Mapping Missouri's Future

A Statewide Geographic Information Strategy
Version 3.0

Document History and Citation Information

The **Missouri Geographic Information Systems Advisory Council (MGISAC) (**www.mgisac.org) was created by an executive mandate of Missouri's Chief Information Officer to provide leadership in the development, management and use of geographic information and related technology in the state. With administrative support from the Missouri Spatial Data Information Service (MSDIS) in the University of Missouri (MU), the Council provides policy advice and makes recommendations regarding efficient investments, management practices, institutional arrangements, and data standards and education.

Mapping Missouri's Future was prepared by the Council's Strategic Planning Sub-Committee and approved by the GIO and MGISAC in July 2008. We would like to acknowledge the use of ideas, constructs, and approaches garnered from the following state reports that preceded our effort:

- Maryland State Geographic information Committee – Building an Effective Statewide Spatial Data Infrastructure - Strategic Plan (2007);
- Minnesota Governor's Council on Geographic Information – A Foundation for Coordinated GIS: Minnesota's Spatial Data Infrastructure - A Strategic Plan (2004); and
- Wisconsin Location Matters: A Statewide Geographic Information Strategy (2007).

The initial MGISAC Strategic Planning Executive Committee members were:
> Pam Kelrick (Chair), GIS Consortium, Adair County
> Tim Haithcoat, GIO, Information Technology Services Division
> Mark Duewell, Program Director, MSDIS
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Web availability: *Mapping Missouri's Future* is available on the Office of Geospatial Information web site at www.gis.mo.gov.

For additional printed copies contact the Office of Geospatial Information at gis@oa.mo.gov.

Version #	Date	Description	Responsible Party
1.0	July 2008	First Adoption	Geographic Information Officer and the Missouri Geographic Information System Advisory Committee
2.0	March 2011	First Update to Plan - Final	Geographic Information Officer, ITSD Director-OGI, and the Missouri Geographic Information System Advisory Council
3.0	November 2011	Update to remove references to GIO.	Director-GIS

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1. Executive Summary

Missouri needs overarching intergovernmental and interdisciplinary sharing of geographic information, technologies, and services. This document presents short- and long-term planning to achieve the goals set forth in the 2008 *Mapping Missouri's Future* document. Progress made since the 2008 document is also noted. That plan consisted of five broad goals and associated strategic elements. These components, have been set in motion, and are propelling the state forward to build the foundational Missouri Spatial Data Infrastructure (MoSDI) and support the realization of an interoperable information vision. Achieving this vision will dramatically improve the effectiveness of state, local and regional programs ranging from public safety to natural resource management to economic development while also reducing costs associated with these programs.

The MoSDI will address the business needs of Missouri's governments while seeking to leverage and facilitate the ongoing data development by local, regional, state, and national organizations to meet common needs. This strategy continues to emphasize local stakeholder production of data, and the development of actionable maintenance plans that clearly identify the benefits, thus serving to focus and leverage investments across this infrastructure.

Strategic Goals for <u>Mapping Missouri's Future</u>

1. Collaboration and Coordination
Implement mechanisms to achieve the broadest range of geospatial coordination and improve technical collaboration among GIS users, developers, and other stakeholders.

2. Data Development and Standards
Establish an effective and efficient standards-based framework to develop, maintain, integrate, and utilize geographic data across all areas and jurisdictions in Missouri.

3. Geospatial Services
Identify, provide, and maintain a comprehensive data clearinghouse and a suite of GIS services for Missouri.

4. Funding
Establish adequate and reliable funding mechanisms dedicated to the coordinated development and maintenance of GIS resources and activities in Missouri as part of the core infrastructure.

5. Communication and Outreach
Increase awareness, knowledge, and expertise in the value, development, stewardship, and uses of geographic information, technology, and services.

2. Introduction

2.1 What is GIS?

A geographic information system (GIS) integrates personnel, hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. GIS allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. The key word to this technology is Geography - this usually means that the data (or at least some proportion of the data) is spatial, in other words, data that is in some way referenced to locations on the earth. More than 80% of all data collected has a geographic—or location—component (such as address, zip code, census tract). Coupled with this geospatial representation is attribute data. An example of this would be schools. The actual location of the school is the spatial data. Additional data such as the school name, level of education taught, school capacity would make up the attribute data. It is the partnership of these two data types that enables GIS to be such an effective problem-solving tool.

GIS operates on many levels. On the most basic level, GIS is used as computer cartography, i.e. mapping. The real power in GIS is through using spatial and statistical methods to analyze attribute and geographic information. The end result of the analysis can be derivative information, interpolated information or prioritized information. GIS is used to analyze demographic trends and patterns; manage assets such as utilities, infrastructure, and resources; form a basis for planning, operations, and decision-making; manage map service locations; and plan and deploy local and statewide response to emergencies and other crises. Geographic data and tools comprise a valuable resource that is becoming widely recognized as a critical asset. Geographic data and GIS technology are vital for responding successfully to many of Missouri's biggest challenges.

Geographic Information Systems (GIS) is one of the most pervasive of today's technologies. Increasingly, our society relies on — and benefits from — information about the location of people, places, things, and events. Principles and practices fundamental to the way our society functions (ownership of land, for example) are based on geographic information. Everyday life is difficult to imagine without maps and locational information to enable vital activities such as land and property administration, transportation and logistics, agriculture, natural resource and wildlife management, environmental management, emergency services, homeland security, and health and human services.

In addition, access to geospatial data has become universally available with Internet tools such as Google Earth and Microsoft Virtual Earth. These tools are used daily by individuals and businesses for navigation and general viewing purposes. The popular media is shining a spotlight on geographic information technology with stories about maps on phones, GPS in cars, and near real-time aerial pictures of news events such as tornados, floods, and military conflicts. Unfortunately, the general public is not always aware of the limitations of the underlying data presented on this variety of Internet mapping sites. Providing education regarding what they see and how to interpret the

information will improve the overall ability of government, businesses, and the general citizenry to use these mechanisms in providing services.

