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GEOSPATIAL INFORMATION

Better Coordination and Oversight Could Help Reduce Duplicative Investments

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GEOSPATIAL INFORMATION

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Highlights

Highlights of GAO-04-824T, testimony before the Subcommittee on Technology, Information Policy, Intergovernmental Relations and the Census, House Committee on Government Reform

Why GAO Did This Study

The collection, maintenance, and use of location-based (geospatial) information are essential to federal agencies carrying out their missions. Geographic information systems (GIS) are critical elements used in the areas of homeland security, healthcare, natural resources conservation, and countless other applications.

GAO was asked to review the extent to which the federal government is coordinating the efficient sharing of geospatial assets, including through Office of Management and Budget (OMB) oversight. GAO's report on this matter, *Geospatial Information: Better Coordination Needed to Identify and Reduce Duplicative Investments* (GAO-04-703), is being released today. GAO's testimony focuses on the extent to which the federal government is coordinating the sharing of geospatial assets, including through oversight measures in place at the Office of Management and Budget (OMB), in order to identify and reduce redundancies in geospatial data and systems.

What GAO Recommends

In its report, GAO recommends that the OMB Director and the Secretary of the Interior develop a current, comprehensive strategic plan for coordinating federal geospatial assets; and makes other recommendations to OMB. In their comments on a draft of the report, OMB and Interior agreed with GAO's recommendations.

www.gao.gov/cgi-bin/getrpt?GAO-04-824T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Linda D. Koontz at (202) 512-6240 or koontzl@gao.gov.

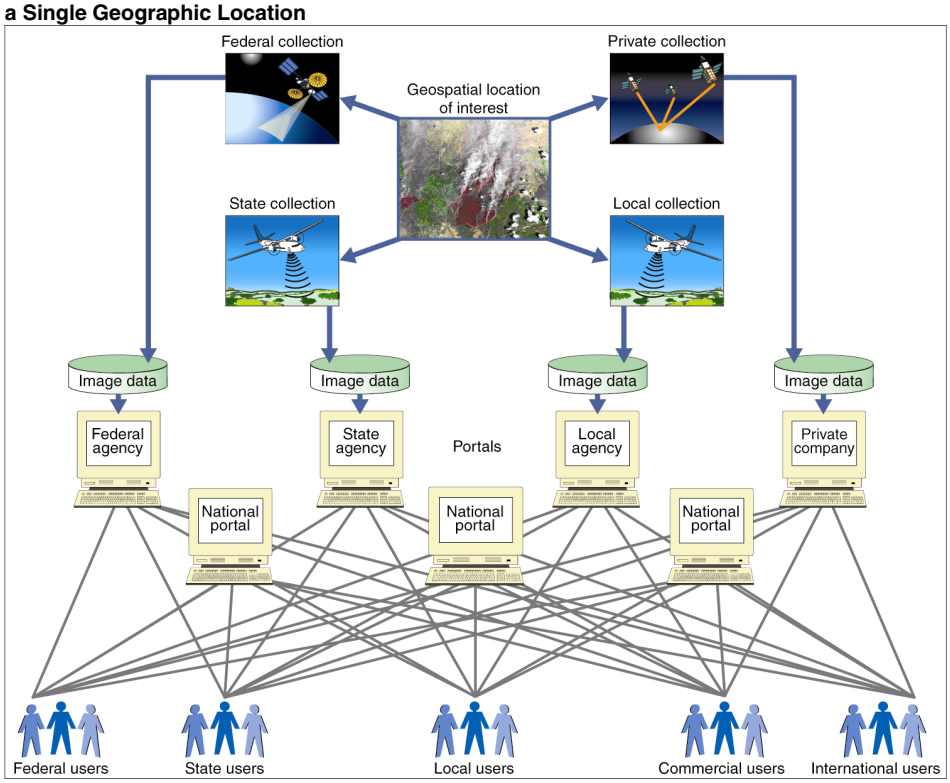
What GAO Found

OMB, cross-government committees, and individual federal agencies have taken actions to coordinate geospatial investments across agencies and with state and local governments. However, these efforts have not been fully successful for several reasons:

- A complete and up-to-date strategic plan is missing. The existing strategic plan for coordinating national geospatial resources and activities is out of date and lacks specific measures for identifying and reducing redundancies.
- Federal agencies are not consistently complying with OMB direction to coordinate their investments.
- OMB's oversight methods have not been effective in identifying or eliminating instances of duplication. This has resulted from OMB not collecting consistent, key investment information from all agencies.

Consequently, agencies continue to independently acquire and maintain potentially duplicative systems. This costly practice is likely to continue unless coordination is significantly improved.

Conceptual Diagram of Multiple Geospatial Data Collections and Processing Associated with a Single Geographic Location



Sources: GAO (analysis); U.S. Forest Service (Earth photo) and Nova Development (clip art).

Mr. Chairman and Members of the Subcommittee:

I am pleased to participate in the Subcommittee's hearing on the federal government's use and coordination of geospatial information. The federal government collects, maintains, and uses geospatial information—information linked to specific geographic locations—to help in decision making and to support many essential functions, including national security, law enforcement, health care, the environment, and natural resources conservation. States, counties, cities, tribal governments, and the private sector also use geospatial information to support critical functions. Federal agencies, states, and local governments may each provide services at the same geographic locations and may independently collect similar geospatial information about those locations, thus raising the question of how well the nation's geospatial assets[1] are coordinated.

