



## NASCIO Governance Series



## Governance of Geospatial Resources: “Where’s the Data? Show Me” - Maximizing the Investment in State Geospatial Resources

### Introduction – The New Emphasis on Location

*Location awareness* is at an all time high and will only increase. Whatever decision or issue is at hand, there is always the question of “where?” Consider how often location information is sought prior to travel and almost any other decision making. Geospatial resources have become a critical and necessary reference for government, industry and individual citizens. *Geographic Information Systems* or *GIS technology* has been employed in state government for decades and can even be considered a *mature* technology. The proliferation of such capabilities has actually created another issue – that is the *lack of governance for managing geospatial investments across the state enterprise*.

***Geospatial Resources refers to more than technology. It includes people (knowledge experts), policies and processes, spatial data, web services, maps, standards, data models, applications, workflows, location dependent business rules, information management discipline, and records management related to spatial understanding and analysis.***

*Geospatial resources* entail more than Geographic Information Systems (GIS) technology. It refers to a whole discipline around managing data with a *spatial orientation* or component to support better decision making. Geospatial resources include a field of knowledge, people, policies, disciplines such as knowledge and data management, tools, web services, data modeling, applications, processes, and technology platforms. Geospatial resources are so ubiquitous anymore that state government as well as citizens and industry think “where?” regarding almost every issue.

The evolution of the internet, high speed wireless, sophisticated wireless devices, mobile applications, and the emergence of Web 2.0 and web based mapping tools (*sometimes referred to as the GeoWeb*) make geospatial resources *available* to everyone including the non-technical masses through simple web browsers, mapping mash-ups, geospatial web services and other collaborative resources. This new availability has contributed to higher productivity toward breaking down organizational silos, empowering states to leverage these valuable resources across the government enterprise.

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Public leaders, decision makers, state workers and citizens are frequently asking for information to be presented geospatially – *they don't want a list – they want a map!* In other instances, business processes trigger or are triggered by geospatially oriented logic that does not *present* a map. In this instance, the geospatial dimension may even be hidden from the decision maker, but nevertheless provides an important reference point or trigger in the decision making process – *such as a trigger to present information regarding required permitting or jurisdictional responsibility.* This new emphasis on *location* is evidenced further as State CIOs named *GIS* on their *Top Ten* list of *Priority Technologies* for 2008. Geospatial capabilities are viewed by state CIOs as a necessary and critical strategic capability. In a recent NASCIO survey of State CIOs, geospatial analysis was listed as one of the *least likely* capabilities considered for outsourcing – along with architecture and security. This demonstrates the high value state CIOs place on qualified staff and capabilities in this area.<sup>1</sup>

The following issues have been debated regarding the *effective use* of this extremely powerful discipline.

- Are state geospatial resources being governed and managed for maximum benefit?
- Are there unnecessary duplicative and redundant investments in geospatial resources?
- Are state geospatial resources readily available for providing contextual and referential information in decision making across government lines of business?
- Is geospatial information readily available to citizens for evaluating government and personal decision making?

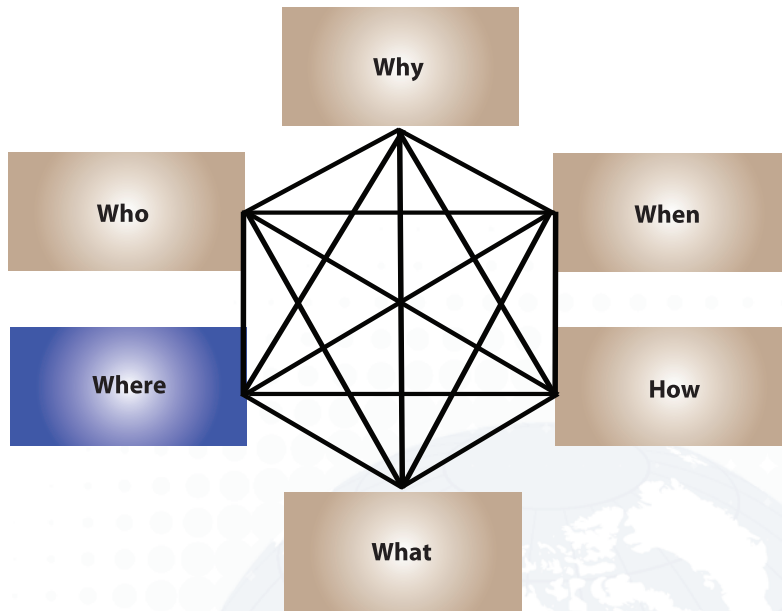
### Governance of Geospatial Resources – Geospatial Applications Abound

News related to *geospatial resources* and *GIS technology* is almost flooding the web

and other news channels. And the term *GIS* is being used to refer to a host of geospatial oriented concepts including more *abstract business information concepts* as well as *technology focused concepts*. Therefore a *clarification* is required in discussion and conversation as to what is meant when using the term *GIS*. (Even in this issue brief there will be some *fuzziness* in the use of terms.) A recent news article listed many of the ways in which geospatial resources, and GIS in particular, are being leveraged by the government to deliver citizen services.<sup>2</sup> From base maps to mapping restorations of architecture and murals in state capital buildings, geospatial resources have arrived on the state government scene as a necessary portfolio of capabilities ready to be employed throughout state government. Geospatial resources and GIS capabilities can be integrated with business applications like Customer Relationship Management (CRM), asset management, and financials to extend analytics, reporting, and visualization of data. The list has been embellished with additional ideas from state GIS Coordinators. As can be seen from this list, nearly every public sector business activity and decision has a *location or spatial* aspect. Given the influence and reliance on this resource, managing geospatial resources for maximum benefit should be part of every state IT and business strategy.

### APPLICATION OF GEOSPATIAL RESOURCES<sup>3</sup>

- Tracking Program Results
- Siting Facilities
- Management of Coastal Resources
- Planning for Sustainable Regions and Communities
- Siting of Conservation Easements
- 911 Response
- Determining Transportation Routes
- Appraisal and Management of Air Quality
- Siting for Development & Smart Growth Practices
- Managing Agricultural Development
- Understanding Population



### Location Relates to the Other Interrogatives in the Zachman Framework

- Demographics and Predictive Modeling
- Tracking Disease Incidence and Prevalence
- Mapping Sex Offender Registries and Crime Patterns
- Mapping of Historical Sites
- Locating Fueling Stations & Tracking Prices
- 3-D Street and Building Modeling for Emergency Response Planning and Law Enforcement
- Management of Public Utilities
- Impact Analysis related to Weather, Flooding and Natural Disasters
- Allocating Staff Resources
- Detecting Food Stamp Fraud
- Routing Field Inspectors
- Training

#### INTERNAL TO FACILITIES

- Management of Human Resources
- Asset Management and Tracking
- Continuity of Operations – Scenario Planning
- Location of Vital Records
- Restoration Initiatives

#### TRACKING MOBILE ASSETS

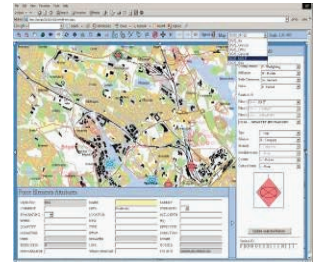
- Routing Freight
- Law Enforcement Vehicles
- Emergency Response Vehicles
- Government Field Services