Geographic Information: It's Foundational to Our Future. Geospatial technology was named by the '*President's High Growth Job Training Initiative'* as one of the 14 industry sectors expected to see exceptional growth in the future. Increasing demand for readily available, consistent, accurate, complete, and current geographic information and the widespread availability and use of advanced technologies is causing rapid expansion and adoption with many sectors being transformed by this technology.

We are seeing increased interest in enterprise GIS services and platforms that allow users to extend their applications to colleagues in other departments, other organizations and across the Web using easy-to-use visualization browsers. Increasingly a web-based platform will be used to serve data, analytic models and maps to other users. The server will also be the platform for supporting integration of GIS knowledge into enterprise systems. As society becomes familiar with visualizing things through mapping portals, there will be increasing interest in services that go beyond simple maps and images. This Web services platform also allows users to integrate GIS data with mainstream enterprise applications and data stores. This type of spatial enabling of business applications promises to further expand the geospatial solutions.

Successful GIS operations are those that have deliberately and consciously integrated GIS use into the strategic planning of the organization. The key to maximizing benefits of GIS comes from the deployment of an enterprise or organization-wide program.

Effective and Efficient Government. Many groups periodically rethink and reengineer their workflows to improve the effectiveness of their processes and to save money by delivering public services more efficiently. Recognizing, understanding, and incorporating the role geography plays in these processes can lead to improvements in the access, delivery, and use of government services. Nearly 90% of all citizen requests to government entities are geographically related. Linking a mapping interface to a government web site leads to a more interactive and informative process. Integrating GIS creates effective communication and collaboration environments. A GIS enables an organization to improve efficiency and do more work with fewer resources while reducing costs and providing better service.

Planning and Economic Development. GIS offers enormous potential to support economic development and planning activities. These systems can be used to support analyses related to business expansion as well as the formulation of effective public policies to support this expansion.
A GIS can be used to identify sites, locate customers and suppliers, and minimize transportation and shipping costs. Economic development is dependent on quality, accurate information from many sources. With sound Missouri geographic information in-hand, promoting desirable and sustainable development to interested business prospects worldwide (with web-based tools to assess site suitability or provide sophisticated marketing analysis) will roll out the welcome mat to new audiences all over the world.

Coordinated Emergency Response Improves Public Safety. Many Missouri communities are subject to natural and man-made disasters. The identification,

prioritization, development, use, and maintenance of statewide geospatial information and technology are critical elements of safety planning activities. The design and implementation of these data collection and dissemination systems ensures that the information collected, processed, and disseminated will continue to grow in its interoperability. These data management processes can be used to collect and distribute location-based damage assessment information that can assist emergency response situational awareness. The mapping and locational asset data is being integrated within Missouri's emergency response system and will lead towards more actionable responses, risk mitigations, and proactive recovery plans.

Standards. Broad use of standardized information reduces the potential for unnecessary costs by preventing duplication of resources and efforts. We cannot afford the inefficiency and cost of incompatible, conflicting, and/or duplicated geographic information resources. Inadequate data-sharing mechanisms can lead to ineffective resource management practices by environmental management, agriculture, and planning agencies.

Missouri's Vision:
The Missouri Spatial Data Infrastructure (MoSDI) parallels the National Spatial Data Infrastructure (NSDI), a nation-wide strategy established in 1994. It is adapted to focus upon Missouri's business needs and priorities. The NSDI calls for technologies and policies that support sharing of geospatial data among all levels of government, the private and non-profit sectors, as well as the academic community. It provides a base or structure of practices and relationships among data producers and users that facilitates data sharing and use. The intended result is to reduce the costs of developing geospatial data while maximizing its value through widespread availability and use.

The NSDI vision is fully compatible with Missouri's vision, embodied in the following strategic guiding principles of the MGISAC:
- Provide expert advice to the Chief Information Officer (CIO) and Director – GIS as well as the broader GIS community on GIS related issues;
- Foster cooperation among state, local, and federal agencies, educational institutions, private industry, and others in the field of Geographic Information Systems (GIS);
- Provide an arena for discussions of relevant GIS issues and facilitate resolution of GIS issues impacting the state;
- Provide programmatic guidance to the Missouri Spatial Data Information Service (MSDIS) in fulfilling the objectives of the Missouri GIS Advisory Council's Strategic Plan;
- Provide GIS standards for the state;
- Coordinate and facilitate statewide training as needed; and
- Work with other states, both regionally and nationally, on standards and other GIS issues.

The MoSDI, like the NSDI, focuses upon standards, policies, procedures, and relationships that support the development, management, maintenance and distribution of commonly used data and content. In Missouri, 10 framework data layers have been selected as essential for the MoSDI. Included within the MoSDI framework data layers are NSDI framework data. Taken together, these layers provide a common base for

mapping other features – for example, parks, residences, hospitals, power plants, or bus routes – data needed to support the efficient and effective delivery of services to Missourians. Others, such as land cover may be added in the future. The seven data layers that serve as a common basis for most GIS applications are illustrated by Figure 1.
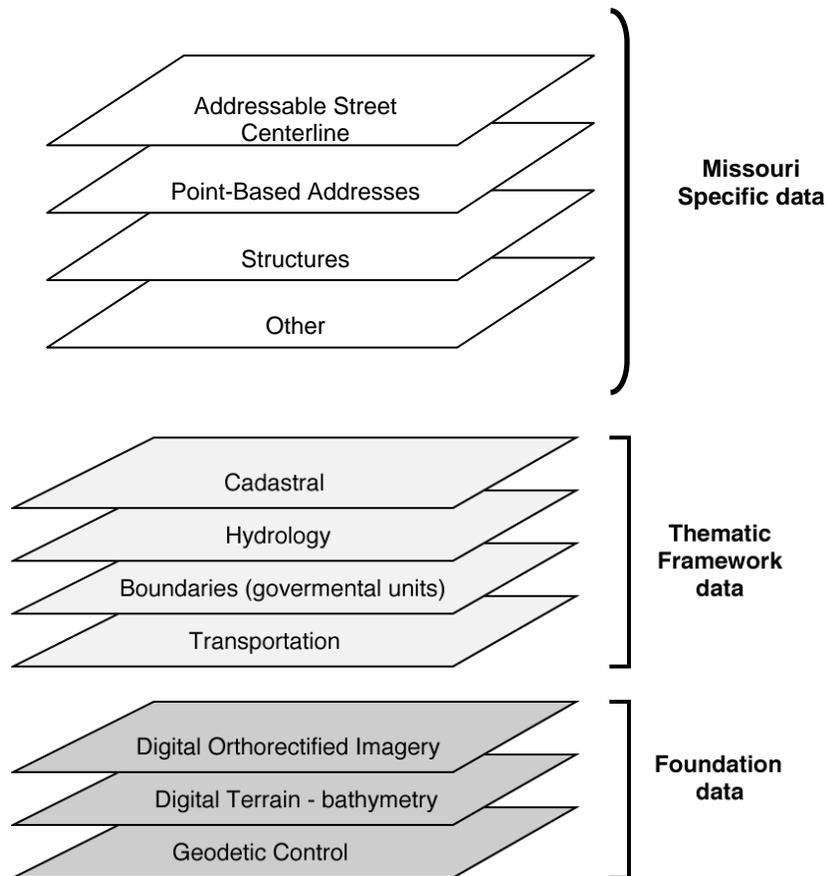
Figure 1: Missouri Spatial Data Infrastructure (MoSDI) Target Layers

