (ASR) registers certain antenna structures (>200 feet in height or located near an airport), Licensable wireless antenna facility location data (e.g. - Tower Maps) locates physical structures & collocation contact but not collocated providers e-NC began with licensed data from Tower Maps; FCC data online are not well documented and appear less complete than Tower Maps collection.
Cellular Provider Service Locations	Provider collocation on existing tower infrastructures, Data availability would support cellular services availability modeling by provider	Could be provided cooperatively in an integratable data format by providers, Possible e911 database(s) e-NC attempt to collect service provider information online has not met expectations

Data Criteria	Description	Sources, Issues & Notes
Cellular Provider Service Coverage	Provider maps of service areas and services offered, Data availability would support cellular services availability modeling by provider	Could be provided cooperatively in an integratable data format by providers, Could be adapted from digital or scanned coverage maps of each providers' service areas for various classes of service e-NC used a simple radius as a first approximation, but has not created a function to estimate coverage based on geospatial datasets
Wi-Fi Hotspots	Geocoordinates of Wi-Fi hotspot locations by SSID and security profile, Added value data could indicate public or commercial usage availabilities, Data availability would support Wi-Fi services availability modeling by provider or authorized partners	Many are secured & dedicated to home or business use, Directories (e.g. - JWire) of public hotspots by access type (free & open, by subscription or transaction), Wardriving? e-NC has not attempted to create a dataset for Wi-Fi

Best Practice with Primary Data from Service Providers using Forms

Forms on a secured website are used for Service Provider's (SPs) data information. The Providers input the new data at least annually, if not more frequently as it is created. No Non-Disclosure Agreement (NDA) is used. SPs know that no harm will come to them by providing their data, such as competitors taking their customers, since e-NC uses confidentiality precautions. Otherwise discussion with e-NC ensues to ensure that SPs data is correctly secured. Forms used by SPs, provided by Executive Director Patterson, are shown on the following graphics (E-mail Jane Patterson/Galen Updike, 12/12/08)

Form on a Secured Website for Wireless Tower Service Provider Data



Form on a Secured Website for Cable Service Providers Data

The e-NC Authority

jwright
Help Log Off

PROVIDER TYPE | PROVIDERS | USERS | REF TABLES | REPORTS

SERVICE PROVIDER UPDATE

Service Location

Create Cable

* required field

Site Name*	
Inactive	☐
Provider*	Charter Communications
Physical Address*	
City*	
State*	NC
Zip*	
Franchise Area	
Local Company	
Primary Owner	
Households Passed	
Number of Head Ends	
Number of Hubs	
Availible Internet Service	☐

Services

Cable Modem Service ☐		
Cable Modem Speed Max Download		Kb/s
Cable Modem Speed Min Download		Kb/s
Cable Modem Speed Max Upload		Kb/s
Cable Modem Speed Min Upload		Kb/s
Cable Modem Qualifying Percent		
Cable Modem Notes		

Confidential

Cable Modem Pricing	

Request Revision | Cancel

Form on a Secured Website for Service Providers' Wire Center Common Language Location Identifier (CLLI) Code Data

The e-NC Authority

jwright
Help Log Off

PROVIDER TYPE | PROVIDERS | USERS | REF TABLES | REPORTS

SERVICE PROVIDER UPDATE

Service Location

Create CLLI - Wire Center

* required field

Site Name (CILLI)*

Inactive ☐

Provider* CITIZENS TELEPHONE CO.

Location

Longitude Decimal Degrees * Degrees Calculator

Latitude Decimal Degrees *

Physical Address

City

State NC

Zip

Phone

Services

ATM	☐	Frame	☐	IMA	☐	DS0	☐
DS1	☐	DS3	☐	OC1	☐	OC3	☐
OC12	☐	OC48	☐	ISDNBRIBUS	☐	ISDNBRIRES	☐
Other	☐	MAN	☐	ISDNPRIBUS	☐	ISDNPRIRES	☐

Other (Specified)

DSL ☐

DSL Speed Max Download Kb/s

DSL Speed Min Download Kb/s

DSL Speed Max Upload Kb/s

DSL Speed Min Upload Kb/s

DSL Qualifying Percent

DSL Notes

Confidential

DSL Pricing

Request Revision | Cancel

Resources

Costs

"CGIA is under contract to e-NC and operates on a cost-recovery basis, so our contracts do reflect costs. There were no significant in-kind costs from our end. E-NC staff has put in substantial time in design, review and management of the database and web map viewer. In addition to CGIA, E-NC had an initial contractor for version 1 and the contractor noted above who developed and maintains the service provider database." (Jeff Brown, Project Manager, CGIA, 5/7/08 e-mail)

e-NC Authority Costs/Budgets (Source: Jane Patterson/Galen Updike e-mail 12/12/08)

Original Budget 2001-2002			Current 3 Year Budget		
KPMG	$900,000.00	Initial inventory of services			
NCCGIA		GIS	NCCGIA	$87,554.00	Technicians at $67/hr.
ML Company	$140,000.00	Service Provider Updates			Analysts at $85/hr
		Actual Coding before launch: 230 - 250 hours			Programmers at $97/hr
		Predicted Coding After launch: 80 - 110 hours	ML Company	$15,000.00	
		Data Base Maintenance: 25 - 50 hours			
		Reports Via Web or Exporting: 40 - 70 hours			
		Data Entry, Testing and Technical writing: 30 hours			
Staff 3 FTE			Staff .75 FTE		
MapInfo - Wire Centers	$10,500.00		MapInfo - Wire Centers	$10,500.00	
MediaPrints - Cable			MediaPrints - Cable		
TowerMaps	$1,225.00		TowerMaps	$1,225.00	
Total	**$1,051,725.00**		**Total**	**$114,279.00**	

Case Studies Previously Studied:

"Notes on Arkansas Approach (From: Jeff Brown, Project Manager, CGIA, e-mail 5/5/08)

1. Obtain access to geospatial data (map layers) for a simple base map:
Streets and highways
Rail and airports
Rivers and Streams
Political boundaries - county, city, voting

2. Obtain access to additional map layers for context:
Census (household density)
Regional boundaries
Zip code boundaries

3. Develop or obtain access to map layers that represent telecommunications data:
Telecommunication towers
Public schools and libraries
Wireless tower service areas
Cable modem service areas
DSL service areas
Central offices
Telecommunication boundaries (area codes, LATA)

4. Develop or obtain access to tabular data from service providers that describe services; link the tabular data to the map features by common unique identifiers (names or numbers).

5. Display selected information in a desktop GIS to staff for analysis and decision support.

6. Display selected information to a wide audience (viewable with a simple web browser).

Data Requirements:
Public agencies are likely to maintain and distribute the datasets in #1 and #2.
Commercial data products are available under license for much of #3. Service provider geospatial information, if available, would be invaluable.
Information from service providers for #4 is invaluable.
Software, Hardware and Labor Requirements:

For the capability to accomplish #5, an agency or its contractor would need:
GIS software, a PC with extra random access memory (RAM), and a person trained in GIS software, geospatial analysis, and data management.

For the capacity to accomplish #6, an agency or its contractor would need:
ArcIMS or an equivalent Internet mapping software, application development tools for customizing the map viewer, a web server, a database server, perhaps a spatial server(s) and staff skilled in programming, database administration and data maintenance, and geospatial concepts.

A map viewer (#6) would need to be customized to meet the business needs and take advantage of the best available data and application development tools."

e-NC Project Deliverables, Outcomes and Impact:

Deliverables: (Source: Jane Patterson Presentation, CA, 2007)
http://www.calink.ca.gov/summit/ppt.asp
"• **e-NC Business & Technology TeleCenters**-primary grantor for these SEVEN technology resource centers for small business growth in economically-distressed areas
• **e-Communities** - grassroots effort started in 2001, *all 85 rural counties* developed assessment of technology needs and assets, and developed plans for digital literacy training, public access, connectivity and Web applications
• **e-Government** - created to show citizens and leaders the benefits of transactional Government, resulted in interactive Web sites for 55 governments
• **TechForce** - in operation for three years**"**

Outcomes

Programs & Activities (Source: Jane Patterson Presentation, CA, 07)
http://www.calink.ca.gov/summit/ppt.asp

- **"Annual 100 County Report**-outlining connectivity availability and last-mile infrastructure statewide
- **GIS Mapping Program**-award-winning, real-time tracking of infrastructure through partnerships with service providers, for public access"
- Best Practices Scientific Survey Work documenting the rise in Internet usage is included here, from East Carolina University, Kenneth Wilson, Ph.D., Oct. 2008, titled "Tracking Home Computers and Internet in North Carolina 1999 - 2008" Executive Summary:
    - Digital technology creates new opportunities but it can also reinforce old social divisions. Unequal access to the Internet can hamper economic development and undermine the general quality of life in under-served areas.
    - Four surveys conducted between 1999 and 2008 document the progress that has been made and an amazing transformation of North Carolina. In 1999, only 53 percent of NC households had home computers. In 2008 that figure has risen to 80 percent. In just nine years, the proportion of homes without a computer has dropped 57 percent. In 1999, the proportion of homes with Internet access was 36 percent but this has risen to 70 percent in 2008. In just nine years, the proportion of homes without Internet access has dropped 53 percent. In 1999 the proportion of North Carolinians who used the Internet anywhere (at home, work, public access, etc.) was 62 percent. Today it has climbed to 82 percent. In less than a decade, North Carolina has been transformed from a place where most people use the Internet but only the elite have it in their homes to a place where almost everyone uses the Internet and most people have it in their homes.
    - These facts suggest a fundamental change - in 1999 knowledge of the Internet was an advantage but today lack of Internet knowledge is a handicap. While they are making some progress, poor families, minorities and high school drop outs lag behind the rest of North Carolina in these skills. Black respondents present an interesting case - in the last four years the proportion of Black households with home computers has remained constant while the proportion of home computers in black households connected to the Internet has grown dramatically (from 68% to 95%). In 1999, North Carolina was struggling with the idea of a digital society that has now become commonplace.
    - In 1999, only about half (57%) of the rural households with home computers had Internet access. By 2004, this figure had

climbed to 91 percent (almost equal to telephone penetration) and in 2008 it was 90 percent. In rural North Carolina, one-third of the people who do not have home Internet access use the Internet somewhere else. Between 2002 and 2004, the proportion of North Carolinians who reported using public access facilities increased from 3 percent to 10 percent. By 2008, 16 percent of rural NC residents who did not have home Internet access had used a public access facility.

- Rural access is only one challenge to universal digital literacy. Low income families face special challenges. In the last 4 years, the poorest families seem to have made remarkable strides. Families with incomes under $15,000 more than doubled their home computer ownership (31% to 65%) and almost doubled their home Internet access (25% to 49%). Families making slightly more made almost no progress during these four years (43% to 45% and 32% to 33%). If there is some program to help the poorest families in North Carolina, this would be evidence of its success.
- During the past 4 years, awareness of county government websites has increased dramatically from 39 percent in 2004 to 62 percent in 2008. Urban residents were more likely to be aware of county government websites (67% vs. 57%) and more likely to express an interest in such a website if they were not aware of one (28% vs. 8%). About a third of those who knew that a website existed had visited it during the past month. The proportion using the county website was roughly the same in urban and rural areas of North Carolina.
- The attitude questions show that the attitudes of North Carolinians have not changed very much during the past four years. Most recognize that the Internet is necessary to maintain a decent standing of living and that young children must master these skills. They support state subsidies for both home and businesses. However they continue to be concerned about possible threats to privacy and the availability of obscene material.

In the four and a half years between these studies, the proportion of homes with computers that also have home Internet access has increased 31 percent from 68% to 89%. While it has not quite caught up with telephone access (about 95%), Internet access among homes with a computer is almost as common. This is a particularly impressive achievement because it includes an increase from 57% to 91% in rural counties. E-NC should be proud that its work promoting computer and Internet literacy has paid off in this unusually strong growth in rural counties.

When examining Table 3, be sure to notice that these results clearly seems to indicate that the major factor creating gaps in home Internet access is the lack of a home computer. This may be because the cost of buying a computer and adding Internet service is too great for certain households. On the other hand, it may be that one of the biggest values derived from home computers is the ability to access the Internet.

Prototype of Survey Results Table

Table 3: Internet Penetration Demographic Percentage of NC Households With Home Computers That Have Home Internet Access				
	1999	**2002**	**2004**	**2008**
Overall	**68%**	**87%**	**89%**	**91%**
Gender				
Men	68%	88%	90%	92%
Women	67%	86%	89%	90%
Generations				
Ages 18 -27	72%	87%	85%	85%
Ages 28-39	69%	89%	91%	90%
Ages 40-49	70%	88%	96%	100%
Ages 50-58	74%	87%	89%	93%
Ages 59-68	52%	80%	84%	90%
Age 69+	50%	85%	81%	77%
Race and ethnicity				
Whites	69%	88%	91%	91%
Blacks	61%	70%	78%	95%
Native American		75%	100%	81%
Hispanic		95%	74%	78%
Other		89%	90%	82%
County Type				
Urban	73%	84%	89%	92%
Rural	57%	88%	91%	90%
Household Income				
Less than $15,000	29%	72%	82%	76%
$15,000 to $24,999	17%	78%	76%	88%
$25,000 to $29,999	73%	87%	87%	95%
$30,000 to $49,999	53%	88%	87%	99%
$50,000 to $74,999	70%	93%	94%	95%
$75,000 to $99,999	62%	94%	95%	99%
$100,000 and above	64%	94%	98%	95%
Educational Attainment				
Less than High School	8%	79%	78%	87%
High School Graduates	64%	85%	88%	89%
Community College Degree	67%	86%	89%	93%
College Degree	76%	92%	96%	96%
Graduate Degree	82%	95%	95%	97%
Children Living at Home				
Yes	70%	88%	92%	95%
No	66%	85%	87%	88%

- **Earlier Citizen Surveys**-analysis of adoption (1999 to 2004) are included here. Publication date: March 2005**, "**North Carolinians Online: Trends from the Citizen Surveys 1999-2004" Executive Summary:

  The Internet may be increasingly ubiquitous in commerce, education, health care, and government, but it is not universally accessible. Tapping into it requires capable technology (hardware and software), an affordable connection with necessary bandwidth, and the know-how to utilize web content and services. Since January 2001, E-NC has worked with state and local public- and private sector partners to ensure that as many North Carolina households and businesses as possible—in all regions and at all levels of income—have the technologies, infrastructure and skills they need to go online. As part of that effort, E-NC closely monitors trends in online connectivity, broadband infrastructure deployment, computer technology usage and digital literacy. This report, using data from extensive household telephone surveys conducted by East Carolina University in 1999, 2002 and 2004, shows that North Carolinians are using the Internet in record numbers, that location is no longer a significant barrier to basic online connectivity, and that non-metro home Internet users in North Carolina are switching to broadband at a pace exceeding the national trend. As infrastructure and services continue to expand and improve, insufficient income and basic digital literacy are emerging as the chief remaining barriers to widespread Internet adoption and use.

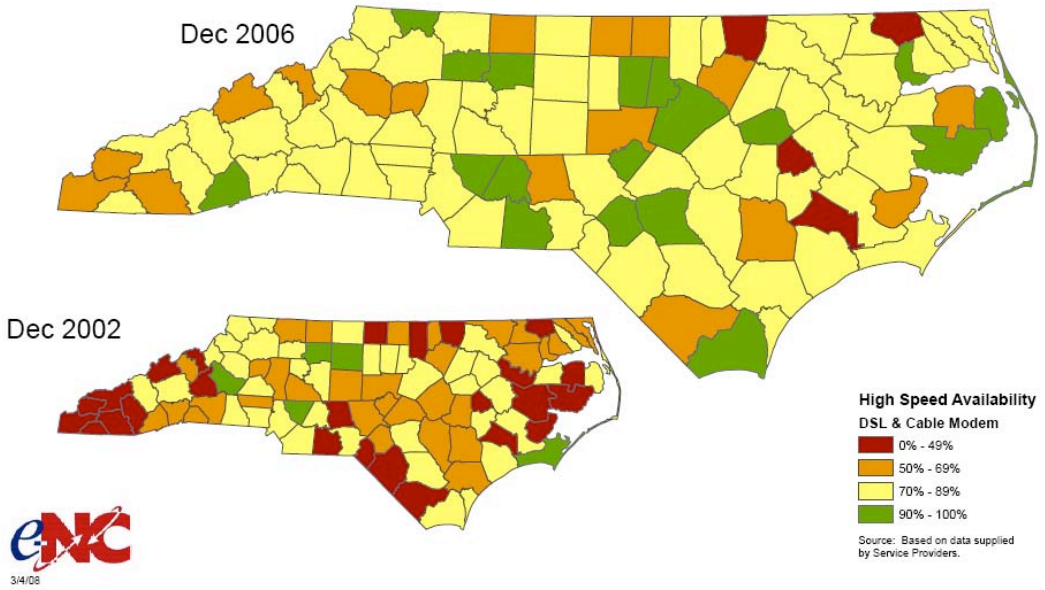
  The following are specific findings from the report:

  - ***Gap in household computer ownership between whites and African Americans has narrowed substantially in last five years.*** In 1999, there was a 30 percentage point difference in home computer ownership in African American and white households (31versus 61 percent). By early 2004, the gap had narrowed to 5 percentage points (63 versus 68 percent).
  - ***Overall Internet penetration in North Carolina exceeds the national average.*** In early 2004, 71 percent of North Carolina adults reported using the Internet at home, work or elsewhere, compared to 64 percent of adults nationwide. The penetration rate was 65 percent in North Carolina in mid-2002, compared to 58 percent nationwide.
  - ***Internet penetration in non-metro North Carolina also exceeds the national average.*** Approximately 66 percent of adults in non-metro North Carolina counties were Internet users in early 2004, compared to 55 percent of non-metro adults nationwide.
  - ***Home Internet use has increased dramatically in North Carolina in the last five years, with the fastest increases in rural (and non-metro) counties.*** In early 2004, 58 percent of all North Carolina adults reported using dialup or broadband service from home, up from 36 percent in 1999. The household Internet penetration rate increased fastest in 85 counties designated as rural—from 27 to 51 percent, a 24 percentage point gain. The increase in 60 non-metro counties was 29 percentage points, from 23 to 52 percent.
  - ***In most of North Carolina, location is no longer a significant barrier to basic home Internet access.*** Eighty-nine percent of North Carolina households that own a computer now access the Internet from home with at least a dial-up connection, a share that is nearly identical in rural and urban counties (and metro and non-metro counties). In early 2004, less than 2 percent of non-metro home Internet users reported making a long distance call to connect to an Internet Service Provider, down from 5 percent in mid-2002.
  - ***Home use of broadband is growing rapidly in North Carolina, in parallel with national trends.*** In mid-2002, 19 percent of home Internet users in North Carolina utilized a broadband connection (e.g., DSL, cable, or ISDN), compared to 22 percent nationwide. By early 2004, 40 percent of North Carolina home Internet users had a broadband connection, compared to 39 percent nationwide.
  - ***Non-metro North Carolina is going "high speed" faster than the rest of non-metro U.S.*** In early 2004, 32 percent of home Internet users in non-metro counties

of North Carolina were linked to the Internet via a broadband connection, up from 15 percent in mid-2002. Comparable U.S. non-metro household broadband take rates in 2002 and 2004 were 11 and 25 percent, respectively, according to the Pew Internet & American Life Project.

- ***Among households with computers that do not have home Internet access, the principal reasons are lack of need and cost.*** In 2004, 67 percent of adults with a home computer and no home Internet access indicated that the reason is that they do not have a significant need for home Internet. Approximately 27 percent of households with home computers and no Internet service cited "cost/too expensive" as the reason. These figures changed little between 2002 and 2004.
- ***Demographics increasingly account for the remaining gap between the average urban and rural home Internet take rates (62 versus 51 percent).*** North Carolina home Internet users are, on the whole, younger, more educated, and wealthier than non-Internet users. A predominance of older, less educated, and lower income populations in rural counties is the principle factor reducing average rural area take rates.

High Speed Internet Access Increase in North Carolina



Impact:

Major Success -The e-NC Model (Source: Jane Patterson e-NC Presentation, CA, 2007) http://www.calink.ca.gov/summit/ppt.asp

- "Hybrid organization -state authority housed in a non-profit rural economic development organization with funding from private foundations *and* state/federal
- Support of state legislature, service providers and local governments
- Three types of connectivity tracking
    - -Availability of high-speed Internet per household
    - -GIS-mapping
    - -Subscription rates - Citizen Surveys
- Consulting model for other states
- First state to create a GIS-based mapping program of a real-time nature
- One of the first out of the gate
    - e-Communities began in 2001
    - e-Government began in 2002
- Three-fold system
    - 1) Build supply
    - 2) Build demand
    - 3) Deliver valuable broadband outcomes research"

- Testimonials from North Carolina Business Owners and Residents about the success of the program are included here (Source: Galen Updike/Jane Patterson e-mail, 12/12/08):
    - Ann Bryson - Jackson County Small Business Owner: http://www.youtube.com/watch?v=gVRcUQUz44Q
    - Lionell Parker - Piedmont Comm. College Librarian, Yanceyville: http://www.youtube.com/watch?v=fOEbM6Oiqko
    - Donna Sibert - Rockingham County single working mother, full-time college student: http://www.youtube.com/watch?v=OSghvcAhdnQ
    - Jean Apple - Caswell County citizen, retiree: http://www.youtube.com/watch?v=wlim6mTq_lk

Project Data Sources and Constraints:

- Data Sources
- ESRI: GIS data
- Census: demographics

Project Lessons Learned and Outlook:

Lessons Learned (Source: Jane Patterson e-NC Presentation, CA, 2007) http://www.calink.ca.gov/summit/ppt.asp

- Many rural populations still must be educated about the value of high-speed connectivity
- "Business case" challenge -service providers rarely expand infrastructure as a gesture of goodwill
- Divide and conquer -N.C. is deceptively large (85 of 100 counties are considered to be rural)
- Teaching them to fish -many elected leaders lacked basic digital literacy and understanding

Major Success -TeleCenters Program

- Technology training programs
- Partnership with local K-12 schools, community colleges and universities
- Valuable results (2001-2006) including 1,190 new jobs created ($5,070 cost per job created), 132,770 public Internet access visits, 20,533 technical/business clients served, and $9,966,760 leveraged by the e-NC Authority

Major Success -e-Communities

- Grassroots organization at LOCAL level, empowering citizens to take ownership of community planning
- Planning grants facilitated to all 85 rural counties -all counties designated by the Governor as an official e-Community
- Grew to include grants for public access, digital literacy training and technology implementation"

The Baller Herbst Law Group report entitled " Bigger Vision, Bolder Action, Brighter Future: Capturing the Promise of Broadband for North Carolina and America", June 2008, presents an outstanding overview of the laudable work and Best Practices performed by e-NC Authority over time and excellent future prospects.

- Executive Summary (Note: Large File 2M) http://www.e-nc.org/pdf/Broadband_report_es_composite.pdf
- Full Report: (Note Large File 3M) http://www.e-nc.org/pdf/Broadband_report_composite.pdf

New MapViewer Application

"CGIA is designing a new web map viewer to replace the 2002 vintage application that is running on a stand-alone web server using ArcIMS 9.1. The new design will take advantage of the geospatial data now managed in SQLServer with ArcSDE 9.1 as part of the NC OneMap database (www.nconemap.com). The old application design would not be relevant to your new integrated system, and I don't have the new design specified yet. We are focusing our new design on users and their likely questions - the quicker we can get a user type (e.g., economic developer) to the information most needed, the more effective the map viewer. We are

considering variations based on user types to simplify the interface and map."(Jeff Brown, Project Manager, CGIA, 5/7/08 e-mail)

Another Approach:
Prof. Ed Feser, Ph.D., Interim Head of Urban and Regional Planning at the Univ. Of Illinois, Urbana-Champagne Campus, worked with Ms. Patterson and e-NC project in prior years. He paid the highest compliments to Jane Patterson as very knowledgeable in the subject matter and ability to work with people throughout the state and country. In retrospect, for states with fewer financial and other resources, he suggests another approach that is less costly for the State and places the initiative with the local, county organizations to initiate the Broadband process. His article in 2007 « Encouraging Broadband Deployment from the Bottom Up » mentions another approach. He suggests that state have the expertise and leadership for provide guidance for communities when they approach the State for help. In that manner, the local organizations select a service provider they think appropriate for the job and the state is relieved of governing the process. More of a laissez-faire approach is Prof. Feser's recommendation for communities with fewer resources available, especially, since e-NC spent approximately $1M on mapping, which needs periodic updates and maintenance. (Prof. Feser, conversation, 7/11/08) See http://www.jrap-journal.org/pastvolumes/2000/v37/F37-1-feser.pdf.

Elizabeth City State University: ECSU recently worked with Windows on the World e-Community Development Corporation (WOW e-CDC - http://wowe-cdc.org/) to produce a $30,000 study, funded with state money, of 21 northeastern NC counties, surveying residents and checking utility poles and switching stations instead of relying on the data provided by Internet service companies and showing 10-20 percent more households did not have broadband access than were reported by e-NC by service providers. An excerpt of the study for Halifax and Nash Counties is available at http://www.indyweekblogs.com/triangulator/wp-content/uploads/2009/02/wow-e-cdc-broadband-studies-halifax-and-nash-counties.pdf.

Outlook (Source: Jane Patterson e-NC Presentation, CA, 2007)
http://www.calink.ca.gov/summit/ppt.asp

Strategic Partnerships
- Service Providers (through board and incentive grants)
- County governments, managers, legislators and economic developers in all 100 counties
- N.C. Healthcare Information & Communications Alliance
- N.C. Technology Association
- Microelectronics Council of North Carolina
- N.C. League of Municipalities & Association of County Commissioners
- N.C. Rural Economic Development Center
- N.C. Dept. of Commerce / U.S. Dept. of Commerce
- Seven N.C. regional economic development partnerships
- Regional Councils of Government
- UNC Center for Public Technology"

Current Policy Work (Source: Jane Patterson e-NC Presentation, CA, 2007)
http://www.calink.ca.gov/summit/ppt.asp

State level:
- Advocating for infrastructure incentive funds -to be matched 100 percent with industry dollars to expand broadband in the most underserved counties (budget is in-process)
- Advocating for funds for continued investment in TeleCenters
- New media / PEG Channels project

Federal level:
- Working with groups in S.C. toward cross-border efforts to drive technology-based economic development as a region
- Working with other states to look at creation of national center to track broadband access and advocate for rural expansion
- Provision of FREE policy and research advice to assist other states in setting up similar programs

Massachusetts Broadband Initiatives http://masstech.org/broadband/

Project Description

Massachusetts had a number of programs underway in the early 2000s, especially in the Western part of the state. A study was released by the State in 2007 showing many citizens in 95 of the state's communities did not have access to Broadband. An initial pilot Broadband Mapping project with a minimal budget was undertaken in June 2007 with data collected from public sources such as Town Halls, Service Providers websites, PUC sources and a Broadband Availability Map for the state was produced. Legislation (HR 4864) to create a new Broadband Institute with a Bond Fund, was introduced by Governor Patrick in Oct. 2007 and later approved and signed by the Governor, Aug. 2008 with an increased sum for the Bond Fund. Since the Legislation passed, a jubilant State of MA is proceeding with plans for increasing Broadband Availability with incentive for ongoing GIS Broadband Mapping in the state, as described in the following sections.

Contacts Massachusetts

Mass. State Department of Telecom & Cable	Commissioner Sharon Gillett	617-305-3580	Sharon.Gillett@state.ma.us
Mass Tech Collaborative - John Adams Innovation Institute	Bill Ennen, Program Dir., Development Assistance, JAII	508-870-0312 x1229	ennen@masstech.org
Mass Tech Collaborative - John Adams Innovation Institute	Adele Burns, Former Project Coordinator		

Project Background

In May 2006, the John Adams Innovation Institute (JAII), the economic development arm of the Massachusetts Technology Collaborative (MTC), developed a broadband initiative to support public-private partnerships to achieve fast, affordable and ubiquitous connectivity throughout Massachusetts. In June 2007, JAII released a study that found citizens in at least parts of 95 communities throughout the state had no means to access any form of broadband Internet service. http://www.masstech.org/broadband/index.html

In April 2007, the former Massachusetts Department of Telecommunications and Energy was formally split into two separate regulatory agencies: the Department of Public Utilities and the Department of Telecommunications and Cable (DTC). Pursuant to Governor Deval Patrick's Reorganization Plan, the DTC will handle telecommunications and cable issues within the Commonwealth.
http://www.mass.gov/?pageID=ocaagencylanding&L=4&L0=Home&L1=Government&L2=Our+Agencies+and+Divisions&L3=Department+of+Public+Utilities&sid=Eoca

Governor Patrick named Sharon Gillett Commissioner of the newly established agency. Prior to being named commissioner, Ms. Gillett was a Principal Research Associate at the Massachusetts Institute of Technology (MIT) where she chaired the Broadband Working Group of MIT's Communications Futures Program and taught courses on telecommunications and Internet policy. Ms. Gillett is also the co-author of February 2006 report 'Measuring the Economic Impact of Broadband Deployment' " (Bill Ennen, edit, 8/15/08)
http://www.eda.gov/ImageCache/EDAPublic/documents/pdfdocs2006/mitcmubbimpactreport_2epdf/v1/mitcmubbimpactreport.pdf
She was on the Wireless Task Force of the Boston Mayor, a Master's Degree Graduate and instructor of Telecom classes at MIT, with a Physics undergraduate degree from Harvard University. In addition to overseeing state regulatory functions pertaining to the

telecommunications and cable sectors as Commissioner of the DTC, Ms. Gillett also advises the state on broadband policy.

MA Broadband Initiative Legislation (HR4864), introduced Oct 2007 by Gov. Patrick, passed the State Congress and signed Aug.4, 2008, creates and funds a new division within JAII's parent corporation, MTC. MTC is a non-profit, quasi-governmental funding agency, with a new organization to be called the Massachusetts Broadband Institute (MBI**).** Originally proposed to be supported by $25M in bond proceeds, the MA Legislature increased the MA Broadband Incentive Fund to a $40M. MBI will invest fund dollars through competitive procurement. http://masstech.org/broadband/legislation/packet.html (Bill Ennen, discussion, 8/5/08)

The MBI will be governed by a Board of Directors, with 5 ex-officio members and 4 members to be appointed by the Governor. Commissioner Sharon Gillett will serve on the board.

- MBI will update existing broadband assessments and mapping while simultaneously developing and executing procurements processes which will initially be focused on Western Massachusetts.. This study will include the collection of data from various sources and the support of various state agencies, including the Massachusetts Geographic Information System (MassGIS), to produce comprehensive broadband availability maps.
- Bond funds cannot be used to make grants. Bond funds are meant to be invested in conjunction with private funding to create sustainable solutions.
- Ultimate ownership of assets funded through MBI - such as conduits and towers - will remain under the purview of MBI on behalf of the Commonwealth." (Bill Ennen, edit, 8/15/08)

Architecture / Implementation

Architecture and Platform:
The data collected by JAII provided the ability to create a broadband availability map. The map will be constructed using a GIS program, although the map was initially constructed manually, and displays whether broadband service is available on a town by town basis.

