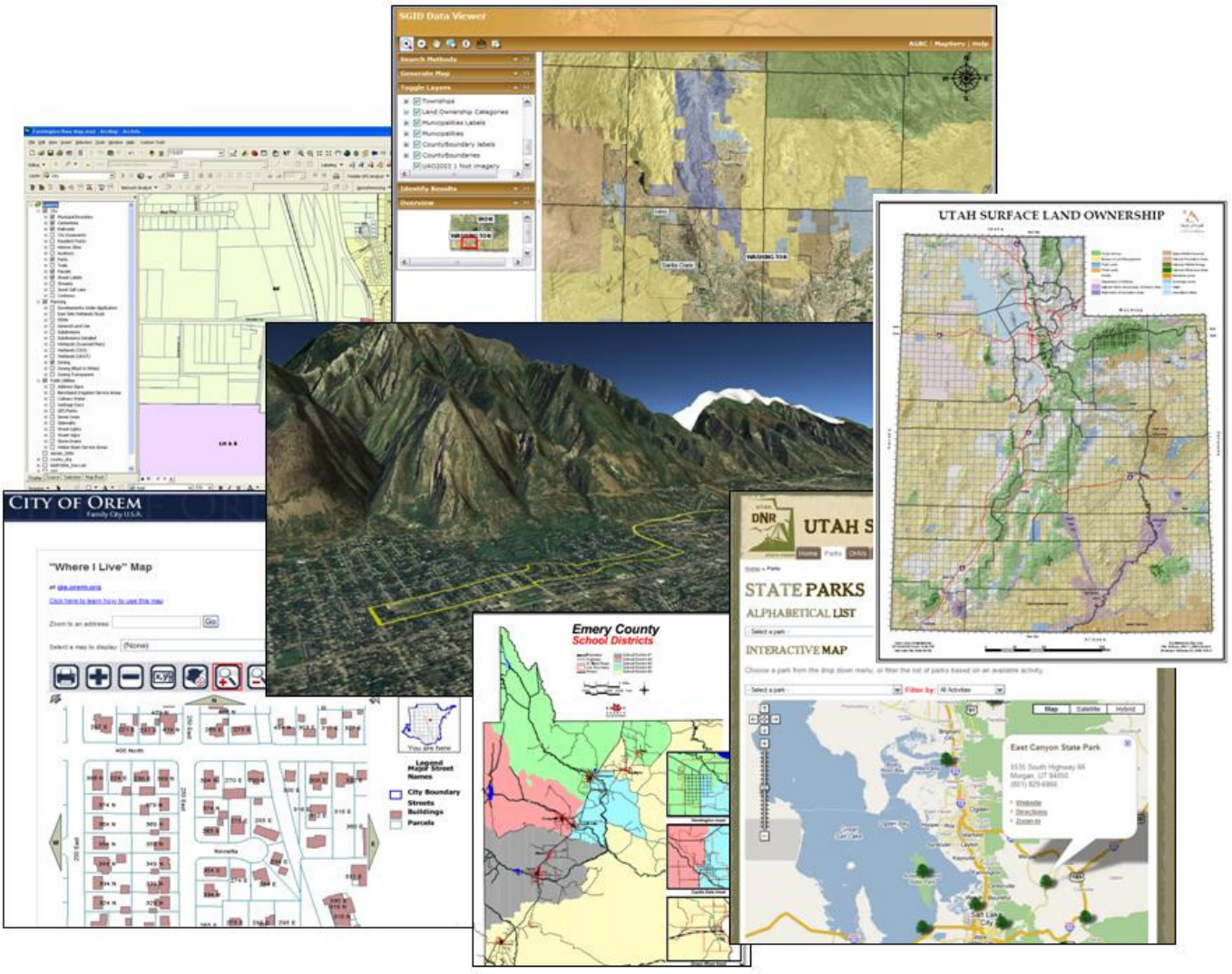
The Utah Geospatial Infrastructure

STRATEGIC PLAN



September 2008

FederalGeographicDataCommittee fgdc

GISAC

Utah GIS Advisory Council

Applied Geographics, Inc.

Empowering People with Spatial Solutions

State of Utah
Department of Technology Services
Automated Geographic Reference Center

6000 State Office Building
Salt Lake City, Utah 84114

September 17, 2008

Contents

1.0 Introduction

The 2,699,554 people who live and work in the 1,330,483 parcels on 84,868 square miles of land covering Utah are all affected by their location, and the location of features like roads, and services like schools and hospitals. To support a wide spectrum of business and government activities and decisions with a geographic component, Utah has a long history of using geospatial technology. Geospatial technology represent a rapidly growing industry of software and data that leverage location-based information, including geographic information systems (GIS), remote imaging, cartography, and global positioning systems (GPS). We have a widespread geospatial community that includes hundreds of professionals in government agencies, businesses, schools, and private and non-profit organizations in every part of the state. The citizens, economy, and elected officials of Utah benefit every day from decisions and services based on geospatial technology, and Utah state government has been consistently rated as one of the top 10 in the nation for the quality of its geospatial program.

According to the U.S. Census Bureau's state rankings, the people of Utah are highly educated (#2 for high school completion, #13 overall) and very literate in computers and the Internet (#1 for computer ownership, #2 for Internet in the home). Utahns rightfully demand that information and services—including location-based information and services—will be accessible, useful, and of a high quality. These demands will continue to grow as technology advances, society evolves, and as our state grows.

Leveraging our past successes to meet these growing demands for the future, the Utah geospatial community proposes to align our current organizations, data, and services into a more robust system called the Utah Geospatial Infrastructure (UGI). This document represents a strategic plan for this system, setting forth our vision and strategic goals for what the UGI should eventually become. After discussing these goals, this document outlines our current strengths and weaknesses, and then introduces several programmatic goals which form a road map of steps necessary to build the UGI over the next three to five years. This plan does not itemize the specific procedures to be performed, or the resources needed, but it does discuss the need for business and technology plans that will develop the details necessary to implement the listed goals.

The Automated Geographic Reference Center (AGRC), a State government agency formed in 1981, has traditionally played a leadership role for geospatial services for the State, but the Utah Geospatial Infrastructure, and this strategic plan, are not about state government. Rather, this is a plan that seeks to serve the common interests of all practitioners of geospatial technology in Utah.

This plan was developed during 2007 and 2008 as part of the Fifty States Initiative, a partnership between the Federal Geographic Data Committee (FGDC) and the National States Geographic Information Council (NSGIC), with funding assistance from FGDC. The process was directed by the Utah Geographic Information Systems Advisory Council (GISAC) through an ad-hoc Strategic Planning Steering Committee that included representatives from all segments of the geospatial community. With the assistance of Applied Geographics, Inc., significant input was gathered through a series of public meetings and a targeted online survey of the geospatial community. While not all parties agreed on every issue, this plan represents the broad consensus of those who participated.

2.0 Vision and Goals

2.1 Vision Statement

The Utah Geospatial Infrastructure (UGI) delivers robust map-based information and services to citizens, businesses, and government to enhance the safety, economy, environment, and quality of life in Utah, through the collaborative efforts of the Utah geospatial community.

2.2 UGI Definition

The Utah Geospatial Infrastructure (UGI) is both a formal and informal partnership among the entire geospatial community in Utah, including federal, state, tribal, and local governments, businesses, colleges and universities, schools, local service districts, and non-profit organizations. The UGI has two parts:

- A technical component that consists of data, software, networks, and Web-based services that facilitate the widespread use of geographic information.
- A human element consisting of associations, agencies, and policies that foster collaboration within the GIS community and cooperation with policy makers and the public.

This infrastructure is necessary to acquire, process, distribute, use, maintain, and preserve spatial data and services for the long-term benefit of all citizens of Utah. Thus, the intended users of the UGI will include not only geospatial professionals, but also any business, government agency, elected official, student, citizen, or visitor in our state.

2.3 Strategic Goals

The four strategic goals listed below represent a consensus of desired characteristics expressed by the geospatial community during the information gathering and analysis phase of the strategic planning process. These overarching strategic goals also contribute to the further alignment of Utah's efforts with the National Spatial Data Infrastructure (NSDI), a federal government led effort to build a strong, nationwide geospatial database. These four goals will be further defined and elaborated in the Programmatic Goals section of this plan (see Section 4).

- Collaboratively maintained statewide data resources are usable, dependable, and relevant.
- Geospatial services are effective, accessible, and reliable.
- Operational efficiencies are achieved through effective organization and communication.
- Decision makers at all levels of government understand the value of building the Utah Geospatial Infrastructure and the benefit of utilizing it to respond to needs and opportunities.