The effective and efficient use of geospatial data to deliver services also requires that the data is available when needed, wherever needed. Too often, geospatial data that can benefit the public goes unused because effective distribution policies or mechanisms are not in place. At times, cost or licensing restrictions have limited data use.

While restricted access to geospatial data may be appropriate in some instances – privacy or public safety are two notable cases – the public benefit will be greatest when geospatial data becomes available through an integrated data distribution infrastructure, supported by clear policies and well-defined organizational relationships. Like the data itself, such technology, policy and organizational issues are essential components of the MoSDI.

This document outlines and tracks strategic elements of plans for data development, management and distribution. Teams of professionals that depend upon select

framework data themes for their work will work to draft business plans. In these plans, teams will provide an overview of each theme, its importance, its description, current status, funding elements, data and distribution issues, stewardship, as well as develop an implementation strategy with short and long-term recommendations.

2.2 Current status of GIS in Missouri

The use of GIS is continuing to permeate all levels of Missouri government. Virtually all agencies collect data that has a geographic aspect, and nearly every one of Missouri's Cabinet Level Departments uses GIS technology in some capacity. Forums such as the MGISAC and the State Agency GIS meetings provide coordination across some organizations. Activities within several agencies are further coordinated by GIS staff. However, unlike other common business functions across state government, such as information technology and procurement, geospatial activities are only now being formally coordinated.

Local governments collect the most detailed, up-to-date geographic data, including new information about roads, properties, buildings, water features, and other aspects of the local landscape. State agencies have realized the tremendous benefit of using local data to achieve their mission at the state level, but the absence or awareness of formal state standards within local government have made integration difficult. Complicated data sharing agreements and cost recovery models continue to stifle this opportunity. More proactive coordination with local governments and their affiliated Associations is being actively pursued by the State.

Coordination

Some coordination occurs through the Director-GIS, as well as the Missouri GIS Advisory Council (MGISAC) and the Missouri Spatial Data Information Service (MSDIS).

A permanent Director of GIS position and the Office of Geospatial Information (OGI) was established in 2011. The OGI (http://www.gis.mo.gov) was created to provide centralized technical, geospatial services to other agencies and clients. It is important that the geospatial enterprise be fully integrated and partnered with the overall state enterprise architecture. This was best achieved by locating the OGI under the CIO and fostering a close working relationship between ITSD and geospatial information and technology. The OGI will provide coordination and support activities for many other agencies and departments (see Figure 1). The Office of Geospatial Information has supervision of assigned staff and provides general oversight and coordination to other GIT staff, MGISAC, and MSDIS.
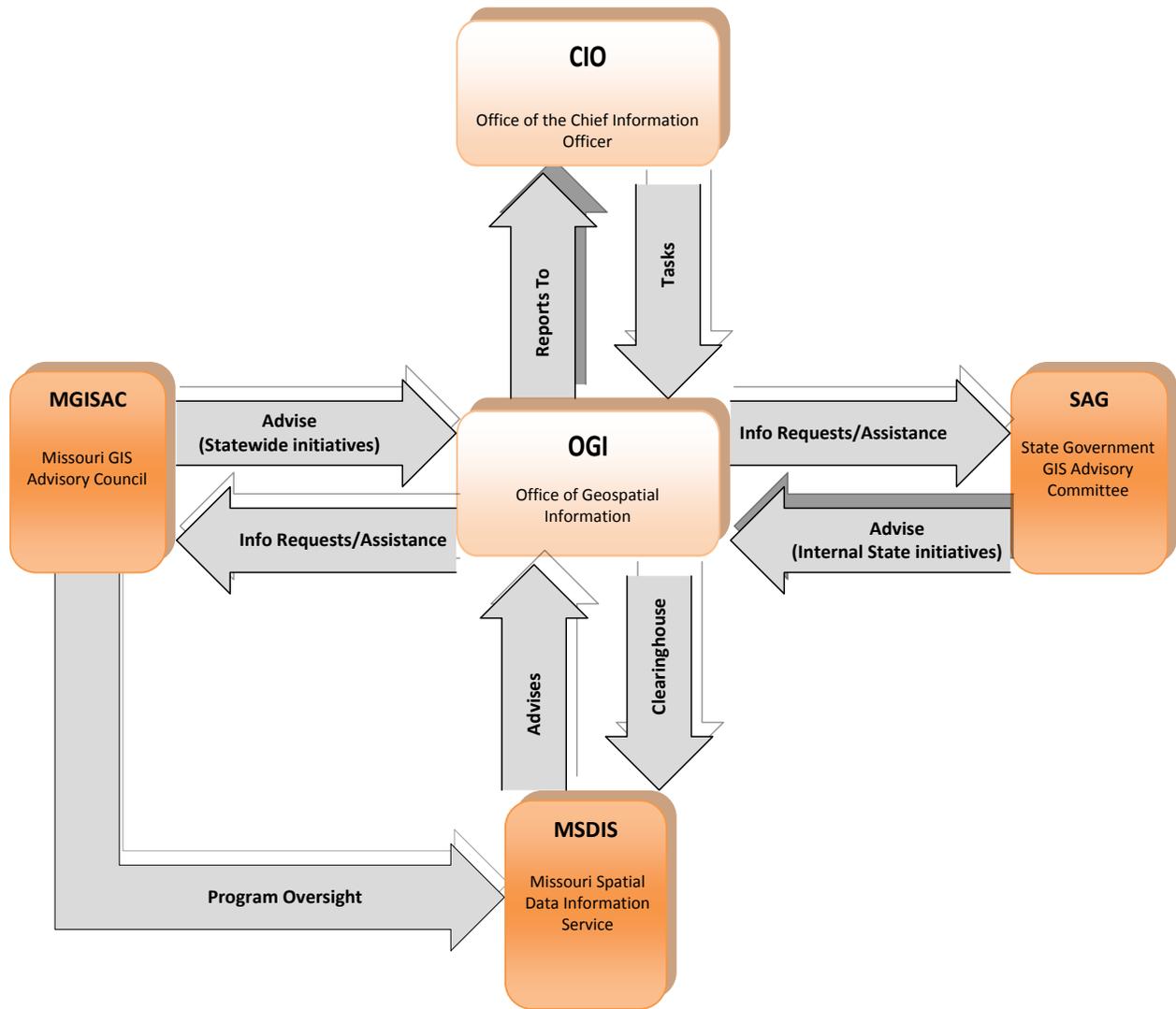
Figure 1: GIS Organization Structure