"It is likely that the MBI will build upon the efforts from the initial broadband availability study and conduct a more comprehensive data collection effort with the goal of producing a more granular map of broadband availability. This effort would more fully utilize the capacity of GIS software and allow the MBI to conduct studies and analysis of broadband service throughout Massachusetts." (Bill Ennen, edit, 8/15/08)
Data Sources, acquisition and processes:

Sources and Acquisition (Adele Burns, discussion, May 2008)
"The June 2007 broadband study conducted by JAII relied on the collection of data primarily at the town level on a limited budget of $100K. The primary sources of the data for this survey were: (1) Town Halls and local regional organizations were asked to respond to the availability of DSL and wireless broadband service and; (2) cable licenses filed with DTC that provided information on the availability of broadband service available through cable systems." (Bill Ennen, edit, 8/15/08)

Surveys were distributed through local/regional broadband groups, e.g. Open Cape.
http://masstech.org/broadband/CommonwealthBroadbandSurvey121907.pdf
Cable: plans filed with DTC after negotiating with Towns, publicly available.
Telcos: number of providers limited: Verizon, Comcast, few wireless providers

- FTTH: Verizon published in newspaper list of towns serving Wire centers: Verizon listed locations publicly available; use 18,000-ft radius/DSL
- DSL: voluntary testing on the Web for consumers data
- DSLAMs: Verizon provides data
- Wi-Fi: Few providers there and they were cooperative
- Processes:
- Call Town Hall CIOs for voluntary reporting of Broadband status in town:

- Cable or none, Underserved, No service

Project Deliverables

Surveys
Where is Broadband Available? (6/7/07) - http://masstech.org/broadband/data0807.pdf
Commonwealth Broadband Survey - http://masstech.org/broadband/CommonwealthBroadbandSurvey121907.pdf
Mapping
Broadband Availability Map - http://masstech.org/broadband/map.pdf
Legislation Information
Broadband Legislation Information Packet - http://masstech.org/broadband/legislation/packet.html

Resources

In-House Agencies and costs
Department of Telecommunications and Cable (DTC)
http://www.mass.gov/?pageID=ocaagencylanding&L=4&L0=Home&L1=Government&L2=Our+Agencies+and+Divisions&L3=Department+of+Telecommunications+and+Cable&sid=Eoca
Sharon Gillett, the new Commissioner DTC, also serves as a principle advisor to the state on broadband policy.
State Economic Development Agencies:
Massachusetts Technology Collaborative (MTC): http://www.masstech.org/index.asp
Agency is responsible for economic development, one-quarter of jobs in-state, renewable energy and technology innovation fostering economic growth and jobs.
http://www.masstech.org/AgencyOverview/whatwedo.htm
John Adams Innovation Institute (JAII): http://www.masstech.org/institute/index.htm
Within MTC, Innovation Institute "..strives to improve Massachusetts' competitive edge in the Innovation Economy, supporting industry clusters and institutions in efforts to stimulate new job creation and job retention in knowledge- and technology-based companies."
http://www.masstech.org/institute/background.html
Cost for in-house surveys of town halls for Service Provider data and related data for mapping was done manually and in-house: $100,000. (Adele Burnes, discussion, 4/08)
MassGIS: Office of Geographic Information Systems http://www.mass.gov/mgis/
MassGIS is a state agency assigned with the mission of being the central source for the collection, storage and dissemination of geographic data.. In its role as the statewide database for spatial information, MassGIS coordinates with state agencies, non-profits and other institutions implementing GIS activities. In this capacity it is likely MassGIS will provide assistance to the MBI for future data collection and GIS mapping activities. (Bill Ennen, edit, 8/15/08) Although, many other state agencies have their own GIS capabilities, e.g. see http://www.mass.gov/portal/index.jsp?pageID=mg2searchlanding&sid=massgov2&query=GIS+agency

Outcomes

The immediate steps following the signing into law HR 4864, will be forming a Board of Directors for the new MA Broadband Institute, and having input from private sector concerning how they would like to shape private-public action going forward, create a process of "finding each other" in the private sector such as locating people owning lands where fiber might be installed and firms getting together for end-to-end solutions, "conditioning the marketplace" which provides for people and firms talking to each and forming partnerships. The State is looking for more cohesion in the private sector to respond to the Bond mandate, more of a "turnkey solution" will be sought rather than binding together disparate private entities.
(Bill Ennen, discussion, 8/5/08)
The Business Plan, now to be constructed, will possibly include an RFQ/RFP process for Middle Mile management and construction of the assets by the private sector rather than the State actually managing the ongoing operations, and leasing out the fiber to the private sector to construct the Last Mile for towns and cities. (Bill Ennen, discussion, 8/5/08)

The Mapping, which originally on a small budget of $100K or so, will now be GIS-based. MA is supportive of federal funding to augment state broadband mapping efforts. Several broadband mapping proposals are before the U.S. Congress, including funding proposal by MA U.S. House Rep. Edward Markey's "Broadband Consensus of America Act of 2007" (HR 3919), which passed the U.S. House in Nov. 2007 and is still pending in the US Senate. Since the Mapping operation will be somewhat labor-intensive, more funding will be required, as the $40M Bond is intended more for "hard" assets. (Bill Ennen, discussion, 8/5/08)

MA, similar to AZ and perhaps other states, has what the Arizona Constitution calls a "Gift Clause", e.g. not being able to give monies to private sector. http://www.goldwaterinstitute.org/AboutUs/ArticleView.aspx?id=1719. Although MA stipulates further, if such a monies are awarded, the State must have some lasting benefit. The MA State will own and control the assets, such as fiber ducts, fiber, cell towers, after the completion of the Middle Mile; however the State will contract out the work for construction of the Middle Mile with an RFP, as Vermont and Maryland are enacting. (Bill Ennen, discussion, 8/5/08)

Open Cape, $150K Award, March07: "The money goes toward the design and development... to build the proposed digital communications network. Initial elements of the system are being built, through matching investments, to use wireless technology to interconnect the three academic institutions... to overcome the region's inadequate infrastructure by using wireless technology, and by aggregating demand for...connectivity on a regional basis... for competitive wholesale pricing. This...solution will drive economic development, save...money for...academic institutions, and become the basis for communications in...a natural disaster." http://www.masstech.org/broadband/cape.html

Connecting Western Massachusetts: Berkshire Connect http://www.bconnect.org/
And Pioneer Valley Connect http://www.pioneervalleyconnect.org/
The organizations were awarded $300K in 2006 for developing sub-regional tests in 3 communities, winning competitive bids. Three competing wireless technologies are piloted to stimulate economic development in an area where 2/3 of the communities are either unserved or underserved. http://www.masstech.org/broadband/western.html

The Unwired Village in Orleans, MA at the far end of Cape Cod was awarded about $137K in Sept. 2005 to innovate a wireless advertising portal for local businesses downtown. http://www.masstech.org/broadband/unwired.html Especially useful for commerce and tourists, the successful venture is a symbol of technology-driven Cape Cod for new and relocating high-tech firms. Furthermore, new Wi-Fi Hotspots were started in Falmouth, in May 2007 for many locations throughout the town. http://unwiredvillage.com/pages/?q=

Lessons Learned

- GIS will be used for all future mapping. (Adele Burns, discussion, 5/08)
- Mapping could utilize the support of MassGIS state agency to develop granular availability maps. (Bill Ennen, discussion, 8/5/08)
- Cable Strand Map must file with the Town, which could be scanned and geocoded if they are not already available in an electronic format. (Adele Burns, op.cit.)
- DSL: Wire centers locations are known, then follow roads for DSL 18,000-ft distance. Voluntary surveys on the Web (e.g., crowdsourcing) could substantiate estimates. (Adele Burns, op.cit.)
- Try to get data directly from Service Providers: attempt to maintain public access to broadband availability data but with flexibility to protect information the providers deem as competitively sensitive, probably with an Non-Disclosure Agreement (NDA). (Adele Burns, op.cit.)

California Broadband Task Force
http://www.calink.ca.gov/taskforce/default.asp

Project Description

Governor and CBTF Goals for Broadband
http://www.calink.ca.gov/pdf/exec_summary.pdf

- California must ensure ubiquitous and affordable broadband infrastructure, made available through a variety of technologies to all Californians.
- California must drive the creation and use of applications that produce the greatest economic, educational, and social benefits for California's economy and communities.
- California must construct next-generation broadband infrastructure, positioning California as the global economic leader in a knowledge-based economy.

Governor and CBTF Mission for Broadband Task Force
http://www.calink.ca.gov/pdf/exec_summary.pdf

(Governor) commissioned California Broadband Task Force (CBTF) to "remove barriers to broadband access, identify opportunities for increased broadband adoption, and enable the creation and deployment of new advanced communication technologies." The governor also requested that the CBTF "pay particular attention to how broadband can be used to substantially benefit educational institutions, healthcare institutions, community-based organizations, and governmental institutions."

Timing: Nov 2006 - January 17, 2008
http://www.calink.ca.gov/pdf/pressreleases/01-17-08.pdf

Seed Funding for Broadband Development: California Emerging Technology Fund (CETF) - http://www.calink.ca.gov/taskforcereport/

Creation of CETF from PUC with Telecom Mergers - http://docs.cpuc.ca.gov/published/NEWS_RELEASE/51357.htm

CETF to enhance seed fund for Broadband Development through private, public contributions

Contacts California Broadband Task Force

California Business, Transportation and Housing	Michael Liang, Deputy Secretary	916-323-5400	mliang@bth.ca.gov
California Business, Transportation and Housing Mgr., CA Broadband Initiative	Anne Neville, Former Mgr.		
CA Dept. Health, GIS Expert	Michael Byrne Former GIS Expert		
Michael Baker, GIS Analysis	Malcolm Adkins, Dir.	510-879-0961	MAdkins@MBakerCorp.com
CETF: CA Emerging Techno. Fund	Alana O'Brien, VP	415-744-2383	Alana.Obrien@cetfund.org

Project Background

Figure: California Broadband Initiative: Data Flow and Money Flow Diagram, on the next page, depicts the Money Flow (green) of grant monies from AT&T and Verizon through the California Emerging Technology Fund (CETF), which funds the Broadband Task Force's Mapping efforts for the Governor. Data Flow (yellow) tracks the major stakeholders in the GIS Mapping process of getting data from Service Providers/ Associations, US Government, and Private Telecom Organizations. GIS mapping operations are coordinated by the Calif. Dept. of Health Planning,

and private firm, Michael Baker, which assembles all the appropriate data (blue) for their GIS Mapping Process (white/red box).

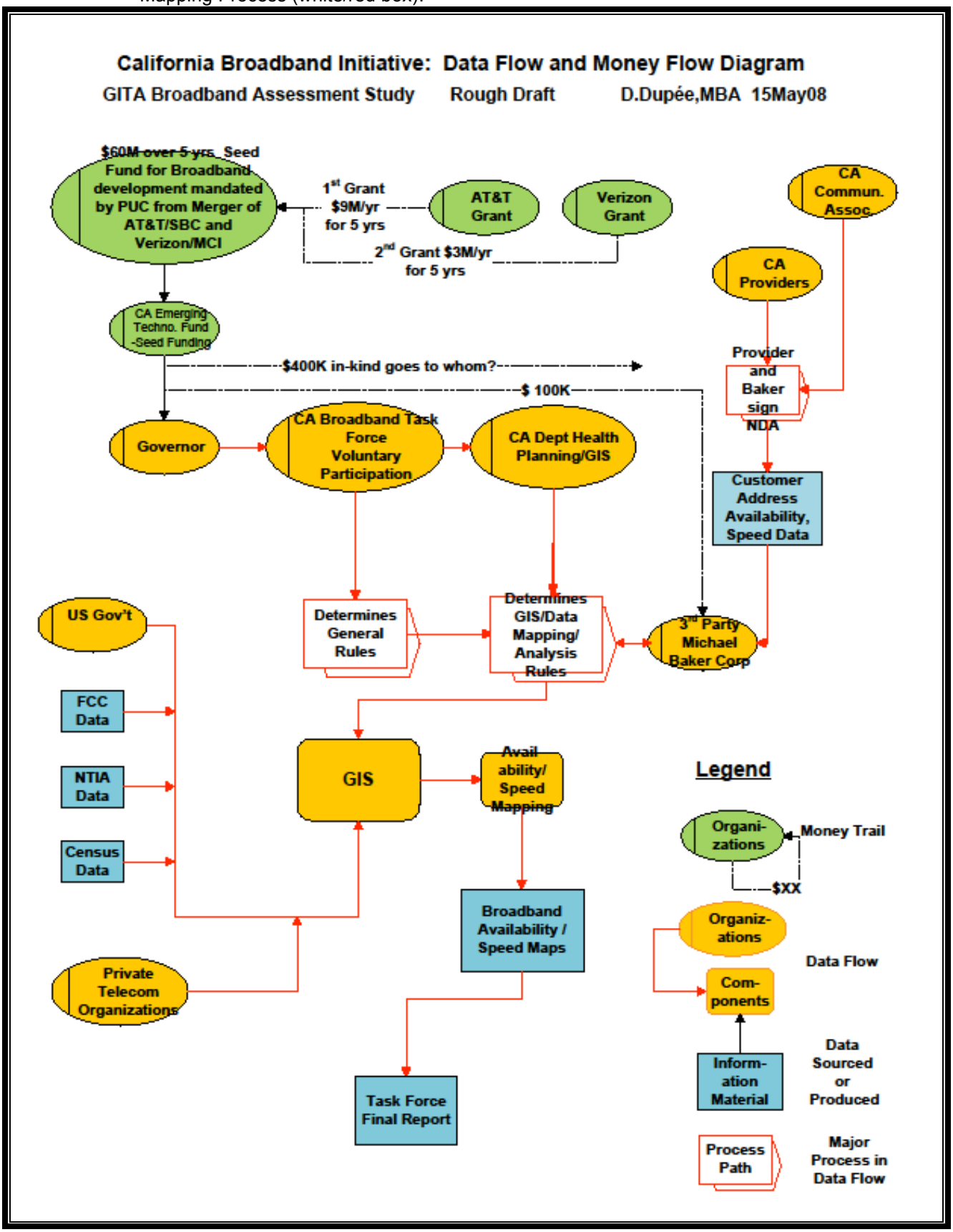


Figure: California Broadband Initiative: Data Flow and Money Flow Diagram

California Broadband Task Force / California Broadband Initiative
CBTF was created by Governor in Nov. 2006 with an Executive Order
http://owa.cetfund.org/documents/Resources/CBBTF_pressrelease.pdf
Milestones, Significant Dates for the California Broadband Initiative
http://www.cetfund.org/Resources/California%20Initiative.aspx
Task Force Members List included many Service Providers and Community Leaders which helped consolidate support among Providers for data (Malcolm Adkin/Michael Baker Corp, discussion, 13May08): http://www.calink.ca.gov/pdf/Task_Force_Members.pdf
Funding Source: California Emerging Technology Fund, non-profit, seed funding from AT&T, Verizon
http://www.cetfund.org/Default.aspx?AspxAutoDetectCookieSupport=1
http://www.cpuc.ca.gov/PUC/Telco/emergingtech/
See CA Data Flow Diagram on previous page.

State Offices Officiate the CBTF Activities:

Ownership: Business, Transportation and Housing Agency: Dale E. Bonner, Agency Secretary: http://www.calink.ca.gov/pdf/CBTF_FINAL_Report.pdf
Anne Neville, Former Project Leader
GIS: Dept. of Health Planning: formerly Michael Byrne, GIS Expert

Implementation:

3rd Party Contractor: Michael Baker, Corp: Worked with Service Providers getting Data, with NDA, GIS and Mapping: http://www.mbakercorp.com/index.html
Background Data for Broadband Need in CA:
Gartner Group Report: Preliminary Rpt: Broadband Deployment in CA, 2/05
http://docs.cpuc.ca.gov/published/COMMENT_DECISION/43597.htm
Gartner Group Report: Final Edition: Broadband Deployment in CA, 4/05
http://docs.cpuc.ca.gov/published/REPORT/45539.htm
Right of Way Codes for all States: Gartner
http://docs.cpuc.ca.gov/published/COMMENT_DECISION/43588.htm

Architecture:

Arch and Platform Overview: (Work Performed by Michael Baker Corp.)
GIS: ESRI applications: ArcView GIS v. 3.1
http://www.mbakercorp.com/services/gis/products/arcview_gis.html
GIS-based Applications include Baker-created Software Applications:

- Raster Background Mapping
- GeoLink mapping application: Field data collecting/GIS-based
- GeoLink Sketching Module: Alternative to field surveying, w/GPS a feature's lines/pts drawn and connected; used in moving vehicles, planes
- GeoLink Sketch Mapper System: GIS-based/raster, vector; Feature location/attributes captured while in a moving vehicle
- GeoPhoto: Photos attached to GPS pts., GIS- integrated

Methodologies:
Gap Analysis of 6 Regions (Existing vs. Desired Broadband End Product) conducted by Connected Nation (Joe Mefford, Sr. Consultant, discussion, 5/15/08)
http://www.connectednation.com/research_and_mapping/
Data Base Structure, Management, Governance
Fields, Records, Files: See Tables and info.
http://www.calink.ca.gov/pdf/applendix_map_method.pdf
Mapping Methodology
Broadband Mapping Methodology (Wireline)
http://www.calink.ca.gov/pdf/applendix_map_method.pdf
Mapping Services, including: Conversion/Digitization, Data Migration, GPS Surveying, Field Data Acquisition: Field Mapping and Data Collection for Database development

Dataflow: Service Providers give data to M. Baker/ NDA; US Government/Census, Telecom Organizations http://www.calink.ca.gov/pdf/CBTF_FINAL_Report.pdf

Project Deliverables

Surveys/ Data Collection
Survey of Pricing: Data Speed and Advertised Cost
http://www.calink.ca.gov/xls/CBTF_PricingSurvey_2007.xls
List of Counties/Communities Unserved by Wireline Broadband
http://www.calink.ca.gov/pdf/Unserved_Communities.pdf
Mapping
Availability Maps for Wireline Broadband (By State, 12 Regions)
http://www.calink.ca.gov/taskforcereport/appendix_wireline_maps.asp
Availability Maps for Wireless Broadband (By State, 12 Regions)
http://www.calink.ca.gov/taskforce/appendix_wirelessmaps.asp
Report to Governor: CBTF issued the Final Report 1/08
http://www.calink.ca.gov/pdf/CBTF_FINAL_Report.pdf
Press Packet: http://www.calink.ca.gov/taskforcereport
Press Release on CBTF Final Report and History
http://www.calink.ca.gov/pdf/pressreleases/01-17-08.pdf
Executive Summary of Gov. & CBTF work: Goals, Vision, Recommendations
http://www.calink.ca.gov/pdf/exec_summary.pdf

Outcomes

Seven Recommendations from CBTF
http://www.calink.ca.gov/pdf/exec_summary.pdf
1. Build out high speed broadband infrastructure to all Californians
Advancing new incentives for deployment and improving existing programs will create a world-class broadband infrastructure in California.
2. Develop model permitting standards and encourage collaboration among providers
Developing a public-private partnership between local governments and broadband providers to endorse permitting standards will improve the speed with which broadband is deployed.
3. Increase the use and adoption of broadband and computer technology
Expanding the opportunities for Californians to access, use, and learn broadband, at home and in the community, will provide the foundation for a digitally literate society that is able to fully benefit from broadband technology.
4. Engage and reward broadband innovation and research
Promoting innovative uses of broadband technology and encouraging wider e-government use will result in quality-of-life improvements, while increasing demand for a robust broadband infrastructure.
5. Create a statewide e-health network
Implementing a sustainable statewide e-health network will improve quality of care across the state and simultaneously increase demand for broadband services.
6. Leverage educational opportunities to increase broadband use
Ensuring high-capacity broadband connections coupled with a robust technology support system, relevant curriculum, literacy standards, and off-campus educational partnerships will provide California's students with the skills they need to compete in a 21st century economy.
7. Continue state-level and statewide leadership
Continuing the California Broadband Initiative and supporting the creation of Community Broadband Leadership Councils will strengthen the statewide leadership necessary to drive broadband access and adoption across California.

Impact: Created Funding and Agency for Ongoing Telcos Broadband Support:

CPUC authorized California Advanced Services Fund (CASF), Dec. 20, 2007 to administer and allocate funds: http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76947.htm
Funding: "$100 million will be collected over a two-year period and projects will include matching funds of at least 60% to achieve a total level of broadband investment of $250 million"
http://www.calink.ca.gov/taskforcereport/updates.asp

Total funding of $100M allocated to CASF, collected with a surcharge by Service Providers:
http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76947-02.htm#P175_39889
"The CHCF-B program provides supplemental revenues to the four largest local exchange carriers in California: Pacific Bell (now AT&T); Verizon of California; SureWest; and Frontier of California. These revenues subsidize the cost of residential lines in high cost areas served by these companies. The purpose of the subsidies is to keep basic telephone service affordable and to meet the Commission's universal service goal... The CHCF-B program is funded by an all-end-user surcharge on total intrastate billings (except billings of Lifeline customers). If the program is not extended, it is likely that this surcharge would be removed from the bills of all ratepayers for intrastate billings after January 1, 2009.(Pending SB 1149)"
http://docs.cpuc.ca.gov/Published/Report/80167.htm
Provider Funding allocations require 60% matching funds by Service Provider
http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76947-04.htm#P281_76133
Criteria for Telephone "Corporations",
http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76947-04.htm#P241_61529
Broadband Minimum speeds defined (3MB down/1MB up),
http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76947-04.htm#P262_69885
Eligibility criteria for Unserved Areas: "currently not being served by any level of broadband"
http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76947-04.htm#P293_79105
Timeline for Build-out of Broadband facilities, max. 24 months, preferably less
http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76947-04.htm#P281_76133
Definition for "Broadband Projects": in terms of "Census Block Groups"
http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76947-04.htm#P262_69885
CASF legislated into being on Feb. 12, 2008 with CA SB 1193, Senator Padilla:
http://www.leginfo.ca.gov/pub/07-08/bill/sen/sb_1151
1200/sb_1193_bill_20080212_introduced.html

Pennsylvania Technology Atlas - http://www.oit.state.pa.us/atlas/ (No Longer Functioning) and Current Broadband Initiatives

The Technology Atlas, the first of its kind, resulted from the efforts of the Documentation of Resources and Technology Transfer Project, which was one of the main projects in Pennsylvania's Link-to-Learn Initiative.

Mapping and Analysis of Pennsylvania's Telecommunications Infrastructure (1999) by Guoray Cai from Proceedings of the Nineteenth Annual ESRI User Conference, 1999

http://ltl13.exp.sis.pitt.edu/Website/Webresume/ESRIPaper/P147.htm or
http://gis.esri.com/library/userconf/proc99/proceed/abstracts/a147.htm or
http://gis.esri.com/library/userconf/proc99/proceed/papers/pap147/p147.htm or
http://spatial.ist.psu.edu/cai/cai-1999-Telegeo.pdf

Abstract on ESRI Site - http://training.esri.com/campus/library/Bibliography/RecordDetail.cfm?ID=6375
Paper (PDF) on ESRI Site - http://gis.esri.com/library/userconf/proc99/proceed/papers/pap147/p147.htm

eMapPA (DEP) - http://www.emappa.dep.state.pa.us/emappa/viewer.htm

The Pennsylvania General Assembly passed Act 183 in 2004 requiring Pennsylvania's incumbent local exchange carriers (ILECs) to develop their networks to deploy broadband services throughout their service territories. Carriers may commit to achieving 100% broadband availability in their service areas in exchange for the opportunity to be regulated under a form of price cap regulation as opposed to the traditional rate base/rate of return regulation, may elect certain options (depending on whether they are considered rural or non-rural carriers) according to which they will commit to meeting certain broadband availability benchmarks by a particular date, and may be required to offer certain programs to promote and facilitate the deployment of broadband service to customers. For more information, see the Pennsylvania Public Utility Commission (PPUC) Broadband Service page at http://www.puc.state.pa.us/telecom/telecom_broadband.aspx, the Pennsylvania Economic Development Department at http://www.eda.gov/Resources/StateEconomicDevelopment.xml, and the Broadband Internet Use in Rural Pennsylvania report from May 2008 available at http://www.ruralpa.org/broadband2008.pdf.

Georgia High-Speed Communications Atlas

http://maps.gis.gatech.edu/telecomweb/index.html (No Longer Functioning)

This interactive atlas of fiber routes and access facilities was designed to support state and local efforts to attract high-technology firms, and to support educational and public sector initiatives for Georgia communities. Due to security concerns from telecommunications providers, the Georgia High-Speed Telecommunications Atlas is no longer available.

Georgia High-Speed Telecommunications Atlas: An ArcIMS Implementation, by **Steven French and Xudong Jia**
http://gis.esri.com/library/userconf/proc01/professional/papers/pap259/p259.htm

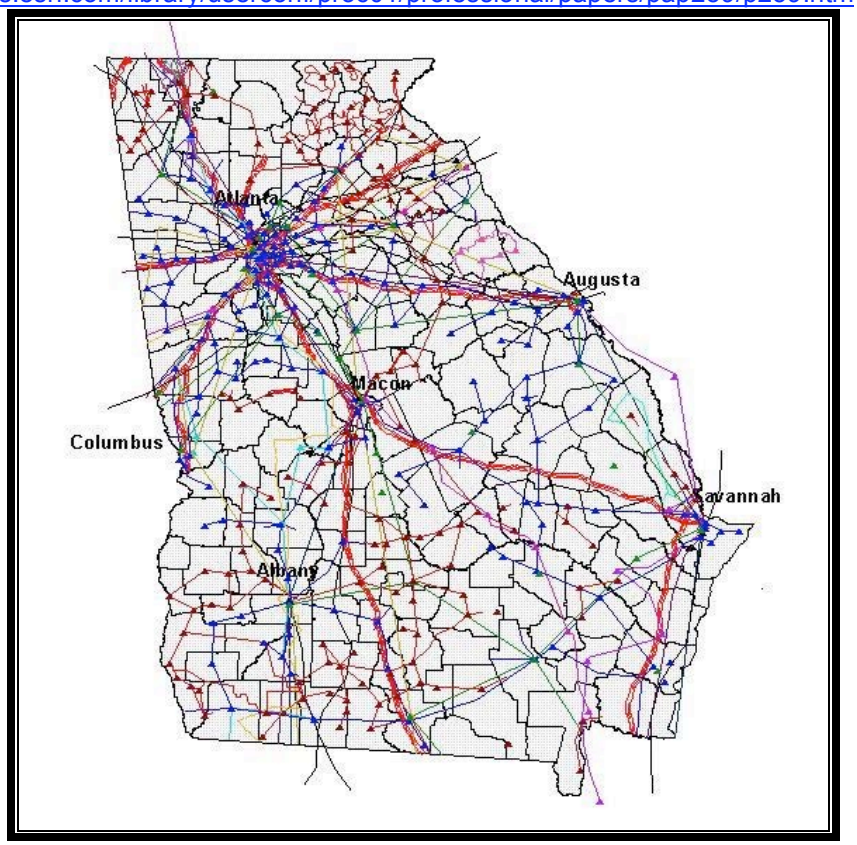


Figure: Major Telecom Lines and Points of Presence

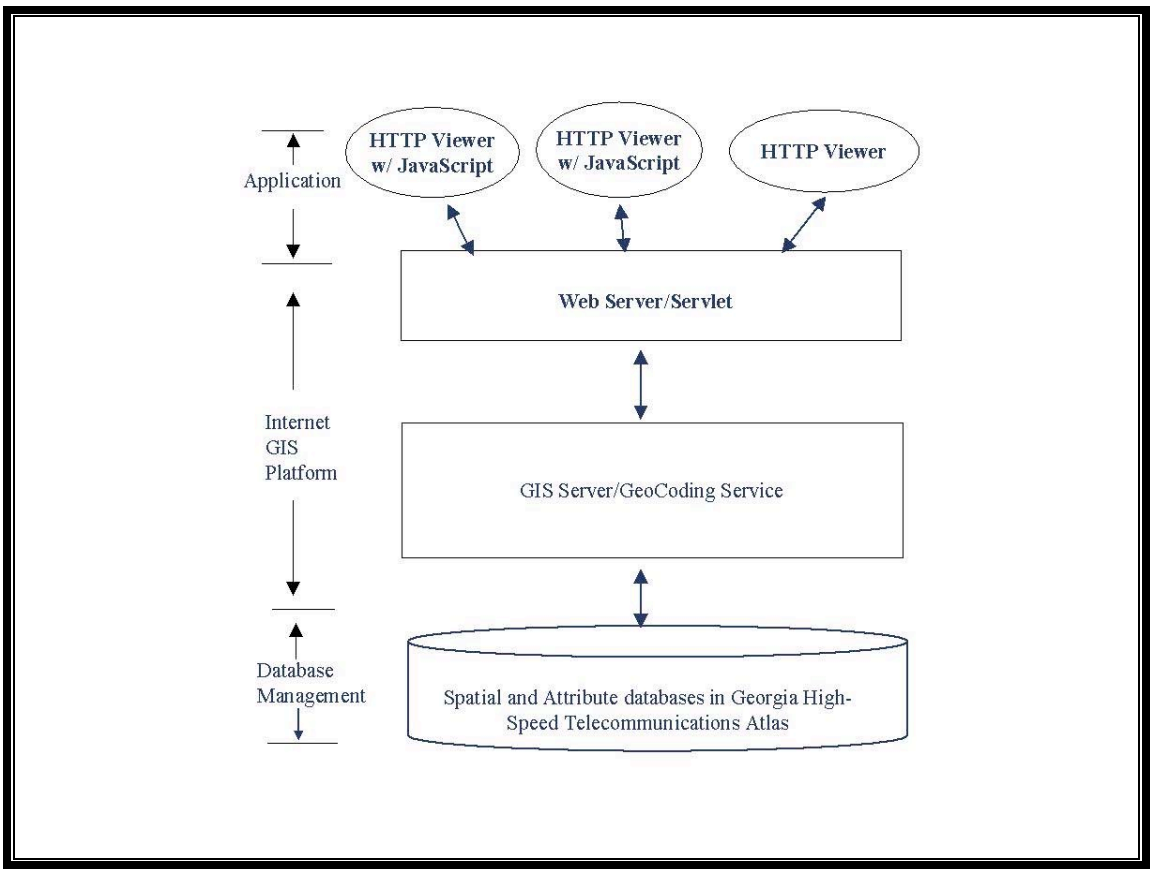


Figure: Conceptual Framework, An Internet-based Client/Server System with Three Tiers

Bottom Tier

- The bottom tier is the GIS database management layer. It contains spatial and attribute databases that are used for the Georgia High-Speed Telecommunications Atlas. The primary databases include a GIS base map, points of presence, and business contact information for the service providers.

Middle Tier

- "The middle tier is the critical component within the conceptual framework whose primary function is to provide an Internet service. There are a series of servers included in the platform. The Web server monitors requests sent from clients using Hypertext Transfer Protocol (HTTP). When requests are received, the Web server further distributes the requests to appropriate applications for processing and sends the results back to the clients. The Web server has a supporting "plug-in" called a Servlet. The Servlet provides seamless links between the Web server and the GIS server. The GIS server contains geocoding and other functions required by this application.