Additional detail and the business case for these goals will be developed in future Business Plans created for the implementation of specific activities.

3.0 The Current State

Utah has a very mature implementation of geospatial information technologies, dating from the late 1970s. Since the early 1990s, Utah has been engaged in creating an informal geospatial infrastructure that laid the groundwork for the UGI described in this plan. An exemplary initiative was the Utah Framework Implementation Plan (also known as the "I-Team Plan"), developed in 2001, which identified and enabled theme-based data stewards. This plan not only informed and guided the geospatial community, but also agency decision makers and elected officials. Because of these past and ongoing activities, Utah has rich geospatial data and technology resources, as well as perceptive, trained users and decisions makers.

Through large public meetings, small group meetings, and interviews, the Utah strategic planning project team[1] gained an "internal perspective" about where the geospatial community in Utah thinks it stands. This perspective included enumerating strengths and weaknesses in the nascent geospatial infrastructure as it currently exists, and identifying many opportunities for enhancing and optimizing its components.

GIS in Action: Blue Stakes

A common application of GIS is to determine the location at which a service will be delivered, including emergency or disaster response and assistance, utilities, delivery and repair businesses, and recreation.

For example, a land developer is ready to begin excavation for a new subdivision. The plat map has been recorded by the city and county and the developer has been issued all necessary building permits. To avoid damaging existing infrastructure and to comply with Utah law, she calls Blue Stakes before actually digging to have existing utility lines marked at the site.

Blue Stakes needs to determine which utility owners may be potentially impacted by the excavation so they can mark their existing underground pipes and cables at the site within the required 48 hour period. This is done by overlaying the location of the new subdivision with the service jurisdictions of utility companies.

Blue Stakes should be able to rely on the UGI for:

- Up-to-date street centerlines, addresses, city limits, and parcel boundaries (including planned subdivisions), for the entire state.
- Almost instantaneous access to the latest information, regardless of the original source.
- Policies that give Blue Stakes the rights to access this information, including data sets that may not be available to the general public.
- Data standards and translation services that make data sets from different sources (e.g., individual counties) look the same to Blue Stakes.

3.1 Strengths

1. **AGRC effectively coordinates the State GIS.** Stakeholders throughout Utah gave AGRC high marks as a reliable source of data and technical support. In addition, AGRC manages the new Utah GIS Portal that facilitates overall geospatial communication across the geospatial community and provides free data to the public. AGRC has also been able to make regular investments in GIS technology and has steadily expanded the services that it offers to partners and the public (e.g., the newly available Web services). Another core strength of AGRC is direct local support. Programs such as rural county grants[2] and enhanced 911 (E911) addressing support have been very effective and have helped build bridges between State and local GIS efforts.

2. **The Utah geospatial community is vibrant and inclusive.** The community is represented through two organizations, the Utah Geographic Information Council (UGIC), a professional association and users group with over 400 members, and the GIS Advisory Council (GISAC), a statutory committee that works with the AGRC to program major initiatives, such as this strategic plan. UGIC has held annual conferences since 1991 that are well-attended, lively, and informative. Other organizations, including the Utah Geography Alliance (for K-12 teachers), the GPS Advisory Committee, Utah Committee on Geographic Names, chapters of national professional societies, and regional user groups also serve elements of the community.

3. **Relationships between GIS agencies in federal, state, local, and tribal governments are strong.** Examples of this include the Data Sharing Agreement signed in 2004 between Governor Walker and 11 federal agencies and non-governmental organizations; cost-sharing agreements for the acquisition of imagery and other data; working relationships between many counties and their respective cities; and, public land planning efforts based on strong cooperation between State, county, and federal agencies.

4. **GIS Software is widely available.** Although professional-grade GIS software can be expensive, related organizations frequently work together to share costs. For example, software vendors established system-wide contracts with the higher education system, including Brigham Young University (BYU) and the public school system, that enable software to be distributed freely across these systems without added costs. Similarly, software vendors have established blanket contracts that provide discounted pricing to State government agencies. Last, while the majority of Utah governments use commercial software, there is an emerging class of Open Source GIS tools that further enhance software availability and present new opportunities for low cost GIS deployment.

5. **Legislative understanding of geospatial technology is strong.** Utah is at the forefront of the nation in having the State's geospatial assets and programs recognized by the State Legislature. Acts and proposed legislation frequently direct AGRC to implement mapping in support of legislative goals. In addition, the legislative research staff is aware of GIS technology and many staff members have GIS skills and access to GIS software within their offices. Thus, GIS technology is put to productive use directly in support of the legislative process. This level of legislative support has been instrumental in maintaining a solid funding base for statewide geospatial activities.

6. **County and local governments are adopting GIS technology.** Local governments have been successful in initiating GIS programs throughout the state and currently there is some level of GIS activity in each of the 29 counties within the state. Programs such as the rural county grant program have been instrumental in building GIS capacity in local government. Numerous cities, particularly along the Wasatch Front, have substantial GIS programs. This widespread adoption of GIS helps generate support for GIS programs and increases the likelihood that high-quality statewide data, such as parcels and addresses, can be developed as well as maintained.

7. **Many strong educational programs exist.** As use of geospatial technology continues to expand, there are increasing demands and opportunities for a trained, GIS workforce. Utah is host to several strong college and university level GIS programs that are capable of producing the type of professional workforce necessary to support GIS activities. Degrees, certificates, and/or courses are offered at Brigham Young University, Salt Lake Community College, Southern Utah University, Utah State University, the University of Utah, Utah Valley University, Weber State University, and even the Utah College of Applied Technology. In fact, the introductory GIS course at Salt Lake Community College is a general education elective. In addition, GIS is becoming increasingly common in K-12 educational curricula and institutions such as Leonardo-Science include geographic information science as an area of learning[3].

GIS Opportunity: K-12 Science Education

Geography, in short, is the science of place. Location is more than the mantra of real estate; it is vital to success in dozens of fields as varied as retailing, biology, and urban planning. Furthermore, global and local issues increasingly demand an awareness of the role that geographic information plays in everyday life. Our schools are probably the best opportunity to build geographic and GIS literacy.

As an example, one of the curriculum standards for high school biology courses in Utah is, "Students will understand that living organisms interact with one another and their environment," essentially covering the science of ecosystems.

Following this standard, a teacher wants to create a lesson plan to use GIS, Remote Imaging, and GPS technologies to help students understand the ecosystem in the mountains near her school, and provide exposure to what it would be like to be a wildlands biologist or land manager. This lesson plan will create groups of two to three students and each group will be assigned a small region.

They will use aerial photography to map the vegetation cover; they will research scientific literature to predict the habitat areas of wildlife; and, they will visit their site with GPS and cameras to check the accuracy of their maps and record further details about the ecosystem. Finally, they will create maps, written reports, and presentations of their findings.

To develop and execute this curriculum, the teacher would need the following from the Utah Geospatial Infrastructure:

- a reliable, up-to-date source of base data (roads, terrain, climate, imagery, etc.) that can be accessed via GIS and Web mapping tools;
- accessible GIS professionals at the agency governing the nearby lands to share data and procedures, and work with the students;
- training courses for her to learn GIS and earn continuing education credit;
- short-term modules to teach students the basics of GIS and GPS technologies;
- access to shared technical equipment and software in the school computer lab; and,
- GIS-savvy science teachers at other schools to develop and test the module together.

3.2 Weaknesses

1. **Data standards are inadequate.** While there is strong geospatial data development taking place throughout the state, there is an overall lack of standards that clearly define the content, format, and quality expectations for key data sets. Many local government stakeholders observed that if standards existed they would be willing to employ them, while others suggested that data model templates would help more. As the State becomes more involved in assembling statewide data sets from the contributions of local governments, standards will be an invaluable tool for ensuring increased levels of data consistency. The more consistent the data, the easier the statewide aggregation process becomes.

2. **Parcel data accuracy and maintenance practices are uneven.** While parcel data exist or are under development in every county, the representational accuracy varies from counties using high-quality control points and appropriate projections to counties using less refined methods with registration errors over 100 feet in places. Similarly, the geospatial stakeholder survey revealed that update schedules ranged from daily to less than once per year. This variation is due to the lack of standards and funding, as described above.

3. **Inter-governmental data sharing procedures are inefficient.** While strong verbal agreement exists between many jurisdictions (federal, State, local) on data sharing, the process is technically cumbersome. Typically data exchange is achieved through the ad-hoc sending of files back and forth. This inconvenience has greatly reduced the participation of data producers. AGRC is experimenting with technologies for automated data exchange, but a truly scalable solution has not been widely implemented.