Director-Geographic Information Systems: Under the OGI, this position is responsible for strategic and tactical planning, developing, coordinating and directing project teams in GIT to support a broad spectrum of needs for state agency business units. The position has decision-making authority and responsibilities. Supervision over professional geographic information technology and support staff is exercised directly or through subordinate managers and/or supervisors. Additional roles and responsibilities of the Director include directing and coordinating inter- and intra- intergovernmental GIT functions. This position serves as the State representative on spatial technology matters, assisting with the use of spatial technology in order to improve citizen, governmental, and State services and operations. Duties include seeking funding coalitions and opportunities for GIT development, facilitating the sharing of spatial data, and ensuring integration of GIT into enterprise-wide information systems. Additional duties include serving as a representative to appropriate state and regional GIS and GIT committees and user groups. Administrative direction is received from the CIO; however, the employee exercises a high degree of independent judgment and decision making in directing or assisting in the direction of the office's activities.

Missouri GIS Advisory Council (MGISAC) (http://www.mgisac.org) serves as the Council for statewide GI/GIT coordination. It is supported by additional regional coordination and users groups in the state. The council was originally established in 1996. The MGISAC operates under and reports to the CIO within the Information Technology Services Division (ITSD). It has no dedicated budget for its activities. The council currently has membership from multiple state agencies, academia, and local and federal government. In February 2011, membership was opened to include private companies and other stakeholder groups. Monthly meetings include a review of administrative elements (by-laws, nominations, treasurer report), OGI reports, and committee reports.

The following Committees are functioning and provide updates and reports for the following areas:
- Data development
- Homeland security
- Local government
- Outreach and education
- Strategic planning

The Council has Liaison Reports from areas such as GIT Architecture (MAEA), Policy and Legislation, MSDIS, Missouri GIS Conference, and the MAGIC Consortium. As well, Cooperating Agency / Organization Reports are provided by representatives from NRCS, USGS, Missouri Resource Assessment Partnership, Missouri Mappers Association, Missouri Society of Professional Surveyors, and the National States Geographic Information Council.

The MGISAC continues to host a GIS conference. This conference is held as a stand-alone conference in odd numbered years and in conjunction with the Mid-America GIS Consortium Symposium (MAGIC) in even numbered years.

The Director-GIS and the Program Director of MSDIS are ex-officio members of the Council.

Missouri Spatial Data Information Service (MSDIS) (http://msdisweb.missouri.edu) The MSDIS is the State geospatial clearinghouse and thus provides data search, status, access, and dissemination services to the entire state. The MSDIS is a registered NSDI Clearinghouse node and is searchable via those mechanisms. It is regularly harvested by the Geospatial One Stop (GOS) to populate the federal geospatial registers. MSDIS has continued to operate on a static state fund provided through the University of Missouri's appropriations. These funds are supplemented by University of Missouri funds as well as project-based funds from state and federal sources. Data have been collected from local, regional, state, federal and other sources to serve this role, including large amounts of imagery data. MSDIS staff have maintained an active role in outreach, education, and coordination to the MGISAC and the State.

MSDIS has the following goals:
- To allocate MSDIS resources where they will most benefit the Missouri GIS

community.

- To establish and make available to the GIS community in state government and beyond a core data base of geographic information to be held and maintained in common as a continuing asset within an archive.
- To encourage development, maintenance, and dissemination of thematic databases built on the core data base foundation.
- To advise and assist the CIO and the Information Technology Services Division in setting GIS standards in Missouri.
- To encourage use of GIS technology and geographic data resources in state government by providing practical support to users
- To inform and educate supervisors, managers and other professionals in the state about GIS technology, its current capabilities and future potential.

State Agency GIS Group (SAG) serves as an informal, internal state government geospatial forum which provides input to the Director of OGI on issues related to the strategic direction for the State GIS program, improving state government services through the coordinated, affordable, reliable, and effective use of geospatial technology, and helps establish priorities for enterprise GIS. The membership includes all state government agencies and constitutional offices, including the Information Technology Services Division and the Missouri Office of Geospatial Information.

3. Strategic Plan for MoSDI

3.1. Missouri's Strategic Planning Process

Recognizing, understanding, prioritizing, and tracking current business drivers and emerging issues are critical for successful GIS strategic planning. Missouri's plan continues to evolve so as to remain responsive to the needs of the state's citizens, businesses, and decision-makers, who expect excellent service and easily accessible and understandable information. There is also an expectation that more work is to be accomplished with fewer resources.

