CASE STUDY

The State of Utah

Goals

- Reduce production of redundant, inconsistent, and conflicting data layers by multiple organizations.
- Establish a clearinghouse and repository for all data layers required by multiple users.
- Establish standard format for geographic information acquired, purchased, or produced by any state agency.
- Coordinate data acquisition and distribution throughout the state.

Results

- A standardized, accurate, up-to-date, and comprehensive database.
- Closer cooperation with other state agencies that had previously preferred a more isolated operational mode.
- Federal agencies are more willing to share and enter into cooperative ventures because they can simultaneously reach nearly all affected players in the state.
- Better decision making through GIS for many land management and planning projects, resulting in more credible decisions, better acceptance by the public, and cost savings.

ESRI
380 New York Street
Redlands, CA 92373-8100, USA

Phone: 909-793-2853
Fax: 909-793-5953
Web: www.esri.com
E-mail: info@esri.com.

Introduction

"The soil, the air, the water are all pure and healthy. Do not suffer them to become polluted. Strive to preserve the elements from being contaminated. Keep your valleys pure, keep your towns pure, keep your hearts pure, and labor as hard as you can without injuring yourselves. Build cities; adorn your habitations; make gardens, orchards, and vineyards; and render the earth so pleasant that when you look upon your labors you may do so with pleasure, and that angels may delight to come and visit your beautiful locations."

Brigham Young

Utah's dedication to safeguarding its precious natural resources began with the Native Americans and continued with its nineteenth century Mormon settlers. When Brigham Young led his followers to the Salt Lake Valley between 1846 and 1848, he charged them to build cities and work hard to farm the land. But he cautioned them to do so responsibly.

Today, Utah is one of several western states that is experiencing growth well beyond the national average, and stewardship of the environment is becoming more challenging.

Many thousands of people have migrated to Utah in recent years. In addition, Utah's birth rate is the highest in the nation while its death rate is ranked as the country's second lowest. Utahans rank number three in longevity at 77.7 years. These statistics may indicate good health and prosperity, but they also are indicators of growth. That growth is primarily urban.

More than three-quarters of Utah's people live in a four-county area surrounding the cities of Salt Lake City, Ogden, and Provo. In the early 1900s, nearly one in four people was involved in farming; today fewer than one in 150 are. Just as Utah and its people have changed over the years, so have the tools they have used to govern the state and manage its natural resources. A vital tool the state uses for these efforts today is a statewide geographic information system (GIS).