4. **Geographic information is not consistently accessible by the general public.** City and county governments have a wide variety of data sharing and pricing policies, ranging from freely available for download to thousands of dollars. Many others have no written policy at all. This variety of practices inhibits the utilization of data and makes data sharing cumbersome. Increasingly, data-producing organizations (especially AGRC and the larger cities and counties) are developing public Web mapping services that allow users to stream the data without necessarily allowing users to download the data. While these types of GIS Web sites should be encouraged as a means of improving overall access to geographic data for the general public, the ability for the public to acquire the actual data sets should not be diminished. Ultimately, the return on data investments is based on how much the data get used, whether by the sponsoring agency or other entities. In short, the more the data get used, regardless of the purpose, the greater the return on investment. Given that most of the geospatial data in Utah emanates from government, promoting greater data sharing and availability increases the return on the public's investment in those data.

5. **There is not a regularly recurring statewide aerial imagery program.** While Utah has been successful in creating several statewide imagery data sets, each of these projects has been undertaken under a unique set of circumstances and funding. In contrast, many states are implementing flyovers on a regular schedule with annual budgets. For example, one state flies one-third of the state each year; so the entire state always has imagery less than four years old. Local governments can buy into these image programs to shorten the schedule or increase the resolution of the imagery while still reducing costs. Collaborating with the federal government may offer further opportunities to align and subsidize statewide image collection.

6. **Access to labor resources is unequal.** Another problem many potential rural users (especially local governments and schools) face is accessing professional GIS labor, whether as full-time employees, consultants, volunteer mentors, or student interns. These people are concentrated along the Wasatch Front (i.e., greater Salt Lake City) as well as in Logan, St. George, and Cedar City to a lesser extent. But even in these areas, the social and business networks to connect those with GIS skills to those who need them are inadequate.

7. **Support from local elected officials for GIS is often inadequate.** Many county and local government stakeholders have reported that while GIS startup activities have been successful, there have been challenges in obtaining budgets to maintain GIS in the long term, or expand the range of its uses. Specifically, a lack of detailed information on the value of GIS applications makes it difficult to convince elected officials and decision makers to make a continuing investment in staff and software maintenance. To paraphrase one local government GIS stakeholder, “we’re better at putting GIS to use than we are at justifying its use.”

8. **Coordination between the GIS-mapping community and the surveying community.** While the surveying and GIS-mapping communities share many technologies and interests, there has been some tension and misunderstanding between these communities. As one stakeholder reported, “there is a lamentable joke amongst surveyors that GIS stands for ‘Get it Surveyed’. In short, the surveying community believes that GIS professionals too easily dismiss concerns about positional accuracy. At the same time, the GIS community believes that surveyors are not sympathetic to the practical realities and compromises that must be made to map large areas (e.g., all parcels in a county). This tension is not unique to Utah and it suggests there are opportunities for further outreach and coordination between these two communities which are ultimately complimentary.

GIS Potential: County General Plan

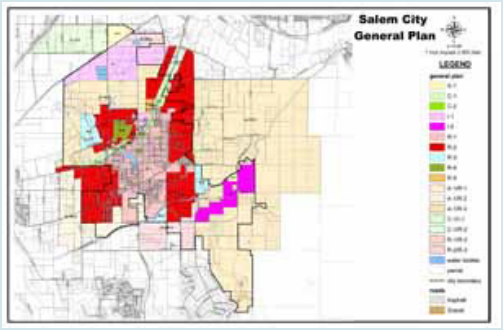
GIS enables powerful visualization, analysis, and the integration of data modeling of natural and constructed features on the Earth's surface. Whether selecting a location for a new energy facility or preparing for future community growth, GIS provides extremely relevant tools for planning and smart development. GIS can also improve the accessibility of the entire process for all citizens.

Hypothetically, a rural county in Southern Utah is working with State, federal, and local agencies on a long-term general plan (land use, transportation, etc.). It is currently routine for planning professionals to use geospatial inputs—such as land use, demographics, natural resources, etc.—in developing such plans. However, county officials also want to involve citizens in the planning process. This involvement can be more than just comments submitted after-the-fact; rather, the county seeks substantive contributions from elected officials, civil servants, expert consultants, and the interested public *throughout* the planning process and through the implementation of the plan.

Current technology would enable the county to present residents or elected officials with the option of creating their own proposals via a Web-based interactive map and have the mapping application automatically provide an initial evaluation of the proposal using analytical planning models. If the public suggestion meets a basic threshold, it could be entered into the pool of proposals to be evaluated by all participants in the process.

The committee that is managing this general plan project would need the following from the UGI:

- Accessible GIS professionals in stakeholder agencies (county, city, State, federal, non-profit).
- Reliable, detailed data relevant to the project, pooled from a variety of sources (transportation, land ownership and management, zoning, terrain, demographics, imagery, etc.).
- Advisement on best practices, standards, and resources from other agencies who have attempted similar projects.
- Technical training on developing and maintaining Web-based mapping technologies.
- A pool of available short-term labor resources (e.g., consultants, student interns) to aid in completing the project.



3.3 Opportunities

1. **The public is increasingly aware of the importance of geographic information.** Location-based services are becoming increasingly widespread in society, including the real-time mapping of election results on television, commercial mapping, and navigation sites (e.g., MapQuest, Google Maps), vehicle navigation systems, and virtual globes (e.g., Microsoft Virtual Earth, Google Earth). Using these tools, the general public increasingly understands the relevance and importance of geography and geographic information. Such awareness provides significant opportunities to generate and enhance public support for geospatial programs and explaining their relevance to elected officials and decision makers.

2. **Technology for GIS integration and dissemination is advancing.** Utah does not have to invent new software for bringing together the data and services scattered across the state and redistributing it to users with varying levels of expertise. Recent developments (which are sure to evolve further) make this process increasingly easy and powerful. Examples of enabling technology for geographic information integration include:

   - public application programming interfaces (APIs) for commercial Web mapping services such as Yahoo! and Google;
   - service protocols for delivering application components that can be combined by end users; and,
   - geospatial data replication services and database integration tools that allow information on many servers to appear and function as a single centralized database.

3. **Utah is rich in data, but it could be easier to locate those data.** As described above, there are numerous players at all levels of government creating digital geospatial data. Unfortunately, the development of a comprehensive index of available digital data has not accompanied the growth of data availability. While AGRC makes its own data holdings in the State Geographic Information Database (SGID) readily searchable, there is not a comprehensive inventory that covers the holdings of all stakeholders. As such, there is a tremendous opportunity to construct or participate in the creation of such an index. Whether this index is an outgrowth of the existing SGID indexing capability or is pursued by using an existing platform such as National States Geographic Information Council's (NSGIC) GIS Inventory tool, the GIS stakeholder community would be well served by a "one-stop shop" for browsing all Utah GIS data holdings.

4. **Much of the community is eager for guidance in data sharing.** As described above, there is little consistency in the practices and fees for obtaining county GIS data. The GIS stakeholder survey indicated that practices for parcel data range from free download to charging over $1,000. Still other jurisdictions do not have written data distribution policies and many counties are curious as to what the "best practices" are in this area and what their colleagues are doing. As such, there are two opportunities in this area: first, to assemble and distribute formal information on best practices for data sharing. Second, there is an opportunity for cooperation between the state and less populated counties to distribute county data using the State's existing infrastructure (i.e., the SGID data distribution engine). Under this system, if a county is interested, they can provide

data to AGRC. AGRC can then distribute the data via the SGID, thereby taking this "workload" off of the county's plate. This type of arrangement would provide four potential benefits:

- The state would gain copies of the data for State use.
- The county would be relieved of the work of distributing the data.
- The county would gain an automated, off-site backup of their GIS assets, and this backup could serve as an element of a disaster recovery plan.
- The data would be made readily available to the public.

While taking this approach may mean that the county foregoes some revenue generating opportunities, it could also be argued that the four benefits outlined above exceed the value of the revenue that might be generated.