3.2 Measures of Effectiveness

The status and trajectory of specific goals of the State's strategic plan are outlined below in sections 3.3 through 3.8. These goals become categories within which metrics must be identified. These measures should reflect a sense of prioritized achievement and should reflect both outcomes and outputs. Specific criteria for individual measurement indicators within each category require that the indicator be informative, feasible to capture, manageable, actionable, and complete. The generic geospatial performance measurement indicators that will be monitored are identified and further described below.

Mission and Business Results: The approach is to quantify the effort expended on a program (inputs), the level of services provided (outputs), the effect a service has on the program's stated objectives (outcomes) and a comparison of the level of inputs with outputs or outcomes (efficiency).
- *Citizens and citizen services*: Number of web mapping services available; number of new users; number of repeat users; feedback mechanisms in place; percentage improvement / growth in web mapping of service;
- *Supports MoSDI*: Use of standards; status of stewardship responsibilities;

Customer Results: This includes such areas as customer benefit, service coverage, timeliness and responsiveness, service quality, and service accessibility.
- *Ease of use measures*: Integration and use of web map services in application development; percentage of customers satisfied with aspects such as application design, maintenance, and support;
- *Broad data-sharing capabilities*: number of cataloged web services; number of data sharing agreements in place;
- *Data availability and accessibility*: percentage of geospatial data holdings available on intranet; percentage of geospatial data holdings available on internet; volume of data sets downloaded;

Processes and Activities: This includes the assessment of financial, productivity and efficiency, cycle time and timeliness, quality, security and privacy, and innovation.
- *Coordination and Streamlining*: level of participation and coordination with other intergovernmental groups and associations;
- *Minimal barriers to obtaining data*: Number of steps to locate data; number of steps to access data; number of steps to extract data; data update cycles; accuracy of data; cost of data;

- *Interagency / Intergovernmental Collaboration*: Number of agencies participating in the dissemination of data; Number of organizations participating in the dissemination of data
- *Funding:* Number of consortia created for expansion and improvement of Missouri's framework and spatial data infrastructure.

Technology: This includes measures of financial infrastructure support, quality and efficiency of the solutions, information and data access, reliability and availability, and overall effectiveness.

- *Reuse, adaptation, and consolidation*: applications developed meet multiple business objectives; percentage reusability of core geospatial components and services;
- *IT performance*: reliability measures for network; reliability measures for application; reliability measures for hardware;
- *Standards adoption*: percentage of data development where geospatial standards are adhered to; percentage of data with identified steward;
- *Supports MoSDI*: number of data sets; number of metadata records; percentage of geospatial data records updated;
- *Purchasing of geospatial components*: total investment in geospatial software components; total investment in geospatial hardware components; licensing costs; data costs; access costs; storage costs;

The degree of commonality or standardization of our collective use of these measures will depend upon whether the geospatial initiative is being managed by a single organization or multiple organizations. A broad organizational assessment / evaluation tool regarding the status of the integration of geospatial technologies within the organization is the Geospatial Maturity Assessment (GMA) that is under development within NSGIC and will be used as a report card and assessment tool for state geospatial programs. The GMA tool and its measures will need to be cross-walked to these measures when they become available.

The following sections outline the original five (5) strategic goals identified in the *2008 Mapping Missouri's Future: Strategic Plan*. The current achievements and status for these goals is listed. These goals, if they continue to be implemented, will increase the understanding, use, effectiveness, and value of GIS to the enterprise.

3.3. Goal 1: Collaboration and Coordination

The most critical element necessary for achieving Missouri's GIS strategic goals is effective coordination. Successful coordination implies broad-based communication and a deep understanding of the responsibilities and needs of organizations that develop, provide and use GIS services across Missouri.

GIS coordination must have executive level support and be led by a coalition of entities that serve to facilitate coordination and collaboration among the various stakeholder groups. With all levels of government facing greater demands with reduced funding, inter- and intra-governmental coordination as well as public-private coordination is critical to the effective operation of counties, municipalities, and the state. This will only be achieved through trusted relationships and strong strategic partnerships among the GIS community.

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Collaboration and Coordination Strategies

Achievements:
- Established a Director - GIS position within an Office of Geospatial Information to serve as the administrative and program lead for geospatial activities within and across the state agencies.
- Renamed the Missouri Geographic Information System Advisory Committee (MGISAC) to the Missouri Geographic Information System Advisory Council (MGISAC).
- Expanded the MGISAC to include more stakeholders from the private sector to form a more broadly representative body whose purpose is to provide a forum for geographic technology discussions and direction for Missouri.
- Continued to develop, expand, and formalize relationships with regional planning councils, universities, state associations, regional homeland security oversight committees, users groups, and other entities. Examples being: the USGS Structures Partnership grants; RHSOC's Region A geospatial pilot; and Broadband Mapping's Community Anchor Institutions and Regional Technology Planning Teams.

Current Activity and Status:
- Establishing a single "Missouri GIS Portal". Still working to populate elements and content. The purpose is to inform and support both the public and the GIS community in the discovery, acquisition, use, and management of geographic data, information, and GIS services.
- Working with ITSD and OA general counsels to develop guidance and language for geospatial data sharing through more authoritative legal opinions with regard to Missouri's Sunshine Law.
- Developing an organizational chart for the state's geospatial leadership components with defined roles and responsibilities.
- Developing data stewards at the state and local level. To date formal stewardship of Hydrography (National Hydrography Dataset (NHD)) has been achieved.
- Coordinating GIS and associated technology vendor product licensing, contracts, consulting services, purchasing, etc has been achieved for State agencies. Work continues on expanding product licensing into other realms (i.e. Statewide

Educational GIS Licensing; Aerial imagery with LiDAR and planimetrics).
- Standardizing process and templates for GIS related RFPs and contracts is occurring within Public Safety for the inventory and review of geospatial data within regions across the state.
- Volunteer work continues in support of GIS strategic planning, funding coordination, and project collaboration.

Short Term Goals:
- Establish funding and budget line for the Missouri Office of Geospatial Information within Missouri State government.
- Develop of a geospatial contact listing for all entities within the state utilizing or developing data as well as any existing data portals or web services.