“The promise of GIS is huge - the promise of location-based information, the promise of location intelligence ... I think the broader implications are that location is only going to become more and more important in our decision-making process.” - Mike Agron, V.P., Business Development at deCarta - *Government Technology*<sup>4</sup>

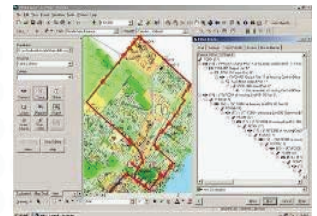
Achieving the full potential of geospatial resources as an enterprise capability is not new. *Location* has been presented for sometime in a number of perspectives including the Zachman Framework<sup>5</sup> which provides a framework for describing enterprise architecture. John Zachman has shown how critical location is and how it (the WHERE question) relates to every other dimension or *interrogative* in the Zachman Framework (WHAT, WHO, WHEN, WHY, HOW). For those familiar with this

### GIS Enables Many Types of Decisions

#### Command & Control



#### Network Management



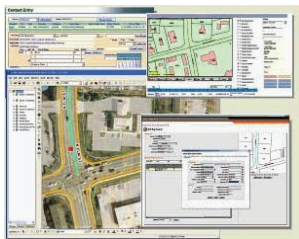
#### Resource Management





## GIS Enables Many Types of Decisions

### Incident Management



### Facility Management



### Cartographic Production



framework the graphic presented on page 3 portrays the inter-connection of the six interrogatives.

## Governance of Geospatial Resources – Intra-Enterprise Collaboration

What is most significant anymore is the *magnitude* of state investment in geospatial resources. This investment represents not only the technology, but even more important is the content – or the knowledge assets that are managed. These knowledge assets and the related technology investments must be properly *governed* through policy, strategy, delivery, procurement, and ongoing program management. Governance must begin with clear identification and understanding of government outcomes being sought. The various components of geospatial resources must be governed and managed within the appropriate disciplines of state government. *Geospatial information* must be included in the policy, strategies, and processes of *state data governance*. *Geospatial technology* must be included in the policy, strategies and processes of state governance of *information technology (IT)*. Geospatial resources are so important, and touch so many areas of government that they *must be* managed as an *enterprise resource* within the greater scope of *enterprise architecture* for the following reasons:

*First, so that state government doesn't spend funds buying the same capability more than once and to avoid inconsistent and possibly conflicting information among state agencies.*

*Second, as collaborative information exchanges continue to proliferate across government lines of business, common governance of geospatial resources afford additional opportunities to share geospatial information. Patterns and relationships can be uncovered*

*that were previously not understood or poorly understood.*

Geospatial resources have been implemented to some extent in almost every state agency. Anymore, business critical systems depend upon integration with *location aware* resources. An *enterprise approach* to managing and fully leveraging state geospatial resources requires an appropriate governance structure to ensure coordination across agencies. And, an *enterprise approach* to managing geospatial resources can be expected to provide the benefits outlined in this report relative to *cross-jurisdictional collaboration*.<sup>6</sup>

Further, governance encompasses the conceptual, logical, and physical layers of a state government geospatial resource architecture. Alan Leidner, former GIS director for New York City proposed that the Return on Investment (ROI) can reach \$4 for every \$1 invested in Enterprise GIS, or *E-GIS*, due to the efficiencies and effectiveness of incorporating geospatial resource capabilities into business processes and decision making.<sup>7</sup> The approach to *enterprise governance* of geospatial resources includes the following.

- Understanding the multipurpose nature of location data.
- Maintaining clear “custodial” responsibility for source data as residing with the appropriate local, state or federal agency or department.
- Maintaining modeling standards for data models – which may include object modeling standards across state government.
- Semantics are consistently depicted, naming standards are adhered to, proper separation between conceptual, logical, and physical data models.
- Ensuring that data is accurately georeferenced to enable proper overlays of multiple kinds of information.
- Metadata remains coupled with the information content or “payload.”
- Defining and maintaining consistent

data definitions – i.e., establishing Master Data Management.

- Consistent symbols and consideration of appropriate scale.
- Records management and preservation plans are properly designed, implemented and supported.
- Integrated workflow across state government providing a single virtual logical database view for the entire state enterprise regardless of the number of separate physical databases.
- Refresh schedules are established based on specific target business and government outcomes.
- Geospatial data, information and knowledge is recognized and accounted for within the state enterprise architecture. Enterprise architecture standards and best practices are applied to managing geospatial resources consistent with planning and management of any other enterprise information, process and organization components.

### Governance of Geospatial Resources – Inter-Enterprise Collaboration

The importance of a *coordinated and collaborative effort* at all levels of government – local, state, tribal and federal - is a primary recommendation from NASCIO and the National States Geographic Information Council (NSGIC). This foundational concept is also stressed at the federal level.<sup>8</sup>

*The Executive Office of the President will use the geospatial profile of the FEA [Federal Enterprise Architecture] to ensure that all organizations will architect, invest, and implement geospatial capabilities in a coordinated way that works for the Federal government, as well as other data sharing partners.*

*Executive Summary*

*... Given that multiple agencies, as well as private sector entities, provide a variety of services over the same geographic areas and/or provide geospatial information and services in support of business, there are efficiencies to be realized through collaboration.*

*Introduction*

*Federal Enterprise Architecture Geospatial Profile Version 1.1*

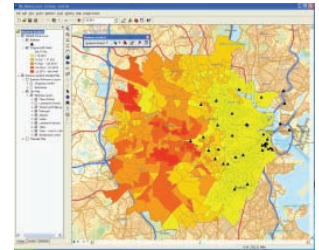
In previously published reports, NASCIO has presented the advantages, the considerations, and the various roles that state government can play in establishing *cross boundary collaborative relationships*.<sup>9,10</sup> A *cross agency and cross jurisdictional collaborative governance* approach leads to the following benefits:

- **improved decision support**
- **streamlined work processes**
- **integrated data and systems**
- **reduced duplication of effort and data**
- **more accurate, defensible, and repeatable decisions**
- **enabled rapid response to new demands**
- **better leveraging of an organization's geospatial data and technology investments**
- **better communications and collaboration across all levels of government**

As an example, water quality data is collected by federal, state, county and municipal authorities—all relating to the same surface water. If such efforts were coordinated, there are two potential outcomes: cooperation and collaboration of multiple efforts to afford a larger sampling database that can be used by all; re-use of sampling data and avoidance of independent sample collection, analysis and reporting. Geospatial resources can be leveraged to help coordinate local, state and federal data collection relative to this and other government initiatives.