5. **Providing additional support to local government GIS programs.** As documented above, and through conversations with local GIS stakeholders, several counties indicated that they are challenged by GIS staffing shortages and that they need to demonstrate to County Commissioners and other senior staff of the benefits of GIS to gain ongoing and "right-sized" support for local GIS programs. Thus, there is an opportunity to supplement the "GIS startup" activities that have been successfully supported via the "rural county grant program" and to provide further support for local government "GIS maturation." Indeed, as AGRC helps local GIS programs grow deeper institutional roots, the State will realize the benefit of more and more counties becoming effective and reliable data partners. Elements of expanded local government support might include:

   - Several counties suggested it would be beneficial to have access to a listing of third-party GIS professionals and consultants that could support local GIS efforts. Such a listing could be made available through a "state blanket contract" or "Master Service Agreement" that would expedite procurement with a set of pre-qualified vendors.
   - Supporting county and local government efforts aimed at GIS strategic planning. Support might take the form of technical assistance and/or direct funding support of such planning studies.
   - Consideration of AGRC broadening its GIS support services by developing a "regional office" or engaging regional associations of government, or increasing the role of Utah State University's Extension Services to be a resource for providing regional GIS support. Given the physical size of the state, having support closer to cities and counties will improve the level of support provided.
   - Development of materials that describe a "model program" for local government GIS and the dissemination of local government best practices for geospatial technology management.

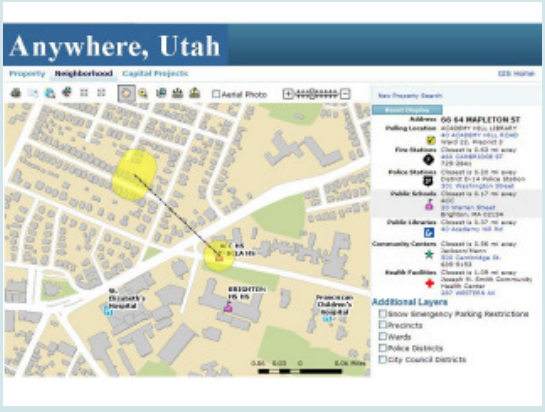
6. **Better currency and accuracy for administrative boundary changes and annexations.** Given the rate of population growth and development in parts of Utah, there is very active municipal annexation. In many areas of the state this results in the need to create and publish administrative boundary data sets on an ongoing basis. During stakeholder workshops and interviews there were several cases cited where there were multiple, varying, and conflicting GIS representations of municipal boundaries.

Administrative boundary data have topological relationships with, and often serve as an important substrate for other layers such as parcels, service districts (e.g., schools, utilities), and voting boundaries. Thus, these other layers should have lines that are coincident with the municipal boundary, and it is critical that boundary changes be managed and mapped in an accurate and timely manner. Given that a formal boundary change process was established when 2005 Government Boundary Changes Bill (HB-113-2005[4]) was enacted, there is an opportunity to potentially improve the quality, consistency, and timeliness of the State receiving digitally mapped annexation information as part of that process. Future improvements may require further legislative action, but a process that recognizes digital mapping is already in place. Ultimately, the end result of an ideal boundary change process would yield a "definitive" municipal boundary layer that is accurately updated by localities and made accessible concurrent with the enacted changes. Ensuring that such a "definitive boundary" layer was suitably accurate will require coordination and collaboration between and among the GIS "mapping community" and the "surveying community" which has a long history of addressing these types of complex, technical issues.

GIS Potential: Public Services Locator

GIS data and analysis need not be limited to the domain of the GIS professional. It is now relatively easy for GIS functionality and information to be accessed by the non-GIS professional and delivered to the end user in a format with no hint of the sophisticated back-end geospatial technology at work. The hypothetical example below demonstrates both the power of GIS for integrating information from almost limitless sources and for providing this information and knowledge for public consumption.

A citizen or visitor is interested in determining basic public services (e.g., voting place, utilities, tourist attractions, school assignments, parks) that are available at or near a specific location in Utah. Through a simple Web interface, this person submits a location, such as their home address, and the range of relevant services nearby (based on the user's interests) are returned in real time. Such an application would be especially useful when accessed via Web-enabled mobile devices.



To provide and maintain this type of statewide location-based information service, the following must be available from the Utah Geospatial Infrastructure:

- Reliable reference data that can locate addresses, zip codes, cities, place names, parcels, or public land survey system (township-range-section).
- Base cartographic layers (e.g., imagery, street map, digital topographic maps, parcel boundaries, etc.) that allow the user to explore their area of interest.
- Databases of facilities, service areas, events, and other location-based information for which users may wish to search.
- Server-based spatial query services that search these databases for features at or near the user's point of interest.
- Spatial database technologies capable of storing and hosting multi-user, distributed update operations, for maintaining better service and more current geographic data.
- Server application hosting infrastructure to efficiently handle high volumes of daily requests.

4.0 Programmatic Goals

The strategic goals were developed through a broad participatory public process. Additional public input was used to create *programmatic goals* to more explicitly define specific strategies for implementing the broad strategic goals. When implemented, these programmatic goals will leverage Utah's strengths, address the State's weaknesses, and capitalize on the opportunities described above.

The strategic and programmatic goals are both driven by what the geospatial community has declared should be the focus of the UGI. Each goal is designed to be actionable, measurable, and achievable. The programmatic goals identified here begin the process of planning, implementing, measuring, and achieving the desired overall strategic outcomes.

4.1 Collaboratively maintained statewide data resources are usable, dependable, and relevant.

During the planning process, stakeholders identified data more frequently than any other aspect of the Utah Geospatial Infrastructure. This goal is intended to address the issues relating to geospatial data. Through the collaboration of all members of the geospatial community in Utah, this goal will be accomplished through the following programs:

1. **Identify and prioritize a master list of data sets, and plan for their creation, maintenance, and distribution.** To meet the needs of local government, State agencies, other public sector users, and the private sector, a list of core data layers will be developed, building on the 2001 Framework Implementation Plan. The data sets will then be prioritized based on the value of the data to support decision making at various levels of government, and will be articulated in tangible use cases that describe the value of the data by determining both quantitative and qualitative benefits. Roles and responsibilities for developing processes and establishing communities of support will be identified through the development of the Business Plan for this initiative.

2. **Develop, publish, and implement standards.** Data standards were identified as a basic need to facilitate the development of high quality data and an efficient aggregation of local data sets into statewide or regional collections. Many agencies indicated a willingness to share data, but desired standards to guide them. These standards would cover issues such as database design, data content, and data quality (accuracy, completeness, and currency). Data standards that currently exist need to be re-assessed, and when necessary, revised. In addition, new data standards should be developed by teams of interested participants under the auspices of, and with extensive review by, the broader geospatial community. These standards should be flexible enough to allow agencies to maintain their own internal database designs and practices, while also enabling these agencies to present their data to the outside world in a consistent way.

3. **Identify data stewards and/or custodians.** The key to having data resources that are dependable and relevant is to have the appropriate agencies take full responsibility for the data sets that each is best qualified

to create, maintain, and distribute. To achieve this, the processes used to identify priority data sets will also identify existing data sources and the data stewards across all levels of government. The process must also recognize that there can be some complex, multi-jurisdictional situations, such as private in-holdings within National Forests, that may require coordination between data stewards. The best data stewards will maintain high quality data through regular updating, and will work with the community to develop policies relating to data maintenance and sharing, thus building a trust between producers and users.

4. **Create and maintain an online inventory.** Even with efforts to build collective database inventories, such as the AGRC's SGID, and federated catalogs such as the FGDC's Geospatial One-Stop (GOS)[5], many data sets maintained by a variety of entities are not included. An online inventory of data resources should serve to make existing data much more accessible. Existing tools such as the NSGIC's GIS Inventory Tool and GOS should be assessed as possible methods for implementation of a comprehensive Utah data inventory. Due to the fact that many GIS projects span political boundaries, the inventory should not be limited to Utah-based data sets, and eventually it should contain the key holdings of neighboring states. This inventory will help the wide variety of data consumers identify and access the best Utah and neighboring state data for their needs. This will also help to direct federal databases and on-line Web mapping services to use the most current data for Utah.

5. **Make the business case for data sharing.** The costs and benefits of sharing data come in many forms, but most can be defined and quantified. Agencies that exchange their data with partners in a form of trading do so because it provides benefits for both. If this exchange is done through a centralized facility, and the data is also available to the public, then both the broader GIS community and the public benefit. A centralized data facility can provide the data steward/contributor with additional benefits, such as having off-site back-up of the data. Another benefit may be a reduction in staff time used in responding to requests for data. The business cases developed for early efforts towards this objective need to be made available to others to help them justify investments in, and gain support for, data sharing initiatives. In addition, template data sharing agreements may serve as a vehicle for making data more accessible.

6. **Formalize processes for data exchange between partners.** Data exchange between complimentary partners (e.g., a metropolitan planning organization and a city therein) can be accomplished within a broad range of options. These can range from delivering data on portable storage media (e.g., DVD) to having Internet-based server-to-server replication of data that are based on established data standards. Data exchange processes should utilize best practices to ensure that these exchanges are efficient and provide the most current and reliable data. Formal agreements should be made between participating partners to ensure that expectations for the data are maintained.