Long Term Goals:
- Establish via Executive Order or legislatively, a dedicated Missouri Geographic Information Officer position (with funding and budget line) within State government to serve as the lead point of contact for geospatial coordination for the state.
- Develop of a list of geospatial champions and stakeholder groups for pro-active development of strategic alliances and partnerships to move forward on the critical issues, priorities, and programs important to the development and implementation of these strategic goals.
- Initiate discussions with surrounding states for interchange and integration of information along our borders.

3.4. Goal 2: Data Development and Standards

The Missouri Spatial Data Infrastructure (MoSDI) when viewed in its broadest sense is comprised of data, technology infrastructure, policies, and organizational relationships. The recommendations contained within *Mapping Missouri's Future (2008)* addressed policies and organizational issues that, when addressed, will result in a robust and sustainable MoSDI. Many of its components were already in place as a result of several decades of voluntary cooperation by Missouri organizations and individuals that have invested in geospatial data and technologies. These components include: a collaborative culture; a supportive institutional framework; shared technology services; and, a commitment to standards.

Mapping Missouri's Future (2008) paid special attention to data. The data layers of importance included the seven framework themes of the National Spatial Data Infrastructure as well as other three (3) other data layers noted by Missouri geospatial stakeholders. These layers in order of importance included:
1. Orthoimagery
2. Cadastral
3. Addressable Street Centerline
4. Transportation
5. Point-based Addresses
6. Elevation (LIDAR focus)
7. Governmental Units
8. Geodetic Control

9. Water Resources
10. Structures

As these themes are prioritized for work, stakeholders from government agencies, professional associations, educational institutions, nonprofit organizations, and business must be assembled to identify data needs and then to develop a business plan to meet those needs.

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Data Development and Standards Strategy

Adopt geographic data framework policies, standards, and best practices
Current Activity and Status:
- Continuing the adoption and adaptation of established international, national, and state-based policies, standards, and best practices, as appropriate. Updates must be made to current standards and these updates incorporated within the Missouri Adaptive Enterprise Architecture. Primary development has focused on imagery acquisition, LiDAR acquisition, and the development of a cadastral mapping standard.
- Continuing the investigation and identification of authoritative sources and stewards for data being developed. Some progress has been made on establishing associated costs for this stewardship role (i.e. NHD).
- Developing and adopting new data models and policies, including draft RFP language and best practices, for building a local spatial data infrastructure within State standards. Examples include the development of the RHSOC GIS Inventory and Structure Review, Point-based Addressing, and Aerial Imagery contracting mechanisms.

Long Term Goals:
- Promote further awareness, dissemination, use, and understanding of policies, standards, and best practices through publication and announcement through the single MoGIS portal.

Inventory and analyze current geographic data
Short Term Goals:
- Inventory statewide geospatial data assets at all levels to determine their current condition and status through the use of the GIS Inventory Tool of NSGIC.

Promote collaboration to create, document, and steward geographic data
Achievements:
- The University of Missouri has built tools and techniques for conflation of legacy data to an enhanced state (positional, attribute, or temporal).

Current Activity and Status:
- Continue the coordination of acquisition and management of statewide geographic data and technologies that support critical business needs through development of state contracts and procurement mechanisms. Examples include: Aerial imagery, LiDAR partnerships, Structures development, and

RHSOC GIS Inventory and Review.
- Continue to provide access to, and education on, Missouri standards for geospatial data, technology, and information. The Point-Based Addressing Workshop, LiDAR Stakeholders meetings and LiDAR business plan, and other forums.

Long Term Goals:
- Formally recognize the authority and responsibility of distributed producers to create and manage geographic data through MOUs, MOAs, or other such mechanisms.
- Continue development of tools and educational opportunities for compliant metadata development and submission.
- Develop web-based applications for local (public) information gathering and update.

3.5.   Goal 3: Geospatial Services

Access to, and discovery of, GIS data and services are critical for a wide variety of functions for stakeholder groups. However, many organizations lack sufficient knowledge of and/or access to GIS data and resources. This inconsistency, especially among governmental agencies at different levels, hinders the sharing and affective use of geographic data across organizational boundaries. This in turn hampers efforts to coordinate the presentation of information and the delivery of programs to the public. The Missouri Spatial Data Information Service (MSDIS) is the recognized geospatial data clearinghouse node for the State of Missouri.

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Geospatial Services Strategy

Missouri Spatial Data Information Service –Clearinghouse Node
Achievements:
- Conducted a review of MSDIS functions, status, and future directions and needs.
- Secured funding and implemented an upgrade of both hardware and software for Missouri's geospatial clearinghouse.
- MSDIS continued to support and is now enhancing through the implementation of a new clearinghouse geospatial portal, GIS metadata development, maintenance, hosting, discovery, query, and distribution services.
- Evaluated and recommended changes in the data delivery options and export formats for data holdings. Promoting a change from .E00 files to geodatabases and clip-and-ship access.
- Supported some GIS data development and maintenance as time and resources allowed. Recommendations from the MSDIS review would like a cleaner a split of these data development activities between the MSDIS and the University's Geographic Resources Center.

Current Activity and Status:
- Enhancing the MSDIS to contain statewide, regional, and local "views" of geographic data created from officially recognized distributed sources. The new upgrades will provide hosting, discovery, query, and distribution services for these data.
- Through ongoing USGS partnership grants the MSDIS has continued to provide liaison and coordination with regional planning commissions for emergency response data activities.
- MSDIS is establishing web imagery services to support Missouri stakeholders.

Short Term Goals:
- MSDIS has evaluated NSGIC's web-based GIS Inventory tool and will be using it to solicit and log information from the broadest stakeholder community (federal, state, local, and private) on data development, data status, and potential collaborative opportunities.
- As appropriate, MSDIS will establish additional web services to support Missouri's stakeholder community.
- Develop a base map service that provides a common look and feel for all state-based Missouri web-mapping applications.
- Inventory, create, and maintain a catalog of Missouri web services, tools, and applications.
- Identify and implement metrics that can be tracked to permit business intelligence to be gathered to support scaled development as geo-services grow and expand.
- Evaluate and recommend a process and funding mechanism to support digital archival of old imagery and geospatial data holdings. This activity is underway through a pass-through Library of Congress award to the Missouri team of OA-ITSD, State Archives, and MSDIS.