### GIS Enables Many Types of Decisions

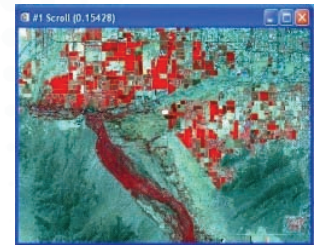
#### Business Analysis

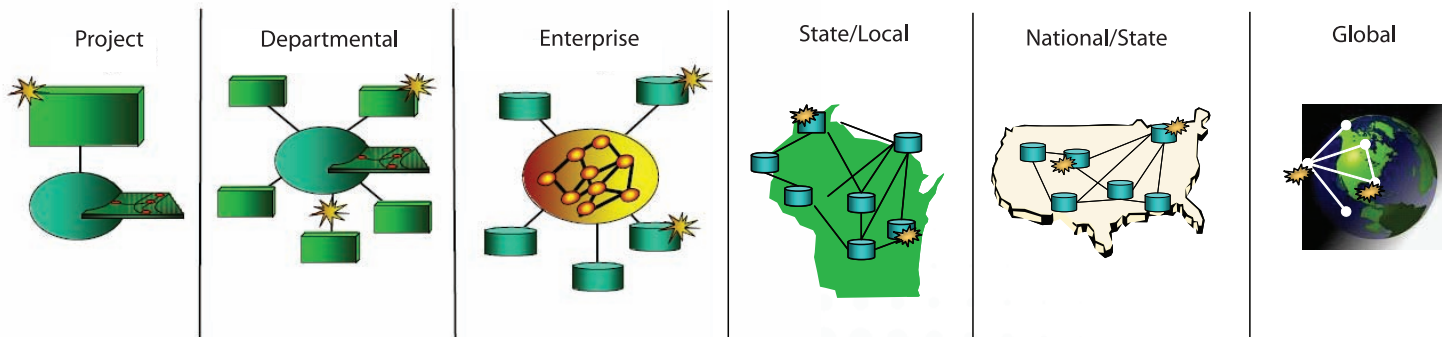


#### Land/property Management



#### Image Management





Evolution of Geospatial Collaboration in the Government Community<sup>13</sup>

*The best governance structures feature a collaborative environment with representation from all relevant business units.*

What started as stand alone implementations of GIS technology has evolved into geospatial resources encompassing enterprise-wide GIS, spatially-enabled data management platforms, and Geoweb 2.0 supporting cross communication, collaboration and mutual dependencies of state government agencies. Today, work orders, permitting, and various citizen services incorporate geospatial information as part of the description, impact and scope. Further, the necessary resources are available to provision this requirement.<sup>11</sup> Geospatial tools are available on the web which makes them reachable by virtually any PDA device, any citizen, and any government employee. Provisioning customer service requests in any government line of business from health and human services to emergency services can be accomplished ensuring the closest and most available resources are deployed to efficiently and effectively answer service calls.

***The best governance structures feature a collaborative environment with representation from all relevant business units. These business units have the authority to mandate change for the entire jurisdiction.***<sup>12</sup>

There is an evolution of collaboration and information sharing relative to geospatial resources. The diagram above describes the evolving understanding and collaboration that has occurred within government. Individual projects have developed useful geospatial capabilities

that have moved from a *point solution* basis to a *department wide* basis where geospatial resources are treated as a *department wide* resource. The next step in this evolution is the recognition that geospatial resources can be – and should be shared *enterprise wide*. Geospatial resources are then shared across local and state government, nationally and even globally. This evolution or progression demonstrates the sharing and contribution of geospatial information as required for today’s decision makers. Geospatial resources should not be developed within organizational silos. That approach creates unnecessary redundancy that not only expends valuable and limited resources unnecessarily, but there is also the recognition that decision making has evolved to a level requiring much more partnership and collaborative information sharing across government lines of business and jurisdictions. State and local government share information - much of the state geospatial resource is sourced from *local government*; federal and state government share information – much of the federal geospatial resource is sourced from *the states*; and global communities will continue to grow in similar fashion.

In more and more situations, government leaders must gain contextual understanding beyond their specific jurisdictions. This requires partnering and collaborative decision making at the regional and national levels. The “e” in



enterprise becomes a capital “E” through this progression. Municipal, county, and state governments are coming together in the decision making process and sharing resources such as geospatial data, analysis models, geo-processing tools and web mapping applications. The evolution will continue to include multiple states working at the national level and even the global level in gathering and evaluating data and information that will be referenced in decision making within environment health, public health, public safety, homeland security, disaster management, transportation, education, and economic development. Decision makers must anticipate this move beyond boundaries toward *regionalism*.

Ideally local, state and federal government and the various government lines of business at each of these levels would have complete agreement on a common data model that entails symbols, terms, definitions, semantics, etc. The reality today is that there is a diversity in collection and representation of geospatial data and information and it often resides within organizational silos at all levels of government. The scope of responsibility and interest is often different from local to state to federal government. Varying scopes of interest and decision making typically require differences in scaling of maps, and level of data granularity. Yet there is much opportunity for collaboration and economies of scale to be achieved through state and local collaborative relationships. State government can play a key role as facilitator in looking at statewide needs across all government lines of business involving counties and municipalities. There is a considerable amount of data that is collected and maintained at the local level. Due to advances in technology this information can be transformed and used by entities at all levels of government. Establishing working groups with equal representation from partnering organizations and jurisdictions is essential. Working group composition often involves a broad spectrum of government, industry and

academic organizations. Benefits gained from forming collaboratives include centralized contract management, economies of scale for software and hardware purchase and subscription agreements, and most importantly better decision making.

## Governance of Geospatial Resources – Key Roles

Each agency has its own expertise, knowledge domain and business processes for delivering services to citizens. However, much of the foundational base mapping, applications, services and infrastructure can and should be shared. Consolidating shared or common components does not take away ownership and control. On the contrary, consolidation provides for leveraging of investments and improves government decision making. As stated - proper governance must accompany management of geospatial resources. Such governance must include *business process owners, GIS specialists, mainstream application and database developers, the Chief Enterprise Architect and the state Chief Information Officer*. Having these roles involved in governance will ensure that all stakeholders understand what needs exist; that government fully explores what is technically and organizationally possible; and the right stakeholders hold the decision rights to set direction for enterprise wide governance of geospatial resources. Often times “catch ball” among these functions or roles can generate ideas and innovation that far out pace what each individual would come up with on their own.

Enterprise governance and management of geospatial resources includes more than managing enterprise applications and databases. It also entails strategies for maintaining the knowledge, skills, and experience of technology professionals including GIS specialists, application developers, database administrators, data modelers, project managers, enterprise architects, and executive decision makers. It entails collaborative inter-enterprise

relationships on the business side leveraging resources from local government, other states, and federal government. Enterprise management will include appropriate and effective evangelism, awareness building and communication of the value of geospatial information throughout the enterprise. Through these activities business and technology professionals become aware of what state and local government capabilities currently exist and are anticipated in the future. These capabilities then enhance the service delivery of agencies across the enterprise and will promote *cross line of business, cross jurisdictional* collaboration and multi-dimensional perspectives. The end result is a comprehensive service delivery to citizens that represents collaborative involvement from state, local and federal jurisdictions.

Enterprise governance and management of geospatial resources must address the expectations of state employees and citizens. Expectations have been driven toward ease of use, and availability with the advent and wide usage of user-friendly geospatial tools. State government geospatial resources must have comparable availability and ease of use.

### Governance of Geospatial Resources – Eliminate Redundant Investment

The issue of redundant effort and investment should not be underestimated. Avoidance of duplicative investment of time and effort has been an ongoing issue in data management and particularly in location information. OMB Circular A-16 was originally issued in 1953 and revised in 1967, 1990 and 2002. It states the following goal:

*“to insure (sic) that surveying and mapping activities may be directed toward meeting the needs of federal and state agencies and the general public, and will be performed expeditiously, without duplication of effort.”<sup>14</sup>*

The propensity for duplicative effort is highlighted here as a historical problem. With the availability and affordability of GIS capabilities today, the likelihood of redundant, uncoordinated effort is even more probable.