To encourage greater coordination, in 1990, OMB established the Federal Geographic Data Committee (FGDC) within the Department of the Interior to be the lead federal executive body responsible for promoting and guiding coordination among federal, state, tribal, and local government entities, academia, and the private sector. One of the committee's responsibilities is to establish a National Geospatial Data Clearinghouse to provide Web-based access to descriptions of available geospatial data, allowing governments at all levels, academia, and the private sector to make their data widely available.[2] In addition to the clearinghouse, more recently, in 2002, OMB established the Geospatial One-Stop initiative to develop an Internet portal to provide easier, faster, and less expensive access to geospatial information for all levels of government and the public.[3] Both the clearinghouse and Geospatial One-Stop, along with many other coordination activities, contribute to the development of the National Spatial Data Infrastructure (NSDI).[4]

[1]Geospatial assets include geographic information systems (GIS), data, technology, and standards.

[2]The National Geospatial Data Clearinghouse is a decentralized system of Internet-based servers that contain descriptions of available geospatial data. It allows individual agencies, consortia, or others to promote their available geospatial data.

[3]Geospatial One-Stop is an e-Government initiative sponsored by OMB to enhance government efficiency and improve citizen service.

[4]The NSDI includes the technologies, policies, and people necessary to promote sharing of geospatial data throughout all levels of government, the private and non profit sectors, and the academic community.

My testimony today follows up on testimony provided to the Subcommittee in June 2003.[5] In my previous testimony, I noted that realizing the vision of a nationwide network of geospatial information systems is a formidable challenge and achieving full participation across governments in its development has been difficult. Today's testimony will highlight the extent to which the federal government is coordinating the sharing of geospatial assets, including through oversight measures in place at the Office of Management and Budget (OMB), in order to identify and reduce redundancies in geospatial data and systems.

My testimony today summarizes a report, prepared at your request, on federal coordination of geospatial investments.[6] This report is being released to you today. Our work in preparing the report was conducted from October 2003 through May 2004 in accordance with generally accepted government auditing standards.

Results in Brief

OMB, individual federal agencies, and cross-government committees have each taken action to coordinate the government's geospatial investments across agencies and with state and local governments. Such coordination could result in reducing redundancies in geospatial activities and investments, with concomitant reductions in the costs associated with these activities. However, these efforts have not been fully successful in reducing redundancies in geospatial investments for several reasons.

First, while the National Geospatial Data Clearinghouse and Geospatial One-Stop have been established to support the development of the NSDI and to address redundant and incompatible geospatial information, a complete and up-to-date strategic plan is not in place to help guide and effectively manage these activities. The government's existing strategic plan for the NSDI is out of date and does not include specific measures for identifying and reducing redundancies.

Second, while in certain cases federal agencies have taken steps to coordinate their specific geospatial activities, federal agencies have not

[5]U.S. General Accounting Office, *Geographic Information Systems: Challenges to Effective Data Sharing*, GAO-03-874T (Washington, D.C.: June 10, 2003).

[6]U.S. General Accounting Office, *Geospatial Information: Better Coordination Needed to Identify and Reduce Duplicative Investments*, GAO-04-703 (Washington, D.C.: June 23, 2004).

always fully complied with OMB direction to coordinate their investments. Specifically, many agency geospatial data holdings are not compliant with established standards or are not published through the clearinghouse, although both are required by OMB in order to help coordinate national geospatial activities and investments.

Finally, although OMB has processes in place that could help identify potentially redundant geospatial investments, these oversight methods have not identified or eliminated specific instances of duplication. The processes used by OMB to identify potentially redundant geospatial investments have not been effective because OMB has not been able to collect key investment information from all agencies in a consistent way so that it could be used to identify redundancies. As a result of these shortcomings, federal agencies are independently acquiring and maintaining potentially duplicative and costly data sets and systems. Without better coordination, such duplication is likely to continue.

Our report includes recommendations to the Director of OMB and to the Secretary of the Interior to direct the development of an improved strategic plan for coordinating federal geospatial assets. It also makes recommendations to the Director of OMB to encourage better agency compliance with Circular A-16 by developing and implementing criteria for assessing the extent of interagency coordination on planned geospatial investments and to strengthen OMB's oversight actions to better ensure that agencies do not invest in potentially redundant geospatial systems or data gathering efforts. In their comments on a draft of the report, representatives of OMB's Offices of Information and Regulatory Affairs and Resource Management and the Assistant Secretary of the Interior—Policy, Management, and Budget generally agreed with these recommendations.

Background

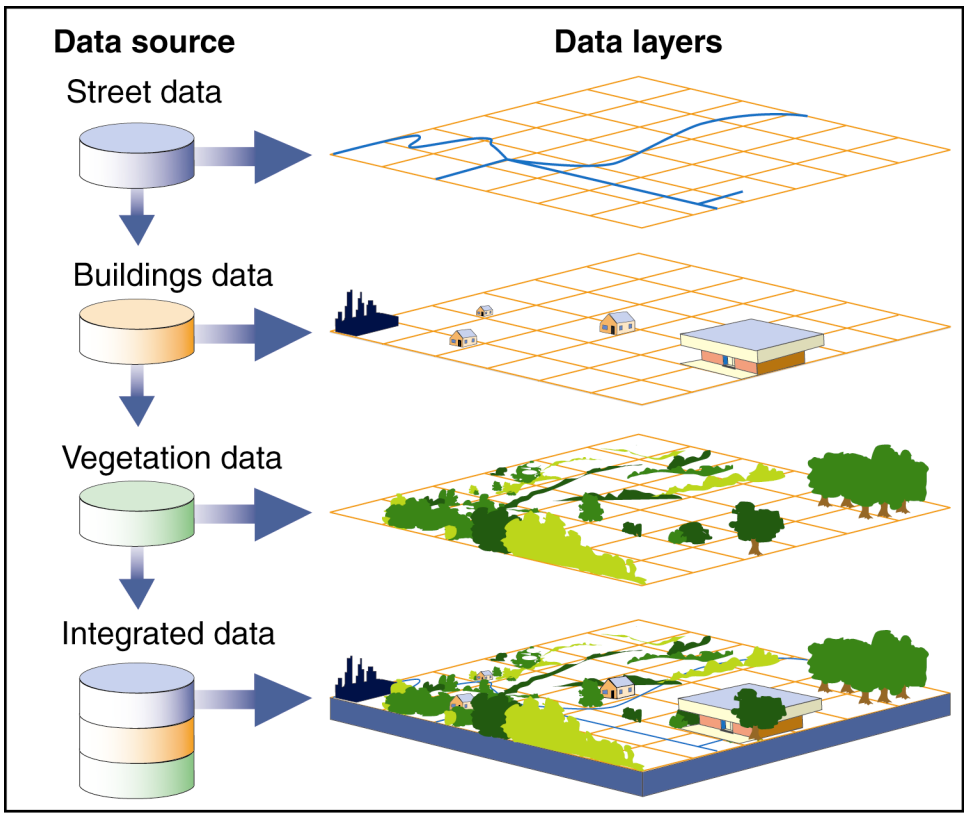
Geospatial information describes entities or phenomena that can be referenced to specific locations relative to the Earth's surface. For example, entities such as houses, rivers, road intersections, power plants, and national parks can all be identified by their locations. In addition, phenomena such as wildfires, the spread of the West Nile virus, and the thinning of trees due to acid rain can also be identified by their geographic locations.