Long Term Goals:
- Develop automated processes to extract, transfer, convert, load, and integrate data into seamless and interoperable statewide and regional views.
- Evaluate and recommend mechanisms to simplify and automate the data search, view, and exchange of geographic data from local sources to the state.

Office of Geospatial Information

Data Sharing
Current Activity and Status:
- Discussions continue to identify and evaluate the effect of Missouri's Sunshine Law, HIPAA, and FERPA on data sharing. Work continues to establish avenues to allow new / continuation of data sharing activities with these laws in mind that also protect the authoritative sources for this information.
- Evaluation and recommendations regarding a process and funding mechanism to support digital archival of old imagery and geospatial data holdings is underway through a pass-through Library of Congress award between OA-ITSD, State Archives, and MSDIS.

GIS Web and Application Services
   Current Activity and Status:
- As appropriate, establish and utilize web services with the State's application development arena to support the State business requirements.

   Long Term Goals:
- Develop and publish enterprise geospatial tools for location (geocoder), routing, drive-time analysis, and area analysis.
- Build upon and leverage existing GIS efforts of local government agencies and private sector organizations.

Core Infrastructure
   Short Term Goals:
- Coordinate the architectural design of information technology infrastructures to support enterprise GIS data, programs, and services.
- Implement and support fail-over, back-up, and recovery for Missouri's geospatial assets.
- Identify and implement metrics that can be tracked to permit business intelligence to be gathered to support scaled development as geo-services grow and expand.

3.6. Goal 4: Funding

Establishing adequate and sustainable funding will remove a significant barrier to the coordinated development, use, and maintenance of GIS resources and services across Missouri. Traditionally, GIS stakeholders have individually funded the development of their respective GIS data and systems. One of the many reasons GIS is used by agencies is because it is an efficient and effective way to deliver essential services to the public. However, GIS service activities are often not funded by the applications that use them and are viewed as support services that must be funded from external sources.

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Funding Strategies

 Achievements:
- External federal funding sources have been secured from USGS Partnerships Grants, NTIA Broadband Mapping and Data Development, and Library of Congress GeoMAPP.
- A fiscal area to store/rollover collaborative funding has been created within the ITSD.
- State-based funding is being aligned under the Office of Homeland Security funds distributed to local governments. These funds and their expenditure is being informed by RHSOC pilot activities in Region A. This arena can be chosen by the individual regions for data development across the state through the RHSOCs.

Current Activity and Status:
- Establishing the level of funding required and defining possible funding models appropriate to support the development and maintenance of the MoSDI. Initial focus developed a cooperatively funded 3-year rotation for leaf-off aerial photography of the state.
- Establishing the appropriate level of funding required for the Office of Geospatial Information (OGI).
- Investigating various potential funding models for State development:
    - A computer usage fee for agencies.
    - A geospatial service usage fee for agencies.

Short Term Goals:
- Evaluate the current level of funding for the MSDIS Clearinghouse and what is required to meet the goals of this Strategic Plan and define an appropriate funding level.

Long Term Goals:
- Explore the possibility of providing the OGI with authorization to obligate funds from the above roll-over fiscal area.
- Build a series of testimonials (success stories) on the return on investment associated with the development of GIS data within the government and private sector. Why is it in my best interest? Who benefits? How?
- Investigate possible cost models for providing off-site back-up for counties and municipalities. Dependent on outcome of data sharing and Sunshine Law discussions.
- Evaluate and recommend a process and funding mechanism to support digital archival of old imagery and geospatial data holdings.

3.7. Goal 5: Communication and Outreach

The use of GIS and its supporting technology is rapidly growing and at the same time continually changing and evolving. As a result, many decision-makers are unaware of the potential uses, benefits, new data, and improved decision making that can be realized by incorporating GIS into their organization. Across Missouri, there is an immediate need to provide leaders and decision-makers with an increased awareness of the concepts, capabilities, potential, and benefits of GIS.

In both the public and private sectors in Missouri, there is a growing need for employees with solid education, training, and skills in GIS and its associated technologies of GPS and remote sensing. Missouri needs to develop a robust communication and outreach plan to reach, develop, support and catalyze this potential.

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Communication and Outreach Strategies
Achievements:
- Supported and expanded the regionalization efforts within the MGISAC, RPCs, Users Groups, and Homeland Security initiatives to create more opportunities for

affordable, local technical and technology workshops and training across the state. Examples include the regional workshops, support of region-based meetings, and other training and educational opportunities occurring within the various associations (Missouri Mappers, etc.).

- Promotion and emphasis of partnership activities that highlight outcomes of the participation in collaborations.
- Promotion of *Geography Awareness Week* and *GIS Day* at the State level through Governor's Proclamations.

Current Activity and Status:

- Developing and expanding the design of the Missouri GIS portal through which access to all geospatial outreach, resources, standards, data, activities, services, and opportunities can be accessed for the State of Missouri. This is to include a functional resource file system and contact listing – concept of 'Director-GIS Filing Cabinet.'
- MGISAC continues to: provide a forum to communicate statewide goals and programs to the various stakeholder groups; recommend policies for data standards, sharing, security, funding, and services; serve as an advisory body to the State's Chief Information Officer (CIO), the MSDIS, and OGI; ensure that minutes of subcommittee meetings are posted; and facilitate discussion and information exchange with federal agencies.

Short Term Goals:

- Explore and develop relationships with other state associations and societies to participate in their conferences, workshops, and other venues to educate and inform these stakeholder groups at their own annual meetings.
- Create opportunities for Missouri's rural governments to become engaged, supported, and more capable to utilize these technologies. The 'How To' guide developed under the '*50 States'* grant and the Rural GIS Summit are several examples.
- Encourage better coordination of GIS educational offerings and internships at all four-year campuses and involve Missouri's vocational - technical college and high school systems.
- Gain more involvement of K-20 in the MGISAC conferences.