The e-Government Act of 2002 also emphasizes the need to avoid redundant effort.<sup>15</sup>

#### SEC.216 COMMON PROTOCOLS FOR GEOGRAPHIC INFORMATION SYSTEMS.

(a) PURPOSES. — The purposes of this section are to —

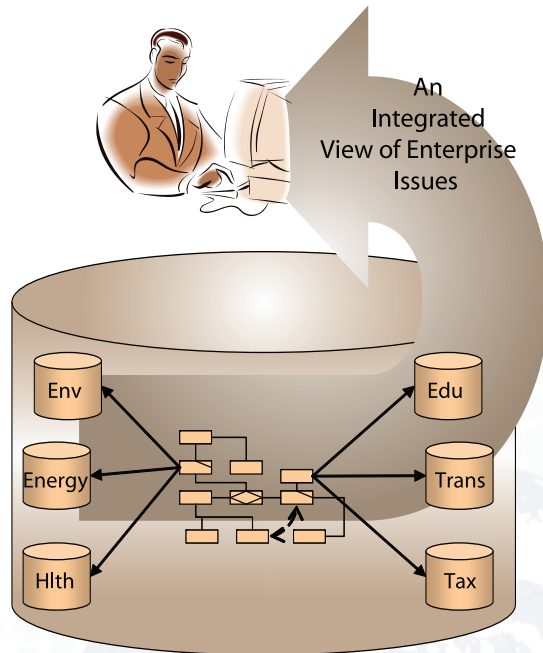
- (1) reduce redundant data collection and information; and
- (2) promote collaboration and use of standards for government geographic information.

(b) DEFINITION. — In this section, the term “geographic information” means information systems that involve locational data, such as maps or other geospatial information resources.

An *enterprise wide approach* to managing geospatial resources provides for integration of spatial data or location related data and GIS technology throughout state government while avoiding redundant investment.<sup>16</sup> An *enterprise wide approach* includes a portfolio of means including central or federated management of core geospatial resources, governed by established standards allowing for interoperability, with distributed use across state agencies. There are also hybrid enterprise models where key state agencies are trusted and accountable to support key services which are created to state-wide standards. The emphasis on standards allows cross line of business leverage of geospatial resources irrespective of where, within the organization, those key services reside.

Exposure of geospatial related services and access to services can be achieved through service oriented architecture (SOA).<sup>17,18</sup> Geospatial services should be managed in a way that is consistent with





### Enterprise Information as One Virtual Database

the state government strategy for managing all enterprise services. Supporting and enabling an enterprise service orientation are referential materials published through the Global Justice Information Sharing Initiative. NASCIO is actively promoting this library of materials which are founded on the Justice Reference Architecture for SOA (JRA).<sup>19</sup> NASCIO continues to participate in the ongoing development and maturity of these reference materials for establishing enterprise SOA initiatives in state government.

to take account of multiple dimensions and secondary effects in their decision making. Geospatial capabilities enable this broad view in analysis and decision making. Much of the technical architecture can be shared across these disciplines while still provisioning the unique requirements of each. Enterprise information and applications, including GIS, can be governed using a tiered approach as suggested by the state of Minnesota.

*Exposure of geospatial related services and access to services can be achieved through service oriented architecture (SOA).*

### Governance of Geospatial Resources - A Balanced Enterprise Framework

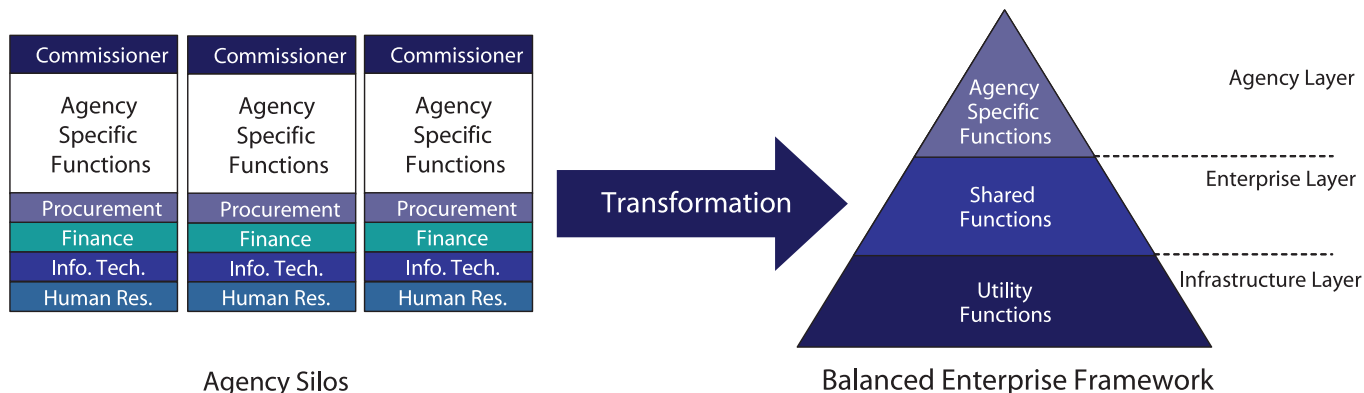
State government information / knowledge management should provide a single enterprise view into geospatial information which can demonstrate the interactions between environmental health and public health; transportation and environmental protection; integrated justice and health; energy and environmental health. The inter-relationships abound and decision makers are required

Minnesota's information technology initiative "Drive for Excellence" has at its core the promotion and implementation of an integrated enterprise view.

*"Moving from current practice of each department being relatively autonomous to a more enterprise or 'whole state' approach is an important step towards making state government more accountable"*

*Governor Tim Pawlenty in his September 9, 2004, press release*

Minnesota describes this strategy using its pyramid "Balanced Enterprise Framework."



### Minnesota’s Migration to a Balanced Enterprise Framework

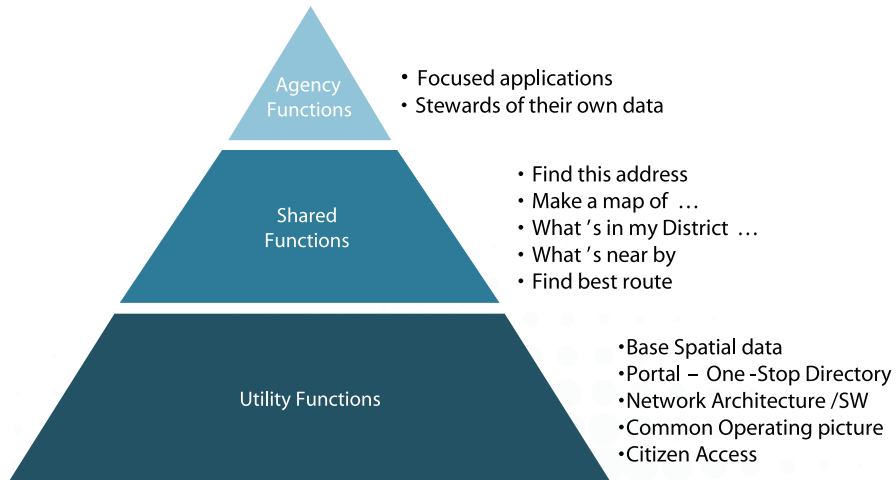
The pyramid also indicates the relative number of agencies or number of consumers of these services. The most focused processes, information and applications are at the top of the pyramid and represent those tools and services unique to a department or agency. The bottom of the pyramid depicts services employed by a greater number of agencies.