A geographic information system (GIS) is a system of computer software, hardware, and data used to capture, store, manipulate, analyze, and graphically present a potentially wide array of geospatial information. The

primary function of a GIS is to link multiple sets of geospatial data and display the combined information as maps with many different layers of information.

Each layer of a GIS map represents a particular "theme" or feature, and one layer could be derived from a data source completely different from the others. Typical geospatial data layers (themes) include cadastral—describing location, ownership, and other information about real property; digital orthoimagery—containing images of the Earth's surface that have the geometric characteristics of a map and image qualities of a photograph; and hydrography—describing water features such as lakes, ponds, streams and rivers, canals, oceans, and coastlines. As long as standard processes and formats have been used to facilitate integration, each of these themes could be based on data originally collected and maintained by a separate organization. Analyzing this layered information as an integrated whole can significantly aid decision makers in considering complex choices, such as where to locate a new department of motor vehicles building to best serve the greatest number of citizens. Figure 1 portrays the concept of data themes in a GIS.

Figure 1: GIS Layers or Themes



Source: GAO.

Geographic Information Systems and Data Are Used and Produced by Federal, State, and Local Governments, and the Private Sector

Federal, state, and local governments and the private sector rely on geographic information systems to provide vital services to their customers. These various entities independently provide information and services, including maintaining land records for federal and nonfederal lands, property taxation, local planning, subdivision control and zoning, and direct delivery of many other public services. These entities also use geographic information and geographic information systems to facilitate and support delivery of these services.

Many federal departments and agencies use GIS technology to help carry out their primary missions. For example, the Department of Health and Human Services uses GIS technology for a variety of public health functions, such as reporting the results of national health surveys; the Census Bureau maintains the Topologically Integrated Geographic Encoding and Referencing (TIGER) database to support its mission to

conduct the decennial census and other censuses and surveys; and the Environmental Protection Agency maintains a variety of databases with information about the quality of air, water, and land in the United States.

State governments also rely on geospatial information to provide information and services to their citizens. For example, the state of New York hosts a Web site to provide citizens with a gateway to state government services at http://www.nysegov.com/map-NY.cfm. Using this Web site, citizens can access information about state agencies and their services, locate county boundaries and services, and locate major state highways. Many other states, such as Oregon (http://www.gis.state.or.us/), Virginia (http://www.vgin.virginia.gov/index.html), and Alaska (http://www.asgdc.state.ak.us/), provide similar Web sites and services.

Local governments use GISs for a variety of activities. For example, local fire departments can use geographic information systems to determine the quickest and most efficient route from a firehouse to a specific location, taking into account changing traffic patterns that occur at various times of day. Additionally, according to a March 2002 Gartner report,[7] New York City's GIS was pivotal in the rescue, response, and recovery efforts after the September 11, 2001, terrorist attacks. The city's GIS provided real-time data on the area around the World Trade Center so that the mayor, governor, federal officials, and emergency response agencies could implement critical rescue, response, and recovery activities. Local governments often possess more recent and higher resolution geospatial data than the federal government, and in many cases private-sector companies collect these data under contract to local government agencies.