4.2 Services are effective, accessible and reliable.

The "geospatial services" covered by this goal include automated, Web-based software that performs many of the functions traditionally handled by desktop GIS software, including map rendering, searching, address geocoding[6], basic spatial analysis, data management, and basic data editing. For example, a public Web mapping site, such as Yahoo! Maps, is a geospatial service that aggregates several smaller geospatial services (mapping, routing, geocoding, search, etc.). To be effective, these services must be based on well-defined, open specifications and must be designed to meet the needs of a specific audience. It is also necessary to be able to integrate geospatial services with non-spatial services (e.g., relational database query, portals, blogs, etc.) to make them as useful as possible. Achieving this goal will involve the following:

1. **Create a common infrastructure for delivering geospatial services.** This will allow the various agencies that provide services to "speak the same language" and thus be more easily integrated into the overall UGI. Utah has no need to reinvent these standards. A multitude of specifications and protocols exist for developing interoperable services, including those from the Open Geospatial Consortium (OGC)[7] which are specialized for geospatial services.

2. **Create exemplary services to serve as a model for others.** AGRC and university researchers are well-positioned to experiment with new types of services, but innovation is already happening around the state. Successful geospatial sites should be showcased, and when possible, the underlying code should be made available to the community to encourage collaborative development.

3. **Develop services to enable data integration.** The UGI needs to be able to bring together thousands of data sets from hundreds of sources spread across the state, in such a way as to appear seamless and transparent to end users. A variety of possible architecture approaches and combinations exist for accomplishing this, including, but not limited to, centralized (i.e., aggregating data on a single server), federated (i.e., separate servers that can exchange data in real time), and distributed (i.e., separate servers that are cataloged and searched from a central application). Further detailed planning needs to take place to determine the best architecture for the UGI and what is required to implement it.

4. **Adopt management and control processes for UGI geospatial services.** Utilization of geospatial services is highly dependent on service awareness, ease of service consumption, and consumer confidence in the service's availability, speed, and reliability (i.e., "up-time"). For this reason, a major goal of the UGI should be to adopt management and control processes for optimized service delivery. Ultimately, this will be a critical element of success as the services architecture will not gain acceptance and use unless it is robust, reliable, and performs well. It should also be noted that maintaining high availability and high performance for Web services is not necessarily one of the historic core competencies of GIS organizations and that appropriate staffing and training will need to be addressed.

4.3 Operational efficiencies are achieved through effective organization and communication.

An important part of the Utah Geospatial Infrastructure is a "human infrastructure," made up of the people who produce and use geographic information, and the organizations that sponsor the effort. The human components of Utah's existing geospatial infrastructure can be improved through the following four programmatic goals:

1. **Optimize the organization of the Utah geospatial community.** Currently there are several organizations that represent elements of the geospatial community, including the GIS Advisory Council (GISAC), the Utah Geographic Information Council (UGIC), regional users groups, and local chapters of national professional societies such as Urban and Regional Information Systems Association (URISA) and the American Society for Photogrammetry and Remote Sensing (ASPRS). While these organizations have successfully advanced GIS in our state, their specific roles can be unclear and overlapping. The community would benefit from being reorganized into a more streamlined and efficient structure. A well-organized geospatial community will be vital to creating the UGI as it will:

   - foster cooperation between professionals and their organizations;
   - present a unified face of GIS to the outside world, including elected officials; and,
   - facilitate service activities such as K-12 mentoring, emergency relief, and education.

   This reorganization may involve refocusing the roles of the existing organizations, or creating new organizations. Either way, the resulting organization must have more clearly defined responsibilities and authority that can help govern all aspects of the UGI. This task will likely need to be completed early in the implementation of this strategic plan in order to best address the other programmatic goals.

2. **Involve all stakeholders in the construction, maintenance, and use of the UGI.** The players in the Utah Geospatial Infrastructure fall into three general categories:

   - The Stewards of the UGI are permanent organizations that take charge of its construction and long-term development of individual data sets. Stewards are typically organizations with a mandated or programmatic requirement for the data. This will likely include individual agencies, AGRC, and organizations representing the broader geospatial community, such as GISAC and/or UGIC.
   - The Producers of the UGI should include all geospatial professionals in Utah, from all levels of government, the private sector, academia, and other organizations. Their contributions of data, software, services, time, expertise and collaboration will make the UGI vastly more powerful and useful to all than if the community expected AGRC to build it single-handedly.
   - The Consumers of the UGI will include all of those who benefit from the data and services that the UGI delivers either directly (e.g., digital data) or indirectly (e.g., a useful map delivered through a Web page). This is not only the geospatial community, but potentially all citizens of Utah, such as the general public, elected officials, students and teachers

(in many subjects), the business community, and even visitors to our state. This group, and the ways in which the technology is employed for real world problems, should always be considered the main constituency and focus of any decisions regarding the UGI.

To be successful, the Utah Geospatial Infrastructure must officially recognize, legitimize, and clarify each of these roles, and recruit significant commitment from all three types of stakeholders.

3. **Leverage the UGI to serve the entire state.** The UGI will contain a wealth of information, technology, and expertise. For the UGI to be of maximum value, the members of the Utah geospatial community must adopt an attitude of service and outreach. Programs that have been successful in the past, such as the mentoring of K-12 teachers and GIS Day, should be retained and improved; however, there are many other service activities that could be developed. These could include:

   - developing a "GIS Rapid Response Team" that is prepared to provide geospatial support during emergencies and disasters[8;]
   - providing pro bono assistance to agencies and organizations with needs for geospatial technology, but with insufficient resources;
   - advocating for geospatial oriented legislation and policy; and,
   - investing in services that can be easily and freely used by the public.

4. **Use communications technology to facilitate cooperation between stakeholders in the UGI.** A variety of Internet-based technologies have emerged that make it easier for dispersed groups to share ideas and work together, including wikis, blogs, and forums. Collectively, such technologies are often referred to as "Web 2.0." It is highly likely that even better technological tools will emerge in the future. The recently released Utah GIS Portal should continue to be enhanced to help the geospatial community work together, including forming specific communities of interest, developing standards and policies, and fostering relationships (e.g., mentoring, service, and advocacy) between GIS professionals and the larger community.

4.4 Decision makers at all levels understand the value of building the Utah Geospatial Infrastructure and the benefit of utilizing it to respond to needs and opportunities.

The UGI must be based on the reality that good intentions and plans only go as far as they are prioritized, supported, and funded by decision makers at all levels. Therefore, it is imperative that the participants in the UGI promote official recognition of both the value of the UGI, and the responsibility of all to participate in it.

1. **Present the UGI to decision makers as a high value project and asset.** Leaders of data producing organizations (e.g., cities, counties, State agencies) should see the benefits to their constituents and others by the delivery of data in a standards-based form and in a timely manner. Quality promotional materials, use cases, and return on investment (ROI) information should be developed to encourage decision makers to continue to support GIS programs and to help them justify the expenses. Data-distributing organizations (e.g., AGRC) should develop applications that will benefit the data-producing organizations and/or their constituents as well as credit data producing organizations as vital participants in the UGI.

2. **Develop a series of key projects to illustrate the benefits of supporting the UGI.** Ultimately, the UGI is not about geospatial technology. Rather, the UGI is about how these technologies are applied to deliver real world outcomes, such as more informed planning, better decisions regarding land use and development, and enhanced emergency response and public safety. As such, a series of "showcase projects" should be designed to illustrate how the UGI can be applied in real world situations. These projects will show the importance of both data producers and data consumers who derive information knowledge from raw GIS data. Such projects should focus on illustrating the benefits that can be achieved by supporting the UGI. These projects and companion materials, such as executive summaries, can then be presented to decision-makers and the public through a variety of media and forums. These outlets could include, but are not limited to:

   - Utah State Legislature
   - Utah Association of Counties (UAC): Commissioners, Councilors, Managers, Recorders, Assessors, Clerks, and Treasurers
   - Utah League of Cities and Towns (ULCT): Councilors, Managers, Mayors, Planners, and Engineers
   - Utah Council of Land Surveyors
   - Utah Geographic Information Council (UGIC)

3. **Develop a support network to sustain local practitioners and build advocacy.** This network, likely based on the organizations and communication tools discussed in Goal 3 (see Section 4.3 above), must provide participants with timely, concise status information concerning the UGI. As the UGI develops, it will be important to communicate its progress to the stakeholder community and to gain a sense of momentum.