*Geospatial resources* slice vertically through the triangle. Some of these resources are foundational capabilities. Some are shared across state agencies. And, some geospatial resources are agency specific. For example, most state agencies will rely on a good base map of streets, water features, city boundaries and aerial photos. However, health and human services agencies would be most interested in tracking locations of foster homes; internal revenue would be most interested in mapping tax zones. In this type of scenario, common base map capabilities would fit in the bottom of the triangle as utility functions while unique agency data and capabilities would fit in the top triangle. Data or capabilities in the top tier are intended to be agency specific yet can be made available for sharing as necessary with other agencies. There is no need for each agency to develop and maintain common functions if they can be built once and made available to all agencies. This approach provides greater

consistency in data and process, and allows each state agency to focus on their *respective core mission*.

The concept of organizing government tasks and resources in this *tiered approach* requires a new perspective regarding state government responsibilities. Using pattern behavior from Minnesota as well as other states, a disciplined evaluation of business functions and processes can reveal commonalities and identify candidate shared services. This type of effort often occurs through the state *enterprise architecture function* working in collaboration with purchasing, the program management office and investment planning. Unnecessary redundant efforts can be eliminated through shared enterprise business services. As state government moves toward a *state enterprise perspective*, this approach to service categorization can be employed within the state enterprise architecture knowledge management and service management efforts. Services can be exposed, or made available, through enterprise service oriented architecture (SOA) as described earlier.

The bottom layer depicts those services that can be shared across the enterprise. These services are not *department (or government function) unique* capabilities. The overall concepts described here present Minnesota’s vision for *governance* of state IT resources.<sup>20</sup>

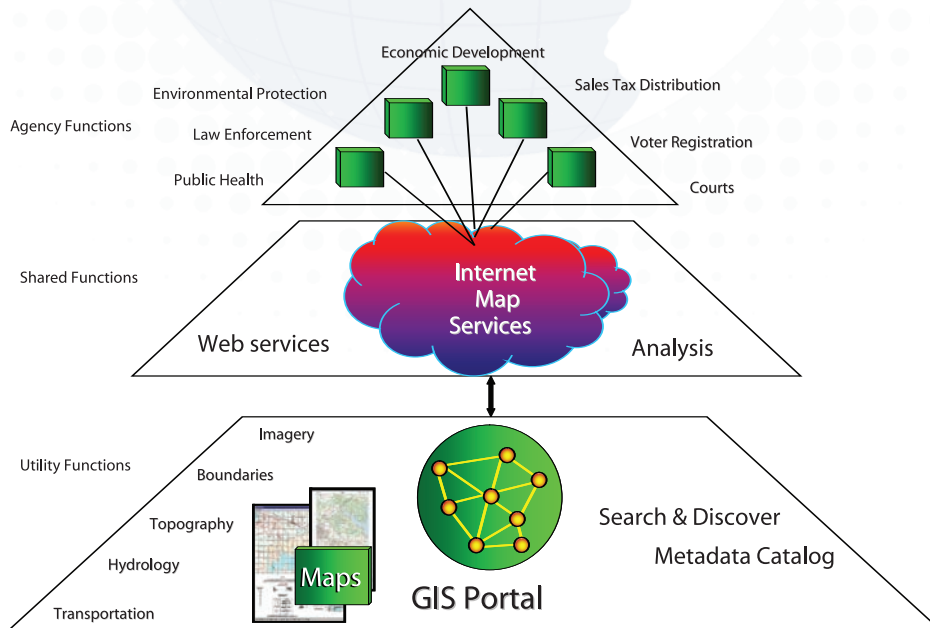


### Segmentations of Services

The diagram below presents a vision for state *geospatial resources and functions* within this conceptual framework.

Geospatial services can be grouped within the *Balanced Enterprise Framework* as shown. At the utility level, corporate partners are working together to provide greater integration of their application packages and underlying databases in order to offer geospatial utilities and location aware provisioning of multiple

and diverse business applications across the enterprise. As more of this type of integration is employed state government knowledge workers using any variety of applications can simply “click” a button or tab to gain a location perspective of data and information related to finance, human resources, asset management, and procurement within virtually any government line of business.



### Conceptual view of Enterprise Geospatial Business and Technology Services



## Governance of Geospatial Resources – Meeting the Challenges

Enterprise integration of geospatial resources is not without its challenges. First, basic geospatial technologies have become much less expensive, much more available, and extremely interesting. With such visibility, the complexities of planning, designing and implementing geospatial capabilities are often not understood. Geospatial technology in state government has become very advanced and requires expenditures in advanced training, license/maintenance fees, and hardware costs. Governance of geospatial capabilities has its challenges:

- organizational and governance issues
- funding
- complex project planning
- time required to properly plan, design and implement
- data development
- security and privacy
- implementation
- scope management
- technical and management challenges
- ongoing maintenance and operations, refresh strategies

As stated, part of the solution is to have in place a strategy for managing geospatial resources and forum for representation in decision making that properly identifies and supports the decision rights of stakeholders. That strategy must include organization, decision rights, manageable process steps and ongoing change competency.<sup>21</sup> Enterprise architecture provides the framework, best practices and methodology for developing and executing on enterprise strategy. That strategy for geospatial resources is presented with some adaptations for state government in Appendix A.

### The Federal Landscape

Given the need for collaboration and information sharing across federal, state

and local government, it is helpful to know what is happening at the federal level. The National States Geographic Information Council (NSGIC) and the Federal Geographic Data Committee (FGDC) have worked together to build and deliver what is termed the National Spatial Data Infrastructure (NSDI) starting in 1992. The two most commonly used definitions come from Presidential Executive Order 12906 and the U.S. Office of Management and Budget Circular A-16 which comprehensively describes the NSDI as “the technology, policies, standards, human resources and related activities necessary to acquire, process, distribute, use, maintain and preserve spatial data.”<sup>22</sup> And as outlined in the Office of Management and Budget (OMB) Circular A-16, a properly functioning NSDI will ensure that data from all jurisdictional levels is available and easily integrated to enhance the understanding of physical and cultural geography.<sup>23</sup> Why is such an initiative needed? NSGIC reported the following estimates that highlight the rationale for national collaboration.

- Data required by state, local, regional, tribal and federal governments will cost in excess of \$6.6 billion for the basic map layers called “framework data” and for information on the nation’s critical infrastructure.<sup>24</sup>
- There are over 18,000 municipal governments, 3,141 counties, 330 regional organizations, 327 tribal governments, 50 states, 6 territories – not counting the federal agencies – all creating geographic data.

With so much activity and uncoordinated investment, the Federal Office of Management and Budget estimated that potentially 50% of the investments across the country are wasted.<sup>25</sup> Without proper governance of geospatial resources through enterprise architecture and inter-enterprise architectures such waste will continue. Given the challenging fiscal circumstances facing states today and into the future, recovery of this potential waste is *essential* to effective and efficient investment management.