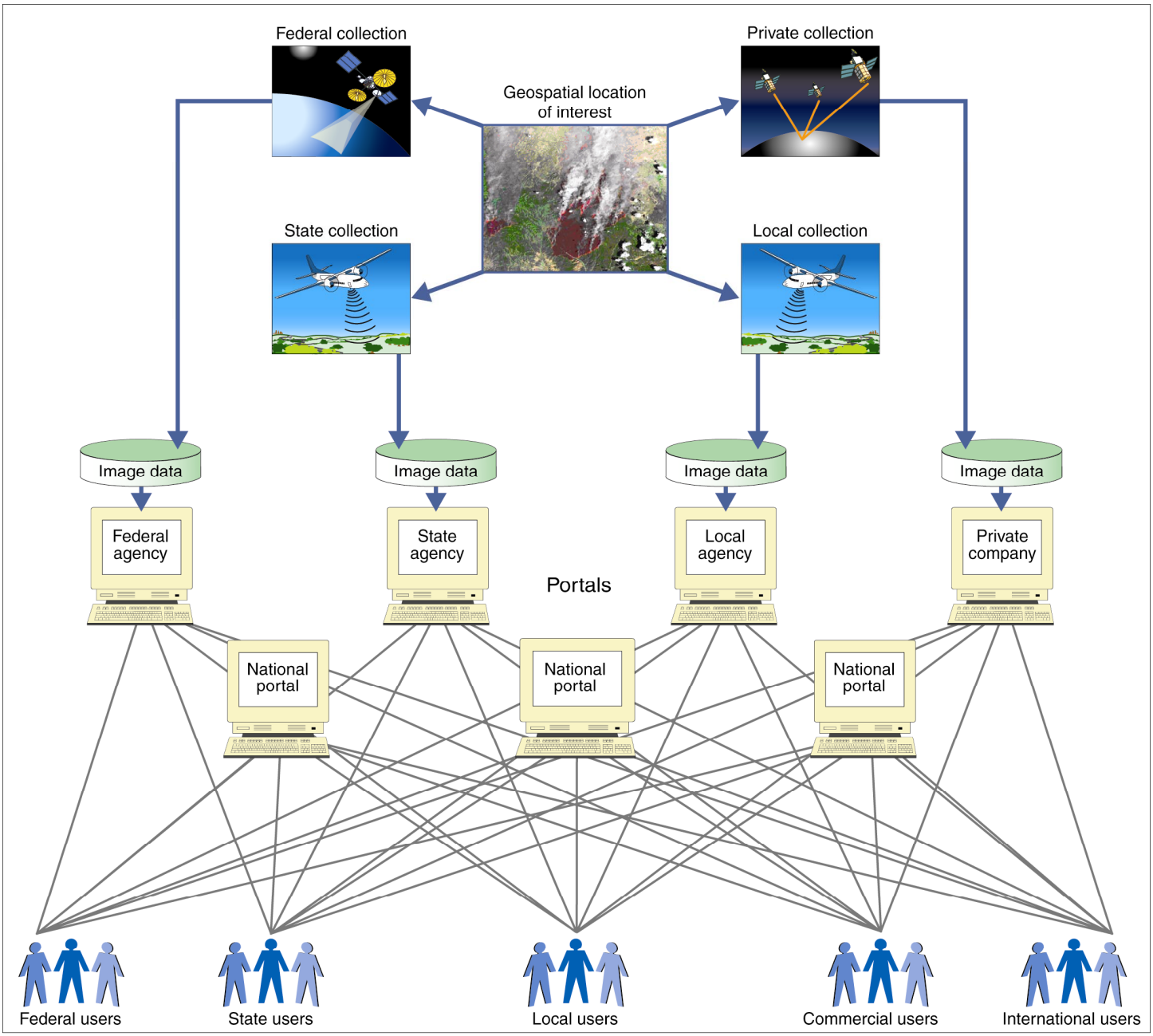
The private sector plays an important role in support of government GIS activities because it captures and maintains a wealth of geospatial data and develops GIS software. Private companies provide services such as aerial photography, digital topographic mapping, digital orthophotography, and digital elevation modeling to produce geospatial data sets that are designed to meet the needs of governmental organizations.

Figure 2 provides a conceptual summary of the many entities—including federal, state, and local governments and the private sector—that may be involved in geospatial data collection and processing relative to a single

[7]B. Keller and G. Kreizman, *To The Rescue: GIS in New York City on Sept. 11* (Gartner Inc., March 2002), http://www.gartner.com (downloaded March 10, 2004).

geographic location or event. Figure 3 shows the multiple data sets that have been collected by different agencies at federal, state, and local levels to capture the location of a segment of roadway in Texas.

Figure 2: Conceptual Diagram of Multiple Geospatial Data Collections and Processing Associated with a Single Geographic Location



Sources: GAO (analysis); U.S. Forest Service (Earth photo) and Nova Development (clip art).

Figure 3: Multiple Street Centerline Data Sets Covering the Same Location in Texas

Texas Councils of Government Road Centerline Data
Texas Strategic Mapping Program Transportation Layer
Texas Department of Transportation (TxDOT) County Road Inventory
TxDOT Digital County/Urban Map Files
U.S. Census Bureau 2000 TIGER Line Data

Source: County Information Project, Texas Association of Counties.

Coordination of Federal Geospatial Activities

As we testified last year, the federal government has for many years taken steps to coordinate geospatial activities, both within and outside of the federal government.[8] These include the issuance of OMB Circular A-16 and Executive Order 12906, and the E-Government Act of 2002. In addition to its responsibilities for geospatial information under the E-Government Act, OMB has specific oversight responsibilities regarding federal information technology (IT) systems and acquisition activities—including GIS—to help ensure their efficient and effective use. These responsibilities are outlined in the Clinger-Cohen Act of 1996,[9] the Paperwork Reduction Act of 1995,[10] and OMB Circular A-11. Table 1 provides a brief summary of federal guidance related to information technology and geospatial information.

[8] GAO-03-874T.

[9] 40 U.S.C. § 11302(b).

[10] 44 U.S.C. § 3504(a)(1).

Table 1: Federal Guidance Related to Information Technology and Geospatial Information

Guidance	Description
OMB Circular A-11	The circular establishes policy for planning, budgeting, acquisition, and management of federal capital assets. Specifically, it requires agencies to submit business cases to OMB for planned or ongoing major IT investments.[a]
OMB Circular A-16	Originally issued in 1953, and last revised in 2002, this circular, among other things, establishes FGDC within the Department of the Interior to promote the coordinated use, sharing, and dissemination of geospatial data nationwide.
Executive Order 12906	Issued in 1994, this order assigns to FGDC the responsibility to coordinate the development of the National Spatial Data Infrastructure (NSDI).
Paperwork Reduction Act of 1995	Includes a general requirement that the Director of OMB oversee the use of information resources to improve the efficiency and effectiveness of governmental operations to serve agency missions.
Clinger-Cohen Act of 1996	Requires the Director of OMB to promote and be responsible for improving the acquisition, use, and disposal of information technology by the federal government to improve the productivity, efficiency, and effectiveness of federal programs.
E-Government Act of 2002	Requires OMB to oversee coordination with state, local, and tribal governments as well as public-private partnerships and other interested persons on the development of standard protocols for sharing geographic information to reduce redundant data collection and promote collaboration and the use of standards.[b]

Source: GAO.