Top Tier

- "The top tier provides the interface to the system users. This layer includes an HTTP interface into which the user can enter a street address. It also provides the capability to display the POPs that fall within a 0.5, 1 or 2 mile radius of the entered street address. This layer also contains a reporting function that enables the user to print the results of the query." http://gis.esri.com/library/userconf/proc01/professional/papers/pap259/p259.htm

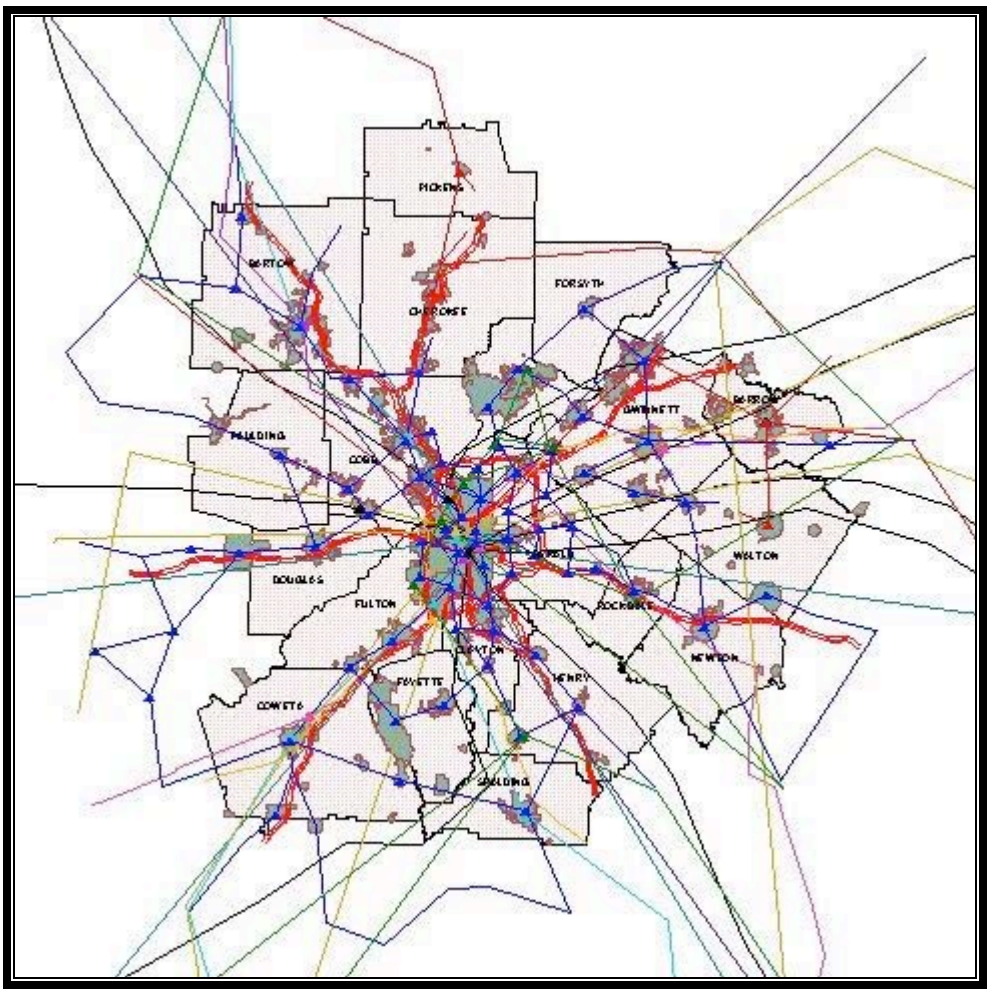


Figure: Enlargement of Location of Points of Presence (POPs) and Central Offices of Telecommunications Carriers throughout the Atlanta Area

Table 1. Fiber Optic Line Capacities

T1	A digital line capable of carrying either voice or data at a speed of 1.5 Mbps. Typically, a copper telephone line with special equipment to accommodate higher transmission rates. Currently, a popular level of service for businesses communicating internally.
DS-1	Digital circuit with a capacity of 1.54 Mbps (million bits per second), equivalent to a T-1 line.
DS-3	Digital circuit with transmitting capacity of 44.736 Mbps. Typically used by a firm with moderately high bandwidth requirements.
OC-3	A digital circuit transmitting at a speed of 155.52 million bits per second (OC-*Optical Carrier*).
OC-48	A digital circuit with a capacity of 2.5 Gbps.
OC-192	Digital transmitting capacity of 10 Gbps.

OC-768	A digital circuit with transmission capacity of 40 Gbps. The largest fiber optic pipes currently deployed. Typically, used in the main backbone of interstate data networks. Source: MEAG Power Telecommunications Glossary of Terms, Telson Telecommunications Glossary

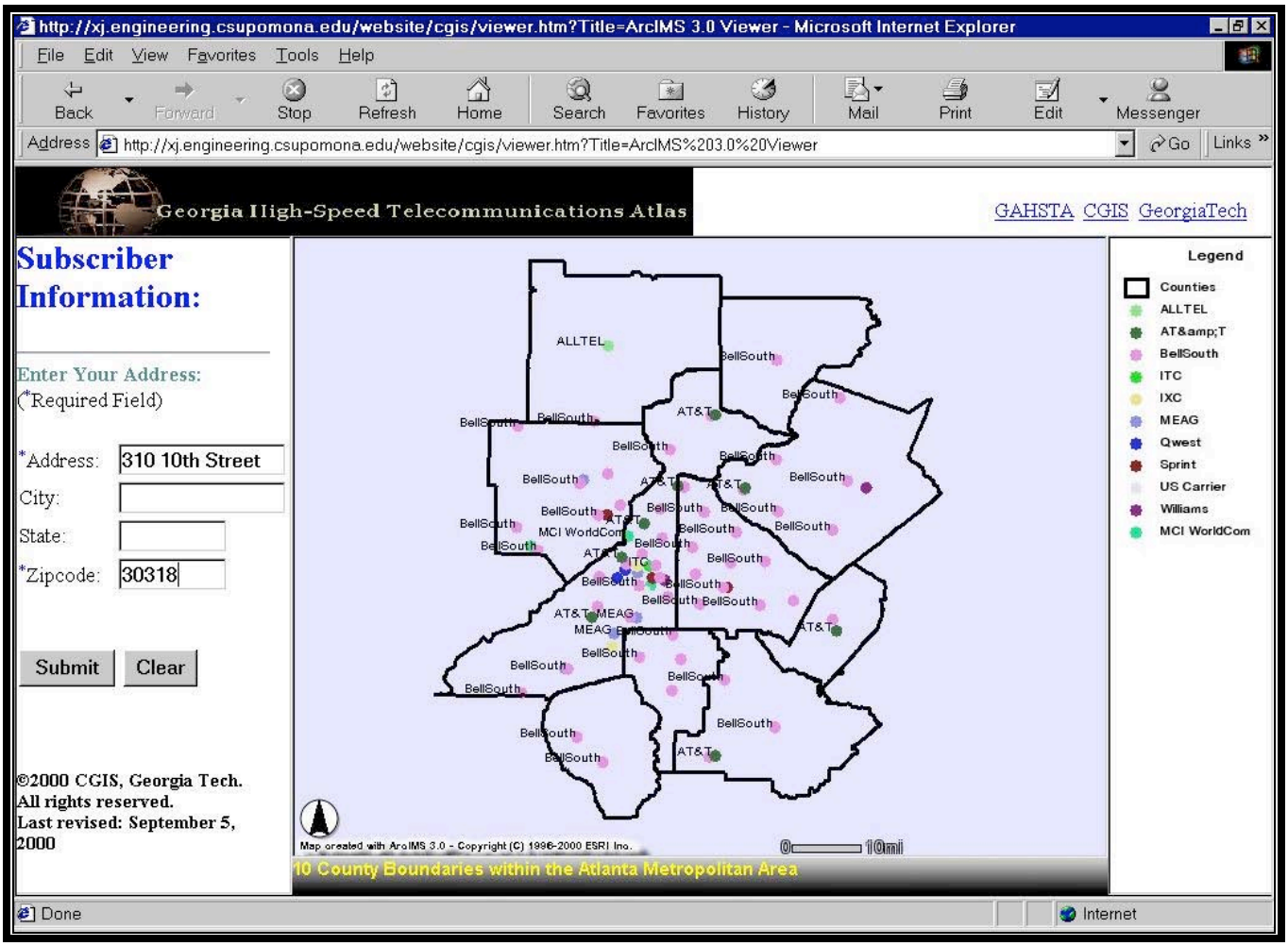


Figure: Early Version of a Query Tool for Address and Service Provider Match

Description
The Figure depicts the function of a Query Search Tool, where the User or Resident enters their address (left side) and their address will be matched, graphically on the map, with a Service Provider (right side) in their area.
http://gis.esri.com/library/userconf/proc01/professional/papers/pap259/p2594.jpg

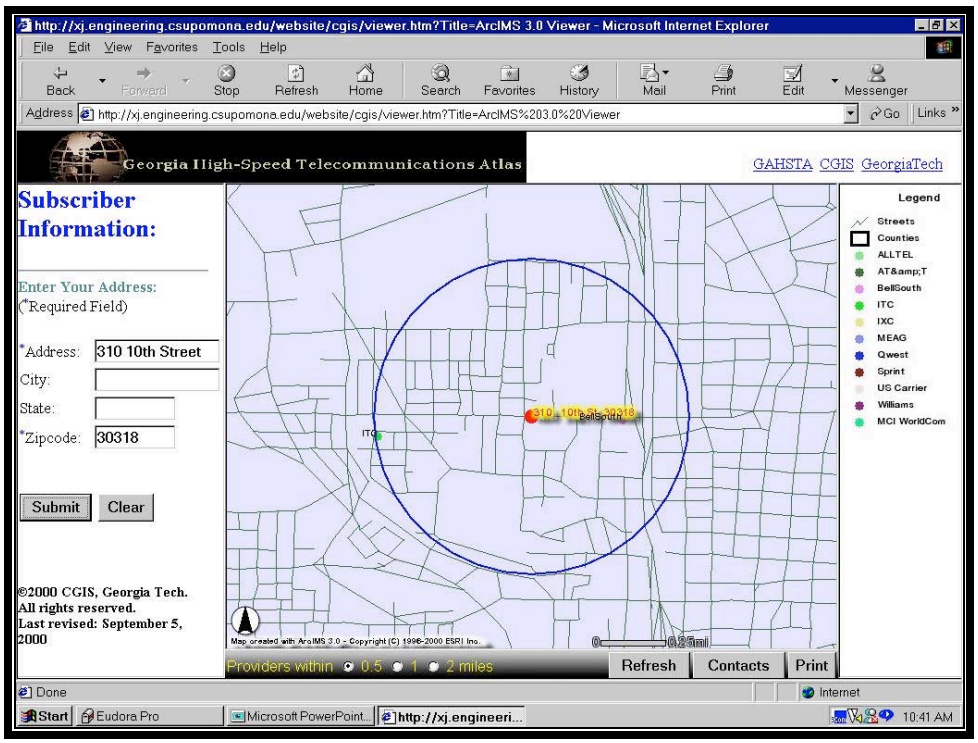


Figure: Query Tool Mapping Street Address and 2 POPs

Description

"...Address-based query tool given the street address "310 10th Street" and the zip code "30318". The 0.5-mile circle in the figure is centered on the street address. There are two symbols within the circle that represent two points of presence (POPs) that fall within this search radius, one POP from the BellSouth and the other POP from ITC."
http://gis.esri.com/library/userconf/proc01/professional/papers/pap259/p2595.jpg

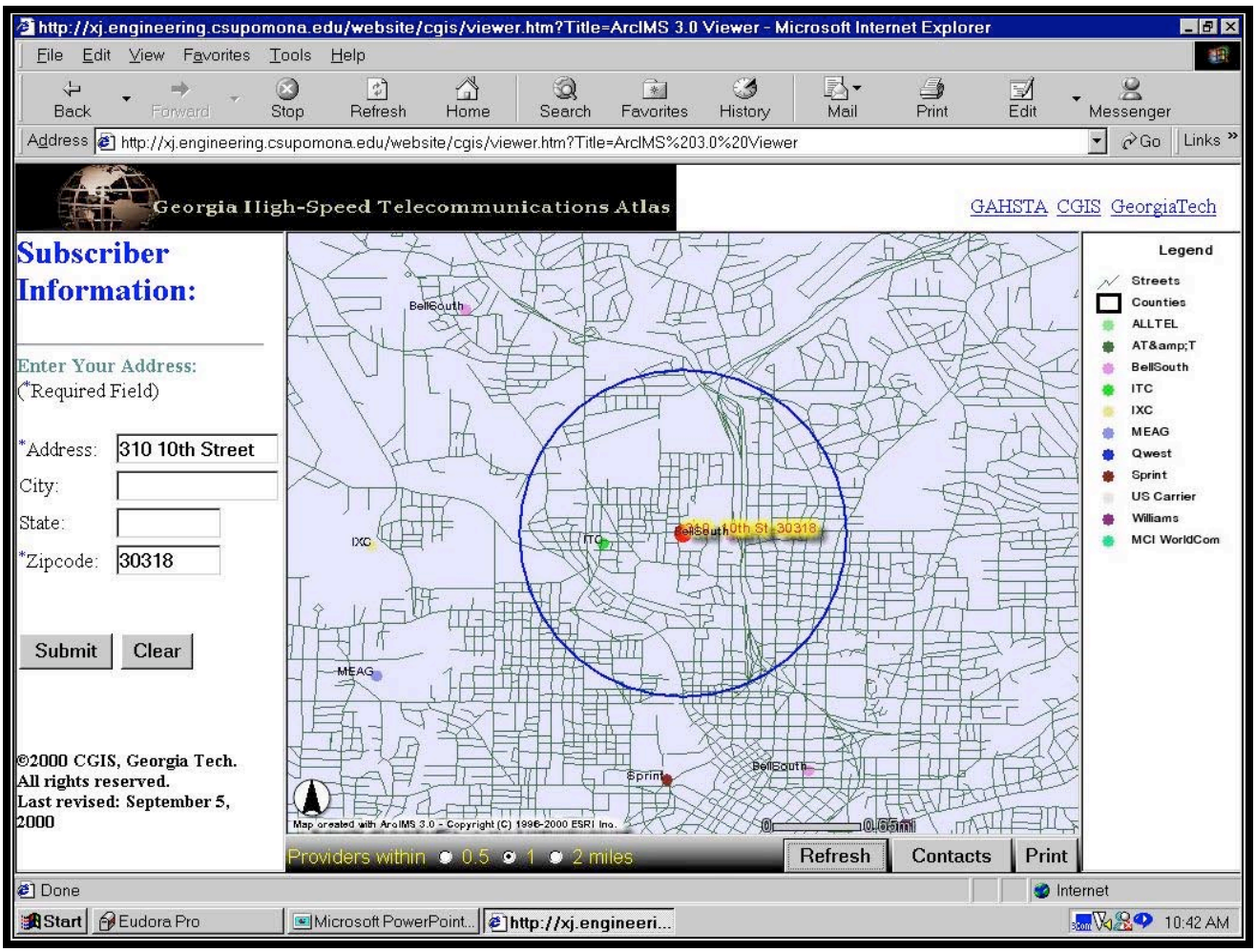


Figure: Points of Presence (POPs) within the 1-Mile Search Circle

Description

After the User or Resident Address is entered (left side), the Point of Presence of the Service Providers (right side) located within the 1-Mile radius of search, as designated by the circle.

http://gis.esri.com/library/userconf/proc01/professional/papers/pap259/p2596.jpg

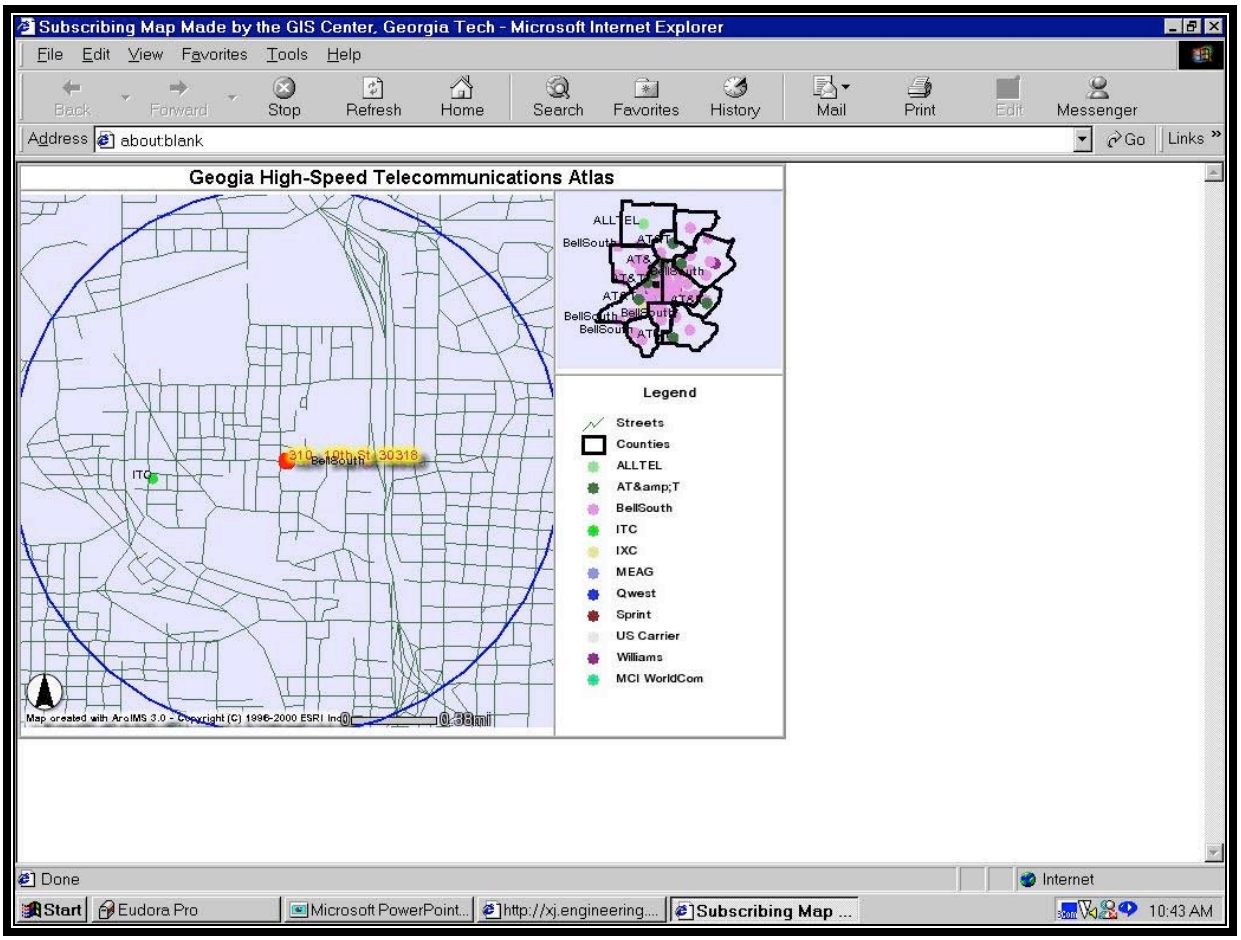


Figure: Two Web Functions, Contact and Print

Outcome

"The web-based system provides users with two Web functions: contact and print. When a user clicks the contact button, the Atlas service will list the contact information of the telecommunications carriers in the area. When a user clicks the print button after finishing the search, the system will assemble the search map and legends and generate a map that can be printed easily." http://gis.esri.com/library/userconf/proc01/professional/papers/pap259/p2597.jpg

Lessons Learned

"The Georgia High-Speed Telecommunications Atlas is a powerful GIS tool to analyze the relationships between telecommunications infrastructure and economic development. It provides an on-line, interactive inventory of Georgia's high-speed telecommunications infrastructure designed to provide information to economic developers and the commercial real estate industry.

- This paper discusses how the initial high-speed telecommunications atlas was extended to incorporate an address based query tool that is useful to firms, realtors and economic developers making location decisions on new buildings, firm headquarters and branch offices. The Atlas provides users with a powerful one-stop shop for telecommunication information for any given location in the Atlanta area. The use of an address-based front end makes this system available to users who are interested in their particular location. This address-based query tool is an important addition to the existing High-Speed Telecommunication Atlas. It can be accessed at http://pansy.gis.gatech.edu/website/telecom_gc/. **References:** French, Steven and Martin, Claudia B. "The Georgia High-Speed Telecommunications Atlas." Presented at 42nd ACSP Annual Conference, Atlanta, Georgia, November 3, 2000. "

Illinois Mapping Project: "Broadband Access in Illinois" Study

Project Description

The Broadband Deployment Council was created by a Gubernatorial Executive Order in 2005 http://www.il.gov/Gov/pdfdocs/execorder2005-9.pdf and well as the Lt. Gov. Pat Quinn's office have provided leadership for the expansive Broadband projects in Illinois. (Ryan Croke, conversation, 7/2/08) For GIS mapping purposes, the project by Prof. David Loomis is most extensive in its scope and depth. Other projects are mentioned in this report, however, providing insight into the Broadband mapping process.

Prof. David G. Loomis, Ph.D. and co-author Dr. J. Lon Carlson, with the Institute for Regulatory Policy Studies in the Dept. of Economics at Illinois State University, conducted a nearly 2-year (June 2006-May2008) "... in-depth study and mapping of broadband access in Illinois. Working in conjunction with Lieutenant Governor Patrick Quinn's Broadband Deployment Council, the Department of Commerce and Economic Opportunity provided funds to Illinois State University..." for the study that is, essentially, testing predictive theory regarding community characteristics and broadband service provider distribution for policy analysis.

Goals/ Objectives

"The goal of this study was not to derive a single agreed-upon definition of what constitutes 'underserved' but rather to provide data and analysis to equip policymakers to act on whatever definition they choose.... Different definitions of what constitutes an "underserved" area with respect to broadband access are bound to exist...

- underserved area as one which has little or no access
- underserved if it has less access to broadband service than a comparable community
- lack of affordably-priced broadband as being underserved since it may be unavailable from an economic standpoint to many households in the community."

"To achieve this goal four objectives were identified:

1. *Determine the availability and pricing for various broadband options at the zip code level throughout the state of Illinois.* Tables and maps of the number of providers and information on average prices have been created but no detail on which providers serve specific areas is being released so as to ensure confidentiality of survey respondents.
2. *Determine the penetration rate of broadband at the zip code level throughout Illinois.* The penetration rate was to be calculated as the total number of broadband lines provided in a zip code divided by the number of households. A table and map of the penetration rate was to be created but no detail on number of lines by provider or by technology was to be released at the zip code level. This objective was highly dependent on the cooperation of broadband providers to report these data for this study. Unfortunately, we were, for a variety of reasons, unable to obtain sufficient data from various survey respondents to complete this aspect of the study as originally proposed.
3. *Use community characteristics to predict the number of providers in an area.* Another objective of the study was to relate the number of providers, by zip code, to the average price of broadband access, population density of that zip code, density of surrounding zip codes, average income level, type/size of company providing voice service, type/size of company providing cable service, and other factors. The goal was to identify areas that have fewer providers than predicted relative to the area's characteristics. The findings would have relevance for the competitiveness of various ISP markets at the local level. Unfortunately, we were, for a variety of reasons, unable to obtain sufficient data from various survey respondents to complete this aspect of the study as originally proposed.
4. *Use community characteristics to predict the penetration rate of broadband in an area.* A final objective of the study was to relate the penetration rate, by zip code, to the average price of broadband access, population density of that zip code, density of surrounding zip codes, average income level, type/size of company providing voice service, type/size of company providing cable service, and other factors. The goal was to identify areas that have less penetration than predicted relative to the area's characteristics. The findings would provide useful input in the formulation future technology policy in Illinois. For instance, based on the importance of certain community characteristics in affecting (positively or negatively) the

broadband penetration rate, a case for government support could be made (see Nuechterlein and Weiser (2005)). Unfortunately, we were, for a variety of reasons, unable to obtain sufficient data from various survey respondents to complete this aspect of the study as originally proposed."

Contacts Illinois

Lt. Gov office: Pat Quinn	Ryan Croke, Policy Advisor	217-558-2929 o 312-285-0745 c	Ryan.Croke@Illinois.gov
Institute Regulatory Policy Studies, Illinois State University	Prof. David G. Loomis, Ph.D.	309-438-7979	dloomis@ilstu.edu
University of Illinois, Urbana Interim Head, Urban & Regional Planning Dept.	Professor Ed Feser, Ph.D.	217.244.6767 217-333-3890- Dept. office	feser@uiuc.edu

Project Background:

Several Projects preceded Prof. Loomis' Study, two of which are described:
Digital Divide Grants
With the merger of SBC and Ameritech in 1999, the Illinois PUC was able to secure $15M from the merger, of which $11M went toward helping the Telcos in "underserved" areas obtain better broadband access. Digital Divide Grants from the $11M to Counties are shown on the map attached. The remaining $4M was swept back into the general fund. (Ryan Croke, phone call, 7/2/08)

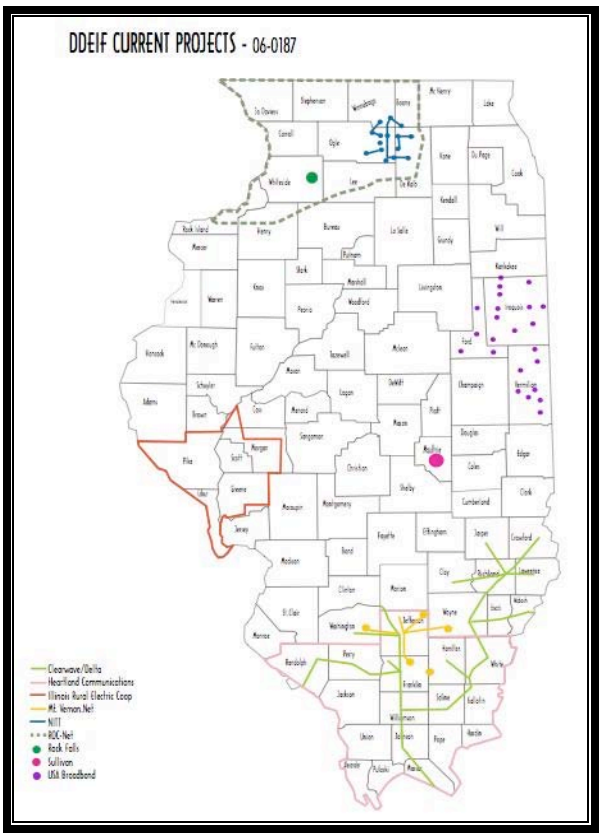


Figure: Digital Divide Grants Showing Names, Locations of Projects

Illinois Commerce Commission Project and Maps

The Illinois Commerce Commission (http://www.icc.illinois.gov) with Prof. Ed Feser, PhD, Interim Head of Urban & Regional Planning at Univ. of Illinois, Urbana-Champagne Campus, produced two GIS maps of gaps in Broadband service in Illinois. Data source was the FCC data on Service Providers Coverage (FCC Form 477). Map 1 (Attached) shows the gaps in Cable and DSL service, while Wireless still may exist in those areas. Map 2 (Attached) displays the gaps in service without Cable, DSL and Wireless. (Prof. Ed Feser, phone call 7/11/08)

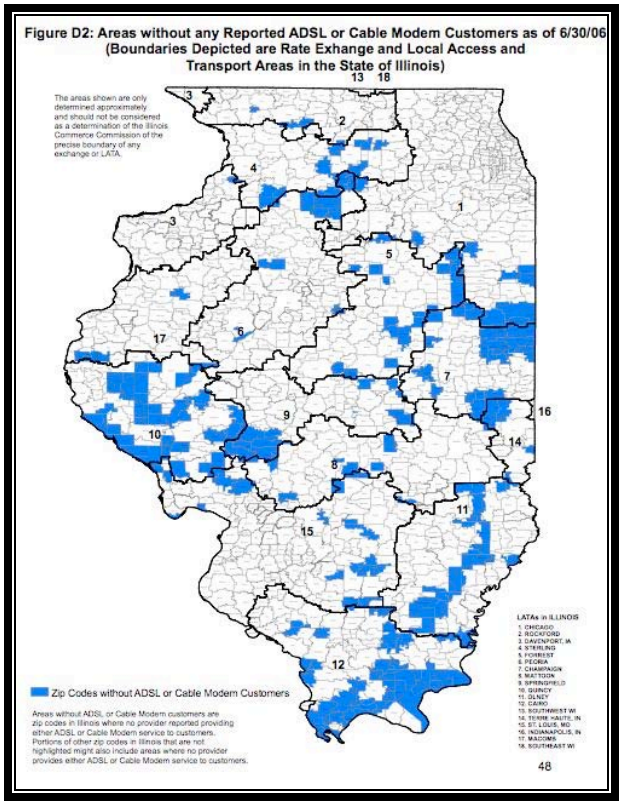


Figure: Map 1 with Zip Codes without DSL, Cable but with Wireless

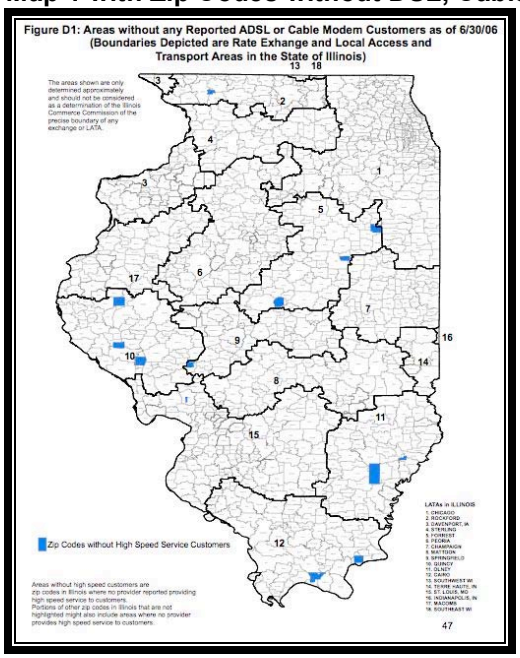


Figure: Map 2: Zip Codes without Broadband

Project Architecture:

Prof. Loomis, with his study

GIS layers were used with ESRI maps and data collected for this study by Prof. Loomis.

GIS Data Layers: (Data Layers verified by Prof. Loomis, e-mail, 7/1/08) See Final Report in "Deliverables" section.

Population Density by Zip Code

- 0-18.3
- 18.3 - 32.1
- 32.1 - 88.5
- 88.5 - 1528.9
- 1528.9 - 60300.0

Median Income levels by Zip Code

- 0-34184
- 34185 - 44643
- 44644 - 58750
- 58751- 87514
- 87515 - 200001

Percent Urban Population by Zip Code

- 0-20
- 21-40
- 41-60
- 61-80
- 81-100

Number of ILL Broadband Providers by Zip Code: Lower Bound Estimate

- 1
- 2
- 3
- 4
- 5-6

Number of ILL Broadband Providers by Zip Code: Upper Bound Estimate

- 1
- 2
- 3
- 4
- 5
- 6-7

Broadband Vendors: total number in state

Layers not included because of lack of data:

- Broadband pricing/vendor / zip code
- Broadband vendor speeds (upload/download) / zip code

Providers Survey

Illinois Broadband High-Speed Internet Access Survey as of June 1, 2006

Section 1 - Company Information

1. Contact Information:
    - Company Name:
    - Company Address: City: State: Zip Code:
    - Telephone #: Fax #:
    - Contact Person and Title:
    - Contact E-Mail Address:

2. What type of service provider is your company? (Please fill out a separate survey for each type of service you provide)
    - ILEC CLEC Cable Wireless Satellite Other Please explain other:

3. Does your company currently provide broadband Internet services (with download speeds greater than 200 Kbps) in Illinois?
    - Yes

- No

3a. If Yes, please list the Internet speeds **(Download/Upload)** you offer (download greater than 200 kbps)**:**

Please go on to Sections 2 & 3.