“There is clearly a trend to migrate disparate line-of-business geospatial systems to an enterprise GIS environment. This trend features core GIS infrastructure maintained by a central IS organization, with data management responsibilities held by the lines of business that are the primary users.”

Gartner—US Public Sector GIS Survey

## The National States Geographic Information Council (NSGIC) Recommendations

NSGIC published nine criteria that its members believe will foster effective coordination [governance] of geospatial resources within state government.<sup>26</sup> Those criteria that will most resonate with state CIOs are listed here:

1. A full-time, paid coordinator position is designated and has the authority to implement the state's [geospatial] business and strategic plans.
2. A clearly defined authority exists for statewide coordination of geospatial information technologies and data production.
3. The statewide coordination office has a formal relationship with state's Chief Information Officer (or similar office).
4. A champion (politician or executive decision maker) is aware and involved in the process of coordination.
7. Sustainable funding sources exist to meet projected needs.

NASCIO recommends the following supplemental criteria:

1. Add a geospatial domain as part of the state enterprise architecture addressing process, information management, and technology.
2. Ensure the development of enterprise data and process standards also address geospatial resources.
3. Privacy and security issues related to geospatial information must be addressed through state policy. For example, citizens may present serious concerns regarding the availability of their personal and property information on the web.
4. Significant geospatial data and information constitute essential records that are critical to the resumption and continuity of government. Ensure that continuity of operations and disaster recovery plans encompass the protection and recoverability of these geospatial

information assets. Fully leverage geospatial resources to document the location of essential and vital records.

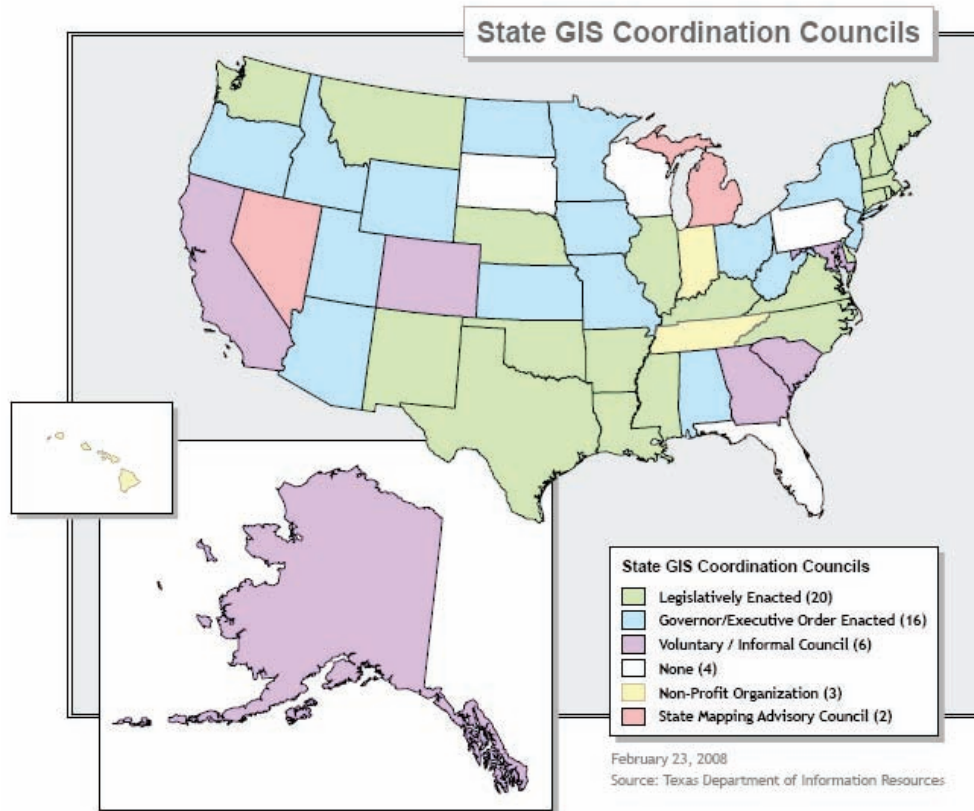
5. GIS capabilities should be included in state government services portfolio. Given the expectations of citizens and government workers, make it standard operating discipline to consider how to present data and information geospatially.
6. Strive for enterprise wide contracts and licensing. Create master contracts for agency software purchasing.
7. Develop strategies for recruiting, and training of personnel with GIS skills. Collaborate with universities in the development of intern programs and other means for introducing students to careers in state and local government. Ensure skill sets of GIS personnel are up to date through appropriate training and professional development plans.

NASCIO highlights the involvement of the state CIO as the office with responsibility and authority for managing state knowledge assets. These assets must include geospatial *data, information* and *knowledge*.

## Bring Together the Stakeholders from All Levels of Government

Many states have created or plan to create governance councils that include many stakeholder groups. The chartering and scope of these councils vary by state. The map on page 14 presents the level of adoption of governance councils across the states and the basis chosen for organizing.

In addition to identifying the NSGIC Coordination Criteria, the Fifty States Initiative Action Plan requires that a more consistent system of statewide councils (or authorities) be established for governance that incorporates the following seven characteristics:<sup>27</sup>



### State Governance Councils

1. Include broad representation and inclusion in decision-making by user communities, including federal, state, county, municipal and tribal governments; private sector GIS users and vendors; academic sector; non-profit organizations; utilities; and the general public.
2. Develop Strategic Plans that incorporate a vision statement with appropriate goals and objectives related to implementing the NSDI.
3. Develop Business and Marketing Plans that detail the development of a geospatial technology infrastructure (including data) to mirror the definition of the NSDI ([www.whitehouse.gov/omb/circulars/a016/a016\\_rev.html](http://www.whitehouse.gov/omb/circulars/a016/a016_rev.html)).
4. Establish formal authorization and operations under appropriate bylaws.
5. Foster implementation of the nine coordination criteria to feed consensus based decision-making into official statewide initiatives.
6. Provide funding and support to enable the operation.
7. Foster member commitments for implementing appropriate OGC, FGDC, ANSI and ISO standards.



## Conclusion

Proper governance of state geospatial resources as part of the state's knowledge asset management and enterprise architecture disciplines will provide the opportunity to fully leverage a powerful enabling capability for today's government decision makers. Fully harvesting this capability has associated challenges within the areas of organization, integrated workflow, shared services, knowledge management, investment planning, and program management. The chief enterprise architect can provide guidance and direction for managing these complexities through the state enterprise architecture discipline. The state CIO is in a unique position to create a collaborative environment and to further develop enterprise geospatial capabilities and offer these capabilities as services that can be reached through enterprise SOA. GIS capabilities will only grow in importance and availability as government moves toward more collaborative decision making within and across all lines of business.