[a]According to OMB Circular A-11, a major IT investment means a system or investment that requires special management attention because of its importance to an agency's mission; the investment was a major investment in the fiscal year 2004 submission and is continuing; the investment is for financial management and spends more than $500,000; the investment is directly tied to the top two layers of the Federal Enterprise Architecture; the investment is an integral part of the agency's modernization blueprint (EA); the investment has significant program or policy implications; the investment has high executive visibility; or the investment is defined as major by the agency's capital planning and investment control process. Investments that are e-government in nature or use e-business technologies must be identified as major investments regardless of their costs.

[b]P.L. 107-347, Section 216.

In addition to activities associated with federal legislation and guidance, OMB's Administrator, Office of Electronic Government and Information Technology, testified before the Subcommittee last June that the strategic management of geospatial assets would be accomplished, in part, through development of a robust and mature federal enterprise architecture. In 2001, the lack of a federal enterprise architecture was cited by OMB's E-Government Task Force as a barrier to the success of the administration's e-government initiatives.[11] In response, OMB began developing the Federal Enterprise Architecture (FEA), and over the last 2 years it has released

[11]OMB's E-Government Task Force identified 23 initiatives (two additional initiatives were subsequently added) aimed at improving service to individuals, service to businesses, intergovernmental affairs, and federal agency-to-agency efficiency and effectiveness.

various versions of all but one of the five FEA reference models.[12] According to OMB, the purpose of the FEA, among other things, is to provide a common frame of reference or taxonomy for agencies' individual enterprise architecture efforts and their planned and ongoing investment activities.[13]

Costs Associated with Gathering, Maintaining, and Using Geospatial Data Are Significant

Costs associated with collecting and maintaining geographically referenced data and systems for the federal government are significant. Specific examples[14] of the costs of collecting and maintaining federal geospatial data and information systems include

- FEMA's Multi-Hazard Flood Map Modernization Program—estimated to cost $1 billion over the next 5 years;
- Census's TIGER database—modernization is estimated to have cost over $170 million between 2001 and 2004;
- Agriculture's Geospatial Database—acquisition and development reportedly cost over $130 million;
- Interior's National Map—development is estimated to cost about $88 million through 2008;[15]
- The Department of the Navy's Primary Oceanographic Prediction, and Oceanographic Information systems—development, modernization, and operation were estimated to cost about $32 million in fiscal year 2003; and

[12]These reference models include the Business Reference Model, the Service Component Reference Model, the Technical Reference Model, the Performance Reference Model, and the Data and Information Reference Model.

[13]An enterprise architecture is a blueprint, defined largely by interrelated models, that describes (in both business and technology terms) an entity's "as is" or current environment, its "to be" or future environment, and its investment plan for transitioning from the current to the future environment.

[14]The scope of these cost estimates varies and may include development, operation, or both. The examples are for illustrative purposes and are not intended to be compared.

[15]This figure does not include costs for data acquisition. Some National Map data are acquired from Landsat satellites, which are estimated to cost about $95 million to operate through 2008.

- NOAA's Coastal Survey—expenditures for geospatial data are estimated to cost about $30 million annually.

In addition to the costs for individual agency GISs and data, the aggregated annual cost of collecting and maintaining geospatial data for all NSDI-related data themes and systems is estimated to be substantial. According to a recent estimate by the National States Geographic Information Council (NSGIC), the cost to collect detailed data for five key data layers of the NSDI—parcel, critical infrastructure, orthoimagery, elevation, and roads—is about $6.6 billion. The estimate assumes that the data development will be coordinated among federal, state, and local government agencies, and the council cautions that without effective coordination, the costs could be far higher.

FGDC and Others Have Taken Steps to Coordinate GIS Activities, but Lack a Complete and Up-to-Date Strategic Plan to Guide Them

Both Executive Order 12906 and OMB Circular A-16 charge FGDC with responsibilities that support coordination of federal GIS investments. Specifically, the committee is designated the lead federal executive body with responsibilities including (1) promoting and guiding coordination among federal, state, tribal, and local government agencies, academia, and the private sector in the collection, production, sharing, and use of spatial information and the implementation of the NSDI; and (2) preparing and maintaining a strategic plan for developing and implementing the NSDI.

Regarding coordination with federal and other entities and development of the NSDI, FGDC has taken a variety of actions. It established a committee structure with participation from federal agencies and key nonfederal organizations such as NSGIC, and the National Association of Counties, and established several programs to help ensure greater participation from federal agencies as well as other government entities. In addition, key actions taken by FGDC to develop the NSDI include implementing the National Geospatial Data Clearinghouse and establishing a framework of data themes.[16] In addition to FGDC's programs, two other efforts are under way that aim to coordinate and consolidate geospatial information and resources across the federal government—the Geospatial One-Stop initiative and The National Map project.

[16]The framework of data themes is a collaborative effort in which commonly used data "layers" are developed, maintained, and integrated by public and private organizations within a geographic area. Local, regional, state, and federal organizations and private companies can use the framework as a way to share resources, improve communications, and increase efficiency.