3b. If No, does your company plan to offer broadband Internet service in Illinois within the next 12 months?

If Yes, Please complete **Section 3.**

- No, You are finished with the survey, Please submit and thank you for your time.

Illinois Broadband High-Speed Internet Access Survey

http://www.irps.ilstu.edu/broadband/broadbandoverview.htm

As of June 1, 2006

Section 1 - Company Information

1. Contact Information:

- Company Name:
- Company Address: City: State: Zip Code:
- Telephone #: Fax #:
- Contact Person and Title:
- Contact E-Mail Address:

2. What type of service provider is your company? (Please fill out a separate survey for each type of service you provide)

- ILEC CLEC Cable Wireless Satellite Other Please explain other:

3. Does your company currently provide broadband Internet services (with download speeds greater than 200 Kbps) in Illinois?

- Yes
- No

3a. If Yes, please list the Internet speeds **(Download/Upload)** you offer (download greater than 200 kbps)**:**

Please go on to Sections 2 & 3.

3b. If No, does your company plan to offer broadband Internet service in Illinois within the next 12 months?

- Yes. Please complete **Section 3.**
- No. You are finished with the survey, Please submit and thank you for your time.

Section 3 - **Prospective Broadband Internet Communities**

5. Please list any additional ZIP codes in which you plan to provide broadband Internet service within the next 12 months (by June 30, 2007).

- List all Additional ZIP codes that will be Served by June 30, 2007
- Month in which High-Speed Internet
- Service will be Available
- Pick a Month

Section 4 - **Pricing Information**

6. Does your company currently provide a stand-alone broadband Internet service?

- Yes. What is the price of that service? Please list all current broadband Internet options and corresponding prices in the table below.
- No. If you answered **NO**, you are finished with the survey.

Type of Service

(Internet Speed, Bundled Services, etc.)

- Recurring Rate Billed to the Customer per Month - Including any Rental Charges for Equipment (List Range if Price Varies by ZIP code)
- Term of Contract - if applicable
- Other Items - Include any Offers or Other Features as applicable Installation Fee
- **Example** - Internet 384 K (up and down) $79.95 1 year contract Free Modem $25.00.

Project Implementation

Note: April 2008, "Broadband Access in Illinois" Study Is not on the Web yet, however GBAS members of this study have a PDF copy or Dr. Loomis.

Aug. 2007," Broadband Access in Illinois" Study
http://www.irps.ilstu.edu/broadband/broadbandoverview.htm

GIS is the data format for base maps, ArcGIS for the mapping by 5 digit zip code.
(David Loomis, e-mail, 6/24/08)
Survey Data: Service Providers and manipulates were surveyed.
Data Sources, Frequency:
http://www.irps.ilstu.edu/broadband/broadbandoverview.htm
Trade Associations for names/contact persons for non-wireless service providers.
Municipalities were surveyed to identify providers in their jurisdictions, however:

> "Survey results indicated that municipalities and townships were, by and large, unable to identify potential wireless providers. Consequently, we conducted additional in house research to identify wireless providers of broadband service in Illinois. Once the list of potential wired and wireless service providers was compiled we then administered a second survey of potential broadband service providers in Illinois. This second survey was conducted in both Year 1 and Year 2 of the study.... second survey designed to collect a variety of information on broadband service in Illinois, including availability by zip code, penetration rates, upload and download speeds and pricing."
>
> "The purpose of the survey of broadband service providers conducted in Year 1 and Year 2 was to collect data on various aspects of the services they provide. The survey instrument requested a range of information, including
> - the respondent's contact information,
> - type of service provider,
> - download and upload speeds,
> - current high-speed Internet customer data by zip code (including number of residential and business customers by Internet speed range),
> - pricing options, and
> - plans for expanded service."
>
> **Survey Sources:** Survey questions used the model from "Iowa Utilities Board (IUB) issued a report entitled "Assessing High-Speed Internet Access in the State of Iowa: Fifth Assessment" (Iowa Utilities Board 2006)." With permission from the IUB project manager. Questions modified for Illinois study.
> The survey was sent out with a cover letter with Lt. Gov. letter head for importance.

Project Resources:

Public agencies: Lt. Governor Pat Quinn supported this project from its inception, after a grant awarded from the State. His letterhead was used for the survey work.
http://www.standingupforillinois.org/pdf/Sept2006BDC.htm
Broadband Deployment Council meeting minutes, Sept 2006
Lt. Gov gives personal support for Study:

> "**Statewide Broadband Mapping**
> Dave Loomis: The effort to map broadband penetration at the residential level by zip codes continues. The hope is now to match Internet availability to underlying economic and demographic information. Phase 1 - identifying local providers through the state - of the project is complete. The final report will be ready by the April, 2008.
> Because of proprietary concerns, broadband availability will be the main focus of the study, rather than service and pricing options. In response to concerns that zip code data will provide a less-than-comprehensive marker of broadband availability, Dave noted this study is not the end-all-be-all, but rather the beginning of an effort to understand broadband availability. At the study's end, he suggested, maybe zip code regions that appear the least developed, should be further investigated.

John Scrivner: suggested via teleconference that the study should mention the prerequisite costs of service for the various broadband options.
Lt. Governor: encouraged everyone to cooperate with the landmark study."

Inhouse GIS mapping: Prof. Loomis, with the help of a graduate student in Economics conducted the GIS mapping without a GIS expert. (Loomis, e-mail. 5/5/08) Other help from IRPS staff, such as Adrienne Hahn, and other acknowledgements in the study.
GIS processing: University of Illinois Geography Dept. (Prof. Loomis, Conversation,
Funding Source: A grant from the Illinois Department of Commerce and Economic Opportunity for approximately $75K funded it. (Ryan Croke, conversation, 7/2/08)
Decision Process: Other studies looked at, for the Survey was the Iowa Utilities Board Survey which they used as a model. Otherwise, the study is referenced with notes annotating other sources.

Project Deliverables:

Academic Reports including display GIS maps:

Summary of Phase 1: Broadband Access in Illinois
Aug. 2007," Broadband Access in Illinois" Study
http://www.irps.ilstu.edu/broadband/broadbandoverview.htm
Summary of Phase 2: Broadband Access in Illinois, April 2008.
PDF Copies available from Prof. Loomis and GBAS Study Members. Not online yet since it was only published and sent out in 7/08. However, when it is available online, see http://www.illinoisconnect.org

Outcome

A GIS Map is shown here (see next page) depicting the number of Broadband Providers (see legend of blue gradients) represented per Zip Code. The map shows the most Service Providers located in Zip Codes where incomes are highest. The least number of Service Providers are located in Zip Codes with the lowest incomes.

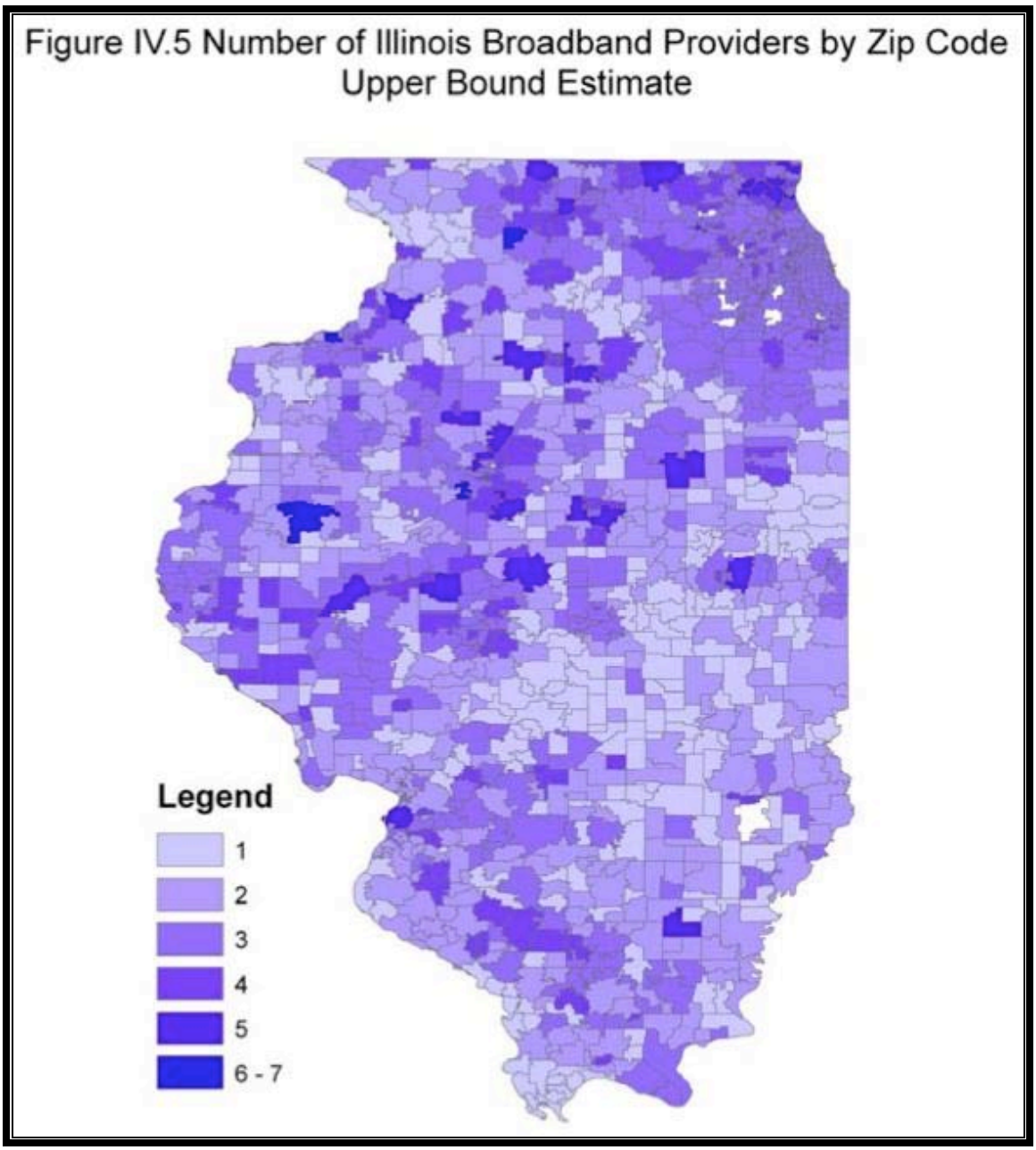


Figure: GIS Map of Illinois with Number (see Legend) of Broadband Providers by Zip Code

Outcome

The Diagram (see Figure next page) shows the impact of the State Broadband Initiative (dark blue) on the many Stakeholders in Illinois. For example, impact on Telecom Economics (green) both within the College curriculum and IRPS, and impact on the Governor's (tan) creation of Illinois Broadband Deployment Council and Telecom Agency creating Pilot Projects that initiate legislation in conjunction with Legislature.

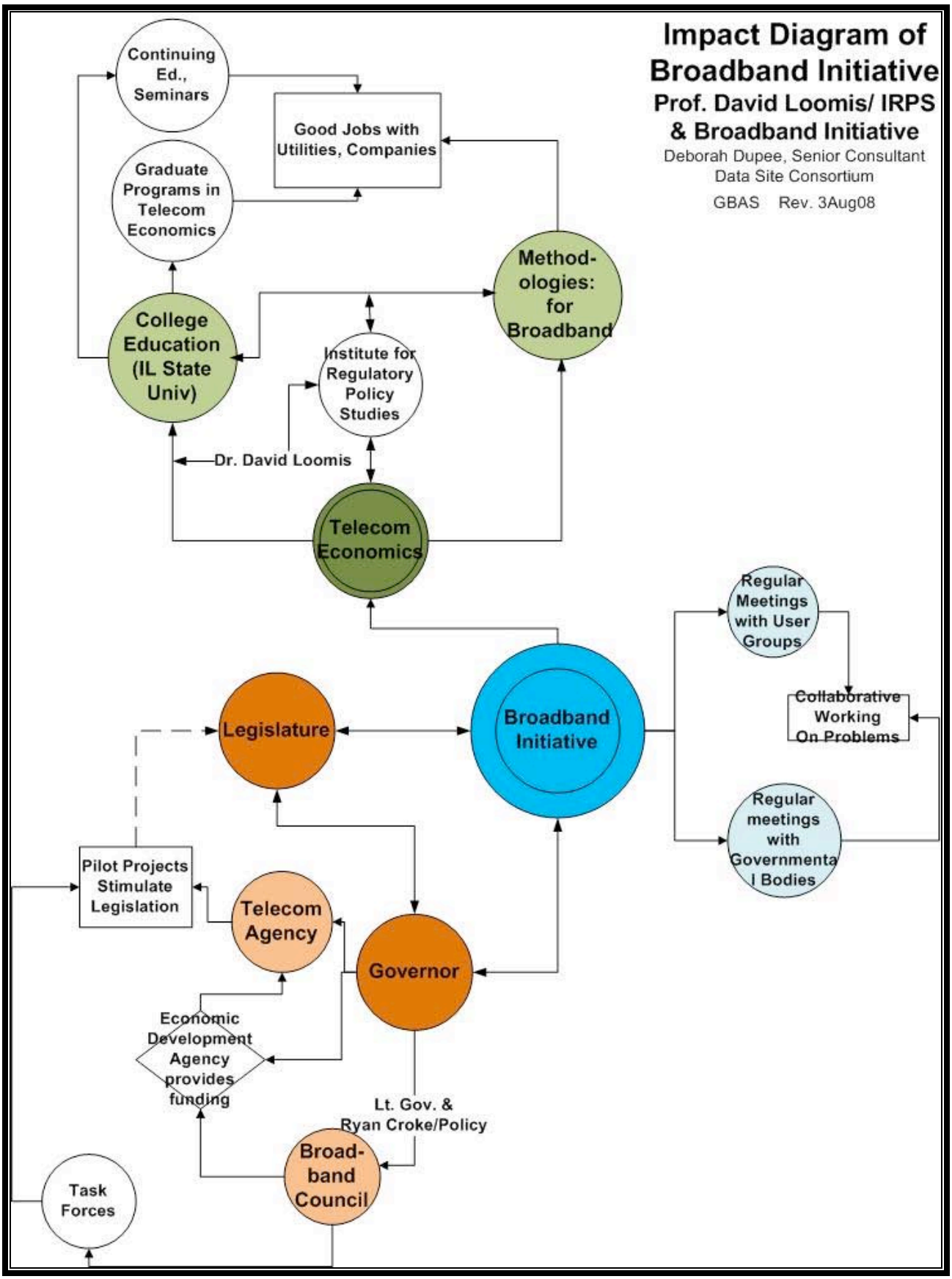


Figure: Impact of Illinois Broadband Initiative on Many State Functions

Project Impact/Lessons Learned:

The second and final study was just completed in April, 2008. However, getting buy-in from the Telcos is essential when this direct source data approach is taken. Although some Telcos were not cooperative totally, he was able to obtain direct data but not to extent he had hoped for. (Prof. Loomis, e-mail, 7/2/08)

Project Outlook Plans:

Prof. Loomis can use them for his Telecom Economics classes in the Dept. of Economics at the Illinois State University and research at the Institute for Regulatory Policy Studies in the Dept. of Economics at Illinois State University. Prof. Loomis is not aware of any State plans for his study. (Prof. Loomis, e-mail, 7/2/08) Legislative or other actions may surface after some time. His research is well known in Illinois and broadband circles. (Ryan Croke, phone call, 7/2/08)

ConnectKentucky http://www.connectkentucky.org/

Project Description

Goals, Timing: To accelerate technology growth and computer literacy among adults and children producing greater economic development for Kentucky, Governor Ernie Fletcher started the *Prescription for Innovation* Program in 2004. At the center was Connect Kentucky, an alliance of business, industry, citizens and government working to development Broadband access in Kentucky. Gov. Fletcher's goals for the Program included:
http://www.connectkentucky.org/what_we_do/prescription_for_innovation.php

- "Full broadband deployment by the end of 2007 (for the whole state of KY);
- Dramatically improved use of computers and the Internet by all Kentuckians;
- A meaningful online presence for all Kentucky communities, to improve citizen services and promote economic development through e-government, virtual education, online healthcare; and
- eCommunity Leadership Teams in every county - local leaders assembled to develop and implement technology growth strategies for local government, business and industry, education, healthcare, agriculture, libraries, tourism, and community-based organizations."

Mission, according to the 2007 Progress Report entails:
http://www.connectkentucky.org/_documents/connectkentucky_2007_report.pdf
"ConnectKentucky helps Kentuckians use technology as a means to achieve personal transformation. Our work improves the lives of people who were once left behind; renews hope for rural communities; increases the number of high-tech companies and jobs; and nurtures an environment for lifetime learning, improved healthcare, and superior quality of life.
"ConnectKentucky is focused on the future, while keeping the traditions that made our communities strong. By leveraging the latest in technology and networking, ConnectKentucky is ensuring Kentucky remains the place of choice to live, work, and raise a family. ConnectKentucky's mission is to accelerate the growth of technology in support of community and economic development, improve healthcare, enhance education, and promote more effective government."

Funding Sources: under Governor Ernie Fletcher, a Grant from Appalachian Regional Commission for *Prescription for Innovation* Initiative, $900,000, July 2005, "in support of the statewide broadband initiative, Prescription for Innovation....toward the expansion of broadband infrastructure and technology adoption throughout the Appalachian region." (See Resources section also.)
http://migration.kentucky.gov/newsroom/connectkentucky/arcgrant.htm

Outlook

In April 2008, the continued funding for Connect Kentucky was vetoed by the new Governor Beshear, in office Jan. 08. http://www.publicknowledge.org/pdf/20080414164528021.pdf
"I am vetoing this part because of the need to allocate scarce resources in the most efficient manner possible. The vetoed part requires funding of $1.2M in each year of the biennium to administer the ConnectKentucky program from the Cabinet for Economic Development's High-Tech Investment Pool without specifically identifying any services to be rendered to the state or providing for any oversight, control or performance measures relative to the services being rendered. This amount represents a twenty-six percent increase over current grant levels for these services in a budget that decreases most appropriations. I support wholeheartedly the continuation of the broadband initiative and accessibility of the high speed Internet throughout the Commonwealth and am proud of the great strides made by Connect Kentucky to date. I am directing the Cabinet for Economic Development to confer with ConnectKentucky, consider the program needs related to the continuation of the Broadband initiative, and structure a funding plan in a fiscally responsible manner that furthers the good work that has been in this area."

All sides of the controversy are pursuing their own solutions.

Contacts

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ConnectKentucky/Connected Nation	Laura Taylor, Chief Analyst	270-799-0449	ltaylor@connectednation.org
Governor Cabinet for Economic Development	Catherine Staib, Legal Counsel	800-626-2930	Catherine.Staib@KY.gov
Governor State Offices Cabinet for Economic Development	Deborah Clayton, Commissioner	800-626-2930	Deborah.Clayton@KY.gov

Connect Kentucky Project Background

http://www.connectkentucky.org/_documents/SNLbroadbandseries121107.pdf

"The state, known for its bourbon and horses, ranked 45th in residential computer use and 43rd in Web use in 2004. In an effort to turn things around, then-Gov. Ernie Fletcher, a Republican, laid out the state's "Prescription for Innovation." The plan sought to boost the availability of broadband by forging public-private partnerships. Fletcher promised universal access to broadband in the state by the end of 2007."

Authority, Leadership http://migration.kentucky.gov/newsroom/connectkentucky/arcgrant.htm

In July 2005 "ConnectKentucky is an alliance of technology-minded businesses, government entities, and universities working together to accelerate technology in the Commonwealth. The ConnectKentucky partnership is chaired by Mr. John R. Hall, the retired Chairman and CEO of Ashland Oil Inc. and Commerce Secretary W. James Host."

Merger of Bell South and AT&T, July 2006, played a role since former Bell South employees were on the staff of Connect Kentucky, including Joe Mefford, a 35-year veteran.

http://psc.ky.gov/agencies/psc/press/072006/0725_r01.pdf

" agreed to certain principles. They include capping rates for basic local service for five years, maintaining local charitable and economic development activities, adhering to labor agreements in place at the time of the merger and notifying the PSC prior to closing any facilities in the state.

Existing agreements with local phone service providers that purchase services will remain in effect following the merger. BellSouth and AT&T also said the merger will speed their deployment of broadband services in rural areas of Kentucky."

AT&T agreed to 100% build-out of their territory in Kentucky by YE 2007, which gave Connect Kentucky an edge.

Architecture/ Implementation

GIS, Survey Data, Mapping Overview: Using ArcGIS for layered mapping, the project used several types of mapping**: Broadband Availability Maps** with state inventory of assets related to telecom (towers, water tanks), demographics and governmental organizations / boundaries, roads. **Broadband Adoption Maps:** Displaying percentages of Adults with Broadband.

Kentucky Broadband Mapping - GIS Data Layers

Demographics are collected by Census Block

http://12.180.242.34/KyBroadband/default.aspx

- Incorporated City
- Proposed Sewer Lines
- Proposed Water Lines
- Proposed Transportation Projects
- Interstate Roads

- Parkway
- US Roads
- Local Roads
- Wireless Broadband Tower
- CCI Tower
- KEWS Tower
- SC Tower
- Water Tank
- Water
- County Boundary
- Broadband Adoption
    - 7-16%
    - 17-21%
    - 22-29%
    - 30-38%
    - 39-55%
- Municipal Broadband Available
- Cable Broadband Available
- DSL Broadband Available
- Wireless Broadband Available
- Density of Unserved Households (in Square Miles)
    - 0-8
    - 9-20
    - 21-40
    - 41-85
    - Area less than 0.25 square mile
- Number of Unserved Households, per Census Block
    - 0-10.9
    - 11-25.9
    - 26-50.9
    - 51-100.9
    - 101+
    - Area less than 0.25 square mile
- Mobile Wireless Broadband Available
- State of Kentucky (ownership)

Types of Data Sources:
Crowdsourcing Internet Speeds in Connect Kentucky:
http://www.businessweek.com/innovate/content/jul2006/id20060713_755844.htm
Wikipedia calls crowdsourcing the "... act of taking a task traditionally performed by an employee or contractor and outsourcing it to an undefined, generally large group of people, in the form of an open call. For example, the public may be invited to develop a new technology..." Crowdsourcing for broadband speed testing is used by organizations such as Communications Workers of America, "SpeedMatters", http://www.speedmatters.org and Virginia Tech's "eCorridors" http://www.ecorridors.vt.edu/maps/broadbandmap.php.
ConnectKentucky has their crowdsourcing website for residents to test their home and/or work connection speed, accessed on the CK website with a green button entitled: "I want to test my connection speed" http://speedtest.connectedky.org/ . The CK crowdsourcing for broadband speeds has been used in their mapping data sources, as noted by "Broadband Available through a Single Platform" on the Availability Map. (Joe Mefford/Laura Taylor, discussion, 8/27/08) ftp://ftp.connectky.org/PUBLIC/Mapping/StatewideMaps/Broadband_Statewide.jpg (Note: large file - requires 1+Mbps connection speed.)
Service Providers: Connect Kentucky and Connected Nation use data from Service Providers directly, under a Non-Disclosure Agreement (NDA). They do not advocate using third party Service Provider data, since they say it is not as updated," not as reliable and often overstated" and does not have the "granularity" needed as the sources with an NDA. (Joe Mefford, e-mail, 6/13/08).
Other 3rd Party data:

Some of the 3rd Party data includes: Towers, Census data by Census Block. (Joe Mefford, e-mail, 6/13/08) Governmental Boundaries, Roads, and other data are used. (See the Map "Data Layers" section.)

NOTE: [Best Practices for Arizona:
Care should be given with the work and mapping information that Arizona provides to the public. Data sources should be properly attributed to forestall controversies. NDAs should keep information private, with security enforcements. NDAs have their own set of problems.]

Project Resources and Funding for Connect Kentucky

Funding from Kentucky Economic Development Authority (EDA:
According to the State Economic Development Authority, a total of $4.05M was granted by EDA to CK between 2001 - 2006. For 2007-08, CK would receive another $1.775M total from EDA funds, ARC and sponsorships with public/private partnerships. (CK Grant Agreement, 2007-08, Kentucky Economic Development Authority)
Additional Funding from Service Providers and Private Business: Administered in other programs, such as "No Child Left Offline®", Business Partners from the Telecom Industry (Telecom associations, industry leaders: Bell South, AT&T, Nortel), computer industry (Microsoft, Intel, CA Inc.), Universities, and Governments (Appalachian Regional Commission). http://www.connectkentucky.org/partners/

- "Contribute to Kentucky technology policy and tech-based economic development;
- Network regularly with leaders and policy-makers;
- Participate in meetings and programs throughout the year to support technology planning;
- Gain access to publications that keep your organization connected to relevant technology activity;
- Obtain powerful market knowledge through regular research reports on Kentucky's technology climate;
- Acquire consulting support for your organization's technology projects; and
- Receive public recognition for your organization's role in accelerating technology in the Commonwealth.
- Be a part of key technology initiatives in the Commonwealth! " http://www.connectkentucky.org/partners/what_do_our_partners_do.php

No Child Left Offline Program (NCLO): an adjunct funding resource and related Initiative
http://www.connectkentucky.org/what_we_do/no_child_left_offline.php
Broadband is essential for the many advanced applications that need more bandwidth, such as Emergency Medical Services (EMS), Telemedicine, eGovernment, and eLearning applications in Education, When students in K-12 have access to the Internet and E-Learning or distance learning programs, their world of learning expands for greater fulfillment of the students' development.
No Child Left Offline is a variation of "One Laptop Per Child" (OLPC) (http://laptop.org/), which uses financial donations, a computer the organization developed and has contributed to international disadvantaged countries especially.
NCLO utilizes industry in-kind donations especially and/or financial contributions for Kentucky programs. "Initially the program worked with schools to extend applications to students who were identified in a sensitive manner as participants in the Free and Reduced-Priced Lunch Program.
"Through ConnectKentucky's No Child Left Offline program, ConnectKentucky provided an opportunity for disadvantaged middle school students to return home to:

- Desktop Computers with Intel Pentium III processors and above.
- Lexmark Inkjet printers complete with replacement ink cartridges.
- Microsoft Software Applications for word processing, spreadsheets and other productivity utilities.
- eTrust Internet Security Suite by Computer Associates containing Antivirus, Firewall, Anti-Spam and PestPatrol Anti-Spyware.

- A suite of additional applications to engage the recipients in educational exercises, healthy lifestyles, problem solving, civics, geography, among others.

"Though the project originally focused on refurbishing computers and distributing them to middle school students in rural or low-income areas, ConnectKentucky has expanded the project to include new computers and also targets other disadvantaged populations and organizations, such as community centers and organizations that serve underprivileged and special populations in both rural and urban areas."
http://www.bizjournals.com/louisville/stories/2007/10/22/daily17.html
Connect Kentucky's "No Child Left Offline" program has received $150,000 from AT&T for computers and technology upgrades to local nonprofit agencies that provide after-school programs and services to students in Jefferson County. Louisville-based investment firm J.J.B. Hilliard, W.L. Lyons Inc. also gave $25,000 for the program. 10/24/07

Educational and Governmental bodies have contributed also, such as **Appalachian Regional Commission (ARC)** noted here:
http://www.connectkentucky.org/_documents/Article_GovFletcherNCLO_91207.pdf
"Governor Ernie Fletcher today presented $300,000 in Appalachian Regional Commission (ARC) funding for No Child Left Offline, the initiative to provide refurbished computers and supplies to underprivileged children and their families." 9/12/07
http://www.connectkentucky.org/_documents/Article_MiddlesboroDailyNews_050508.pdf
"The ConnectKentucky NCLO program was made possible by a $300,000 grant from the Appalachian Regional Commission (ARC). The program donates over 1000 refurbished computers throughout the ARC region.
"Connect Kentucky has already initiated and executed a successful pilot project of NCLO and has delivered nearly 2000 Internet-ready computers to middle school students and their families in 11 ARC counties. NCLO places computers in the homes of students who may not otherwise ever be able to own one. This gives these students the opportunity and resources to compete in today's global technology based economy."
http://www.connectkentucky.org/_documents/Article_MiddlesboroDailyNews_050508.pdf
"The 202 computers donated to students in Bell County are Internet-ready and were donated by Morehead State University. The computers will be paired with a Lexmark inkjet printer and will have security software donated by CA Inc., and XP operating systems and Office applications donated by Microsoft. 5/5/08
eCommunities Funding:
http://migration.kentucky.gov/newsroom/connectkentucky/commconnect.htm
9/19/06: Frankfort, KY: The Rural Utilities Services, a department of the U.S. Department of Agriculture (USDA), recently named four Kentucky communities as recipients of the competitive Community Connect Grants. The federal grants, totaling nearly $1 million, will create vital broadband networks for rural communities that do not have high-speed Internet service. Communities awarded the grants are Berry (Harrison County), Columbus (Hickman County), Concord (Lewis County) and Monterey (Owen County).
"These funds will provide a critical link between essential community facilities in areas where no broadband service currently exists," Agriculture Deputy Secretary Chuck Conner said. "The goal is to improve public safety and also enable residents to pursue educational opportunities." "

Project GIS Deliverables http://www.connectkentucky.org/

Maps: Availability and Adoption Maps

Types of Availability Maps:

http://www.connectkentucky.org/broadband_landscape/availability_maps.php

Statewide Broadband Inventory

"...large and highly detailed map; data includes broadband coverage by single platform and multiple platform, tower and water tank sites, county boundaries, and detailed road information."

Statewide Broadband Inventory: More Detailed Map

"....smaller, printer-friendly version of the large statewide broadband inventory map; data includes broadband coverage by single platform and multiple platform, county seat locations, county boundaries, and general road information."

Number of Households Unserved by a Broadband Provider by Census Block

"...number of unserved households by Census block along with proposed roads and water projects."

Broadband Service Growth in Kentucky, 2004 onward

"...progress of broadband deployment in Kentucky over the course of the project."
"Broadband Service in Existence prior to January 2004
Redundant Broadband Service created since 2004
Broadband Service created in Unserved Areas since January 2004
Unserved Area"

Statewide Density of Unserved Households by Census Block

"...density of the households in unserved census blocks. This map also shows proposed roads and water projects."

County Broadband, Census, and Density Maps

http://www.connectkentucky.org/find_your_county/counties/

"...maps are available on each of the individual county profiles on the Community Profiles page."