### CIO CALLS TO ACTION

1. Pursue an enterprise wide approach to governance of geospatial resources. Geospatial information and technology should be addressed in the state IT strategic plan. Rationalize contracts and capabilities to provide a centralized portfolio of GIS services that can be reached from across state government. Seek partnerships internally and externally that can facilitate sharing of information and best practices. Maintain the vitality of the governance of geospatial resources recognizing that geospatial data and information are constantly changing.
2. To ensure stability and continuity, help institutionalize a coordinated GIS program through statute or administrative rule. Review current legislation for relevancy and currency.
3. Recognize and incorporate geospatial data as a domain within the state enterprise data architecture. Implement existing GIS data standards and requirements throughout the enterprise where applicable and to the extent practical. Incorporate governance of geospatial information as part of enterprise data governance within the greater umbrella of state government enterprise architecture. Ensure enterprise architecture principles and discipline are applied to the ongoing management of geospatial resources.
4. Review and prioritize the NSGIC nine criteria for effective coordination of GIS and the Fifty States Initiative seven characteristics for effective statewide GIS councils. Engage the state chief enterprise architect and the state GIS coordinator to strategize on the delivery process.
5. As has been recommended regarding roles related to records management, and security, engage the state GIS Coordinator as a member of the CIO strategy team for guiding all information technology related projects in order to uncover challenges and opportunities related to *location aware* information.
6. Review disaster recovery and continuity of operations plans to ensure appropriate geospatial records are listed as essential records. Engage geospatial resources to document the location of vital and essential records. Recognize the importance of geospatial resources to disaster preparedness strategies. Employ these resources in planning, risk assessment, response, recovery and resumption processes.
7. Reexamine job classes and job codes and make appropriate changes and updates to ensure these reflect the market demands and required skill sets. Ensure human resource policy maintains relevancy and is in step with the dramatic pace in information technology personnel management and planning needs. Establish and maintain a recruiting and training strategy for attracting people into state government geospatial careers. Ensure personnel are current with relevant business, communication and technology competencies. Understand the expectations of government employees, and citizens, relative to applications, ease of use, and availability.

8. Recognize and support the essential role of local government as a critical partner in managing and sharing geospatial resources. Remember that local government organizations are the custodians of significant geospatial information resources. Build collaborative relationships and governance that embraces local government as an equal partner for establishing consistent standards, methods and procedures. This ensures that the state plan effectively becomes a *statewide plan* that is relevant to the needs and incentives of local government as well as state government. Through this approach, state government will derive greater value from its geospatial knowledge base.



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## Resources:

### **National Association of State Chief Information Officers (NASCIO)**

**[www.nascio.org](http://www.nascio.org)**

IT Governance and Business Outcomes – A Shared Responsibility between IT and Business Leadership  
<http://www.nascio.org/committees/EA/download.cfm?id=98>

Data Governance - Managing Information As An Enterprise Asset: Part I - An Introduction  
<http://www.nascio.org/committees/EA/download.cfm?id=100>

Enterprise Architecture: The Path to Government Transformation  
<http://www.nascio.org/committees/EA/>

Getting Started in Cross-Boundary Collaboration: What State CIOs Need to Know  
<http://www.nascio.org/publications/documents/NASCIO-CrossBoundaryCollaboration.pdf>

Connecting State and Local Government: Collaboration through Trust and Leadership  
<http://www.nascio.org/publications/documents/NASCIO-Cross%20BoundaryNov2007.pdf>

Call for Action, A Blueprint for Better Government: The Information Sharing Imperative  
<http://www.nascio.org/advocacy/dcFlyIn/callForAction05.pdf>

Service Oriented Architecture: An Enabler of the Agile Enterprise  
<http://www.nascio.org/committees/EA/download.cfm?id=45>

NASCIO Enterprise Architecture SOA Webinar Archive CD  
 Order: <https://www.amrms.com/ssl/nascio/store/index.cfm#96>

PERSPECTIVES: Government Information Sharing Calls to Action  
<http://www.nascio.org/publications/index.cfm#19>

In Hot Pursuit: Achieving Interoperability Through XML  
<http://www.nascio.org/publications/index.cfm#21>

We Need to Talk: Governance Models to Advance Communications Interoperability  
<http://www.nascio.org/publications/index.cfm#50>

A National Framework for Collaborative Information Exchange: What is NIEM?  
<http://www.nascio.org/publications/index.cfm#47>

List of NASCIO Corporate Partners  
<http://www.nascio.org/aboutNascio/corpProfiles/>

List of NASCIO Publications  
<http://www.nascio.org/publications/index.cfm>

List of NASCIO Committees  
<http://www.nascio.org/committees/>

**National States Geographic Information Council (NSGIC)** <http://www.nsgic.org/>

**The Federal Geographic Data Committee (FGDC)** <http://www.fgdc.gov/>

**The National Spatial Data Infrastructure (NSDI)**  
<http://www.fgdc.gov/nsdi/nsdi.html>

**State of Minnesota Drive For Excellence Initiative**

Delivering Effective, Efficient, Economical Government  
<http://www.state.mn.us/portal/mn/jsp/home.do?agency=Excellence>

**United States Geographical Survey**

Description of Geographical Information Systems

[http://erg.usgs.gov/isb/pubs/gis\\_poster/](http://erg.usgs.gov/isb/pubs/gis_poster/)

**Federal Enterprise Architecture Profiles**

- Includes the Geospatial Profile (in development)

<http://www.whitehouse.gov/omb/egov/a-2-EAProfilesNEW2.html>

**Canadian Geospatial Data Infrastructure**

Online Training

Glossary

Abbreviations

[http://www.geoconnections.org/publications/training\\_manual/e/index.htm](http://www.geoconnections.org/publications/training_manual/e/index.htm)

**The Data Administration Newsletter**

<http://www.tdan.com/index.php>

**The Data Governance Institute**

<http://datagovernance.com/>

**The Data Management Association International – DAMA – [www.dama.org](http://www.dama.org)****The Data Management Body of Knowledge (DMBOK) -**

<http://www.dama.org/i4a/pages/index.cfm?pageid=3364>

**The IT Governance Institute (ITGI)**

<http://www.itgi.org/>

**Information Systems Audit and Control Association (ISACA)**

<http://www.isaca.org/>

**Certification in Governance of Enterprise IT (CGEIT) from ISACA**

<http://www.isaca.org/Template.cfm?Section=Certification&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=16&ContentID=36129>

**The Center for Information Systems Research (CISR)**

<http://mitsloan.mit.edu/cisr/>

**The National Information Exchange Model (NIEM)**

[www.niem.gov](http://www.niem.gov)

**Global Justice Reference Architecture for SOA**

[http://www.it.ojp.gov/topic.jsp?topic\\_id=242](http://www.it.ojp.gov/topic.jsp?topic_id=242)

The Global Justice Reference Architecture (JRA) Specification, Working Draft Version 1.4

The Global Justice Reference Architecture (JRA) Web Services Service Interaction Profile Version 1.1

The Global Justice Reference Architecture (JRA) ebXML Messaging Service Interaction Profile Version 1.0

## Appendix A: An Enterprise Strategy for Governance of Geospatial Resources

### 1. An Objective Review

- Review the *current state* with particular focus on strategic intent – i.e., what outcomes are being sought.
- Maintain objectivity by utilizing a committee that represents all stakeholders, or an objective facilitator
- Evaluate the organization
- Identify problems or challenges encountered or anticipated
- Identify opportunities
- Establish assumptions