An Enterprise GIS is Born

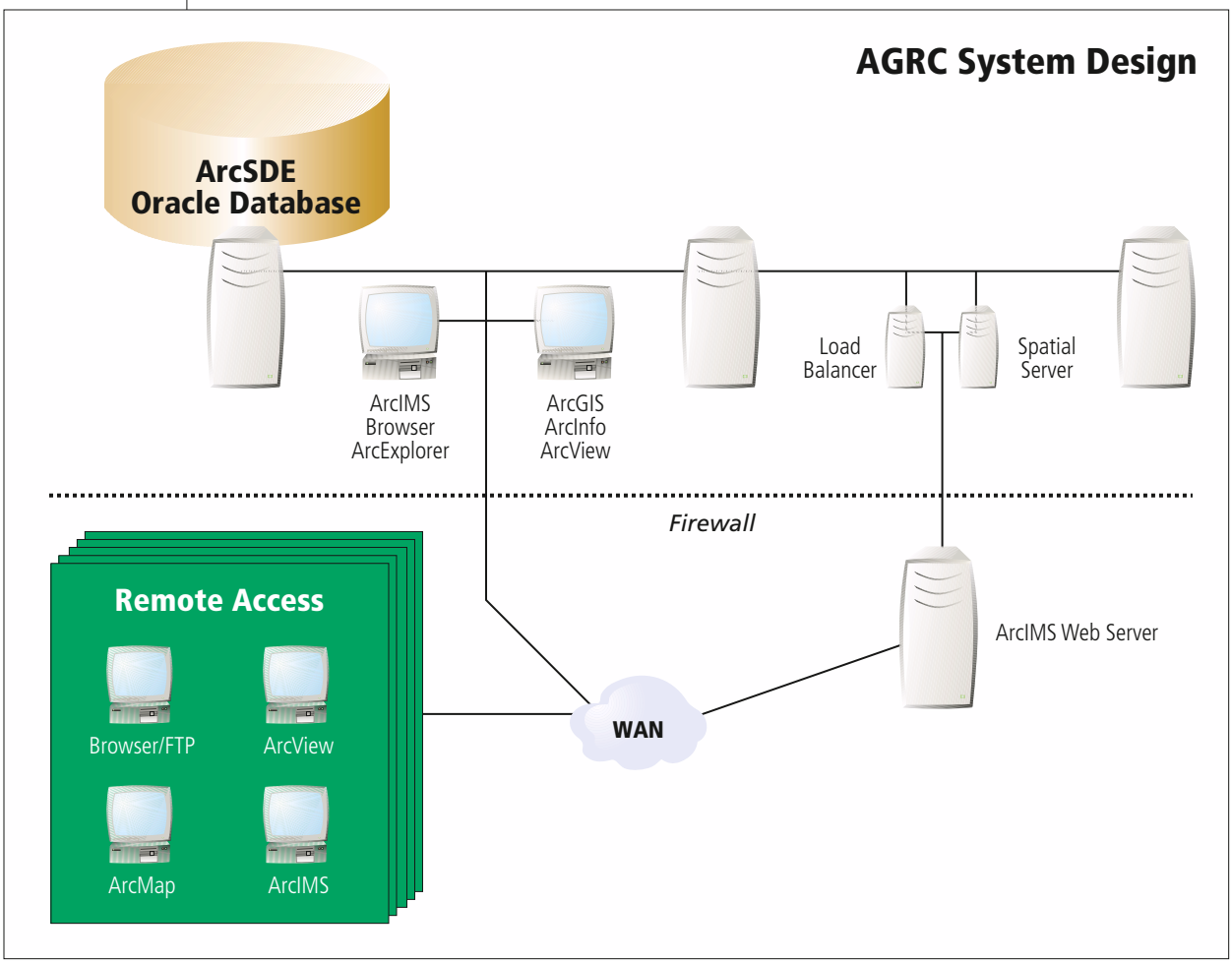
In Utah, the notion of an enterprisewide GIS has been around for more than 25 years. In May 1977, Governor Scott Matheson requested a study to develop recommendations for a centralized database management system. An interagency committee was formed to determine the statistical and geographic data needs of each state agency. The assessment was completed in November 1978 and emphasized the need for a geographic database for resource management, planning, and interagency coordination.

In 1980, ESRI was hired as a consultant to assist with a plan for GIS implementation for the state. ESRI recommended that a centralized computer facility serve all state agencies' GIS needs. Part of this function would include the development of a statewide database that "would provide for a standardized approach for data format, uniformity of scale, and compatibility of data elements." In May 1981, the state signed a contract with ESRI for the purchase of hardware, software, and training.

Early in 1982, the Automated Geographic Reference (AGR) was established in the Department of Natural Resources. In 1983, a steering committee was created to assess the utility of GIS in state government. This committee identified three actions deemed necessary for the effective implementation of GIS technology in state government: (1) the formation of a single, functional GIS work unit, (2) the purchase of state-of-the-art hardware and software, and (3) the relocation of AGR to Capitol Hill. Unfortunately, the AGR was moved from department to department during the remainder of the 1980s. Its priorities shifted as it moved, and the AGR was unable to develop a comprehensive database.

In 1989, the AGR Center (AGRC) was created in the Department of Administrative Services, Division of Information Technology Services, thereby moving the staff one more time. This change again brought new priorities for AGRC. First among these, however, was the creation of the State Geographic Information Database