5.0 Future Planning Efforts

This strategic plan is only the first step toward realizing the Utah Geospatial Infrastructure. To highlight our long-term goals, it is necessarily broad and conceptual. Thus, future efforts must develop the next level of detailed plans and procedures, and program the necessary funding to construct and maintain the UGI. This section gives a general outline of the next steps.

5.1 Implementation Plans

The plan for implementing the Utah Geospatial Strategic Plan will be developed after the presentation of the plan to the stakeholder community at the 2008 Annual UGIC Conference, subsequent presentations, and finalization of the strategic plan. The feedback gained from these sessions will be utilized in developing and refining the implementation plan. Implementation will not be covered by a single plan, but a series of planning efforts that will unfold over one to two years. Specific planning efforts include the following:

- **Prioritizing** the programmatic goals discussed above, followed by a **phasing** plan and development of assessment measures.
- **Business plans**, developing precise procedures to implement the highest priority programmatic goals.
- **Budget Plans** and resource requirements.
- **Awareness campaign** and associated formal marketing efforts.
- **Measuring success**, assessment, and recalibration.

5.2 Technology Plan

A companion technology plan for the UGI is currently under development. The technology plan differs from the strategic plan in that it focuses on the specific hardware, software, and data models necessary to construct a robust, efficient, and performant UGI, especially focusing on the server end. The goals of this plan are expected to be realized over the next tow to three years and include:

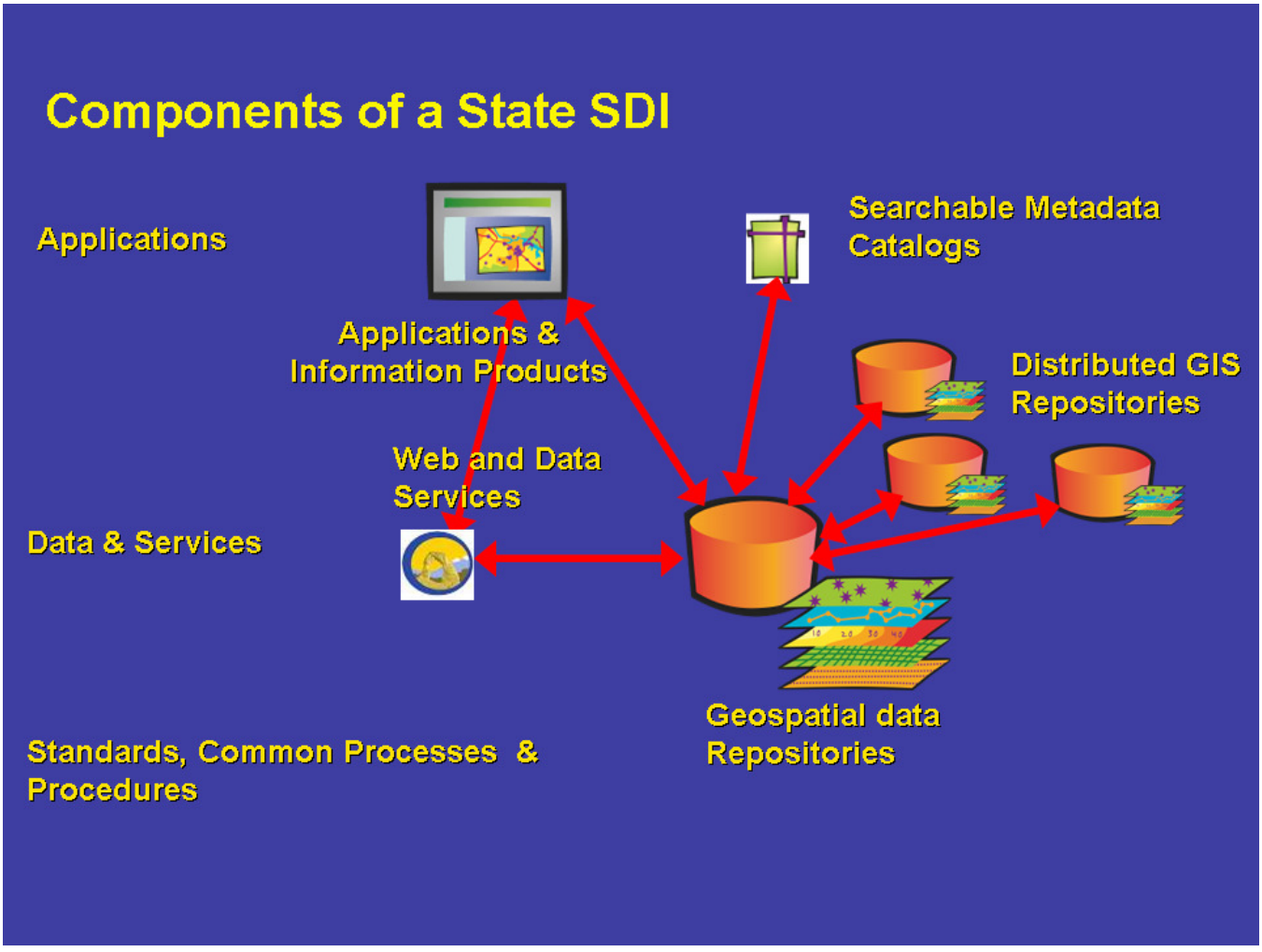
- The **design of core geographic data sets** that can be easily accessed by a variety of users using a variety of GIS software programs.
- **Specifications to guide the development of data sets** by many partner organizations (e.g., city and county governments) to maximize the ease of sharing between them.
- **Common industry standards for the discovery and consumption of services.** This would include publishing services using the Open Geospatial Consortium's (OGC) open GIS standards, such WMS and KML, and registering the services with the appropriate servers and search mechanisms.

The UGI will evolve to provide new and additional Web services (beyond AGRC's current capacities) as well as other capabilities. Some of these services will be targeted at programmers and developers that are building mainstream business/IT applications. Other capabilities for data management may be

developed to facilitate data sharing through industry data interoperability standards with partners. Potential capabilities include, but are not limited to:

- Address geocoding and geographic name (e.g., Gazetteer) search tools.
- Geocode address and return relevant jurisdictions (e.g., point-in-polygon determination).
- A set of common base map services for both 2D and 3D.
- Route finders between two or more locations.
- Back-end infrastructure that includes a resource and metadata catalog, server architecture, a security layer, and data and systems management processes.

While some of these capabilities exist today, there are a number of new business and technical opportunities that require planning to match these needs to available technology and data. The development of a Technology Strategy provides an approach to developing these new capabilities to meet the needs of the State in the future.



Endnotes

1. The Strategic Planning Project Team acted as an hoc committee of GISAC that included GISAC members and members of the AGRC staff. See Section 6.1 for Project Team membership.

2. This funding program has grown out of an initiative begun in 1997, called the Rural Government GIS Assistance Program. This was initiated to help the rural counties gain the GIS infrastructure and training necessary to begin using this technology. The Utah Association of Counties (UAC) studied the impact of these pass through funds and has found that a Number of the less populated, rural counties rely on these funds exclusively for cadastral data acquisition. This type of funding assistance is critical for the building of border to border parcel coverage for the State. The data generated at the county level via these funds is used both at the county level for their day-to-day business and at the state level to expand and improve the State Geographic Information Database (SGID). This partnership between the State and the counties has significantly increased the quality, currency and reliability of data available to all levels of government and the public and is critical to on-going standardization of data and processes to maintain the information.

3. See: http://utahsciencecenter.org/lows/exhibit_preview/geographic_information_science.php for further information.

4. See: http://www.le.state.ut.us/~2005/htmdoc/hbillhtm/HB0113S01.htm for further details.

5. See: http://gos2.geodata.gov/wps/portal/gos for further details.

6. Geocoding is the process of converting an address (e.g., 121 Main St.) into a specific coordinate location on a map (e.g., a latitude/longitude coordinate).

7. See: http://www.opengeospatial.org for further details.

8. Groups of volunteer GIS practitioners have been mobilized, generally in an ad hoc, after-the-fact manner to assist in the response and recovery to many recent emergency situations ranging from 9/11 to Hurricane Katrina to last year's Southern California wildfires.