Broadband Adoption Maps

ftp://ftp.connectky.org/PUBLIC/Mapping/MiscellaneousMaps/Adoption_100107.pdf

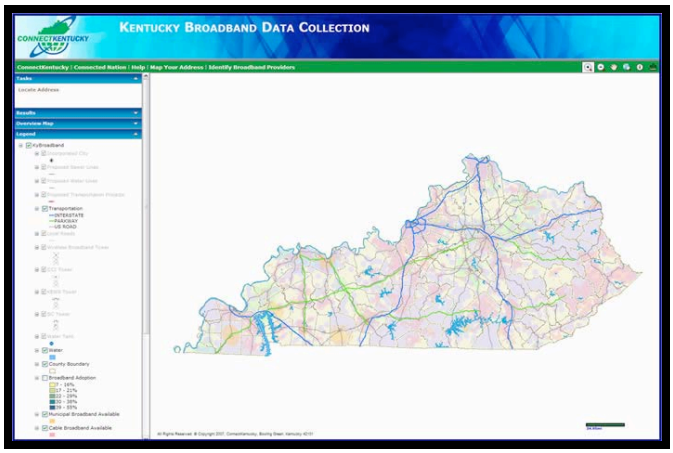
"...statewide view of Kentucky counties and their adoption rates."

"Percent of Adults with a Home Broadband Connection

- 7 - 16%
- 17 - 21%
- 22 - 29%
- 30 - 38%
- 39 - 55%"

Map: Interactive

http://www.connectkentucky.org/broadband_landscape/interactive_map.php



"This map is intended to allow users to create completely customized views of broadband infrastructure across the state. The link below contains a very large amount of data, and a broadband connection is recommended for viewing."

Kentucky Broadband Inventory Map: Residents locate their Broadband Provider(s) using a separate screen:
How to Identify Broadband Providers
http://12.180.242.34/KyBroadband/Help/Identify.html
This tool is used to obtain a list of broadband providers at a selected location and access more information about a layer in the map.
Map your Address:
http://12.180.242.34/KyBroadband/default.aspx

Find your County: County Profiles
For example, the first County, Adair:

Contact
- (Project Manager)
  (E-mail Address)
  (Telephone Number)

Connect Adair County
- April 4, 2006
- Contents: (PDF Format)
- Adair County Strategic Technology Plan (352K)
  Best Practices Resource Guide (137K)
  Adair County eCommunity Leadership Team (61K)
  Adair County Demographics (88K)

Maps (Note: downloads take time -needs 1Mbps connection
- Statewide Broadband Inventory (29M file)
- Adair County Broadband Inventory
- Adair County, Number of Households Unserved by a Broadband Provider
- Adair County, Density of Households Unserved by a Broadband Provider

Technology Statistics
- Kentucky Technology Statistics (71K)
- Adair County Technology Statistics (203K)
- Prescription for Innovation Executive Summary (122K)
  Community Benchmarking Tool (3M)

About ConnectKentucky
- ConnectKentucky Presentation (552K)
- ConnectKentucky Overview (83K)
- Glossary of Broadband Terms (148K)

Community Benchmarking Tool: (Note- large 1+M Tool file)

"The Community Benchmarking Tool is designed to provide a benchmark for your community's current readiness to participate in the enormous economic, social, governmental, and personal changes that high-speed communications entail. More importantly, this guide provides a vision of specific steps and actions your community—government, businesses, schools, community groups, and citizens—can take to benefit from these changes."

Research: Studies conducted:
http://www.connectkentucky.org/research/
Kentucky Technology Trends
2007 Residential Survey

"This report on Kentucky Technology Trends highlights the results of the 2007 ConnectKentucky Technology Assessment, conducted in September 2007. Kentucky adults were surveyed on their use of computers, the Internet and technology in general. The survey involved

nearly 11,000 Kentuckians representing each of Kentucky's 120 counties."

2006 Business Survey

"This report on Kentucky Technology Trends highlights the results of the 2006 ConnectKentucky Technology Assessment, conducted in November 2006. Kentucky businesses were surveyed on their use of computers, the Internet and technology in general. ConnectKentucky surveyed more than 800 businesses across Kentucky, sampled and weighted by industry sector and company size."

KY120 Profiles

"Citizens across the Commonwealth use technology in innovative ways to ensure that Kentucky remains the place of choice to live work and raise a family. ConnectKentucky is profiling businesses and Kentuckians in each of Kentucky's 120 counties to identify lessons learned on the path to successful innovation."

In the News: News clippings over time
http://www.connectkentucky.org/news_&_events/

Press Releases, Recent
http://www.connectkentucky.org/news_&_events/press_releases.p

Publications: Progress Reports, Connected Newsletter, eCommunities Strategies newsletter
http://www.connectkentucky.org/news_&_events/Publications/

Impact on Legislation and New Organization Formed

Appeared before U.S. Congress several times, influencing Legislation

Connect Kentucky staff appeared before the House, about May 2007, subsequently influencing many bills including S. 1492, "Broadband Data Improvement Act" by Senator Inouye, (D-HI), and Sen. Dick Durbin "Connect the Nation Act". However, as of August 2008, Congress has not passed any of the bills.
http://arstechnica.com/news.ars/post/20070525-new-senate-bill-pushes-for-second-generation-broadband.html
"The $40 million appropriations request seems motivated by the success of Connect Kentucky, a state/business partnership for making broadband affordable and available to 100 percent of Kentucky residents by the end of this year. The group's CEO appeared before the House committee last week to a warm reception, and it looks like the Senate is also open to replicating the model in other states."

The Farm Bill originally had a Broadband Survey provision in it for $40M in grants, however the bill that finally Congress passed in May 2008, had removed the Broadband Survey sections and grants entirely. (See HR 2419: Food, Conservation and Energy Act of 2008 (http://www.govtrack.us/congress/bill.xpd?bill=h110-2419)

Associated organization was formed, Connected Nation
http://www.kvoa.com/Global/story.asp?S=6910918&nav=menu216_3_2
"...formed a national umbrella organization called Connected Nation. Connected Nation assists with statewide comprehensive technology expansion efforts across America that effectively enhance the supply of available broadband while dramatically increasing demand through state and local grassroots awareness/adoption campaigns. Connected Nation specializes in increasing technology access and literacy towards greater digital inclusion for all." 8/9/07

Outlook for Future Organization, Funding

Connected Nation Connected Nation has selected a roadmap derived from Connect Kentucky experience that they are developing with other states. Using a template derived from the Connect Kentucky model, Connected Nation is talking with many other states and applying their methodologies.

Connected Nation has engaged other states TN and Ohio, all of their Broadband projects; W. VA and S. Carolina, their Mapping portion; Minn. is forthcoming. Gap Analysis for 6 regions in the California Broadband Initiative / Task Force; 15 other states have expressed great interest. (Joe Mefford, phone call/e-mail, 5/21/08)
See Connected Nation website for States Programs.
http://www.connectednation.org/state_programs

ConnectKentucky 2008 Funding
April 15, 2008, Stacy Higginbotham, "Connect Kentucky gets Disconnected":
http://gigaom.com/2008/04/15/connect-kentucky-gets-disconnected/
"The Democratic Governor of Kentucky has vetoed two years of funding for the continuation of a statewide broadband expansion program that's a model for pushing nationwide rural broadband. Governor Steven Beshear vetoed $2.4 million in state funding for Connect Kentucky, a group founded in 2002 to spread broadband access around the Bluegrass State.
"In vetoing the law Bershear commended the work CK has done to connect the state, but pointed out that, in a time of budget cuts, increasing the program's funding by 26 percent wasn't prudent. While Connect Kentucky has its attackers, it enjoys support from both sides of the political aisle and has spawned a national broadband program called Connected Nation.. Perhaps Connect Kentucky will find its funding elsewhere."

All sides of the controversy are pursuing their own solutions.

What did CK accomplish? According to Mark Rutledge, CIO Kentucky in 1/07, CK's reports a great deal in 3 years:
(http://www.techlines.ky.gov/2007/jan/rutledge_interview.htm)
"Since the *Prescription for Innovation* plan was put into place, statewide broadband availability increased by 36 percent and usage increased by 45 percent, according to Connect Kentucky, an alliance of government, universities and technology companies, and broadband Internet access is available to 375,000 households that previously had no such access."

Some reports claim anecdotal statements of criticism, such as Art Brodsky, Communications Director of Public Knowledge, reports on earlier CK history and other issues. http://www.publicknowledge.org/node/1334 Brodsky's article is noted as critical of the CK work, which has been refuted by Brian Mefford, CEO, Connected Nation in a "Detailed Rebuttal to Public Knowledge, Jan. 15, 2008", obtained from Joe Mefford, however a similar rebuttal is located on the website:
http://www.wcai.com/images/pdf/2008/2008_rural_ConnectedNation%20Rebuttle.pdf
The Public Knowledge article is also refuted by Robert D. Atkinson, Ph.D., Alliance for Public Technology http://blog.apt.org/my_weblog/2008/01/disconnected-co.html

FCC Action: An *ex parte* (rule making before the FCC) was filed by CK/CN on July 1, 2008 expressing opposition to the FCC proposal to take the Broadband Mapping into the FCC. An *ex parte*, July 11, 2008, filed by the Kentucky Municipal Utilities Assoc. (KMUA), a group of 14 Kentucky utilities and 1 Kentucky city, differing with CK/CN views. The FCC is proposing a Federal level Broadband Mapping effort. The KMUA supported the FCC proposal with comments and refutes the objections raised by CK/CN regarding their services, mapping, and organization. CK/CN objected with an *ex parte* against KMUA, which in turn issued an ex parte against CK/CN. The FCC will be the decision-maker regarding the issues of concern. The issues are documented in the FCC WC Docket No. 07-38, dated August 1, 2008. Anecdotal statements have been made by CK/CN about the progress they made over time. For instance, No Child Left Offline Program lists programs completed and testimonials from families. (See Table and Link.) http://www.appanet.org/files/PDFs/APPAKMUAFCCCommentsin073807172008.pdf

Maryland Broadband Cooperative http://www.mdbc.us/

Project Description

http://www.govtech.com/pcio/articles/125732

With the support of Gov. O'Malley, the State Department of Business and Economic Development and the Maryland Department of Transportation, the Maryland Broadband Cooperative (MDBC) is heading up the regional fiber Middle Mile Infrastructure network for the Eastern Shores and Southern Maryland, which lack broadband infrastructure.
http://www.gov.state.md.us/pressreleases/071009.html

"The Rural Broadband Communication bill (SB 753) was signed in May 2006 to bring access to fiber optic lines to the nine counties on the Eastern Shore and the three counties in Southern Maryland. An Internet Point of Presence (POP) will be located in each county along this new fiber line, focusing on connecting business and industrial parks.

"The need for broadband on the Eastern Shore and Southern Maryland was a key finding in the Maryland Technology Development Corporation's (TEDCO) 2003 report. Despite the fact that Maryland ranks above most states in both the deployment and usage of information and communication technologies, the report found that households and businesses in Western Maryland, Southern Maryland and the Eastern Shore lag behind other areas in their rate of access and usage of high-speed communications."

Maryland Broadband Cooperative (MDBC) http://www.mdbc.us/

"MDBC is a public/private partnership to promote economic development through the deployment of technology supporting infrastructures."

On the perimeter of Washington, DC in Maryland, MDBC is managing the construction of the regional broadband infrastructure with the last mile build-out by private, members, ISPs and WISPs.

MDBC has Board of Directors members from the 5 Regional Councils in Maryland:

- The Tri-County Council for Southern Maryland
- The Tri-County Council for Western Maryland
- The Tri-County Council for the Lower Eastern Shore
- The Upper Shore Regional Council
- The Mid-Shore Regional Council

Goals www.tccsmd.org/downloads/Wayne's%20MdBC%20presentation.ppt

- "Create early opportunities to provide service.
- Build fiber infrastructure in areas where fiber does not currently exist.
- Capitalize on existing fiber resources through resource sharing and lease agreement.
- Enable private sector ISPs and WISPs to bring last mile connectivity to business and residents.
- Build Network Operation Centers with incubator space to increase economic development opportunities. "

Mission: http://www.mdbc.us/

"Our Mission is to drive economic development through universal, open access to broadband services via a fiber optic network that serves rural Maryland by building an advanced, world-class broadband network across the rural communities of Eastern, Southern and Western Maryland supported by its' members who provide "Last Mile" services."

Timeline:

http://www.adestagroup.com/adesta/contents/news/Adesta%20MDBC%20release.pdf

"The first leg of the MDBC Network backbone runs from the NASA Flight Facility in Wallops, VA North into Maryland ending in Salisbury. Lateral connections will be constructed to several locations including; UMES, MIST and Salisbury University. Engineering and construction are underway on this segment and completion is scheduled for Q2 2007. The second backbone section will travel North and West from Salisbury to the Chesapeake Bay Bridge through the cities of Cambridge and Easton. Included are diverse loops around the bypasses of Salisbury and Easton. Design and engineering are underway with full testing and turn-up planned for Q1 2008.

Adesta's turnkey solution will consist of design and construction of the fiber-optic network with 144 to 288 strands of dedicated fiber backbone. Adesta will provide and install an advanced, open-access, fiber-optic SONET system, with an OC-192 backbone and smaller connections at lateral endpoints across segments of the network. These end points will connect to universities, industrial parks and other points of interests such as business development and technology centers."

Maps (not GIS)

Map of regional network designates build-out through 2009.
http://www.mdbc.us/mdbc_map.html
More detailed plans are shown over maps, "Southern MD Broadband Report" link
http://www.tccsmd.org/index.cfm?content=83

Phase I and II: Fiber Backbone Infrastructure in Progress

http://www.choosemaryland.org/pressroom/pressreleases/Broadband%20Event%20062507.doc.html
The Broadband project is a 5-year program, projecting to approx. 2012. (Gary Ruack, discussion, 6/25/08).

Maryland State Budget Office

http://mlis.state.md.us/2008RS/budget_docs/All/Operating/T00F__Dept_of_Business_and_Economic_Development_PAYGO.pdf
Phase I was completed, July 2007, when NASA's Wallops Island Space Facility was linked to Salisbury State University. Phase II is scheduled for 2009 completion with Salisbury to the Bay Bridge route. Phase III would link the Bay Bridge to Baltimore and communities in Western MD. Timeline assumed that Phases I - III would be completed in 2007, 2008, 2009 timeframe respectively.

Funding:

The massive project funding is emanating from the state and federal sources primarily. However, funding through FY09 is the total State budget so far and Gov. O'Malley released the final State funding of $2 M FY09 to the project in June 07. Sen. Barbara Mikulski in 2007 obtained $3.2M Federal funds. Further funding: See Resources Section for details.

Outlook:

The scope of the project is large and important considering the proximity to Washington, DC. DOD funded some of the MDBC venture with Navy, NASA and other Federal facilities along the fiber route. Sen Barbara Mikulski is their broadband advocate in Washington with US DOC Economic Development funding sporadically. Further State funding requires attention, since the project is funded through FY2009. The Maryland Budget Office report mentioned they were lacking a report regarding the projections and accountability for the funding thus far, before issuing further funding.
http://mlis.state.md.us/2008RS/budget_docs/All/Operating/T00F__Dept_of_Business_and_Economic_Development_PAYGO.pdf
The MDBC belatedly completed a Business Plan in June 2008, but it is proprietary and requires a NDA. (Mike Pennington, phone call, 8july08). The MDBC will use their leasing income from Service Providers in the Last Mile and other connections and members fees to further their Broadband Network activities/maintenance, without repayment of any initial Federal/State construction grants.

Contacts

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Lower Shore Regional	Mike	410-632-4700	mike@lowershore.org

Council	Pennington, Exec. Dir.		
US Senate, Washington, DC	Sen Barbara Mikulski	202-224-4654	
OSP Insight - GIS-based, Tech Specs	Randy Anderson, Tech. Mgr	801-936-0970x130	RandyA@AdvanceFiber.com
Adesta Advance Fiber, Corp Office, NE	W. Bruce Downing, VP Operations	402.233.7720	bdowning@adestagroup.com

Project Background

The formulation of the Fiber Backbone project has been nearly 10-yrs in the works. (Mike Pennington, phone call, 7/8/08).

Maryland Rural Broadband Task Force:

http://www.ncsl.org/programs/lis/ConnectAmericaPubs.htm#State

"The Maryland Task Force for the Deployment of Broadband in Rural Maryland was established during the 2003 General Assembly session, and in 2005, the General Assembly extended it through June 2006.

- The task force examined what works best in other regions of the country to expand broadband communications to rural communities.
- Next, the Task Force considered resources, infrastructure, and cost structures available in Maryland's rural regions to develop or access broadband communications.
- To establish and enhance broadband communications in the state's rural areas, the task force developed proposals and made recommendations to meet predetermined goals for deployment of effective broadband communications in unserved and underserved areas of the state.
- The task force recommended legislation, budget provisions or amendments, and changes in state procurement policy."

The Task Force was responsible for the Rural Broadband Communications Services Act (SB 753/HB 1156) that passed the State Legislature in 2006. The legislation put in place funding and an oversight organization (Rural Broadband Coordination Board) to facilitate the creation of a Broadband Authority (Maryland Broadband Cooperative) to own, design, construct and maintain the regional Middle Mile Backbone Infrastructure:

Tech Council of MD: http://mdbiolab.com/tcm/pdf/TCM_Final_Annapolis_Report_2006.pdf

Legislation: Rural Broadband Communication Services (SB 753/HB 1156) -

"Creates a Rural Broadband Coordination Board and the Rural Broadband Assistance Fund to provide broadband communication infrastructure to underserved areas of the State. Requires the Governor to include in the annual budget at least $4 million in FY2008 and FY2009 for the Rural Broadband Assistance Fund. The FY2007 budget contains $2 million for rural broadband development. Ensuring that Maryland's underserved regions, particularly those in rural regions, have access to broadband is important to economic development efforts and the ability to grow tech businesses in every corner of the State. *Outcome: SB 753 signed by the Governor as Chapter 269, Acts of 2006 - effective July 1, 2006."*

http://www.adestagroup.com/adesta/contents/news/Adesta%20MDBC%20release.pdf

"Open-access fiber optic network to stimulate Maryland's economic development across rural communities in Eastern, Southern and Western Maryland (April 2007)

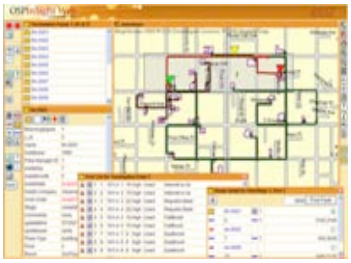
Adesta, LLC, a systems integrator and project management company for communication networks and security systems, today announced that it has been awarded contracts from the Maryland Broadband Cooperative (MDBC) valued at over $8 million to design and build the first 140-miles in the Eastern Shore Area of an open-access telecommunications infrastructure in Maryland's rural communities.

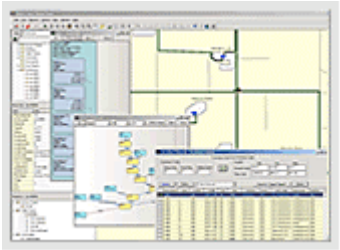
The MDBC is a universal access, fiber optic network designed to deliver an advanced, world class broadband access to rural communities in Eastern, Southern and Western Maryland fostering economic development supported by its' members who will provide Last Mile Services. Members can purchase low-cost access while building their market and customer base. Members can be existing and future competitive local exchange carriers or Internet Service Providers (ISPs); businesses desiring their own internal communications networks;

governmental agencies (federal, state and local); and even existing incumbent carriers and cable television companies that desire expanded or improved coverage of their networks via a fiber optic backbone.
"MDBC is very pleased to be working with Adesta to design and build the optimum fiber optic network for rural Maryland," said MDBC Executive Director, Patrick Mitchell. "Their experience in the industry is critical to integrating future expansion of our network as funding becomes available. The availability of these broadband services will be key to improving the quality of life, increasing the labor pool for businesses considering relocating to the area, and drawing attention to the business friendly environment of Maryland.

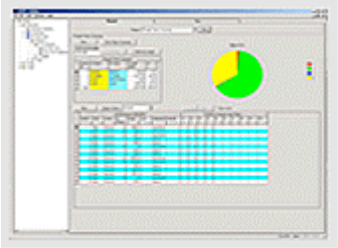
Project Architecture:

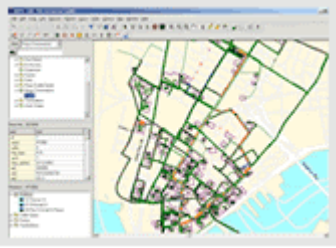
The proprietary nature of the Maryland Broadband Cooperative (MDBC) has obstructed information regarding the architecture, data sources and relevant data for this section. (Patrick Mitchell, phone call, 30june08) The primary route for the Middle Mile network is along the MD DOT Right-of-Way for major thoroughfares. Therefore the data sources might be accessed through DOT and their sources.
Firms related to this section were contacted: Adesta, which is designing/ their fiber network route and construction detailing. However that is their proprietary work. (Bruce Downing, phone call, 11July08) MDBC is using OSP Insight software and the Corp. office for OSP software said their Users have ESRI GIS data bases and applications, with the specific Users' network modeling/routing superimposed on the ESRI application layers. (Randy Anderson, phone call, 11july08) Skyline Engineering, the OSP distributor in MD, is actually performing the work with the OSP software for MDBC. (Glenn Manning, phone call, 7/11/08).
Project Implementation
Maryland Broadband Cooperative (MDBC), the planning organization for the network, is using OSPInsight (http://ospinsight.com/osp/) software from Advance Fiber Optics, Inc. for GIS and network modeling/display, according to Gary Ruack, IT Services Manager (Gary Ruack, phone call, 6/25/08)
"...store valuable and minutely detailed information about every aspect of your fiber optic, coaxial and copper network quicker and easier than any other GIS based network modeling system. It empowers your entire organization with instant and easy access to specific and cumulative network data retrieved from a relational database and displayed in customizable tabular and graphical formats to fit each individual's needs.
The OSPInSight system consists of Outside Plant Management (OSPM) applications, namely OSPM-Edit, OSPM-View, OSPM-ViewLITE, OSPM-Admin and OSPM-Web; and Inside Plant Management (ISPM) applications, currently ISPM-Edit and ISPM-View. Together the OSPInSight suite of products offers affordable choices that can be scaled to any size organization."
For the current network modeling/design, construction, and turn-up stages, the MDBC is using





OSP Insight, an ESRI GIS-based (ESRI and MapInfo alternatives) software that incorporates network design/modeling, network tech specs with spreadsheets superimposed on the GIS base. (Randy Anderson, phone call, 7/11/08)





It can be used for GIS display, network technical detailing, network monitoring of fiber breaks/splicing etc. The software packages include modules for

Editing or Viewing only (ESRI-based pricing: $5000 initial cost, $1000/yr upgrades/maintenance/tech support for Editing version. For Viewing only version: $1500 initial cost, $250/yr. upgrades, and so on. (Randy Anderson, phone call, 11july08) Distributors of the software locally have contractors who can manage the software and inputting data, etc. for a company.

Tri-County Broadband Availability study by consultant: CCG with mapping, Sept. 2005
http://www.tccsmd.org/downloads/Broadband%20Final%20Report.pdf
CCG Consulting, a Beltsville, MD company, conducted an in-depth study for Southern Maryland Broadband Study, Sept. 2005, discussed their methodologies for creating their mapping of service providers: CCG used an estimation tool from a Telco, for DSL ranges used 15,000-ft distance and other methodologies to create a display map. However, whether it is GIS-based is not clear, although maps included are detailed. (Doug Dawson, phone call, 7/9/08)

Resources:

Regional Network Ownership by Maryland Broadband Cooperative
http://www.tccsmd.org/index.cfm?content=83
"The fiber optic backbone network, industrial park collocation facilities, and the shell equipment will be built and owned by the MdBC to allow competitive carriers affordable access to the fiber optic network. MdBC, a company that has been formed, and is a legal not-for-profit cooperative, incorporated with the State of Maryland, will be the "IOE" or Independent Operating Entity as preferred by the Maryland Rural Broadband Coordination Board... MdBC will own the assets, and will have the ultimate responsibility for ensuring the assets (fiber cable, facilities, shell equipment, etc.) are used in a manner that creates operational revenue for the cooperative. Most importantly, this will help create an environment for economic revitalization for the local communities within rural Maryland."
Funding Sources: http://www.ruralforvm.state.md.us/AR_2006.pdf
As a non-profit cooperative, the MDBC estimates $29M will be required for a regional, fiber backbone infrastructure. State and Federal funding are the primary sponsors; subsidiary sources are membership fees currently.
"Rural Broadband Communications Services Act (SB 753/HB 1156) that passed in 2006 ." ... will help fund broadband infrastructure deployment in rural areas. The state ...will provide at least $10 million of the estimated $29 million needed for the deployment of a rural fiber-optic backbone network. The State will provide $10 million over the next three years for broadband infrastructure deployment in Southern Maryland and on the Eastern Shore."
Gov. O'Malley initiated the Phase II of the Rural Broadband Initiative, June 2007, with additional funds of $2M from FY09 budget to continue construction.
http://somd.com/news/headlines/2007/6045.shtml
"The funds, which will come from the Maryland Department of Business and Economic Development's Maryland Economic Development Assistance Fund (MEDAF), are being advanced from the department's FY 09 budget."
Federal funding recently secured by Maryland's Congressional Delegation will also be used. Another $2 million in federal money has been appropriated to construct a fiber optic network connecting NASA on Wallops Island, VA with communities on Maryland's Eastern Shore. Federal funding is also expected next year."
Senator Barbara Mikulski secured a $3.2M grant from the U.S. Dept. of Commerce& Economic Development, which was given to the MDBC in 2007. (Senator Mikulski's office, phone call, 11july08). Her Office said the prospects of any Federal Broadband Legislation passing before the session ends for Summer Break '08 are very slim, since so many bills are still pending.
Rural Broadband Coordination Board, which was created by the Rural Broadband Communications Services Act of 2006, began its work during FY 2007 and will continue into FY 2008. It oversees the distribution of State funding to eligible service providers, is coordinated by the Rural Maryland Council. (David Jenkin, phone call, 7/10/08)
http://www.msa.md.gov/msa/mdmanual/26excom/html/31rural.html
"The Board consists of nine members. They include the Secretary of Business and Economic Development; the Secretary of Transportation; a representative from the Department of Budget and Management; the chair of the Rural Maryland Council; and the chair or designee from five

regional councils. The Board is staffed by the Rural Maryland Council, which also includes in its annual report an account of Board activities."
Rural Maryland Broadband Cooperative (MDBC) ("Rural" has subsequently been dropped) being formed by the five rural regional councils will be responsible for overseeing the planning, construction, and management of this network."
Rural Maryland Council (RMC), an independent state agency that aligns business, governmental interests and profit/non-profit organizations, has advocated rural broadband service for more than a decade.

MDBC Memberships http://www.mdbc.us/services.asp
Membership is necessary for Service Providers, institutions, businesses to connect from the fiber backbone, e.g. the basis of a "cooperative" is for members to benefit.
Class A Membership:
Founding Members of MDBC (Tri-County Council of the Lower Shore, Mid-Shore Regional Council, Upper-Shore Regional Council, Tri-County Council of Southern Maryland, Tri-County Council of Western Maryland)
Class B Membership:
$500.00 one-time fee
Telecommunications Service Providers (ILEC, CLEC, MLEC, Telephone Cooperatives, ISP, IXC, Cable Operators, Wireless, Cellular, including private and municipal providers)
Class C Membership:
$1,500.00 one-time fee
Governmental / Public Sector Providers (users of public use fiber and or managed services for economic development activities. Use could include marketing assistance from MDBC on benefits of the network, assistance in marketing industrial parks, attending site visits, and assistance with preparing marketing literature and web development. Members may include State, County, City, Town, Federal, & Local Agencies, and Higher Education Institutions (public and private).
Class D Membership:
$3,000.00 one-time fee
Commercial and Industrial Users (case by case basis as determined by the Board of Directors in its sole discretion for users who need to use the MDBC network for economic development/job creation activities. Services could include collocation, server farm hosting, data center and storage, network monitoring, or dark fiber).
Class E Membership:
$500.00 one-time fee
Joint Use / Shared Resource Providers (Entities which have agreed to share with the Corporation, or have otherwise agreed to convey, assign, lease or license to the Corporation, a portion of their respective assets, rights or privileges, on such terms and conditions which have been determined by the Board of Directors, in its sole discretion, to be of substantial current or future benefit to the Corporation, and in furtherance of the purposes of the Corporation.)
Previous Models Looked At: The Mid-Atlantic Broadband Cooperative in Virginia
http://mbc-va.com/
The rural Electrification Cooperatives from 1930-40s under FDR is a model of community-based, members ownership that these states have adopted. (Mike Pennington, phone call, 7/5/08)
Virginia Mid-Atlantic Broadband Cooperative
http://www.ecorridors.vt.edu/networks/?network_id=22
"The RBI will provide an advanced telecommunications infrastructure that will span over 700 miles, connect four cities, 20 counties and 56 industrial parks while providing high-speed Internet access to nearly 700,000 citizens and over 19,000 businesses. The project will also be integrated into a larger fiber-optic system across the state. The initiative stems from a unique collaboration between the Virginia Tobacco Indemnification and Community Revitalization Commission, the U.S. Department of Commerce-Economic Development Administration and a non-profit organization."
ECorridors - User map testing Site by Virginia Tech
http://www.ecorridors.vt.edu/maps/broadbandmap.php

"To provide on the ground data that can be used by consumers or municipalities in corroborating and assessing advertised bandwidth service levels, when averages of multiple data points can be determined"
http://www.ecorridors.vt.edu/maps/CBAM/

- "In areas where the map reveals an abundance of high-speed connectivity, communities could use the map as a means to attract technology workers and employers as well as promote entrepreneurial growth of emerging network economy businesses.
- In areas where the map reveals a lack of high-speed connectivity, communities could use the map to justify the need for competitive service provision and/or the development of local broadband infrastructure.
- Service providers could use the map as a tool for locating new market areas for expansion or expeditionary marketing.
- Citizens could use the map as input for personal location decisions, to identify workforce training opportunities, and distance education capabilities."

Project Deliverables:

Most of the initial research of the project was executed years ago, leading up to the current construction phase of the fiber Middle Mile Infrastructure. Studies were performed around 2000-05 by consultants, such as TLA Assoc. and the Yankee Group regarding demand-supply, and by CCG Consulting for the Southern Maryland.
http://www.uppershoreregionalcouncil.org/minutes/Exec%20minutes%20of%208-19-05.doc
"With respect to (physical, demographic) Infrastructure, Washington College GIS department has assembled a tool that will assist local Economic Development Offices with the potential recruitment of new businesses. There will be a GIS map of each county that can be customized to show various entities that would be attractive to future businesses, such as: location of schools, housing communities, water and sewer lines, etc. Also the GIS map will be backed up with an informational database." (2005) Unfortunately, most of the reports are not available, due to proprietary concerns since MDBC is a private organization. (Patrick Mitchell, phone conversation, 6/30/08) and many are outdated by now.
http://www.marylandtedco.org/_media/pdf/publications/ExecutiveSummary.pdf
The Maryland Technology Development Corporation (TEDCO), "a specialized technology transfer arm of the Maryland Department of Business and Economic Development, was established by the General Assembly as a tool for Maryland to use in maintaining and enhancing its reputation as a leader in technology. TEDCO's mission is to foster the development of a technology economy that will create and sustain businesses throughout all regions in the State of Maryland. Currently, TEDCO has programs that aid and promote state-funded incubators, and federal and university laboratories to increase technology transfer and Maryland's eCommerce."
http://www.marylandtedco.org/publications/ereadinessarchive.cfm
performed a study, "eReadiness Maryland", in conjunction with many public/private organizations in 2003: (Renee Winsky, phone call, 10july08)
http://www.marylandtedco.org/_media/pdf/broadbandinruralmd/ESPressRelease.pdf May 2004: Governor Robert L. Ehrlich, Senator Paul Sarbanes, Senator Barbara Mikulski and Congressman Wayne Gilchrest...Senator Pipkin also serves as the Chairman of the Task Force for the Deployment of Broadband in Rural Maryland.