- Geospatial One-Stop is intended to accelerate the development and implementation of the NSDI to provide federal and state agencies with a single point of access to map-related data, which in turn will enable consolidation of redundant geospatial data. OMB selected Geospatial One-Stop as one of its e-government initiatives, in part to support development of an inventory of national geospatial assets, and also to support reducing redundancies in federal geospatial assets. In addition, the portal includes a "marketplace" that provides information on planned and ongoing geospatial acquisitions for use by agencies that are considering acquiring new data to facilitate coordination of existing and planned acquisitions.

- The National Map is being developed and implemented by the U.S. Geological Survey (USGS) as a database to provide core geospatial data about the United States and its territories, similar to the data traditionally provided on USGS paper topographic maps. USGS relies heavily on partnerships with other federal agencies as well as states, localities, and the private sector to maintain the accuracy and currency of the national core geospatial data set as represented in The National Map.

According to Interior's Assistant Secretary—Policy, Management, and Budget, FGDC, Geospatial One-Stop, and The National Map are coordinating their activities in several areas, including developing standards and framework data layers for the NSDI, increasing the effectiveness of the clearinghouse, and making information about existing and planned data acquisitions available through the Geospatial One-Stop Web site.

Regarding preparing and maintaining a strategic plan for developing and implementing the NSDI, in 1994, FGDC issued a strategic plan that described actions federal agencies and others could take to develop the NSDI, such as establishing data themes and standards, training programs, and partnerships to promote coordination and data sharing. In April 1997, FGDC published an updated plan—with input from many organizations and individuals having a stake in developing the NSDI—that defined strategic goals and objectives to support the vision of the NSDI as defined in the 1994 plan. No further updates have been made.

As the current national geospatial strategy document, FGDC's 1997 plan is out of date. First, it does not reflect the recent broadened use of geospatial data and systems by many government agencies. Second, it does not take into account the increased importance that has been placed on homeland security in the wake of the September 11, 2001, attacks. Geospatial data and systems have an essential role to play in supporting decision makers

and emergency responders in protecting critical infrastructure and responding to threats. Finally, significant governmentwide geospatial efforts—including the Geospatial One-Stop and National Map projects—did not exist in 1997, and are therefore not reflected in the strategic plan.

In addition to being out of date, the 1997 document lacks important elements that should be included in an effective strategic plan. According to the Government Performance and Results Act of 1993,[17] such plans should include a set of outcome-related strategic goals, a description of how those goals are to be achieved, and an identification of risk factors that could significantly affect their achievement. The plans should also include performance goals and measures, with resources needed to achieve them, as well as a description of the processes to be used to measure progress.

While the 1997 NSDI plan contains a vision statement and goals and objectives, it does not include other essential elements. These missing elements include (1) a set of outcome-related goals, with actions to achieve those goals, that would bring together the various actions being taken to coordinate geospatial assets and achieve the vision of the NSDI; (2) key risk factors that could significantly affect the achievement of the goals and objectives; and (3) performance goals and measures to help ensure that the steps being taken result in the development of the National Spatial Data Infrastructure.

FGDC officials, in consultation with the executive director of Geospatial One-Stop, USGS, and participating FGDC member agencies, have initiated a "future directions" effort to begin the process of updating their existing plan. However, this activity is just beginning, and there is no time frame as to when a new strategy will be in place. Until a comprehensive national strategy is in place, the current state of ineffective coordination is likely to remain, and the vision of the NSDI will likely not be fully realized.

[17]P.L. 103-62, section 3.

Individual Agencies Have Coordinated Specific Geospatial Investments, but Have Not Fully Complied with OMB Guidance

OMB Circular A-16 directs federal agencies to coordinate their investments to facilitate building the NSDI. The circular lists 11 specific responsibilities for federal agencies, including (1) preparing, maintaining, publishing, and implementing a strategy for advancing geographic information and related spatial data activities appropriate to their mission, in support of the NSDI; (2) using FGDC standards, including metadata[18] and other appropriate standards, documenting spatial data with relevant metadata; and (3) making metadata available online through a registered NSDI-compatible clearinghouse site.

In certain cases, federal agencies have taken steps to coordinate their specific geospatial activities. For example, the Forest Service and Bureau of Land Management collaborated to develop the National Integrated Land System (NILS), which is intended to provide land managers with software tools for the collection, management, and sharing of survey data, cadastral data, and land records information. At an estimated cost of about $34 million, a single GIS—NILS—was developed that can accommodate the shared geospatial needs of both agencies, eliminating the need for each agency to develop a separate system.

However, despite specific examples of coordination such as this, agencies have not consistently complied with OMB's broader geospatial coordination requirements. For example, only 10 of 17 agencies that provided reports to FGDC reported having published geospatial strategies as required by Circular A-16. In addition, agencies' spatial data holdings are generally not compliant with FGDC standards. Specifically, the annual report shows that, of the 17 agencies that provided reports to FGDC, only 4 reported that their spatial data holdings were compliant with FGDC standards. Ten agencies reported being partially compliant, and 3 agencies provided answers that were unclear as to whether they were compliant. Finally, regarding the requirement for agencies to post their data to the National Geospatial Data Clearinghouse,[19] only 6 of the 17 agencies indicated that their data or metadata were published through the clearinghouse, 10 indicated that their data were not published, 1 indicated that some data were available through the clearinghouse.

[18]Metadata refers to data that contain or define other data. For geospatial information, metadata provides information about, among other things, sources used, collection methods, and the date the data were collected.

[19]According to Circular A-16, agencies are required to publish only data that they are able to share with the public.

According to comments provided by agencies to FGDC in the annual report submissions, there are several reasons why agencies have not complied with their responsibilities under Circular A-16, including the lack of performance measures that link funding to coordination efforts. According to the Natural Resources Conservation Service, few incentives exist for cross-agency cooperation because budget allocations are linked to individual agency performance rather than to cooperative efforts. In addition, according to USGS, agencies' activities and funding are driven primarily by individual agency missions and do not address interagency geospatial coordination. In addition to the information provided in the annual report, Department of Agriculture officials said that no clear performance measures exist linking funding to interagency coordination.