9. See: http://www.fgdc.gov/policyandplanning/50states for further details.

APPENDICES

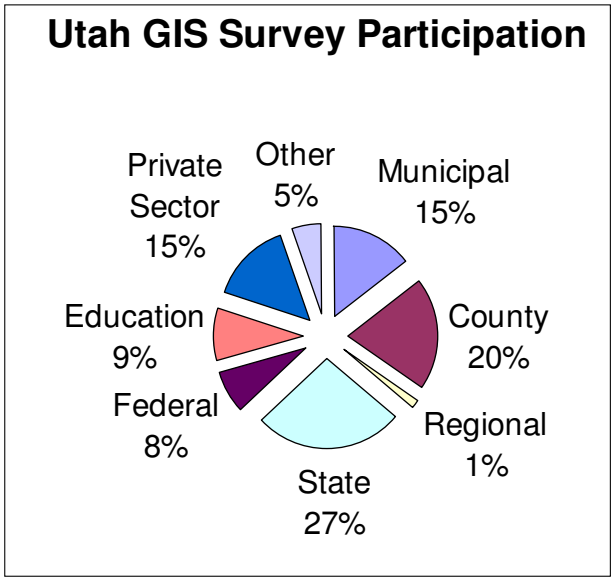
APPENDIX 1: STRATEGIC PLANNING PROCEDURE

This strategic plan aims to represent the interests of all GIS stakeholders in Utah, including all levels of governments (federal, State, county, tribal, local), as well as the private and educational sectors. While AGRC has traditionally played a leadership role in geospatial services for the State, the Utah Geospatial Infrastructure and this strategic plan are not about State government. Rather, this is a plan that reflects the common interests of all producers and users of geographic information in Utah.

This planning process was supported through a grant from the Federal Geographic Data Committee (FGDC) Cooperative Agreement Program (CAP) as part of the Fifty States Initiative (a partnership between FGDC and NSGIC, the National States Geographic Information Council)[9]. Project administration and contracting was provided by the Utah Automated Geographic Reference Center (AGRC). Project oversight was provided by the Utah Geographic Information Systems Advisory Council (GISAC) through an ad hoc Strategic Planning Committee, with the following members, including AGRC subject expert participation:

- Dennis Goreham, Bert Granberg, Matt Peters, and Jeannie Watanabe: AGRC (representing state government)
- Dr. Brandon Plewe: Brigham Young University (representing education)
- Kevin Sato: Cottonwood Heights (representing city government)
- Dave Vincent: United States Geological Survey (representing federal government)
- James Wingate: Blue Stakes of Utah (representing the private sector)
- Don Wood: Wasatch County (representing county government)

Another key participant and supporter of the process was the Utah Geographic Information Council (UGIC), which included strategic planning sessions in its annual conferences in April 2007 and 2008, and at a mid-year conference in October 2007.

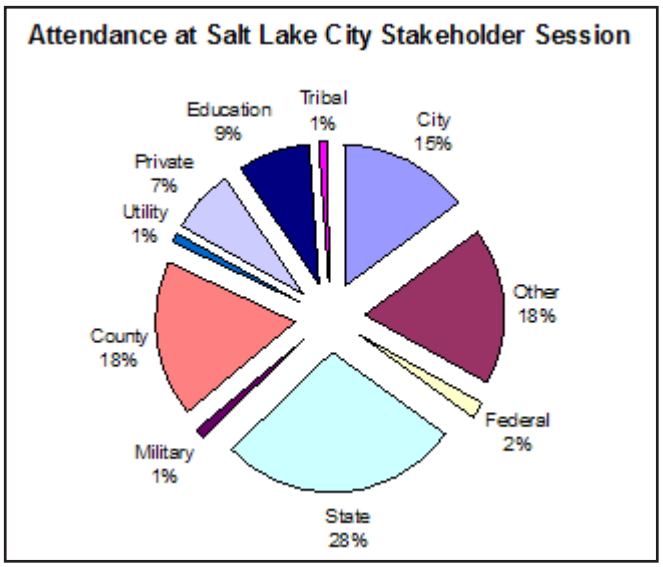


These organizations engaged Applied Geographics, Inc. to facilitate the planning process. To represent the broad array of GIS stakeholder interests, the planning process was designed to be both inclusive and transparent. This included incorporating the perspectives of as much of the Utah geospatial community as possible. Several distinct activities gathered direct, firsthand input from the community, including:

- **A statewide GIS Survey**: The survey was created to gather factual information that would characterize GIS adoption across the state and across stakeholder groups. Survey topics included funding models, software utilization, data availability and quality, and data distribution practices and issues to which GIS are applied. The survey was completed by 75 stakeholders,

and as the chart above illustrates, it was successful in reaching a broad cross section of stakeholders.

- **Large Group GIS Stakeholder Strategic Planning Workshop**: During November, 2007 a GIS stakeholder strategic planning workshop was held in Salt Lake City. As with the survey, this workshop succeeded in attracting a broad array of 79 stakeholders and in obtaining direct input that influenced the overall shape of the plan.



Appendix 2: Survey Results

The images on the following pages provide an overview of the results of the on-line survey that was completed during this project. The survey was made available to the Utah GIS stakeholder community during November, 2007 and the results reflect the 75 responses that were completed.

Fantastic Response

	Response Percent	Response Count
Municipality pop: <1,000	0.0%	0
Municipality pop: 1,000-10,000	2.7%	2
Municipality pop: 10,000-20,000	0.0%	0
Municipality pop: 20,000-50,000	2.7%	2
Municipality pop: >50,000	9.3%	7
County pop: < 4,000	1.3%	1
County pop: 4,000-11,000	4.0%	3
County pop: 11,000-31,000	8.0%	6
County pop: 31,000-125,000	1.3%	1
County pop: 125,000-700,000	2.7%	2
County pop: > 700,000	2.7%	2
Regional Planning Organization	1.3%	1

Survey Respondent Characteristics

- Experienced stakeholders:
  - 78% has >5 years experience
  - 54% has >10 years experience
- Full-time GIS staff are prevalent
  - 80% of organizations have full-time GIS staff
  - 28% have 5 or more full-time staff
- Large numbers of GIS users
  - Only 25% of organizations have <5 GIS users
  - 18% have >50 users
  - 32% have 15-50 users

GIS Finances

- 80% funded via operating budget
- 30% receive grant funding
- 16% use capital funding
- Only 13% through "service fees"

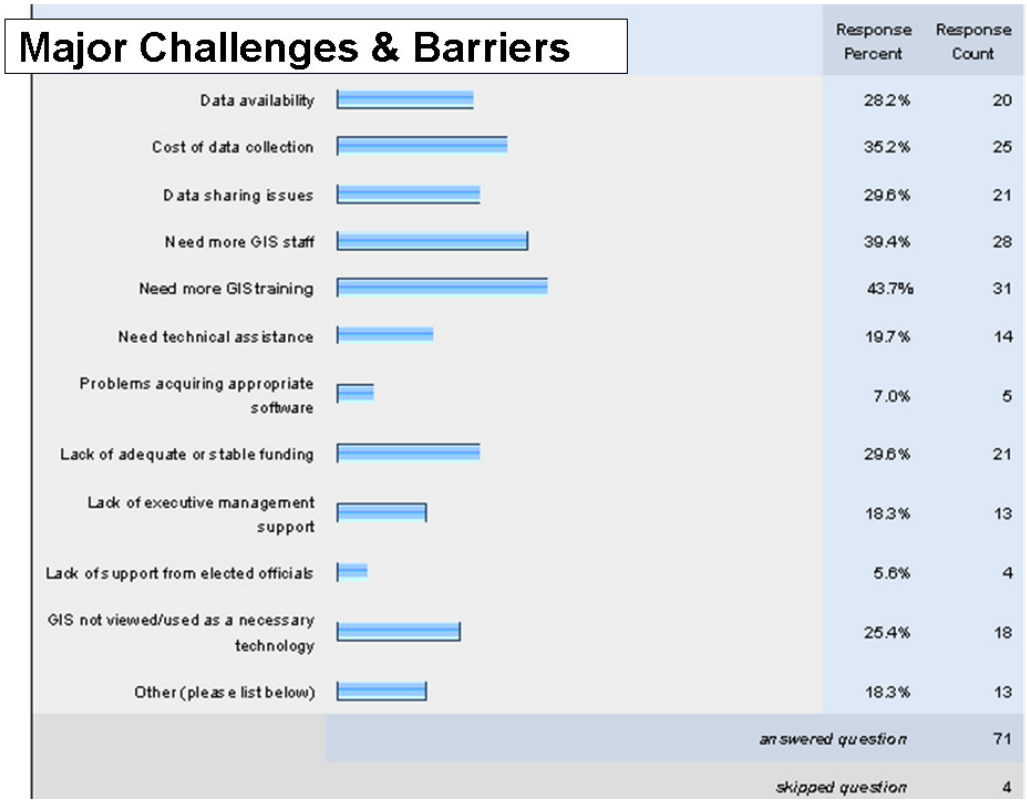
GIS Spending	Response Percent	Response Count
<$5,000	16.3%	8
$5,000-$10,000	14.3%	7
$10,000-$25,000	22.4%	11
$25,000-$50,000	**28.6%**	14
$50,000-$100,000	6.1%	3
>$100,000	12.2%	6
answered question		**49**
skipped question		**26**