However, all of the studies performed their mission -getting the process going: a rural Broadband Task Force was formed, Legislation (SB 753) subsequently enacted to form the organizations responsible for funding oversight (Rural MD Cooperative Board), for designing/constructing the Middle Mile Infrastructure: Maryland Broadband Cooperative (MDBC), which is directed by a Board from the members of the 5 Regional Councils, and members who are participants in Fiber Infrastructure: Service Providers, Governments, Businesses and so on.

Outcomes:

The construction phase of the MDBC project began in 2007 essentially, yet has accomplished a great deal in this short time. Phase I of the construction of the network is completed and well into Phase II construction.

Adesta constructing Fiber OC-192 Middle Mile Backbone Infrastructure:
http://www.adestagroup.com/adesta/contents/news/Adesta%20MDBC%20release.pdf
"The first leg of the MDBC Network backbone runs from the NASA Flight Facility in Wallops, VA North into Maryland ending in Salisbury. Lateral connections will be constructed to several locations including; UMES, MIST and Salisbury University. Engineering and construction are underway on this segment and completion is scheduled for Q2 2007. The second backbone section will travel North and West from Salisbury to the Chesapeake Bay Bridge through the cities of Cambridge and Easton. Included are diverse loops around the bypasses of Salisbury and Easton. Design and engineering are underway with full testing and turn-up planned for Q1 2008.
"Adesta's turnkey solution will consist of design and construction of the fiber-optic network with 144 to 288 strands of dedicated fiber backbone. Adesta will provide and install an advanced, open-access, fiber-optic SONET system, with an OC-192 backbone and smaller connections at lateral endpoints across segments of the network. These end points will connect to universities, industrial parks and other points of interests such as business development and technology. Adesta is proud to be chosen as a member of the team bringing this world class network to the rural communities of Maryland," said Bob Sommerfeld, President of Adesta."
"Telecommunications network construction is at the core of our foundation. We look forward to working with the MDBC on the development of their network."

Impact:

Western Maryland has developed Broadband networks, without waiting for the MDBC network to arrive, which will be in 1-2 yrs before connecting to the regional Middle Mile Infrastructure.
http://www.allconet.org/Telephony_Magazine.pdf
http://www.allconet.org/Wireless-Business-Technology.pdf
CONXX Networks with WiMAX backbones/backhaul of 311Mbps and Wi-Fi networks have constructed AllCoNet2, a SONET backbone for Allegheny County Government, schools, libraries, with Wi-Fi drops to businesses and residences. (Brent Mortensen, phone call, 3july08) (CONXX Carrier-Grade Multi-Service Network: Business Model, March 11, 2008)
"Networking Case study*:* A Maryland community is saving millions of dollars with a JCI automated meter reading (AMR) project and is using the savings to deploy a next generation Wi-Fi / WiMAX municipal network. Covering over 12 miles the community leaders are instituting a number or programs including:
 Free or inexpensive Internet connections for children who qualify for free or reduced lunch (E-rate program qualifications). They are also given used computers that have been loaded with open source software. The school district now offers on-line tutoring and is planning on introducing web based video instruction.
 Free Wi-Fi in the main business district and tourist areas
 Chamber of Commerce is sponsoring a "walled garden" or free information on local restaurants, current and upcoming events.
 Free access to government web sites and agendas"
New Businesses Locating to Eastern Shores, MD
A Data Center (privacy prohibits naming) is looking for a new location in MD. Poole & Assoc., a Defense Contractor, is seeking a location in the region. (Mike Pennington, phone call, 8July08)

Project Lessons Learned:

A large team of diverse players is necessary: Federal, State elected/staff officials, County officials/commissioners and local officials, businesses and residential representatives, all worked successfully in the some 10 years of planning the Regional Broadband Backbone Middle Mile and Last Mile. From the early Task Force stage to the later stages of planning Last Mile with Service Providers, a diverse team produced economic development for the Region, as shown on one regional website: http://www.skipjack.net (Mike Pennington, 8july08)

Outlook:

The Maryland Regional Model Middle Mile Infrastructure is well grounded with support for over nearly a decade from local to federal level participants. The many Regional Councils are prospering now, e.g., http://lowershore.org/Home.html, with economic development growing from the impetus of the Broadband Middle Mile.

ConnectedTennessee http://www.connectedtennessee.org/

Project Description

Connected Tennessee is in its second year of operation. An off-shoot from ConnectKentucky concepts and staffing, Connected Nation is the organizer of the project. The two to three years framework for getting the project up and achieving goals is the target for the short term. The Governor's 5 Goals are the focus:
http://www.connectedtennessee.org/_documents/CTNHealthcareOverview.pdf

"Blazing Governor Phil Bredesen's Trail to Innovation is Connected Tennessee's highest priority. Connected Tennessee is creating and growing a collaborative network among telecommunications and information technology providers, public agencies, business leaders, community leaders, researchers and universities in an effort to meet the five comprehensive goals of the Trail to Innovation:

- Affordable broadband availability for all Tennessee.
- Dramatically improved use of computers and the Internet by all Tennesseans.
- The formation of eCommunity Leadership Teams in every county - local leaders who assemble to develop and implement technology growth strategies for local government, business and industry, education, healthcare, agriculture, libraries, tourism and community-based organizations.
- A policy and regulatory framework that encourages continued investment in communications and information technologies year after year.
- A meaningful online presence for all Tennessee communities, to improve citizen services and promote economic development through e-government, virtual education and online healthcare."

For the formation of Connected Tennessee, creating a Governor's Broadband Task Force with representatives from the major Service Providers, TRA, and other stakeholders, Legislation Senate Bill 2152 was approved by the Gov, June 17, 2005. Charged with determining an assessment of Broadband deployment in TN, the Report due to Legislature by Jan. 1, 2006
http://www.tennessee.gov/sos/acts/104/pub/pc0413.pdf
"The enabling legislation charged the (Tennessee Broadband Task Force) with assessing broadband deployment in the state, with emphasis on DSL and cable infrastructure. However, the new law expressly did not seek to enable the task force or such agents as (Tennessee Regulatory Authority) to "require private industries to release proprietary information, including the penetration of customers or customer information." The law did say that telephone and cable businesses "shall submit" information the task force needs for its assessment... (The) response to a recent TRA survey of broadband deployment had been woefully inadequate to support the task force's information needs, with only 45 of 104 known broadband service providers having responded." (e.g. Service Providers weren't cooperative with their data. - DD)
Http://www.nashvillepost.com/news/2006/4/20/assemblys_broadband_task_force_confronts_reluctant_industry Under Tennessee's open records law, information supplied to the TRA is available to the public. Broadband providers are thus discouraged from providing deployment information to the TRA, because such data would be available to their competitors.

"Arnold Reed, with the Tennessee Regulatory Authority (TRA), estimated statewide penetration of residential broadband lines for the Broadband Task Force in July 2006 by dividing FCC-reported residential broadband lines in service by US Census Bureau estimates of households. (FCC data is available at http://www.fcc.gov/wcb/iatd/comp.html, and the most recent Census estimates of households (July 2006 as of this writing) is available at http://www.census.gov/popest/housing/HU-EST2006.html) The FCC does not currently publish broadband data below Zip code, and the data is typically several months old by the time the FCC releases it. This calculation showed that as of June 2005, less than one-quarter of Tennessee households had adopted broadband. (The corresponding figure for July 2007 is 42%.) A May 2006 report by the Government Accountability Office (GAO) (see http://www.gao.gov/new.items/d06426.pdf) estimated that 17% of rural households had

adopted broadband compared with 29% of urban and 28% of suburban households. This report demonstrated the likelihood that the less-populated areas of Tennessee might lack access to broadband compared with urban and suburban areas. Because detailed deployment data from providers was not available, it was necessary to utilize assumptions to estimate the theoretical deployment of broadband for a typical rural county. In September 2006, Mr. Reed estimated the theoretical deployment of telephone company-provided broadband (DSL) in a typical rural county by drawing a 9,000 foot radius around the location of each telephone company central office. (Broadband can typically be provided within a distance of 10,000 feet from the central office; a 9,000 foot radius was chosen because cable plant rarely runs in a straight line.) Cable TV franchise agreements typically require deployment of broadband in areas with a density of 20 homes per square mile or greater. Thus the theoretical broadband deployment for a typical rural county showed that 66% of the population but only 13% of the geography would have access to broadband." (Arnold Reed, edit, 26Aug08)

The Governor's Broadband Task Force Report, issued January 10, 2007, stated that information from Providers in rural areas was lacking, and "the Task Force cannot determine specifically where Broadband is deployed. Broadband providers consider that information proprietary." Their (Task Force) recommendation for obtaining information was to model the ConnectKentucky effort, which afforded a public-private partnership to which Providers agreed they would submit data. Other concepts from ConnectKentucky were named as models to determine Broadband Availability, since that KY team discussed their project with the Task Force.
The Task Force set out an agenda: "Where are we? Where do we want to go? How do we get there? "
Other States' Programs and many Providers discussed options with the Task Force over alternative strategies for deployment.
http://state.tn.us/tra/bbtaskforce/Tenn.%20Broadband%20Task%20Force%20Report%20and%20Recommendations.pdf

The precedent for ConnectKentucky's success stories, e.g. going from 60% Broadband adoption to near 90% adoption 3 yrs after the Program began, encouraged the TN authorities to engage the services of Connected Nation, the spin-off from ConnectKentucky. Mike Ramage, Exec. Dir. worked with ConnectKentucky and transferred over to ConnectedTennessee program. (Mike Ramage, discussion, 5/20/08)

Funding Source
ConnectedTennessee received a grant over $6M in 2007 for 3 yrs, or $2.25M/yr from the TN Dept. of Economic Community Development. The grant is used for functions, such as mapping, research, which Connected Nation performs for them, local planning processes (e.g. Exec. Dir., PM salaries), Computers 4Kids program and some communities functions such as advertising broadband issues. (Mike Ramage, discussion, 5/20/08)

Outlook
According to Executive Director Mike Ramage, they are doing well after 2 years. (Mike Ramage, discussion, 5/20/08)
Other sources have contrary findings if TN is in any way reminiscent of Connect Kentucky's outcomes, e.g., http://www.publicknowledge.org/node/1334
.
Nashville Business Journal, 5/13/08
http://memphis.bizjournals.com/nashville/stories/2008/05/12/daily4.html
"Tennessee businesses with broadband Internet access rose 16 percent in the second half of last year, according to a new report.
Connected Tennessee, a public-private partnership organization formed to accelerate technology in Tennessee communities, released its technology trends report, which tracked broadband access through December 2007.
Overall, 64 percent of businesses in Tennessee have broadband service, up from 55 percent in July 2007. Small businesses, or businesses with 20 employees or less, showed the most significant jump in broadband adoption, increasing from 61 percent to 77 percent.

Half of all Tennesseans have broadband service at home, up from 43 percent in July 2007. The study tracks the use and impact of computers, the Internet and broadband technology among residents and businesses, and found that rural communities saw a spike in broadband usage.
According to Connected Tennessee, a correlation exists between the presence of broadband connection and company revenue. Tennessee businesses with a broadband Internet connection have median annual revenues that are more than two times greater than companies that rely on dial-up service, according to the organization. "

Contacts

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Project Background

The Governor started the TN Broadband Assessment in 2005 with investigations and research prepared after a General Assembly Public Chapter 413 of 2005. The final Tennessee Broadband Task Force Report and Recommendations delivered Jan.10, 2007. http://state.tn.us/tra/bbtaskforce/Tenn.%20Broadband%20Task%20Force%20Report%20and%20Recommendations.pdf The Report recommended using the Connect Kentucky model and hiring Connected Nation, which the Governor approved in 2007.

Tennessee State Government, Economic and Community Development Dept, Matthew Kisber, Commissioner, was the channel through which the more than $6M grant for 3 years from the State passed. (Mike Ramage, discussion, 20May08) Connected Tennessee keeps contact with the ECD, according to Arnold Reed, TRA. (Arnold Reed, discussion, 6/3/08) http://www.state.tn.us/ecd/comdev.htm

Mike Ramage, Executive Director, Connected Tennessee, as former Project Manager with ConnectKentucky, Ramage's role was "facilitating comprehensive GIS-based Inventory Assessment of existing broadband infrastructure and service availability, the community-by-community implementation planning process and ensuring that every county in Kentucky's western region has an online presence and the ability to improve the quality of life at the local level." http://www.spock.com/Michael-Ramage-jOnXB1EO

Connected Tennessee Architecture and Platform/ Implementation:

Connected Nation performs the Research and Mapping for all their affiliated states projects, according to Joe Mefford (discussion, 5/15/08). The Team accumulated contacts and "lessons learned" from experiences with other states mapping/research and contacts with major service providers. Service Providers are presented an NDA with the 3rd neutral party, e.g. Connected Nation, and the providers have been cooperative. However, their process with the Providers is a "black box". No one exactly what data is collected, how it is assimilated/interpreted, or how accurate the data might be. Only the output in map format is disclosed.
Mefford stated that Service Providers find they benefit from market data they otherwise wouldn't have from the Demand side.

ESRI SUITE of products is the platform for Connected Tennessee, with providers supplying their data in any format they have, which is converted into GIS platform by the Mapping Team.

(Mike Ramage, discussion, 5/20/08) Updates from the Providers are supplied when the Providers have them and in the format of the Providers choice, again converted to GIS.

An example of Data Layers in mapping is attached:
http://12.180.242.34/tnbroadband/default.aspx

Major Layers

- TN Broadband
- City
- Interstate
- US Road
- Local Roads
- County Boundary
- Broadband Adoption
  - Significantly lower (< 27%)
  - Lower (27-42%)
  - Statewide Average (43%)
  - Higher (44-55%)
  - Significantly Higher (>55%)
- National and State Parks
- Water
- Broadband Available
  - Broadband Available (high)
  - Broadband Likely Available (low)

- Density of Unserved Households (in Sq Mi), per Census Block
  - 0-8
  - 9-20
  - 21-40
  - 41-85
  - 86+
  - Area less than 0.25 sq. mi.

- Number of Unserved Households, per Census Block
  - 0-10.9
  - 11-25.9
  - 26-50.9
  - 51-100.0
  - 101+
  - Area less than 0.25 sq. mi.
  - Aerial Imagery
- Ortho statewide 400 ft Scale B&W
- State of Tennessee

Data Sources:

State GIS Maps:

"The State's Office for Information Resources (OIR) GIS Services Director, Dennis Pedersen, met with Connected Tennessee to see what CT would need. OIR GIS Services is providing them with base maps (imagery, street centerlines) of TN without telecom boundaries. Through a contract between the State and Tele Atlas, the Dynamap Transportation product is currently being used by CT. OIR GIS Services offered to host a "public-facing" GIS application so that

the public could type in an address and find out which Broadband service might be close / available. However CT developed their own GIS application."
http://www.connectedtn.org/broadband_landscape/interactive_map.php
(Dennis Pedersen, edit, 8/19/08)

TN and Related GIS Links throughout public and private sectors:
http://tnmap.state.tn.us/portal/GISLinks.aspx#UserGroups

Service Providers: Data emanates from the providers, who have been cooperative with NDAs and given access to final data results. They willingly provide updates to their data when it is available and in whatever format they are using. When they see the Demand with ROI, providers are willing to build out networks to accommodate customers, according to Mike Ramage, Exec. Dir., CT. (Mike Ramage, discussion, 5/20/08)

Communities and populations: The Connected Nation Research team is involved with some basic survey work. The Communities formulate their Strategy Plan, revolving around: Where are we? Where do we want to go? How will we get there? (e.g. gap analysis)
"One of the key goals of Connected Tennessee is to establish eCommunity Leadership Teams in every county. Connected Tennessee's technology planning specialists (eCommunity Strategists) will work with these teams to develop comprehensive technology growth plans that involve many sectors of the community including local government, business and industry, education, healthcare, agriculture, libraries, tourism, and community-based organizations. Each eCommunity team will complete a Strategic Technology Plan for their respective county. The reports will provide every Tennessee county with a tactical plan to address its own challenges related to technology growth. Each Tennessee resident stands to benefit from the eCommunity Leadership Teams' hard work.**"**
http://connectedtennessee.org/find_your_county/ecommunity_strategies.php
Community Benchmarking Tool is created for every sector analyzed: Agriculture, Business/Industry, Community-based organizations, education (Higher, K-12), local government (eGovernment), healthcare, libraries, and tourism. For example see Higher Education Benchmarking Tool: http://www.connectedtn.org/_documents/HigherEducation.pdf
The Surveys and Benchmarking Tools are used in Gap Analysis, e.g., where are we in 200X and where do we want to be in 200X+ 2 yr. Then: How do we get there? Broadband Deployment may be one the solutions. For example, the Business and Industry Benchmarking Tool:
http://www.connectedtn.org/_documents/BusinessandIndustry.pdf

Connected Tennessee Resources

State-funded Networks and Services which may or may not be included in Connected Tennessee's framework:
Other programs in TN with broadband, includes the State: **Tennessee Integrated Infrastructure (TNII)** as pubic/private partnership of companies, educational institutions, governments on high-speed Carrier-Class Network ATM backbone (OC-12) across the state connecting all 95 counties with 1300 sites. The network is now "powered by AT&T and serviced by AT&T network managers." http://www.tnii.net/ehealth/about.htm
http://www.tennessee.gov/finance/oir/ops/tnii/
"The TNII Network is a highly fault-tolerant, integrated Internet Protocol (IP) network supporting data, voice, video, and Internet services. The core network is constructed around five Network Access Points (Naps) that are cross-connected by extremely high speed circuits (typically DS3, OC3, or faster). The network is constructed so that failure of any circuit - or even an entire NAP - will not bring down the network.
Point of Presence (POP) sites are geographically dispersed throughout Tennessee, connecting to the NAPs using multiple DS3 links. A central Network Operations Center (NOC) actively monitors and maintains the network 24 hours per day, every day of the year."
http://www.tnii.net/Network.aspx

http://www.tnii.net/Network.aspx ; http://www.tennessee.gov/finance/oir/ops/tnii/
State GIS Services: http://gis.state.tn.us/
"The mission of the GIS Services Division is to provide the highest possible quality geospatial services to users within the State of Tennessee in a timely fashion as economically as possible. The Division will facilitate the efficient and effective management of the human, cultural, and financial, and natural resources of the State of Tennessee, and its local communities. Geospatial services are defined as technical, management, and administrative consulting, data provision, application development and implementation services of spatial information."
State Base GIS Maps available without charge will be used by Connected Tennessee
(Dennis Pedersen, Director State GIS, discussion, 3June08)
Base GIS Map of TN: http://tnmap.state.tn.us/viewer/
Base GIS Maps for all Counties: http://www.tngis.org/doqq/tnbasemap/
Base GIS County Maps, 2007 National Agriculture Imagery Program (NAIP)
http://tnmap.state.tn.us/portal/DataSales.aspx
State Supported E-Health activities and networks: (TBD whether used or not)
"TNII is available to any health care provider in any of Tennessee's 95 counties. And with state-negotiated prices, you can benefit from the same purchasing power a large hospital or state agency would have. TNII will allow you to spend resources on your patients, not on IT staff."
http://www.tnii.net/ehealth/about.htm
"Today, there are six eHealth activities that specifically benefit from broadband:

- **Electronic Medical Records** The collection, communication, storage, indexing and access to patient data.
- **Clinical eHealth** The collection, communication, storage, indexing and access to patient data.
- **Evidence Based Medicine** Aimed primarily at health care professionals, this service delivers information on appropriate treatment under certain patient conditions so that the professional can determine whether a diagnosis is in line with current scientific research.
- **Consumer medical and health information** Consumers are able to use the Internet to obtain specialized health information and on-line discussion groups to provide peer-to-peer support.
- **Medical education** The use of online medical education for health professionals and special medical education seminars for targeted groups in remote locations.
- **Virtual healthcare teams**. The creation of teams of healthcare professionals who collaborate and share information on patients through digital equipment (for transmutable care).

"State TNII Broadband offers five delivery mechanisms to support these activities:

- **Advanced network services** These include both dedicate high-speed lines and connections and Virtual Private Networks (VPNs). Networks link tertiary care hospitals and clinics with outlying clinics and community health centers in rural or suburban areas. Studies by the several agencies within the U.S. Department of Health and Human Services and private vendors place the number of existing telemedicine networks in the United States at roughly 200. These programs involve close to 2,000 medical institutions throughout the country. Of these programs, it is estimated that about half (100) are actively

providing patient care services on a daily basis. The others are only occasionally used for patient care and are primarily for administrative or educational use.

- **Point-to-point connections** Using private networks, hospitals and clinics deliver services directly or contract out specialty services to independent medical service providers at ambulatory care sites. Radiology, mental health and even intensive care services are being provided under contract using telemedicine to deliver the services.
- **Network to End-User Connections** Primary or specialty care to the home involves connecting primary care providers, specialists and home health nurses with patients over broadband video systems for interactive clinical consultations.
- **Home to monitoring center links** Specialized broadband applications are used for cardiac, pulmonary or fetal monitoring, home care and related services that provide care to patients in the home.
- **Web-based e-health patient service sites** These provide direct consumer outreach and services over the Internet. Under telemedicine, these include those sites that provide direct patient care. "
  http://www.tnii.net/ehealth/

Education Network of America (ENA), after 10 years in existence is one of largest E-Rate recipients in TN, expects to have 10Mbps or more at each school within 3-5 years, according 2006 report.
http://state.tn.us/tra/bbtaskforce/Tenn.%20Broadband%20Task%20Force%20Report%20and%20Recommendations.pdf

In June 2006, the Tennessee Regulatory Authority (TRA) estimated residential broadband penetration at 23.8% by dividing FCC reported residential broadband lines by Census estimates of households. (The most recent data from the FCC (June 2007) shows that approximately 42% of Tennessee households have broadband.) In September 2006 Uses 9,000 ft radius for Broadband from Central Office since 18,000 ft hypothetical radius requires cable runs in straight line. Their data shows 34% population and households with 87% of area in sq. miles not served by Broadband. (Sept. 2006)
http://state.tn.us/tra/bbtaskforce/Tenn.%20Broadband%20Task%20Force%20Report%20and%20Recommendations.pdf

Impact

Legislation recently passed in TN for AT&T to have a state franchise to serve cable for TN state. (Pub Ch. 932, SB1933, and HR1421), effective July 1, 2008**:**
"Broadband Internet service" means an asymmetrical connection to the Internet from a home computer with an expected download data transfer rate of at least one and one-half megabits per second (1.5 Mbps), or, after January 1, 2012..."
http://www.legislature.state.tn.us/bills/currentga/Chapter/PC0932.pdf

According to Jan. 24, 2008, Memphis Business Journal, AT&T is providing free Wi-Fi locations in TN and worldwide: http://memphis.bizjournals.com/memphis/stories/2008/01/21/daily16.html
"**AT&T Inc.** is making wireless Internet free at more than 10,000 hot spots nationwide for the company's broadband customers, including 39 in Memphis. The plan is geared toward AT&T's wireless-enabled devices such as iPhones and PDAs, which are growing in popularity. According to a the Wireless Internet Access 2007 report by Pew Internet & American Life Project, more than one-third of Internet users have logged on using a wireless connection from home, work, restaurants, retail stores or airports, which demonstrates an increase in on-the-go connections, AT&T said." AT&T free locations throughout TN, especially in McDonalds in rural areas, are shown on the Map: http://attwifi.know-where.com/attwifi/cgi/region?country=US&region=TN&design=default&lang=en&option=&mapid=US&optionOPT1=&optionOPT2=

Although this item is found on the State TNII website, it could be influenced by Inventory/Accountability emphasis with Connected Tennessee and similar projects:

"March 24, 2008 | Congress introduces FLAIR Act
Representative Marsha Blackburn from Tennessee is co-sponsoring HB5532, referred to as the Federal Land Asset Inventory Reform (FLAIR) Act. This bill creates a single, Federal multipurpose cadastre (a uniform Federal computer database), in accordance with standards recommended by the National Academy of Sciences (NAS). The bill also calls for an "inventory of inventories," so that duplication can be identified and eliminated. The FLAIR Act will provide all agencies owning Federal real property an improved accounting for their land assets. Such an inventory will assist in improved Federal land management, resource conservation, environmental protection and utilization of real property.
"In December 2006, the Government Accountability Office (GAO) reported the Federal government failed its audit for FY 2006. GAO has repeatedly (108th, 109th, 110th Congresses) designated Federal Real Property Asset Management **one of the high-risk areas within the Federal government most prone to waste, fraud and abuse. One of the reasons cited by GAO is the fact that the government does not have a current, accurate inventory of the land it owns**."
http://tnmap.state.tn.us/portal/newsarticles/20080320_Congress_introduces_FLAIR_Act.pdf

Outcome

From an article in the Nashville Post, July 27, 2007:
"The Connected Tennessee campaign is designed to enlist state and local elected officials, business executives, educators, individual consumers and such organizations as regional technology councils.
"As the outreach effort expands, it is likely to influence next year's anticipated General Assembly debate over changes to state laws governing cable- and video-services franchises. Concern about service to rural areas, as well as power that might be lost to local municipalities in the wake of reform, were pivotal in the collapse of that legislative effort, in May."
http://www.nashvillepost.com/news/2007/7/27/report_shows_digitally_divided_urban_rural_tennessee

Vermont Telecom Authority http://www.telecomvt.org/

"Our congressional delegation, especially Senator Leahy, has done great work over the past several years in bringing millions of dollars to the state for broadband."
http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf

Project Description

Mission
"The Authority is designed with three guiding principles: (1) commitment to providing the most advanced services to all Vermonters; (2) taking action to complement private sector investments; and (3) creating a sustainable model that will continue to keep Vermont on the leading edge of these services.
"...The Authority will be empowered financially, with bonding and traditional loan resources and with the assets of the state such as, rights of way, lands, towers and buildings."
http://finance.state.vt.us/Fin%20Budget%20Documents/2008%20ebrs.pdf

Goals, Timing and Funding Source for Projects

"Governor Douglas proposed that by 2010, Vermont become the nation's first true "e-state" - the first state to provide universal cellular and broadband coverage everywhere and anywhere within its borders. The Governor also proposed the creation of the Vermont Telecommunications Authority (VTA). The state can provide the VTA with the state's moral obligation to enable the VTA to borrow up to $40 million in revenue bonds to back projects in the first year of construction, and possibly more if needed and sustainable. The initial target is to leverage more than $200 million in private sector investment. Repayment of the borrowing for the project will be based on revenues generated from leasing access to the infrastructure, such as fiber optics networks or space on the towers, or the revenues from services provided over the network." http://finance.state.vt.us/Fin%20Budget%20Documents/2008%20ebrs.pdf

Goals: Short, Long Term
"The state, through the 2004 *Vermont Telecommunications Plan*, established a goal that 90% of Vermonters have access to broadband services by 2007 and 100% by 2010. This year (2007), the Governor has renewed the goal of achieving universal availability of broadband services by 2010, and has also called for universal availability of cellular service in Vermont by 2010 (with Act 79).
"(Vermont) must focus on *both* short and long term horizons. For the short term, we must bring high speed Internet access to as many Vermonters as possible, as quickly as possible (e.g., wireless). We must also start now on an extended effort to support the development in Vermont of the next generation networks..., which are the future of Internet, television and telephone services (fiber)."
http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf

Funding Source for VTA Administration
"The authority will need operating funds as well. The Governor's budget recommends the amount of $450,000 to be made available for next year's budget." (FY2008)
http://finance.state.vt.us/Fin%20Budget%20Documents/2008%20ebrs.pdf
With the Governor's initial creation of the VTA, Jan 2007, he allocated $200,000 for FY 2007 budget

Contacts

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	Project Mgr.		
VT Dept. of Public Service	Corey Chase, Telecom Infrastructure Specialist	802-828-1257	

VTA Project Background

"In the winter of 2002-2003, the Vermont Council on Rural Development (VCRD) and the Northeast Kingdom Collaborative sponsored a study of the use of the Internet by businesses and residents in northeastern Vermont. While the use of the Internet was high, even in the most rural areas, the smaller communities were frustrated by a lack of affordable high speed Internet access. As a result, the VCRD created the Vermont Rural Broadband Project to assist rural communities (approx. 40) across the state in local efforts to acquire affordable broadband service for their areas." A list is provided of Broadband efforts by all 40 towns.
http://www.vtruralbroadband.com/about-thisproject.html
The VT Dept. of Public Service is a Consumer Advocacy organization within the Governor's Administration. They lobby for citizens before the PSB (VT Public Service Board), take complaints and produced a Vermont Telecommunications Plan, v.4 in Sept. 2004.
http://publicservice.vermont.gov/pub/state-plans-telecom.html
Availability Maps from 2002 are precursors to the current 2008 efforts.
http://publicservice.vermont.gov/pub/telplan4-mapgallery.htm
"As of early 2006, broadband was available to approximately 84% of Vermonters by population. This figure is currently being update to include new deployment, but we anticipate it will be nearly 90%.
The final 10% of Vermonters will be the most difficult to reach. Major broadband providers have said they will not reach everyone and small start-up broadband providers are expanding service, but at a limited pace...Cellular service in Vermont is also inadequate. We have approximately 85% coverage along our interstates and major highways like Routes 2, 4, 7, and 9, but several major and many minor gaps remain sufficient to disrupt the experience of users. Coverage in smaller communities and secondary highways is much less reliable. Lack of coverage is a serious issue for employers, residents, visitors, and colleges trying to recruit and retain students."
http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf

Funding 2005-2007

Federal Assistance:
"Federal grants and appropriations are currently funding three large infrastructure projects in Vermont. The ConnectVermont Fiber Project, which will place fiber optic cable in interstate highway rights-of-way, is funded through a ten million dollar Federal Highway Administration. High Priority earmark obtained through Senator Leahy. The North-Link project will construct fiber rings around Vermont's six northern counties. Senator Jeffords worked closely with the Economic Development Administration, which has provided $3 million in grants for the North-Link project. Senator Leahy announced a $500,000 federal appropriation for the project in December 2005. Both the North-Link and ConnectVermont projects do require local match, and each has particular limitations and requirements linked to the project, such as the requirement that the ConnectVermont dollars be spent on routes that will support Intelligent Transportation Systems (ITS). However, they do make financially feasible infrastructure projects that would not be on their own. In both of these cases, federal grant money has been available for "middle mile" projects."
Federal USDA Rural Utility Service (RUS) Funding: Vermont Service Providers have not qualified for RUS funds.
Vermont Economic Development Assoc. (VEDA) "The Vermont Economic Development Authority (VEDA)19 administers the Technology Infrastructure Fund (TIF) and has made available close to $2 million in below market interest rate loans as part of the TIF Program. The TIF Program can make loans of up to $1 million and was designed to aid the development of advanced technology infrastructure in Vermont."