### 2. Establish a realistic vision of the outcomes sought

- Identify guiding principles
- Identify the implications of these principles
- Establish the necessary standards to support these principles
- Identify the necessary supportive factors for the initiative to be successful
- Identify necessary resources
- Develop roles and responsibilities and accountabilities
  - Data Ownership*
  - Data Stewardship*
  - Data Security and Privacy*
  - Steering Committee*
  - Performance Monitoring*
  - Communications and Organizational Change*
  - Project/Program/Portfolio Management*

### 3. Develop a delivery process

- Establish realistic delivery goals and crisp objectives
- Define what “success” means
- Develop an organizational model
- Define realistic milestones based on availability of resources
- Define manageable phases and iterate – remind the organization that project plans are *continually, progressively* elaborated based on new learnings, environmental influences and changing priorities
- Plan for contingencies; identify risks, impacts and responses

### 4. Create a geospatial profile as part of the state government enterprise architecture

- Integrate geospatial information into existing operations
  - Data Governance*
  - Data Security*
  - Data Architecture*
  - Service Management*
- Integrated workflow
  - Drive adoption within current and planned business processes*

**5. Establish a “Network of Leadership”**

- ❑ Because enterprise GIS involves many areas of the organization a *leadership network* is required for successful delivery and vitality
- ❑ Includes leadership for the overall effort but also champions at the executive level and stakeholder areas
- ❑ Create a “culture of collaboration”

**6. Develop policies and procedures for ongoing dynamic strategy, change competency, implementation and operations**

- ❑ Establish *Enterprise Governance for Geospatial Resources*
  - ❑ Must include a “refresh” strategy and schedules *particularly for imagery*
- ❑ Gain participation in governance processes from state, county and municipal stakeholders





## Appendix B: Endnotes

<sup>1</sup> "State IT Workforce: Here Today, Gone Tomorrow?, A National Survey of the States", NASCIO, September 2007, available at [www.nascio.org/publicatons](http://www.nascio.org/publicatons).

<sup>2</sup> Vander Veen, C., "Web-Based Mapping Tools Help Governments Transform GIS into New Services", *Government Technology*, February 6, 2008, retrieved on February 14, 2008, from [http://www.govtech.com/gt/241047?id=&topic=117676&story\\_pg=6](http://www.govtech.com/gt/241047?id=&topic=117676&story_pg=6).

<sup>3</sup> A comprehensive list of geospatial applications is provided in Appendix D of the Federal Enterprise Architecture Profile for Geospatial information. Federal Enterprise Architecture Geospatial Profile Version 1.1, January 27, 2006, co-published by the U.S. Federal CIO Council and the U.S. Federal Geographic Data Committee, retrieved on February 15, 2008, from <http://www.whitehouse.gov/omb/egov/a-2-EAProfilesNEW2.html>.

<sup>4</sup> Vander Veen, C., p. 5.

<sup>5</sup> *The Zachman Framework*, see [www.ZIFA.com](http://www.ZIFA.com).

<sup>6</sup> "Enterprise GIS for Municipal Government", p.10.

<sup>7</sup> Leidner, A., *The American City & County*; March 2007, 122, 3; Research Library pg. 26. See [www.americancityandcounty.com](http://www.americancityandcounty.com). Note: Some adaptations have been made to the published list.

<sup>8</sup> FEA Geospatial Profile, p.3.

<sup>9</sup> "Getting Started in Cross-Boundary Collaboration: What the State CIOs Need to Know", May 2007, available at [www.nascio.org/publications/](http://www.nascio.org/publications/).

<sup>10</sup> "Connecting State and Local Government: Collaboration through Trust and Leadership", November 2007, available at [www.nascio.org/publications/](http://www.nascio.org/publications/).

<sup>11</sup> "Enterprise GIS for Municipal Government", ESRI White Paper, July 2003, retrieved on March 25, 2008, from [www.esri.com/library/whitepapers/pdfs/municipal-gov.pdf](http://www.esri.com/library/whitepapers/pdfs/municipal-gov.pdf).

<sup>12</sup> Greg Kreizman, US Public Sector GIS Survey: Key Issues and Trends, Gartner, 3 December 2002, referenced in the Wisconsin Best Practices Report.

<sup>13</sup> Adapted from "Enterprise GIS for Municipal Government", p. 2.

<sup>14</sup> Revised OMB Circular A-16 retrieved from [http://www.whitehouse.gov/omb/circulars/a016/a016\\_rev.html](http://www.whitehouse.gov/omb/circulars/a016/a016_rev.html).

<sup>15</sup> Section 216 ("Common Protocols for Geographic Information Systems", Public Law 44 USC Ch 36) is part of the EGovernment Act of 2002.

<sup>16</sup> Somers, R., "Achieving Enterprise GIS", *Management / Geospatial Solutions*, January 1, 2005, retrieved on June 4, 2008 from [www.geospatial-solutions.com](http://www.geospatial-solutions.com).

<sup>17</sup> See NASCIO issue brief, *Service Oriented Architecture: An Enabler of the Agile Enterprise*, May 2006, available at [www.nascio.org/publications](http://www.nascio.org/publications).

<sup>18</sup> See *NASCIO Enterprise Architecture SOA Webinar Archive CD* available at [www.nascio.org/publications](http://www.nascio.org/publications).

<sup>19</sup> The Justice Reference Architecture for SOA and supporting library can be retrieved from the Global Justice Information Sharing Initiative at [http://www.it.ojp.gov/topic.jsp?topic\\_id=242](http://www.it.ojp.gov/topic.jsp?topic_id=242).

<sup>20</sup> From State of Minnesota Drive to Excellence initiative.

<sup>21</sup> Somers, R.

<sup>22</sup> Office of Management and Budget, Circular No. A-16, Revised, August 19, 2002, retrieved on June 16, 2008, from [http://www.whitehouse.gov/omb/circulars/a016/a016\\_rev.html#2](http://www.whitehouse.gov/omb/circulars/a016/a016_rev.html#2).

<sup>23</sup> "FDGC Future Directions – Fifty States Initiative"; NSGIC, March 6, 2006, retrieved on June 25, 2008, from <http://www.nsgic.org/hottopics/fiftystatesinitiativehandout.pdf>.

<sup>24</sup> U.S. Mapping Costs, NSGIC (Burgess, W.), December 2002, retrieved on July 8, 2008, from [http://www.nsgic.org/hottopics/iftn/presentation\\_template.ppt#359,9,NSGIC Estimate of Data Costs](http://www.nsgic.org/hottopics/iftn/presentation_template.ppt#359,9,NSGIC Estimate of Data Costs).

<sup>25</sup> Testimony during a 2003 Congressional Hearing by Mark Forman, E-Government Chief, OMB ([http://www.gcn.com/print/23\\_17/26480-1.html?topic=news](http://www.gcn.com/print/23_17/26480-1.html?topic=news)).

<sup>26</sup> "FDGC Future Directions – Fifty States Initiative", pp. 1-2.

<sup>27</sup> The Fifty States Initiative is a partnership between the National States Geographic Information Council (NSGIC) and the Federal Geographic Data Committee (FGDC). It is designed to bring all public and private stakeholders together in statewide GIS coordination bodies that help to form effective partnerships and lasting relationships. See [http://www.nsgic.org/hottopics/fifty\\_states.cfm](http://www.nsgic.org/hottopics/fifty_states.cfm).

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