GIS Finances

GIS Staff Salary Ranges	Response Percent	Response Count
No GIS staff	18.5%	10
<$15,000	1.9%	1
$15,000-$25,000	3.7%	2
$25,000-$35,000	27.8%	15
$35,000-$45,000	**53.7%**	29
$45,000-$55,000	40.7%	22
$55,000-$75,000	31.5%	17
>$75,000	7.4%	4
answered question		**54**
skipped question		**21**

GIS is used for:

Business Uses	Primary + Secondary	Primary	Secondary
Community Planning	86%	42%	44%
Environmental	79%	47%	31%
Infrastructure/Asset Mgmt	77%	40%	38%
Economic Development	74%	29%	45%
Transportation	73%	37%	37%
E911/Emergency Planning	67%	42%	24%
Education	57%	17%	40%
Parcel Recording	50%	28%	22%
Parcel Assessment/Valuation	35%	13%	23%
Health	34%	12%	22%



Major Challenges & Barriers
Answers to "Other, please specify" response

- Lack of info on vendor capabilities
- Lack of info on implementation strategies
- Need information on applications for available data
- Interdepartmental coordination/cooperation
- Keeping up with technology/keeping staff current
- Open mindedness to new approaches (i.e. "we've always done it this way")
- Staff with the right skills (e.g. programming)
- Management understanding of costs and benefits

Technology

- ESRI-centric, but not exclusive
  - 95% use ESRI technology
  - 57% use Google Earth
  - 31% use Autodesk
  - 14% use MS Virtual Earth
  - 8.5% use Open Source server products
  - MapInfo, Manifold, Intergraph, Global Mapper also represented
- Wide use of GPS
  - 87% report use of GPS
  - 4% are subscribers to TURN GPS network
- High-bandwidth Internet is available
  - 83% have broadband leased line (T1, T3, etc.)
  - ***None*** reported dial-up**
  - 66% report maintaining GIS web-sites (Internet and intranet)

**On-line survey may report biased results

Parcel Availability

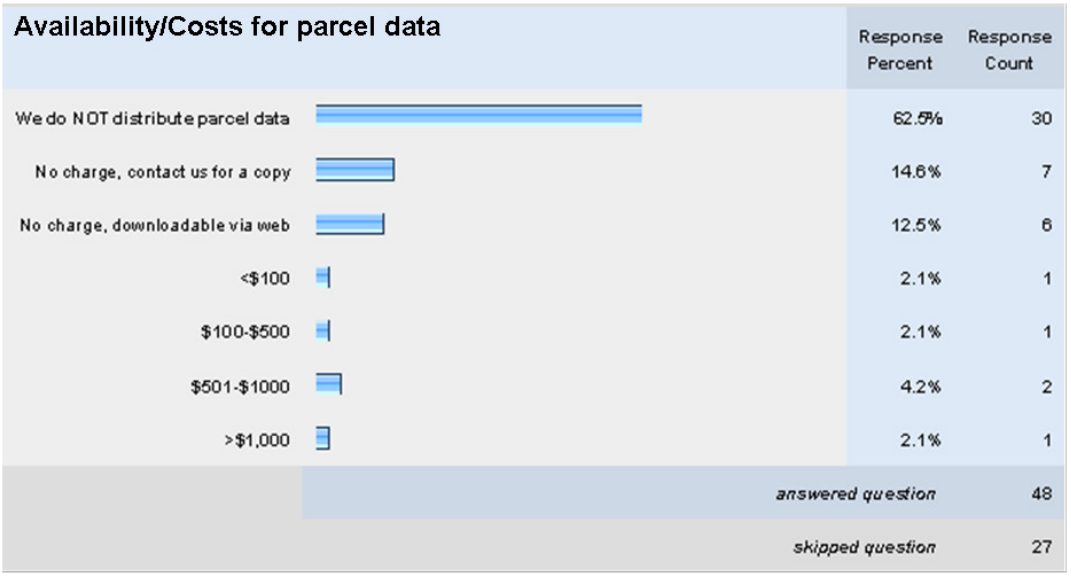
Number of parcels in County: More parcels = More likely to have GIS	Response Percent	Response Count
<1,000	3.3%	1
1,000 – 5,000	6.7%	2
5,000-10,000	3.3%	1
10,000-20,000	20.0%	6
20,000-50,000	26.7%	8
>50,000	40.0%	12
answered question		30
skipped question		45

Parcel Availability

Update frequency varies	Response Percent	Response Count
Daily	36.7%	11
Weekly	3.3%	1
Monthly	20.0%	6
Quarterly	16.7%	5
Annually	16.7%	5
Less frequent than once per year	6.7%	2
answered question		30
skipped question		45

Digital Data Distribution

- Only 37% of organizations have a written data distribution policy



AGRC Performance & Priorities
Sorted on Top Priority

AGRC Activity	Top Priority %	Med Priority %	Low Priority %	TOTAL %	Response Count
Data for download	81%	18%	0%	98%	62
Data hosting	69%	28%	0%	97%	58
Statewide GIS policy development	60%	15%	7%	82%	60
Statewide GIS strategic planning	60%	17%	2%	78%	60
Standards development	59%	21%	2%	81%	58
Funding and grants to support GIS	45%	34%	13%	92%	53
Training	38%	34%	15%	87%	61
Data development	36%	38%	11%	85%	55
Support for local GIS strategic planning	36%	28%	16%	79%	58
Technical support	31%	31%	33%	95%	58
On-line data viewer(s)	29%	41%	23%	93%	56
Geocoding services	25%	27%	33%	85%	52
User groups support	25%	29%	11%	64%	56
Online forum for collaboration	23%	29%	18%	70%	56
Consumable web mapping services for developers	22%	24%	47%	93%	55
Workshops on special topics	22%	30%	18%	70%	60
Application hosting	20%	25%	47%	92%	51
Geospatial application development	18%	26%	48%	92%	50

AGRC Performance & Priorities

Sorted on Total Priority

AGRC Activity	Top Priority %	Med Priority %	Low Priority %	TOTAL %	Response Count
Data for download	81%	18%	0%	98%	62
Data hosting	69%	28%	0%	97%	58
Technical support	31%	31%	33%	95%	58
On-line data viewer(s)	29%	41%	23%	93%	56
Consumable web mapping services for developers	22%	24%	47%	93%	55
Funding and grants to support GIS	45%	34%	13%	92%	53
Application hosting	20%	25%	47%	92%	51
Geospatial application development	18%	26%	48%	92%	50
Training	38%	34%	15%	87%	61
Data development	36%	38%	11%	85%	55
Geocoding services	25%	27%	33%	85%	52
Statewide GIS policy development	60%	15%	7%	82%	60
Standards development	59%	21%	2%	81%	58
Support for local GIS strategic planning	36%	28%	16%	79%	58
Statewide GIS strategic planning	60%	17%	2%	78%	60
Workshops on special topics	22%	30%	18%	70%	60
Online forum for collaboration	23%	29%	18%	70%	56
User groups support	25%	29%	11%	64%	56

Priority Data Sets

% of users who access 17 priority themes

Data Theme	Use these Data	Do NOT use	% Who Use
Street centerlines	59	0	100%
Administrative boundaries (state, county, municipal, legislative districts, etc.)	61	1	98%
Hydrography (surface water, streams, ponds, dams, watersheds, etc.)	57	1	98%
Other transportation (e.g. rail, airports)	55	2	96%
Parcels and Land ownership	57	3	95%
Land use (e.g. zoning)	52	6	90%
Elevation (contours, digital elevation models, etc.)	56	7	89%
PLSS features (e.g. section corners)	53	7	88%
Geographic names	51	8	86%
Demographic data	46	9	84%
Hazards (e.g. faults, floodplains, hazardous waste)	47	10	82%
Address points (specific X,Y location of individual addresses)	47	12	80%
Critical facilities and infrastructure (e.g. hospitals)	42	12	78%
Utilities (e.g. electric, pipelines, sewer, water distribution, stormwater, etc.)	42	13	76%
District boundaries (school, fire, voting, utility, etc.)	45	14	76%
Land cover (e.g. vegetation)	42	14	75%
Geodetic control (e.g. survey markers, CORS locations, etc.)	39	18	68%