State Funding For initial studies 2005-2007, data collection, mapping, and reports conducted by the VT DPS and VCGI's GIS mapping, many organizations established a consortium of funds for grants:
"A grant program was established by the state in partnership with the Agency of Commerce and Community Development, the Department of Information and Innovation, the Vermont Sustainable Jobs Fund, the Vermont Council on Rural Development, and the Vermont Broadband Council. The program provides grants to communities that do not have, or likely are not able to financially afford, broadband service. The program is funded through the capital budget, with $550,000 cumulatively appropriated in fiscal years 2005-2007, and has thus far awarded grants to twelve Vermont towns. Grants are limited to not more than $50,000 per application. Because of the small size of the grants and the criteria of the program, which favor proposals that can cover large portions of a town, all awards to date have been for wireless broadband projects."
Municipal "Municipally facilitated financing has been used in the development of Burlington Telecom. The city financed the construction of a fiber network to city and school locations throughout Burlington and the hiring of an operations staff by re-directing dollars that were being spent on the purchase of telecommunications services. The expansion of the network to residential locations is financed through a capital lease provided by the private company Koch Financial, payment of which is backed by revenues from the network."
http://publicservice.vermont.gov/Broadband/Broadband%20Deployment%20in%20Vermont%20Final.pdf

VT Legislature passed Act 79 in 2007 to extend wireless and broadband coverage to 100% of state by 2010. The Vermont Telecom Authority, a quasi-governmental agency that works with the PUC and the Public sectors, was created in the legislation as well. VTA work began YE07. (Source: Jim Robinson, VTA Program Director, discussion 5/28/08)

Outlook:
VT has a sophisticated and educated population. The geography is rough, mountainous, beautiful green trees / pastures during summer and snowed-in during winter, with a deep Environmental tradition. With a year-round tourist population to enjoy temperate, scenic springs/ summers, colorful mountains in fall and ski-slopes in winter, the state has a need for excellent communication systems with transient vacationers as well as year-round users.

Very innovative solutions are being encouraged and used, such as the following:

- For wireless antenna placements: making deals with communities/utilities to use water towers, utility poles, silos from private sector.
- State Government making deals with Service Providers who will build-out rural areas by offering State Assets (ROW, towers, etc.) at a discounted price or no charge.
- Strict Environmental laws were superseded with new permitting legislation allowing: Streamlining Permitting
  - New permitting process for a **network permitting basis**, not site by site permitting: "If Vermonters require a network of sites in order to get service, it makes sense to review the environmental impact of such proposals as a network instead of a collection of individual sites. We propose that developers of wireless communications infrastructure (such as the Vermont Telecommunications Authority) be given the option to request a permit from the Public Service Board in lieu of local and Act 250 permits, if they are proposing a multi-site development. Such a process should require the Board to weigh relevant...criteria, the requirements of the municipalities involved, as well as the state's need for service. In addition, we recommend the creation of a streamlined review process for wireless facility attachments to existing electric transmission and generation facilities, which are already reviewed by the Public Service Board. To avoid drawn-out litigation, these processes should have statutory clocks for a decision to be rendered."
    http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf
  - "Use the government capital for infrastructure of cell towers, which the private sector leases and eventually pays back the $40M bond to the government.

- ROW on government land (state/local) streamlined permitting to facilitate rapid permitting.
- With Utilities: stimulating deals for using dark fiber for back haul of wireless communications, providing enhanced substation and Smart Grid connections.

(Source: Jim Robinson, VTA Program Director, edits, 11/16/08)

Architecture:

GIS mapping will be performed by the Vermont Center for Geographic Information, a non-profit organization created by the VT State Legislature. (See Resources section for more detail.)

Implementation:

Data Sources

Two organizations collect the data from Services Providers (SPs).

- VDPS: Requests data when they issue Permits with a Reporting Requirement for Telcos/DSL and Cable
- VTA: No Reporting Requirements for Wireless SPs, but Non-Disclosure Agreements (NDAs)

VTA Mapping for Service Providers:

- NDAs signed with Providers
- Formal mapping is done through VCGI using the ArcGIS program suite. Internally, Google Earth is used in mapping to record the location of features, e.g. towers, silos, for future use.
- Data is leveraged from several fortuitous deals/merger with wireline Telcos, Cable:
- Verizon sold VT land lines to FairPoint of Charlotte, North Carolina.
  "FairPoint and Verizon announced plans early this year for the transfer, which involves 1.6 million phone lines in New Hampshire, Vermont and Maine for $2.7 billion."
  http://www.boston.com/news/local/new_hampshire/articles/2007/05/03/senate_passes_telecom_authority_bill/
  - With the sale, Fairpoint agreed to build out 50% of its VT exchanges to 100% availability with DSL. Remote switch locations will be built out. DSL locations are reported to the DPS annually.
- Adelphia Cable, in financial trouble in early 2000s, was watched by the DPS closely and had to turn in maps and expansion plans to DPS. Prior to when Comcast bought the assets from bankrupted Adelphia, the DPS obtained an agreement with Adelphia to build out the 300 extra miles.
- FairPoint, with Verizon's lines, would build out their 50% of the state with DSL as a sales agreement.
- With wireless Service Providers, RF coverage and wireless data from DPS:
  - Wireless by RF band by year, by site
  - Verizon wireless in central VT
  - U.S. Cellular primarily in southern VT
  - AT&T will obtain RCC wireless in VT, as a condition of the Verizon Wireless purchase.

(Source: Jim Robinson, VTA Program Director, edits, 11/16/08)

Resources

State has a non-profit State GIS / Mapping organization, Vermont Center for Geographic Information (VCGI) http://www.vcgi.org

"VCGI is a non-profit public corporation charged with the development and implementation of a comprehensive strategy for the Vermont Geographic Information System (VGIS). Further, VCGI is charged with ensuring that all data gathered by state agencies that are relevant to the VGIS shall be in a form that is compatible with, useful to, and shared with that geographic information system."

VCGI has geospatial data (digital maps) which include a number of layers such as roads, rivers, Census demographics, building densities, broadband coverage, and many others.

(Source: Jim Robinson, VTA Program Dir; Steve Sharp, VCGI, Edits, 11/6/08)

Some Data Sources and Mapping with VCGI
Service Providers Data: 2005-2006: Cable, DSL, Wireless, Telecom Facilities, Telephone Exchange Boundaries
http://www.vcgi.org/dataware/?page=./search_tools/search_action.cfm&query=theme&theme_id=019-0015
Maps by Theme
http://www.vcgi.org/dataware/?page=./theme_index/default_content.cfm

Comparative cost of Wireless, Wireline Networks**:**
"Typically, it will cost **a cable provider** approximately $23,000 a mile to deliver cable services. **DSL services** based out of the phone companies' central offices have a limited range (18,000 wire feet) and are unable to reach many of the consumers more than three miles from the center of town. Permitting for this these types of deployment, not to mention the environmental impact of running miles of cable, could take until 2010 just to get started. In the end, these solutions for low-density areas do not make economic sense for the providers and are cost prohibitive for the consumers. .. **high-speed wireless Internet access**,.reaching rural consumers with costs that are significantly lower, have faster deployment times and have less environmental impact, a key factor for residents living in rural areas. These benefits are in addition to an ability to defy rough terrain and topographies while providing line of sight (LOS) customers access from more than 20 miles away.
By comparison to the high cost of DSL or cable deployment, the cost of a single wireless access point, using **fixed wireless or point-to-multipoint** solution capable of serving hundreds of customers can cost as little as $20,000. Deployment times can' be as little time as one week to light up the access point and begin delivering services to' customers.
"**Fixed wireless rate plans** start at $59 a month, including free installation. **Meshed WiFi** monthly plans start at $14.95. For visitors, the company offers plans for an hour, day, week or month. Four month seasonal plans are also available. For businesses,...symmetrical speeds, meaning the same download and upload speeds..."
http://findarticles.com/p/articles/mi_qa3675/is_200707/ai_n19434672/pg_3
Private and Public Partnerships:
"The Authority will negotiate with those entities that already own networks and infrastructure to utilize those assets on a favorable commercial basis. We will contract with companies that have specific expertise, such as tower development, management, and marketing. The Authority is essentially a facilitator of infrastructure development that will attract private investment, providing opportunities for a spectrum of carriers, wired and wireless.
The ability of the Authority to create enabling infrastructure will also dramatically improve the business model for companies looking to deploy infrastructure services. For example, if the Authority is able to develop networks of modest towers that fill in coverage gaps, wireless service providers will not have to worry about the expensive and lengthy tower permitting process and will benefit from robust backhaul capacity provided through the Authority."
http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf
The State of Vermont will permit the use of state assets to the Service Providers if they will develop and expand coverage into unserved areas.
(Source: Jim Robinson, VTA Program Director, edits, 11/16/08)
States Consortium:
Vermont, Maine and New Hampshire have formed a 3-state consortium for providing oversight in the transition by Fairpoint in assuming the operations of Verizon.
(Source: Jim Robinson, VTA Program Director, edits, 11/16/08)
Funding Sources for VTA:
State will provide "moral authority for $40M in bonds". However, a change in plans may be pending: "Although the VTA was granted the legislative charter to issue revenue bonds, it was informed in October that federal requirements currently prohibit the issuing of tax-exempt bonds (similar to those issued by VEDA, VHFA, etc). The reason that telecom service providers have not already expanded to unserved areas is because they don't anticipate an adequate return on investment - and non-tax exempt revenue bonding requires similar levels of returns. This may prove to be a barrier for the Authority. The Authority can issue taxable bonds, but these increase the cost of capital and are more difficult to sell. The Board has contacted Vermont's Washington delegation about this problem and continues to discuss it with them."

http://www.telecomvt.org/documents/Vermont_Telecommunications_Authority_2007_legislative_report.pdf
For other alternative funding sources:
"The value of the assets controlled or created by the Authority will also help to secure the value of any bonds...The Authority and other public sector partners would have the opportunity to further enhance the attractiveness of investments in infrastructure through federal funding or creative financing.
The Authority will work with the Vermont Economic Development Authority, the Vermont State Treasurer and the Vermont Municipal Bond Bank to develop alternative financing solutions for the networks.
"HOW WILL WE ACHIEVE SUSTAINABILITY?
Ultimately, the users of telecommunications services in Vermont, taken as a whole, can pay for the development of broadband and wireless networks through the fees that they pay to use the services on the network. Our job, then, is to facilitate the financing and development of these networks, and to insist that they cover all of Vermont, and not only parts. As the Authority will mitigate the risk of the projects, it would share in a revenue stream that the Authority will be able to repay bonded debt and reinvest in building future capacity and deploying the latest technology."
However, some of the original plans are being revisited since two of the major premises are undergoing scrutiny:
"The Authority has several possible concerns that may need state legislative assistance:

- "The ability of power or other utilities to hang or bury more fiber than is immediately necessary for their own specific needs on privately owned right of ways, so that they may resell or lease access to the excess capacity. -

- "A requirement for any communications service provider in the State who does not already have to report such info to the PSD to provide to the Authority, under an NDA, an annual detailed map of its current network and specific details as to its build out plans over the next 2 years."

"Prior to the formation of the VTA, the Department of Innovation and Information developed a preliminary business plan for the launch of the VTA. It is a model of a tower build/lease project that could serve as the basis of a future business plan. The Board has concluded that a new business plan should be drafted by the Executive Director with its approval and input. Expect early versions of that plan to be brought to various committees before the end of this session."
http://www.telecomvt.org/documents/Vermont_Telecommunications_Authority_2007_legislative_report.pdf

Other VT Private Enterprise Business Models, e.g. Proposed by ECFiber, Tim Nulty, Chr. (former CEO of Burlington Telecom)
http://www.ecfiber.net/index.php?sectionID=327&pageID=344
"The project will be funded with a capital lease. The network would be owned by the leasing company, and leased to the group of towns until the lease is paid off. This kind of funding is very common for projects that are expected to generate revenue, such as parking garages. Subscribers pay the interest, principal, and operating costs. There is no cash outlay by the towns. Under the provisions of H.248, (the bill that formed the Vermont Telecommunications Authority) a capital lease is not considered a debt of the town. The lease would come with a low municipal interest rate. Because it is tax-free to the investor, a 5% return would actually provide a higher yield, making it more attractive.

- How much will it cost? It depends on how many towns end up participating. The amount of the lease will include enough to build the network, and will cover initial operating losses and interest until subscriber revenues can sustain them. What factors contribute to the financial success of the project? The following factors determine the success or failure of the project:
- Population - A group of towns working together (20,000+ people) Housing density - The financial model requires a minimum density of 12 houses per mile. With the current set of towns, the density is over 15 per mile, depending on which towns join. Subscription

rate - A high first-year subscription rate is a very important factor in achieving positive cash flow. Average revenue - A high level of service participation (monthly subscription package) is another very important factor. "

More Alternative Business Models in Vermont: "Bottom-Up Approach"
(See the section by Prof. E. Feser, "Bottom-Up Approach" for more details)
Vermont Council on Rural Development is sponsoring Vermont Rural Broadband. (http://www.vtruralbroadband.com/) Community groups are forming on a voluntary basis to "aggregate demand" in their local area. Citizens talk with each other and sign up to pledge interest. Then the citizens negotiate with various Service Providers to deliver Broadband in their locale. Most of the new SPs are wireless companies. Approximately 10 projects have located SPs, 7 wireless, 3 with fiber. http://www.vtruralbroadband.com/

VTA Project Deliverables:

Early Telecom Mapping Deliverables

The VT Dept. of Public Service (DPS), as consumer advocate, took on the task of Telecom oversight, producing a Telecom division in the DPS:
http://publicservice.vermont.gov/telecom/telecom.html

- Broadband Availability http://publicservice.vermont.gov/cable/broadband-availability-map.html on the website has many reports on diverse Service Providers.
- A Broadband Availability map was produced in 2006 http://publicservice.vermont.gov/cable/broadband_availability_map.html.pdf
- A final report, Access for All: Meeting Vermont's Broadband and Wireless Goals, part of the Act 172, issued in Feb. 2007 by the VT DPS, included many policies for Broadband development, including the following:
  - **Cable Line Extensions**
    "Public Service Board rules require cable companies to extend their lines without customer contribution where there is an excess of 25 homes per mile, except when specified differently in the company's certificate and tariff. Larger cable companies are building down to a density of 12-18 homes per mile. These requirements that extend cable television coverage also have the effect of extending broadband availability in Vermont."
  - **Pole Attachments**
    "Pole attachment policies in Vermont are designed to give fair access to utility poles in the state. This facilitates expansion of service and encourages capital deployment throughout Vermont. Access to utility poles is an essential requirement for providing wireline broadband services in Vermont for service providers who do not own poles (primarily cable companies and competitive telephone companies). Regulated rates are available to utilities with a Certificate of Public Good (CPG), such as cable and telephone providers. The ability to attach to utility poles could also be useful to Wireless Internet Service Providers (WISPs) who do not currently have CPGs issued by the Public Service Board. WISPs in Vermont must negotiate independently for utility pole arrangements."
    http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf

Implement Coverage of VT

By 2010, Act 79 requires 100% coverage of the VT with wireless at least. The State is constructing the "hardware infrastructure" of Towers for Service Providers, who will provide the equipment and services for the State.
"This approach appears to go beyond mere ROW problem definition. It appears to establish neutral-infrastructure that is made available to a larger number of competitive providers. Such an approach likely could be made sustainable by establishing a tower maintenance/operational fund, etc. I applaud VT's approach and their willingness to 'take action.' "(Source: Michael Keeling, e-mail, 5/17/08, responding to Valley News: Vermont Telecom Authority Chooses Towers over Cables for Statewide Broadband 5/15/08)
"I agree with Mike. It is an open source network built and managed by government which essentially provides for "middle mile" development and encourages all other players to compete

on an equal basis for further build out and customer base. It could be win, win." (Source: Albert Sterman, e-mail, 5/17/08, responding to Mike Keeling and Valley News article referenced)

Grants to Private Organizations

Making grants with $300,000 of state funding to private service providers in $25-$50K sums, for build-out is beginning.

VTA Project Impact

Alternative Actions by Local Groups to promote Fiber Use

To counter VTA issues and wireless proposals, 20 towns created an "Interlocal Contract" organization along with the local non-profit, ValleyNet, to create a fiber network, along with ECFiber, on April 21, 2008.

"Concurrently, ValleyNet has concluded an agreement with Atlantic Engineering Group (AEG), one of the foremost design/build telecommunications engineering firms in the country, for a fixed price construction contract covering 75% of the projected capital expenditure. AEG has successfully built 65 Fiber-to-the-Premises networks, of which 16 are municipally-owned. The balance of the capital expenditures includes the "pole make-ready" which work must be done by the utilities that own the poles, and is governed by Vermont law and regulation, and the design and construction of the network hub, which ValleyNet prefers to do on its own. AEG extensively reviewed the same data presented by ECF to VTA, and stated: "AEG considers the ECFiber network design to be sound and has tested the ValleyNet cost figures using its own proprietary pricing models … and has concluded that ValleyNet's figures … are reasonable and achievable. AEG believes that the execution schedule…is reasonable and will commit to meet that schedule.

"ECF believes this agreement with AEG will provide a significant measure of comfort to private financiers by essentially eliminating the timing and cost over-run risks associated with a project of this magnitude. ECF now has all the elements in place to approach the private capital markets with a final prospectus, and has already received encouragement from a number of interested investors. Nonetheless, given the turmoil in the capital markets, this is expected to be a much longer process than would have been the case a year ago. However, ECF is confident that it will secure the municipal capital lease financing upon which its business model is based, with the continued and growing grassroots support that has made this project possible."
http://www.ecfiber.net/index.php?sectionID=322&pageID=485

ECFiber has a schedule for the network, with a goal to start signing subscribers by YE 2009. The network roll-out starts YE 2008 - 1Q09.
http://www.ecfiber.net/index.php?sectionID=327&pageID=331

VTA Project Data Sources:

VTA is using many existing mapping, GIS and data sources, including the following:

- Census: population density, demographics
- Vermont Center for Geographic Information (VCGI): local, state boundaries, zoning, etc
- Public Safety: E-911 maps being made
- Topography maps with streets
- FCC: Inventory of cell Towers maps: ownership, w/ collocations on tower
- FCC: Commercial radio locations
- Fire towers locations
- Electric company assets - including fiber routes, install antennas on electric poles thru PUC, tie fiber to ground strand on power lines, use abandoned lines for back haul

(Source: Jim Robinson, VTA Program Director, discussion 5/28/08)

Outlook

"Vermont's broadband strategy at this time should focus both on spurring the development of wireless broadband networks to rapidly fill in gaps in broadband availability over the next few years, as well as starting now on an effort to support the development of networks offering next generation capabilities (e.g., fiber) throughout the state."
http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf

Two major directions are being undertaken by various stakeholders in the VT Broadband landscape: Wireless/VTA and Wireline/Local Providers, towns:

VTA: “Bill Shuttleworth and Mary Evslin acknowledged that the strategy (building Towers for wireless) is driven, in part, by their stark deadline and limited resources.” We have to be very judicious about how we're going to pull these three things off with just 40 million (dollars) and 2½ years,” Evslin said. “Every buck we have we're trying to leverage two or three ways, if we can.
“The VTA hopes to further smooth the way for companies by paying for the towers' construction. The structures typically cost about $300,000 each. Private companies would have to provide their own radio equipment, at an estimated cost of about $200,000 per tower. They would then pay rent to the VTA, which the agency would use to pay off the debt incurred to build the towers. The cost would be formidable. Building 200 towers would require about $60 million. The VTA has $40 million in bonds. Shuttleworth said it's possible -- depending on how companies and the credit market react to the final VTA business plan -- which the agency might return to the Legislature to ask for more money or an easing of the Act 79 requirements. That may be one of the trade-offs,” Shuttleworth said. “We may be able to go back, and this is only hypothetical, and say look, I can get 90 percent coverage of the state for $30 million of bonding. But if you want 100 percent coverage, I need $130 million of bonding.”
http://www.vnews.com/05152008/4855014.htm
“The Authority will solicit proposals from partners who are willing to provide telecommunications services and build telecommunications infrastructure and investors who will work with the state to leverage the state’s contribution. The initial focus will be on delivering broadband services to currently underserved, rural areas and to deploy wireless services throughout these areas.”

Some Local VT Users and Providers favoring Fiber, e.g. ECFiber
“The quality of wireless Internet varies according to terrain and proximity to antennas, but in some cases the service reaches only half or less of the 1.5-megabit-per-second speed deemed adequate by the Legislature in Act 79...It is an incremental improvement of a modest sort. It does not make any significant progress toward a genuine vision of Vermont as an ‘E-State,' ” said Tim Nulty, former director of Burlington Telecom, a municipally owned fiber-optic cable network in the city of Burlington. Nulty, who now chairs the East Central Vermont Community Fiber Network, known as ECFiber -- the group of 23 towns in and around the Upper Valley whose application for funding the VTA recently rejected, citing shortcomings in its business plan -- said the VTA approach might go some way toward meeting the Act 79 requirement of universal access, but risks leaving Vermonters with inferior Internet service. “If your emphasis is on the quick fix, it's the closest thing to a quick fix you can have,” Nulty said. Those concerns were echoed by State Rep. Jim Masland, D-Thetford, who has worked for years to improve rural Internet access... ‘Given the possibilities, relying on wireless to fulfill this requirement of Act 79 is kind of a poor man's choice,’ Masland said.”
http://www.vnews.com/05152008/4855014.htm

Funding and Investment Outlook
“The Authority and other public sector partners would have the opportunity to further enhance the attractiveness of investments in infrastructure through federal funding or creative financing. For example, any portion of the networks that could be paid for directly though a federal appropriation would reduce the amount of capital required without necessarily reducing revenues, thereby lowering the risk involved in the project. In a different kind of incentive, some private investment could be structured so that it flows through limited-obligation municipal indebtedness and gains the advantages of that investment. As the Authority shares in the cost of development with other partners, it should share in a revenue stream from them so that the Authority will be able to achieve financial self-sufficiency and reinvest in infrastructure.”
http://publicservice.vermont.gov/Broadband/Act172FinalReport.pdf

Virtual Alabama http://dhs.alabama.gov/virtual_alabama/home.aspx?sm=g_a

Project Description:

Program Goals:
http://www.dhs.alabama.gov/virtual_alabama/pdf_files/VirAL_Fact_Sheet.pdf
"Massive amounts of data and imagery inventory currently exist in Alabama. The goal of Virtual Alabama is to create efficiencies and cost savings by utilizing existing data in lieu of gathering new costly imagery. AL DHS relies heavily on state and local partnerships to provide previously collected imagery and asset data. Virtual Alabama leverages existing data sets to give an overall visual representation of the state's data inventory.
The visualization platform helps stakeholders, users, and decision makers understand the quality, resolution, scale, coverage, vintage, and useful applications of existing data and imagery. This, in turn, provides valuable information that will improve efficiencies, reduce redundancies throughout the state, and illustrate where data is currently missing or incomplete. The AL DHS team is committed to building collaborative partnerships and data sharing cooperatives throughout Alabama.
Furthermore, Virtual Alabama will create a forum to provide information about upcoming data acquisitions and facilitate cost sharing opportunities among state and local agencies and the federal government."

Funding:
According to Assistant Director Joe Davis, the funding is primarily from Dept. Homeland Security (Joe Davis, phone call, 7/24/08).
"Furthermore, Virtual Alabama will create a forum to provide information about upcoming data acquisitions and facilitate cost sharing opportunities among state and local agencies and the federal government."
http://www.dhs.alabama.gov/virtual_alabama/pdf_files/VirAL_Fact_Sheet.pdf

Some Costs and Time Frame
http://govtsecurity.com/state_local_security/alabama_gets_virtual/
"(DHS Dir. Jim) Walker said the state purchased the software, hardware and license for Google Earth from the company for $150,000 and distributed it to the state's agencies and governments for free.
It has taken about 15 months to compile data from all 67 counties in Alabama, a task that has sometimes bumped up against political and proprietary obstacles.
(Gov.)Riley said some people will be concerned about state government becoming too intrusive, but said that is not the goal of Virtual Alabama. A password is necessary to access the information.
'What we are doing is making government more responsive,' he said."

Contacts

GTAC- US Space & Rocket Center	Chris Johnson, VP	256-721-7104	chrisj@gstac.com
AL DHS	Jim Walker, Director	334-956-7250	
AL DHS Grants	Joe Davis, Assistant Director Management	334-956-7253	Joe.Davis@dhs.alabama.gov
AL DHS , Science & Technology	Norveen Goddard, Assistant Director	256-955-3327	

Project Background

http://www.dhs.alabama.gov/virtual_alabama/pdf_files/VirAL_Fact_Sheet.pdf

"In October 2005, the Alabama Department of Homeland Security (AL DHS) initiated a project to access new technologies in 3D visualization. At the request of Governor Bob Riley, AL DHS began exploring and identifying ways to leverage existing state asset imagery and infrastructure data into a visualization tool that is affordable, scalable, maintainable, and capable of employing the power of existing and evolving Internet based applications. As a result, the Virtual Alabama program was created.

Virtual Alabama uses a 3D globe interface to retrieve images from a merged global imagery dataset. This dataset transforms massive amounts of data into useful information for technical and non-technical users. As an example, Virtual Alabama provides the common operating picture and situational awareness needed by Alabama's first responders to protect lives and safeguard citizens before, during, and after a disaster.

Virtual Alabama serves a wide user base of state and local officials at various levels of technological proficiency. As an information tool, Virtual Alabama reduces technology gaps in economically challenged areas and levels the information "playing field" throughout the state. Additionally, the program provides the ability to integrate and distribute proprietary data securely across the Internet.

In August 2006, Virtual Alabama reached initial operational capability (IOC). In November 2007, Virtual Alabama had over 1800 online users and the best imagery available from all 67 Alabama counties ingested into the program.

Partners: Alabama Department of Homeland Security; U.S. Space & Rocket Center; and various federal, state, and local government agencies.

Who is benefiting from Virtual Alabama?

- Homeland Security
- Emergency Management and Fire Services
- Public Safety
- City and County Government
- Economic Development/Planning
- Natural Resource Management
- Environmental Agencies
- Law Enforcement and Forensics
- Education
- Agriculture
- Transportation
- Military "

Architecture

Google Earth Enterprise is the platform with aerial photos and many other applications from various agencies and counties.

http://earth.google.com/enterprise/virtual_alabama.html

"The Alabama Governor's office started the first state level Dept. of Homeland Security (ALDHS) in 2003, which sought to unify the State information regarding homeland security. Data already collected, information to be shared among levels of government (Fed, State, Local) was researched, with the state agency, Geospatial Training and Application Center (GTAC) http://www.gstac.com/gtac.html , located at with the U.S. Space and Rocket Center in Huntsville, taking the lead for bridging research and end-users communities.

"Since the usage spanned so many functional levels of governments with many privacy, security concerns, the "end product not only needed to be affordable and Internet-based but also absolutely secure and easy to use. After reviewing solutions offered by several leading technology vendors, ALDHS chose Google Earth Enterprise, the solution for creating and publishing customized Google Earth databases on private networks. Not only did the Google platform offer an intuitive interface that was accessible to users not trained as GIS specialists, but it was powerful enough to integrate large volumes of GIS data into a consistent, effective graphical display." http://earth.google.com/enterprise/virtual_alabama.html

http://www.dhs.alabama.gov/virtual_alabama/pdf_files/VirAL_Fact_Sheet.pdf

Real time activities associated with Virtual Alabama:

- Common operational picture
- Emergency evacuation routing
- Situational awareness/understanding
- Vehicle and asset tracking
- Critical infrastructure mapping
- Student density
- Identification of assets and vulnerabilities
- Visualization of risks
- Plume modeling and real time sensors feeds
- Implementation of protective measures during events
- Damage assessment

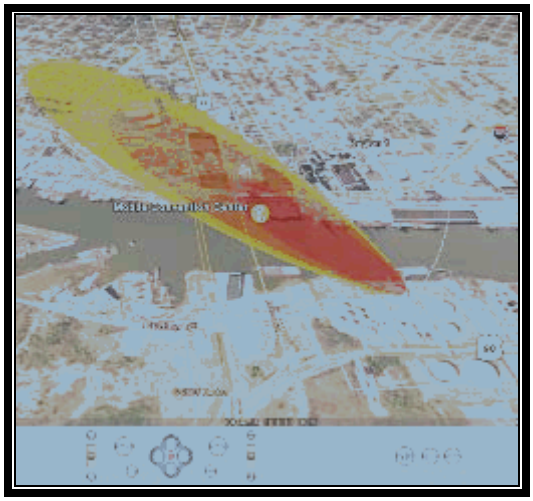

Figure Upper: Google Earth Virtual Alabama showing Plume
Figure Lower: Google Earth Virtual Alabama showing main routes/evacuation

Applications
http://earth.google.com/enterprise/virtual_alabama.html
“The central goal of the Virtual Alabama program is to ensure "the right people have the right information at the right time." Using Google Earth Enterprise, the Virtual Alabama team has built what the department calls a "bridge of communication between emergency responders." Equipped with the Google Earth platform, ALDHS has been able do such things as model hazardous explosions with resulting plume possibilities, allowing department officials to plan public evacuation routes more effectively.
“In addition, **SketchUp**, **Google's three-dimensional architectural modeling tool**, has given the Virtual Alabama team the capability to build accurate models of schools and critical fixed assets, and overlay those models with fire hydrant, electrical wire, and hazardous chemical data. With the enhanced situational awareness provided by such data, ALDHS officials can not only plan more effective disaster response scenarios, but

emergency teams are better equipped to respond to crises because they have access to accurate data shared by all ER teams.
"Encouraged by the success of the program's first stage of implementation, ALDHS is working with the Google Earth team to develop tools that take situational awareness to the next level. Additional applications include delivering detailed views of the interiors of buildings including furniture and live footage, directing responder teams in emergencies through the platform, overlaying real-time data (traffic, etc.) with route mapping to better manage and control resources and integrating a public emergency broadcast system."