OMB's Oversight of Federal Geospatial Assets and Activities Has Not Yet Identified Redundancies

OMB has recognized that potentially redundant geospatial assets need to be identified and that federal geospatial systems and information activities need to be coordinated. To help identify potential redundancies, OMB's Administrator of E-Government and Information Technology testified in June 2003 that the agency uses three key sources of information: (1) business cases for planned or ongoing IT investments, submitted by agencies as part of the annual budget process; (2) comparisons of agency lines of business with the Federal Enterprise Architecture (FEA); and (3) annual reports compiled by FGDC and submitted to OMB. However, none of these major oversight processes have been effective tools to help OMB identify major redundancies in federal GIS investments.

Agency IT Business Cases Do Not Completely Describe Geospatial Data Assets

In their IT business cases, agencies must report the types of data that will be used, including geospatial data. According to OMB's branch chief for information policy and technology, OMB reviews these business cases to determine whether any redundant geospatial investments are being funded. Specifically, the process for reviewing a business case includes comparing proposed investments, IT management and strategic plans, and other business cases, in an attempt to determine whether a proposed investment duplicates another agency's existing or already-approved investment.

However, business cases submitted to OMB under Circular A-11 do not always include enough information to effectively identify potential geospatial data and systems redundancies because OMB does not require such information in agency business cases. For example, OMB does not require that agencies clearly link information about their proposed or existing geospatial investments to the spatial data categories (themes)

established by Circular A-16. Geospatial systems and data are ubiquitous throughout federal agencies and are frequently integrated into agencies' mission-related systems and business processes. Business cases that focus on mission-related aspects of agency systems and data may not provide the information necessary to compare specific geospatial investments with other, potentially similar investments unless the data identified in the business cases are categorized to allow OMB to more readily compare data sets and identify potential redundancies.

For example, FEMA's fiscal year 2004 business case for its Multi-Hazard Flood Map Modernization project indicates that topographic and base data are used to perform engineering analyses for estimating flood discharge, developing floodplain mapping, and locating areas of interest related to hazards. However, FEMA does not categorize these data according to standardized spatial data themes specified in Circular A-16, such as elevation (bathymetric or terrestrial), transportation, and hydrography. As a result, it is difficult to determine whether the data overlap with other federal data sets. Without categorizing the data using the standard data themes as an important step toward coordinating that data, information about agencies' planned or ongoing use of geospatial data in their business cases cannot be effectively assessed to determine whether it could be integrated with other existing or planned federal geospatial assets.

The Federal Enterprise Architecture Has Not Yet Effectively Identified Potentially Redundant Geospatial Investments

An FEA is being constructed that, once it is further developed, may help identify potentially redundant geospatial investments. According to OMB, the FEA will comprise a collection of five interrelated reference models designed to facilitate cross-agency analysis and the identification of duplicative investments, gaps, and opportunities for collaboration within and across federal agencies. According to recent GAO testimony on the status of the FEA, although OMB has made progress on the FEA, it remains a work in process and is still maturing.[20]

OMB has identified multiple purposes for the FEA. One purpose cited is to inform agencies' individual enterprise architectures and to facilitate their development by providing a common classification structure and vocabulary. Another stated purpose is to provide a governmentwide

[20]U.S. General Accounting Office, *Information Technology: The Federal Enterprise Architecture and Agencies' Enterprise Architectures Are Still Maturing*, GAO-04-798T (Washington, D.C.: May 19, 2004).

framework that can increase agencies' awareness of IT capabilities that other agencies have or plan to acquire, so that agencies can explore opportunities for reuse. Still another stated purpose is to help OMB decision makers identify opportunities for collaboration among agencies through the implementation of common, reusable, and interoperable solutions. We support the FEA as a framework for achieving these ends.

According to OMB's branch chief for information policy and technology, OMB reviews all new investment proposals against the federal government's lines of business in its Business Reference Model to identify those investments that appear to have some commonality. Many of the model's lines of business include areas in which geospatial information is of critical importance, including disaster management (the cleanup and restoration activities that take place after a disaster); environmental management (functions required to monitor the environment and weather, determine proper environmental standards, and address environmental hazards and contamination); and transportation (federally supported activities related to the safe passage, conveyance, or transportation of goods and people).

The Service Component Reference Model includes specific references to geospatial data and systems. It is intended to identify and classify IT service components (i.e., applications) that support federal agencies and promote the reuse of components across agencies. The model includes 29 types of services—including customer relationship management and the visualization service, which defines capabilities that support the conversion of data into graphical or picture form. One component of the visualization service is associated with mapping, geospatial, elevation, and global positioning system services. Identification of redundant investments under the visualization service could provide OMB with information that would be useful in identifying redundant geospatial systems investments.

Finally, the Data and Information Reference Model would likely be the most critical FEA element in identifying potentially redundant geospatial investments. According to OMB, this model will categorize the government's information along general content areas and describe data components that are common to many business processes or activities.

Although the FEA includes elements that could be used to help identify redundant investments, it is not yet sufficiently developed to be useful in identifying redundant geospatial investments. While the Business and Service Component reference models have aspects related to geospatial investments, the Data and Information Reference Model may be the

critical element for identifying agency use of geospatial data because it is planned to provide standard categories of data that could support comparing data sets among federal agencies. However, this model has not yet been completed and thus is not in use. Until the FEA is completed and OMB develops effective analytical processes to use it, it will not be able to contribute to identifying potentially redundant geospatial investments.