Long Term Goals:

- Develop a 'mailing list' for interaction with Missouri's broad user community that is maintained and comprehensive with contact information.
- Seek opportunities to engage decision makers at the legislative level (Freshman Tour), county commissioner, agency director, and other levels, to increase awareness, understanding, and support of MoSDI requirements and benefits.
- Evaluate and recommend the use of various technologies to reach the state and its broad user community (webcasts, user forums, regional workshops, etc.)
- Create modules on use and development of GIS and associated technologies for use as Continuing Education Credits for such groups as mappers, surveyors, planners, and others with certification processes.
- Identify champions, groups, and organizations that would benefit from GIS education and training and develop resources to provide this learning experience.

- Initiate formal membership agreements with organizations that have voluntarily decided to join the MGISAC.

Conclusion

The state must approach the use of GIS in a thoughtful, organized fashion. *Mapping Missouri's Future (2008)* described an approach that emphasizes collaboration to achieve five goals that, when achieved, will make people safer, enhance economic development, protect the environment, and improve government. However, even the best of plans are rarely implemented in their entirety. Circumstances and needs change over time. In endorsing *Mapping Missouri's Future*, the Office of Geospatial Information and MGISAC recognize the need to continually monitor progress against its goals and the need to periodically review and adjust the plan.

Appendix A: Goals by Organization

Short-Term

The OGI, MGISAC, and MSDIS will either continue or initiate the following actions and activities through the end of June 2012.

Office of Geospatial Information

- Establish funding and budget line for the Office of Geospatial Information.
- Evaluate the current level of funding for the MSDIS Clearinghouse and what is required to meet the goals of this Strategic Plan and define an appropriate funding level.
- Develop a geospatial contact listing for all entities within the state utilizing or developing data as well as any existing data portals or web services.
- Identify and implement metrics that can be tracked and gathered to support scaled development as geo-services grow and expand.
- Evaluate and recommend a process and funding mechanism to support digital archival of imagery and geospatial data holdings.
- The State will coordinate the architectural design of information technology infrastructures to support enterprise GIS data, programs, and services.
- The State will implement and support fail-over, back-up, and recovery for Missouri's geospatial assets.
- Encourage better coordination of GIS internships within state agencies.

MGISAC

- Identify and implement metrics that can be tracked and gathered to support scaled development as geo-services grow and expand.
- Explore and develop relationships with other state associations and societies to participate in their conferences, workshops, and other venues to educate and inform these stakeholder groups at their own annual meetings.
- Create opportunities for Missouri's rural governments to become engaged, supported, and more capable to utilize these technologies. The 'How To' guide developed under the '*50 States'* grant and the Rural GIS Summit are several examples.
- Encourage better coordination of GIS educational offerings and internships at all four-year campuses, Missouri's vocational - technical colleges, and high school systems.
- Gain more involvement of K-20 in the MGISAC conferences.

MSDIS

- MSDIS to conduct a statewide GIS inventory (NSGIC model) of geospatial data assets at all levels to determine their current condition and status.
- As appropriate, MSDIS will establish additional web services to support Missouri's stakeholder community.
- MSDIS will develop a base map service that provides a common look and feel for all state-based Missouri web-mapping applications.
- MSDIS will inventory, create, and maintain a catalog of Missouri web services, tools, and applications.
- Identify and implement metrics that can be tracked to permit business intelligence to be gathered to support scaled development as geo-services grow and expand.

Long-Term

The OGI, MGISAC, and the MSDIS should plan to continue or initiate the following actions and activities after July 1, 2012 to ensure the effective implementation of the MoSDI vision and the sustained maintenance and operation of its components.

Office of Geospatial Information
- Establish via Executive Order or legislatively, a dedicated Missouri Geographic Information Officer position (with funding and budget line) within State government to serve as the lead point of contact for geospatial coordination for the state.
- Promote further awareness, dissemination, use, and understanding of policies, standards, and best practices through publication and announcement through the single MoGIS portal.
- Formally recognize the authority and responsibility of distributed producers to create and manage geographic data through MOUs, MOAs, or other such mechanisms.
- State to develop and publish enterprise geospatial tools for location (geocoder), routing, drive-time analysis, and area analysis.
- State to build upon and leverage existing GIS efforts of local government agencies and private sector organizations.
- Explore the possibility of providing the OGI with authorization to obligate funds from the above roll-over fiscal area.
- Investigate possible cost models for providing off-site back-up for counties and municipalities. Dependent on outcome of data sharing and Sunshine Law discussions.
- Evaluate and recommend a process and funding mechanism to support digital archival of old imagery and geospatial data holdings.

MGISAC
- Establish via Executive Order or legislatively, a dedicated Missouri Geographic Information Officer position (with funding and budget line) within State government to serve as the lead point of contact for geospatial coordination for the state.
- Develop of a list of geospatial champions and stakeholder groups for pro-active development of strategic alliances and partnerships.
- Build a series of testimonials (success stories) on the return on investment associated with the development of GIS data within the government and private sector. Why is it in my best interest? Who benefits? How?
- Develop a 'mailing list' for interaction with Missouri's broad user community that is maintained and comprehensive with contact information.
- Seek opportunities to engage decision makers at the legislative level (Freshman Tour), county commissioner, agency director, and other levels, to increase awareness, understanding, and support of MoSDI requirements and benefits.
- Evaluate and recommend the use of various technologies to reach the state and its broad user community (webcasts, user forums, regional workshops, etc.)
- Create modules on use and development of GIS and associated technologies for use as Continuing Education Credits.
- Identify champions, groups, and organizations that would benefit from GIS education and training and develop resources to provide this learning experience.
- Initiate formal membership agreements with organizations that have voluntarily decided to join the MGISAC.

MSDIS
- Initiate discussions with surrounding states for interchange and integration of information along our borders.
- Continue development of tools and educational opportunities for compliant metadata development and submission.
- Develop web-based applications for local (public) information gathering and update.
- Develop automated processes to extract, transfer, convert, load, and integrate data into seamless and interoperable statewide and regional views.
- Evaluate and recommend mechanisms to simplify and automate the data search, view, and exchange of geographic data from local sources to the state.