Data Layers:

Depending on the use for the various agencies, counties using the platform, the data layers differ. However, the "Tour" website provides an overview of the Google Earth platform with all the counties of Alabama on the Tour.
http://www.virtu-al.org/countymap.html?sm=g_f

Two example counties are shown following for data layers:
Tallega County layers
http://www.virtu-al.org/countymap.html?sm=g_f
Imagery
- 2ft, 1ft and 6in color Feb2006
Vector Layers
- City Limits
- Schools
- School Districts
- Recreational Areas
- Government Facilities
- Military Installations
- Commercial Facilities
- Churches and Cemeteries
- Voting Districts
- Parcels
- Communications Towers
- Utility Facilities
- Water Towers
- Floodplains
- Floodways
- Assisted Living Facilities
- Correctional Facilities
- EMS Stations
- Fire Stations
- Hospitals
- Weather Sirens
- Emergency Shelters
- Railroads
Tuscalousa County Data Layers
Imagery
- County, 6in panchromatic 2002
- City, 6in color Oct2004
Vector Layers
- City Limits
- Schools
- School Districts
- Recreational Areas
- Churches and Cemeteries
- Historic Districts
- Voting Districts
- Manholes
- Sewer Lines

- Sewer Pump Stations
- Traffic Signals
- Water Towers
- Floodplains
- Floodways
- Fire Stations
- Fire Hydrants
- Police Stations
- Weather Sirens

Implementation:

Although not many people responded to my inquiries, undoubtedly due to security issues, Director David Hartin of the Tuscalousa Emergency Management Agency discussed some applications used and uses for the database:
Each city uploads the data they want to use. Google Earth is very practical for mobile organizations, such as patrol cars, which upload Google Earth in the patrol cars in real time and upload buildings for fires, for example. All the data is behind a Firewall and view-only, not copied without permission. Aerial photos in black/white and color are uploaded and viewable based on permissions. AL DHS sets the permissions, for example, who can view the cameras in schools.
Originally they used MapInfo as the base, but now just Google Earth is used.
(David Hartin, phone call, 7/23/08) http://www.ci.tuscaloosa.al.us/index.asp?NID=55

Resources

Virtual Alabama funding and other issues unique to that one organization were not isolated from the Alabama Department of Homeland Security. For example, Joe Davis, Assistant Director of Management, also responsible for Grants, said their funding came through DHS. (Joe Davis, phone call, 7/24/08)
The Alabama Dept. Homeland Security will receive a DHS grant for $12.7M in FY2008. Since agencies, municipalities and applications are part of Virtual Alabama, many organizations benefit as part of ALDHS and Virtual Alabama:

"MONTGOMERY- Alabama will receive more than $12.7 million in federal grants from the U.S. Department of Homeland Security for fiscal year 2008.
These grants are the primary sources of federal funding for building and sustaining the nation's ability to prevent, prepare for and respond to terrorist attacks and disasters. Alabama will see an increased amount of money in each grant category for fiscal year 2008 even though Alabama's neighboring states regrettably will not. This is also the first year for the State Homeland Security Program Tribal Supplement in which the Poarch Creek Tribe received 100% of their requested funding.
'The infusion of this grant funding allows us to further develop homeland security capabilities to protect and serve our citizens,' Director Jim Walker said. 'In many instances, this funding is the lifeblood for Alabama's first responders, whether they serve in rural or urban parts of our state.'
The grant amounts are categorized below. More information about the individual grant programs is available online at www.dhs.gov.
State Homeland Security Program (SHSGP) including Law Enforcement Terrorism Prevention Program (LETPP): 11,170,000
State Homeland Security Program Tribal Supplement: 70,000
Metropolitan Medical Response System (MMRS): $1,284,884
Citizen Corps Program (CCP): $242,636"
http://www.homelandsecurity.alabama.gov/headlines/2008/july_sept/12.7M_federal_grants.aspx

Outcomes and Impact

Unique Leader but other States Following

'Alabama is the only state in the union that has this capability,' (Gov. Bob) Riley said at a news conference, where officials demonstrated the state-sponsored Web site.

Michael Jones, chief technologist with Google Earth, says several states are developing Web sites that layer government information into a quickly accessible format, but Alabama is "unique in the United States" because its Web site includes data submitted by every county.

'You just name it and we can load this stuff,' Jim Walker, director of the Alabama Department of Homeland Security told *The Tuscaloosa News*. "It's become a very powerful tool."

From fire and police departments responding to emergencies to emergency management agencies assessing damage from natural disasters, Virtual Alabama can provide city, county and state officials with information ranging from building layouts to fire hydrant locations with a few mouse clicks.

'If you're a firefighter,' Walker says, 'before you go into a burning building, wouldn't you like to know all that stuff?' (12/07)

http://govtsecurity.com/state_local_security/alabama_gets_virtual/

Virtual Alabama Wins Award: July 18, 2008

" For the fourth time since its unveiling late last year, Virtual Alabama has won an award. This week Virtual Alabama earned the state the 2008 Innovations Award for the Southern Region from the Council of State Governments. Previous awards won by Virtual Alabama were presented by the American Council for Technology, the Google Enterprise Award and the National Governors Association.

'Alabama continues being recognized for this very advanced program,' Governor Bob Riley said. "I'm very proud that Alabama keeps receiving these top awards and is being recognized as a national leader in technology and government."

Alabama Homeland Security Director Jim Walker said, 'Virtual Alabama is a state program that all Alabamians can be proud of. It's an honor to represent Alabama and showcase this program that could revolutionize the way state government collaborates.'

Virtual Alabama is a computerized database of information superimposed on satellite imagery and aerial photography of all 67 counties. It is the only comprehensive database of its kind in the country, according to a release from the Governor's Office.

The amount of information counties can load on to Virtual Alabama is endless, and the program can help emergency responders, law enforcement, economic developers and more with their planning and response.

The Council of State Governments chose Virtual Alabama because it is a cutting-edge program that can benefit other states. Director Walker has been in contact with several Southern states as they attempt to develop a Virtual Alabama model in their states**."**

http://www.govtech.com/gt/379226

An Alternative Mapping Approach: Broadband Deployment from the Bottom Up

http://www.jrap-journal.org/pastvolumes/2000/v37/F37-1-feser.pdf

Project Description and History

Prof. Ed Feser, Ph.D., Interim Head of Urban and Regional Planning at the Univ. Of Illinois, Urbana-Champagne Campus, worked with e-NC Authority project Jane Patterson in prior years, as a Regional Planning Economist with the State. He paid the highest compliments to Jane Patterson as very knowledgeable in the subject matter and her ability to work with people throughout the state and country. He suggests many aspects of the e-NC Model can be utilized, but without the expensive and exhaustive state mapping process and service provider data problems. Programs and grants or funding is more important than mapping project per se. "TechSupport Centers" and local support are more critical to the success of a program.

His article in 2007 "Encouraging Broadband Deployment from the Bottom Up" in the Journal of Regional Analysis & Policy, 2007, (http://www.jrap-journal.org/pastvolumes/2000/v37/F37-1-feser.pdf) discusses the problems with the "Rational-Comprehensive Approach", which is the intensive GIS mapping endeavor by e-NC and others. In retrospect, for states with fewer financial and other resources (e.g., e-NC original GIS mapping cost $1M and not many states have that funding), he suggests another approach that is less costly for a State and places the initiative with the local, county organizations in the Broadband process.

Project Approach: Rational-Comprehensive or Top Down

According to Prof. Ed Feser, PhD, in his article, "Encouraging Broadband Deployment from the Bottom Up": the Top Down Approach or “Rational-Comprehensive Approach” has several problems:

- “One might argue that states should first document all infrastructure needs, evaluate the costs and benefits of closing various gaps, and direct investments accordingly.
- “The problem with that rational-comprehensive approach is that the creation of an up-to-date map or catalog of a state’s information technology infrastructure is extraordinarily difficult,
    - both because providers are loath to release information on their networks and
    - because the infrastructure is evolving rapidly;
    - maps are out-of-date shortly after they are created.
    - The rational-comprehensive approach also implies that the state could successfully direct the closure of gaps even when no local initiatives are driving the intervention.”

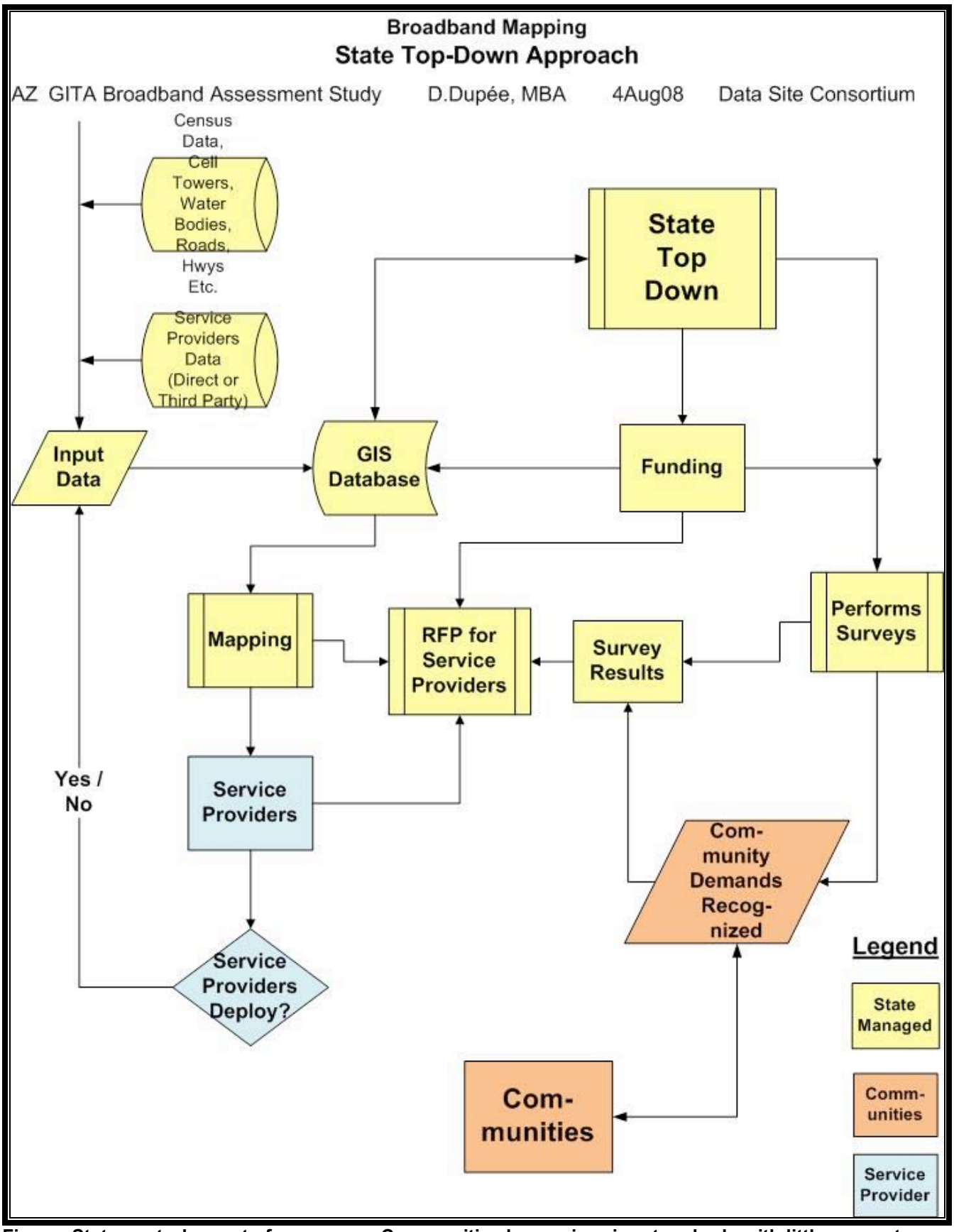

Figure: State controls most of processes. Communities have minor input and role with little support politically, financially.

Project Approach: Bottom Up with State as E-Champion

Rather than extensive state-wide mapping, Feser suggests that states could develop the expertise and leadership for provide guidance for counties and communities. States, with state or other funding, can conduct State-wide Demand Surveys from Residents of the state, providing information regarding locational gaps in Broadband coverage, types of services wanted by residents, pricing and other criteria for which Service Providers can respond to the local communities.

- States can provide the "One-Stop Shop" expertise and teaching the Local Residents skills, as used by e-NC with "TeleCenters", dispersed throughout counties and providing technical education centers for locales; and

- "e-Communities" offering leadership for counties' residents to develop strategic plans and obtaining funding.

- In this manner, the local organizations select service providers who respond to their demand and the residents think appropriate for the job, perhaps with an RFP. The state is relieved of "governing" the process, with obtaining Service Provider data and mapping, which is fraught with problems procuring, maintaining the data and needs periodic updates from Providers.

- This is more of a localized strategy Prof. Feser's recommends for states and communities with fewer resources available, especially, since e-NC spent approximately $1M on mapping (Prof. Feser, conversation, 7/11/08 & 7/17/08)

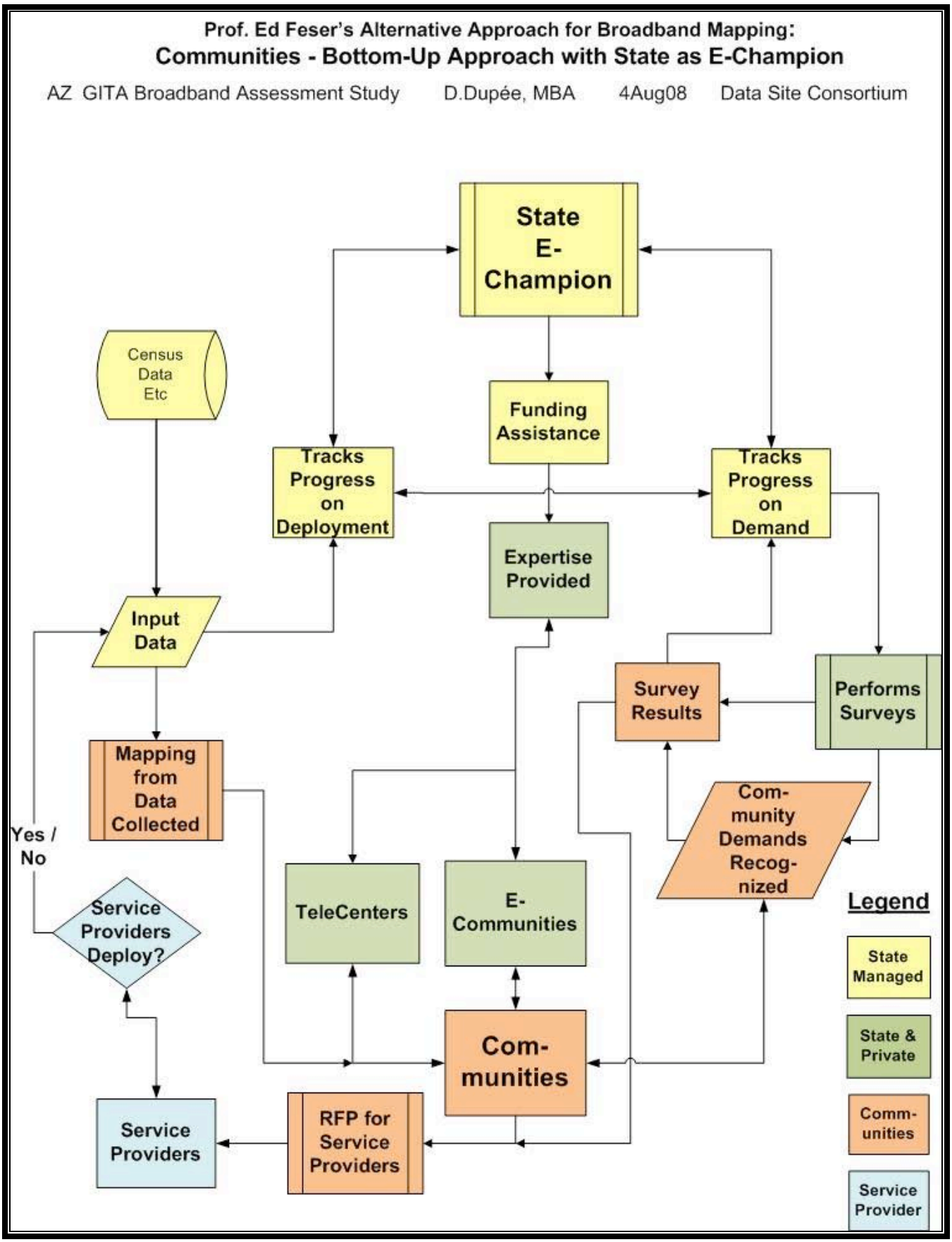

Figure: State as E-Champion with Public/Private Partnerships, Communities have large role

Project Implementation, Resources

Prof. Feser further comments on the summary preceding (Prof. Feser, e-mail, 7/27/08):
“The key is to realize that a map doesn't have to be the first step, as so many assume; it is often the second or later step.

1)”That states can move forward without large scale mapping, if they do not have sufficient resources to undertake a mapping effort (don't let the absence of extensive mapping data on broadband gaps stall deployment
initiatives);

2)”That by doing small scale projects, assisted by a state-level "e-champion" organization that also tracks progress on deployment and demand, states learn a lot about where gaps in service are that might be filled with a combination of public and private efforts (effectively creating a "map" of sorts); and

3)”The more projects that get going, the more value a larger scale mapping effort can become (since more entities can benefit from the information)--that may result in sufficient political support for the financial resources necessary, as well as greater willingness on the part of private sector providers to provide information.

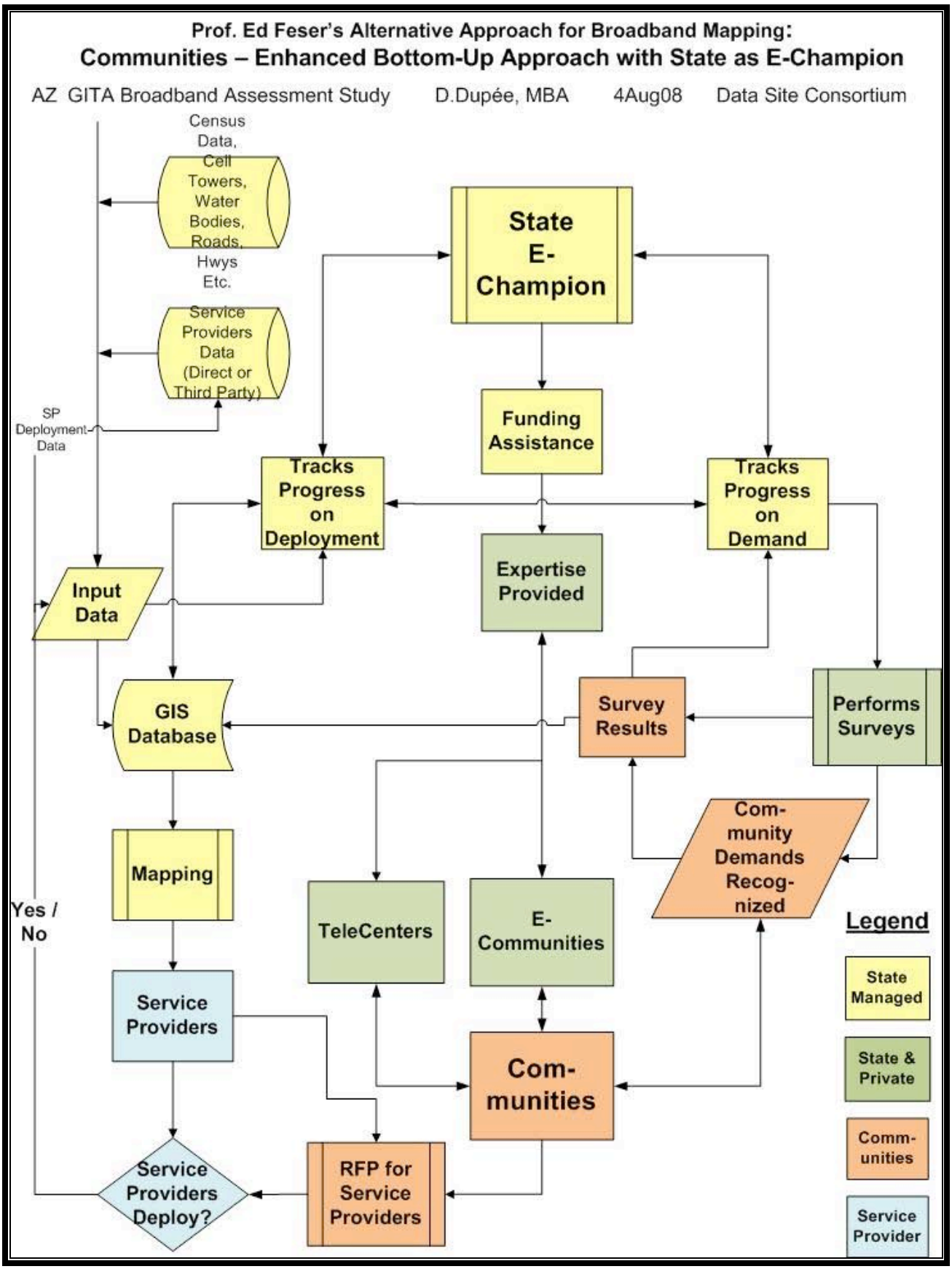

Figure: Many Communities with Broadband Demand Studies, State Mapping is valued and politically supported

Prof. Ed Feser's article, "Encouraging Broadband Deployment from the Bottom Up", in the Journal of Regional Analysis & Policy, 2007, http://www.jrap-journal.org/pastvolumes/2000/v37/F37-1-feser.pdf is quoted in an outline format (per D. Dupée Editor) in the following:

"State governments that have elected to make investments to increase the availability of affordable broadband service in rural areas and low income urban neighborhoods should organize their efforts around a strategy that encourages and leverages locally-driven initiatives, rather than follow a top-down approach that seeks to identify and close all broadband service gaps in a comprehensive fashion.

"A bottom-up approach to state broadband policy has three major advantages.

- First, it is a conservative policy response in an economic arena in which the appropriate role of the public sector is highly contested and in which private sector deployment is proceeding rapidly, even as gaps in service in rural and poorer communities remain.

- Second, it acknowledges the extraordinary practical difficulty of identifying and addressing all broadband infrastructure and service gaps at any point in time,

    - given data limitations and
    - rapid pace at which technologies, services and the telecommunications industry itself are evolving.

- Third, it facilitates the design of solutions that are unique to the local conditions in places where gaps exist and where local commitment to policy action is clearly demonstrated.

"Today a growing number of states are debating whether to develop programs or enact legislation designed to encourage faster deployment of broadband infrastructure to rural areas and lower income urban neighborhoods (Brennan Center 2006).

"Issues: Broadband Definition

"Broadband Deployment

"Debates around broadband deployment as a subnational policy issue generally center on two related questions.

- The first is whether broadband is an increasingly critical infrastructure for economic development at the state and local levels. While careful empirical studies of the link between broadband and local and/or rural development are few, a recent study commissioned by the U.S. Economic Development Administration finds higher rates of economic growth in zip codes served by broadband, versus a matched sample of zip codes unserved by broadband (Gillett et al, 2006).

    - Other studies have focused on the substantial economic impact of broadband (Crandall and Jackson 2001), potential U.S. productivity losses from a failure to improve broadband networks and performance (Ferguson 2002), and case studies of positive impacts from deployment efforts in specific communities (e.g., DTI 2003).

    - Such evidence, together with the fact that a number of countries in Europe and Asia have implemented significant broadband deployment strategies in recent years, has convinced some state leaders that U.S. telecommunications policy is too passive and that state governments should step in to ensure their own infrastructures are globally competitive (Bleha 2005).

    - May 2005 statistics compiled by the International Telecommunications Union (ITU) show the U.S. ranking 16th in broadband subscribers per 100 inhabitants (often referred to as "broadband penetration"). Leading the U.S. are countries such as South Korea (1st), the Netherlands (3rd), Canada (5th) and Japan (13th). Of more concern to observers is the precipitous decline of the U.S. ranking. The U.S. ranked fourth in ITU's survey in 2001.

- "The second subnational policy question is whether states should take action to ensure that all citizens and geographic areas have the opportunity to purchase some type of broadband service, preferably at an affordable rate. The existence and potential consequences of differing rates of utilization of computer and Internet technology among different population segments—rich and poor, rural and urban—were publicized widely in a series of reports prepared by the National Telecommunications and Information Administration during the 1990s (NTIA 1995; 1998; 1999; 2000).

    - The reports, titled *Falling through the Net*, tracked the information disadvantaged—"those who are not connected to the National Information Infrastructure"— finding that they are disproportionately located in rural areas and poorer central cities.
        - The series fed concerns that a "digital divide" is emerging in the United States, such that those who cannot access, afford or properly use computing and Internet technologies will be left behind as the knowledge- and information-intensity of the economy increases.
        - Another study finds that rural small businesses subscribe to broadband at lower rates than their urban counterparts, and that rural businesses typically face higher prices for service (Pociask 2005).

Do Something or Do Nothing?

When state officials take up the broadband policy question, they quickly find that the environment in which they might design and implement any response is characterized by extraordinary debate, complexity and flux, including:

- The absence of a consensus of the appropriate role of government in broadband provisioning, with proponents of government action citing public goods and imperfect competition rationales and opponents pointing to high rates of private sector deployment as evidence the market should be left alone;

- Rapid, ongoing changes in broadband technologies and related standards, such as the emergence of various wireless protocols/systems and continuing development of satellite, broadband over power line, and fiber to the curb/premise solutions;
- Shifting definitions of broadband as bandwidth demands evolve, and widespread disagreement among experts about what speeds to target;

- The absence of a single optimal technological approach appropriate for all provider situations and geographic cases;

- Broadband provisioning business models whose viability is not generic, but is rather dependent on specific local or regional conditions;

- Multiple potential provider types to address specific broadband needs, including traditional telephone companies, cable companies, for-profit and nonprofit wireless providers, municipalities, electricity companies and cooperatives, and existing state owned networks;

- Diverse sources of potential federal funding to accelerate deployment, including programs operated by the Small Business Administration, U.S. Dept. of Agriculture, and U.S. Dept. of Commerce;

- Continuing strong rates of market-driven deployment in many areas;

- A continuously evolving federal regulatory environment and very little state control over the thorniest regulatory issues governing competition in the broadband marketplace.

- "In this environment, it is no surprise that some states have opted to take a wait-and-see attitude with respect to broadband deployment. They are encouraged in that approach by telephone companies, cable companies, and other private sector interests that are wary of any government involvement that might result in additional competition in the markets they serve.

- Moreover, surveys show that broadband penetration is increasing fairly rapidly in the U.S. and differences in availability in take-up rates by race, income and location are narrowing (Horrigan et al., 2003; Bell et al., 2004).

- If the complexity of the problem is high— implying that government's effectiveness is likely to be low—and market forces are moving in the right direction, why do anything at all?

- It is possible there is no significant role for state government to play.

Advocates of public sector action cite several reasons why some government intervention is justified.

First, despite overall upward trends in broadband penetration, there is ample evidence that some areas—particularly geographically remote ones and low income urban communities—are unserved and probably will remain so for some time given the absence of sufficient current demand to motivate purely private sector investment (Pociask 2005).

- To the degree that states place value on broadband access for all citizens, targeted efforts to remove persistent gaps is both justified and necessary. Market forces alone are not likely to close such gaps, a clear market failure if access to information is regarded as a merit good.

Second, while at least low-end (e.g., DSL, cable) broadband is becoming more ubiquitous, affordability is still a problem.

- Competition is limited in many rural areas and consequently prices remain high (Brennan Center 2006).
- In many places, the local telecommunications market is very clearly not a competitive one.

Third, as broadband infrastructure improves, demand-side challenges in rural and low-income areas persist,

- namely the need to provide adequate training for users,
- to encourage the development of products and applications tailored for the specific needs of rural or disadvantaged populations,
- and to address the absence of terminal equipment (home and school computers to connect to the Internet).
- Here again, the policy rationale rests on a public goods case for access to digital information and technologies.
- It is not clear that the highly contested broadband policy debate can be settled definitively, given legitimate arguments on both sides.
- In that context, what advice might be offered those states that have already sought to intervene in the broadband provisioning market to improve deployment in underserved rural and urban communities?

What states *should not do*, given the challenging broadband technology, market and regulatory environment described above, is attempt a large-scale strategy that seeks to address all broadband concerns in a comprehensive fashion.

- On the one hand, it has proven very difficult for states to get an accurate picture of where infrastructure gaps exist, given poor data and unwillingness of providers to supply information on their facilities and networks.

- On the other hand, appropriate solutions are often so locally specific and dependent on the cooperative efforts of local private and public sector players, that state efforts to push solutions from the top down are too likely to fail.

- Instead, states that are seeking to boost broadband deployment and utilization should adopt a policy framework that explicitly encourages innovative *locally-based* solutions to broadband provisioning.

A bottom-up approach sees state government as a:
- catalyst,
- facilitator,
- occasionally co-investor to local initiatives.
- And, while it is difficult to make a blanket case for or against government intervention in broadband deployment as a general matter, it is much easier to make competent policy decisions when specific initiatives in specific places are in play.

Finding Gaps and Targeting Solutions

A bottom-up strategy is not necessarily an easy strategy.
- it means undertaking multiple simultaneous activities, including provision of consumer and business information,
- technical support for local planning and deployment
- brokering of local partnerships
- ongoing study and development of policy to reduce obstacles to local deployment,
- monitoring of deployment and utilization trends.

To do those things well, states need the administrative capability to maintain maximum flexibility in the delivery of support.
- Flexible bottom-up approaches are often harder to implement than top-down grants and
- Spending programs constrained by arbitrary parameters (technology type, eligibility of provider type, eligibility of area, grant size, etc.).

The state role as catalyst is probably most effectively coordinated by a single small but flexible organization that has the expertise, resources and authority to maintain sustained leadership on broadband and digital divide issues.
- While such an organization must serve as:
    - information clearinghouse
    - technical resource
    - policy advisor
- It would not act as a major program administrator,
    - since deployment initiatives would be driven by agencies and organizations at the local level.

The state organization would provide a “one stop shop” to assist service providers, consumers, and local governments undertaking broadband initiatives
- help facilitate leveraging of federal, corporate and foundation funding sources
- maintain a catalog of best practices
- provide training as necessary to help build local capacity to address broadband needs;
- ensure that broadband issues receive sustained state-level policy attention.

One might argue that states should first document all infrastructure needs, evaluate the costs and benefits of closing various gaps, and direct investments accordingly.

The problem with that rational-comprehensive approach is that the creation of an up-to-date map or catalog of a state’s information technology infrastructure is extraordinarily difficult,
- both because providers are loath to release information on their networks and
- because the infrastructure is evolving rapidly; maps are out-of-date shortly after they are created.
- the rational-comprehensive approach also implies that the state could successfully direct the closure of gaps even when no local initiatives are driving the intervention.

By letting local efforts push solutions, the state can leverage the efforts it believes will be most successful,
- conducting due diligence accordingly
- while also building a catalog of infrastructure gaps and needs
- the organization can also maintain a degree of neutrality toward technologies- and provider-types.

While private sector provisioning is preferred as a default, public (e.g., municipal) and public-private provisioning options can be encouraged where needs dictate and local citizen and business interest is present. When local

projects and needs dictate solutions, state programs are less likely to inadvertently encourage a particular technology or provisioning model as a "magic bullet."

The bottom-up strategy is being implemented successfully in some states.

The leader is probably North Carolina,

- which describes its broadband policy explicitly as a "grassroots" effort
- with a state-designated "echampion" organization acting as a catalyst and resource for locally driven initiatives (E-NC 2003).
- North Carolina's broadband authority is a lean organization, operating with a permanent staff of six people and an annual operating budget of $1.8 million.
- It reports leveraging over $206 million in federal, community and business support for local projects between its founding in 2000 and the end of 2005 (ENC 2005).

While North Carolina has developed perhaps the most complete infrastructure mapping system to aid its decision making, many of its efforts could have been implemented without a detailed statewide infrastructure catalog.

Kentucky has also established an initiative designed to encourage decentralized solutions, patterned closely after the North Carolina model, though Kentucky's is more limited in its scope.

Summary

- Whether and how states should encourage the deployment and utilization of broadband technology are challenging questions.

- Given the complexity of the technological, regulatory and market environment in which broadband is developing, states should avoid attempts to design and implement high cost, top down, comprehensive strategies aimed at closing all infrastructure gaps.

- Instead, they should look to design and implement flexible programs to incentivize and assist locally-driven efforts to improve provisioning and encourage demand.

- While that will require building a capability to truly catalyze local efforts, preferably housed in a single small organization or authority with the necessary expertise, it need not require massive expansion in government programs or the creation of a large bureaucracy."

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