FGDC-Administered Agency Reports Are Not Sufficient for Identifying Redundant Geospatial Investments

OMB Circular A-16 requires agencies to report annually to OMB on their achievements in advancing geographic information and related spatial data activities appropriate to their missions and in support of the NSDI. To support this requirement, FGDC has developed a structure for agencies to use to report such information in a consistent format and for aggregating individual agencies' information. Using the agency reports, the committee prepares an annual report to OMB purportedly identifying the scope and depth of spatial data activities across agencies.

For the fiscal year 2003 report, agencies were asked to respond to several specific questions about their geospatial activities, including (1) whether a detailed strategy had been developed for integrating geographic information and spatial data into their business processes, (2) how they ensure that data are not already available prior to collecting new geospatial data, and (3) whether geospatial data are a component of the agency's enterprise architecture. However, additional information that is critical to identifying redundancies was not required. For example, agencies were not requested to provide information on their specific GIS investments or the geospatial data sets they collected and maintained. According to the FGDC staff director, the annual reports are not meant to provide an inventory of federal geospatial assets. As a result, they cannot provide OMB with sufficient information to identify redundancies in federal geospatial investments.

Further, because not all agencies provide reports to FGDC, the information that OMB has available to identify redundancies is incomplete. According to OMB's program examiner for the Department of the Interior, OMB does not know how well agencies are complying with the reporting requirements in Circular A-16. Until the information reported by agencies is consistent and complete, OMB will not be able to effectively use it to identify potential geospatial redundancies.

According to OMB officials responsible for oversight of geospatial activities, the agency's methods have not yet led to the identification of redundant investments that could be targeted for consolidation or

elimination. The OMB officials said they believe that, with further refinement, these tools will be effective in the future in helping them identify redundancies. In addition, OMB representatives told us that they are planning to institute a new process to collect more complete information on agencies' geospatial investments by requiring agencies to report all such investments through the Geospatial One-Stop Web portal. OMB representatives told us that reporting requirements for agencies would be detailed in a new directive that OMB expects to issue by the end of summer 2004.

Federal Agencies Continue to Collect and Maintain Duplicative Data and Systems

Without a complete and up-to-date strategy for coordination or effective investment oversight by OMB, federal agencies continue to acquire and maintain duplicative data and systems. According to the initial business case for the Geospatial One-Stop initiative, about 50 percent of the federal government's geospatial data investment is duplicative. Such duplication is widely recognized. Officials from federal and state agencies and OMB have all stated that unnecessarily redundant geospatial data and systems exist throughout the federal government. The Staff Director of FGDC agreed that redundancies continue to exist throughout the federal government and that more work needs to be done to specifically identify them. DHS's Geospatial Information Officer also acknowledged redundancies in geospatial data acquisitions at his agency, and said that DHS is working to create an enterprisewide approach to managing geospatial data in order to reduce redundancies. Similarly, state representatives to the National States Geographic Information Council have identified cases in which they have observed multiple federal agencies funding the acquisition of similar data to meet individual agency needs.

For example, USGS, FEMA, and the Department of Defense (DOD) each maintain separate elevation data sets: USGS's National Elevation Dataset, FEMA's flood hazard mapping elevation data program, and DOD's elevation data regarding Defense installations. FEMA officials indicated that they obtained much of their data from state and local partners or purchased them from the private sector because data from those sources better fit their accuracy and resolution requirements than elevation data available from USGS. Similarly, according to one Army official, available USGS elevation data sets generally do not include military installations, and even when such data are available for specific installations, they are typically not accurate enough for DOD's purposes. As a result, DOD collects its own elevation data for its installations. In this example, if USGS elevation data-collection projects were coordinated with FEMA and DOD to help ensure that the needs of as many federal agencies as possible

were met through the project, potentially costly and redundant data-collection activities could be avoided. According to the USGS Associate Director for Geography, USGS is currently working to develop relationships with FEMA and DOD, along with other federal agencies, to determine where these agencies' data-collection activities overlap.

In another example, officials at the Department of Agriculture and the National Geospatial-Intelligence Agency (NGA) both said they have purchased data sets containing street-centerline data from commercial sources, even though the Census Bureau maintains such data in its TIGER database. According to these officials, they purchased the data commercially because they had concerns about the accuracy of the TIGER data. The Census Bureau is currently working to enhance its TIGER data in preparation for the 2010 census, and a major objective of the project is to improve the accuracy of its street location data. However, despite Agriculture and NGA's use of street location data, Census did not include either agency in the TIGER enhancement project plan's list of agencies that will be affected by the initiative. Without better coordination, agencies such as Agriculture and NGA are likely to continue to need to purchase redundant commercial data sets in the future.

In summary, although various cross-government committees and initiatives, individual federal agencies, and OMB have each taken actions to coordinate the government's geospatial investments across agencies and with state and local governments, agencies continue to purchase and maintain uncoordinated and duplicative geospatial investments. Without better coordination, such duplication is likely to continue. In order to improve the coordination of federal geospatial investments, our report recommends that the Director of OMB and the Secretary of the Interior direct the development of a national geospatial data strategy with outcome-related goals and objectives; a plan for how the goals and objectives are to be achieved; identification of key risk factors; and performance measures. Our report also recommends that the Director of OMB develop criteria for assessing the extent of interagency coordination on proposals for potential geospatial investments. Based on these criteria, funding for potential geospatial investments should be delayed or denied when coordination is not adequately addressed in agencies' proposals. Finally, our report provides specific recommendations to the Director of OMB in order to strengthen the agency's oversight actions to more effectively coordinate federal geospatial data and systems acquisitions and thereby reduce potentially redundant investments.

Mr. Chairman, this concludes my testimony. I would be pleased to respond to any questions that you or other Members of the Subcommittee may have at this time.

Contact and Acknowledgments

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