Continued on page 3

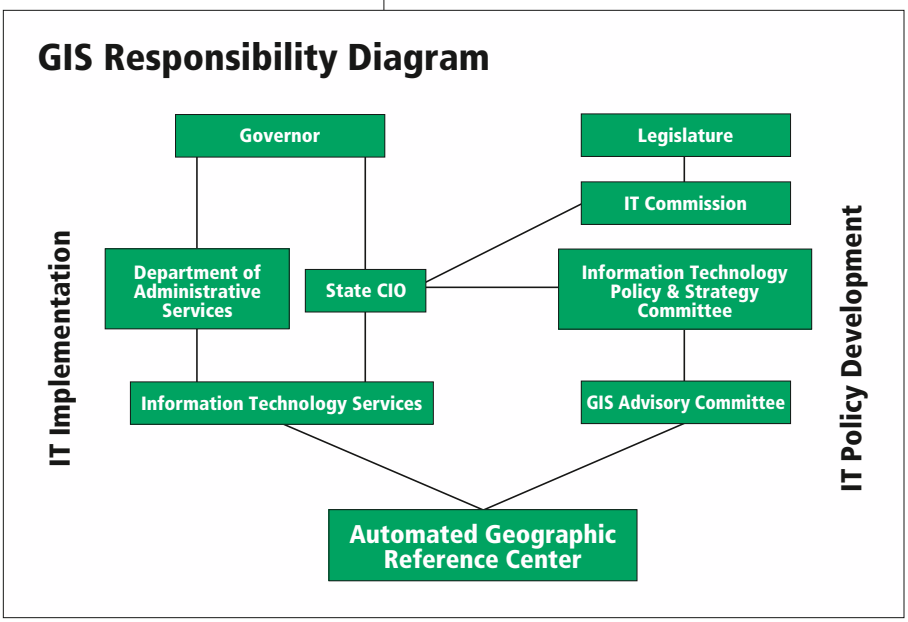


Continued from page 2

(SGID). In less than a year, the SGID infrastructure was complete. The SGID consisted of four parts: the database itself, a menu-driven query interface, a set of software tools for database administration, and a published SGID Users Guide. The Users Guide was distributed to all state, federal, and local agencies involved with GIS in Utah and provided an offline data dictionary and catalog with instructions for using the menu query system and ordering data. The Users Guide was also the first attempt to inventory all data available from other GIS sites in the state.

The state legislature soon passed a bill creating AGRC by statute. The law charged the center to provide geographic information system services to state agencies; provide geographic information services to the federal government, local political subdivisions, and private persons; manage the SGID; and establish standard format, lineage, and other requirements for the database.

This activity was further focused in 1997 when Governor Michael Leavitt signed a Memorandum of Understanding (MOU) for Data Sharing and Integration. Along with the governor, nine federal agencies signed this agreement to coordinate data acquisition and distribution activities in the state. At the signing ceremony, Governor Leavitt declared that this agreement "is a victory for common sense" since state, federal, and local agencies commonly need the same data. John Moeller, staff director of the Federal Geographic Data Committee, stated that the "MOU is the first of a kind signed at such a high policy level among so many agencies and a governor."



Organization

Twenty-five years after the initial recommendation to create it, the SGID is now one of the most complete and sophisticated geographic data clearinghouses in the nation. In its state profile of Utah, the Western Governor's Association said, "Utah has perhaps the strongest direction for geographic information and related technology among the western states."

The state of Utah's primary GIS coordinating group is the GIS Advisory Committee (GISAC). Its mission is to "recommend GIS policy and standards, encourage GIS use and education, and promote data collection and dissemination among all GIS users. Collectively, these activities promote increased productivity, better decisions, and improved services to customers." GISAC is made up of representatives from state, federal, local, and Native American tribal governments as well as universities. This group develops recommendations, policies, and legislation to enable data acquisition and sharing.

The central GIS office, the AGRC, has a staff of 14 people with more than 120 years cumulative experience in GIS representing one of the most experienced organizations in the region. The AGRC remains nested in the Division of Information Technology Services within the Department of Administrative Services. This provides the context for AGRC to be a support and service agency to other state agencies. AGRC also has the statutory responsibility to coordinate and promote the use of GIS in Utah and administer the state's enterprisewide GIS data library.

The AGRC also works closely with the Office of the Chief Information Officer (CIO) who develops the enterprise strategies and policies for the state's information technology. Utah's CIO views GIS as an important component in the state's information management strategy, supports the efforts of AGRC, and has assigned a staff person to assist AGRC in identifying and implementing enterprise GIS initiatives.

In order to improve the operational efficiency and effectiveness of the SGID, AGRC set out to design a distributed system for storage, retrieval, and integration of large amounts of geospatial data that would also provide a central access point to search and download GIS data sets from the SGID database. The solution selected was ESRI's ArcSDE 8.2 software using an Oracle database and the new metadata services now available on ArcIMS 4.

AGRC plans to use the multiuser editing features in ArcSDE to allow each data steward that contributes to the

Continued on page 4

Benefits

- Closer cooperation with other state agencies that had previously preferred a more isolated operational mode.
- Economies of scale are being manifested in costs for data maintenance and staffing. Federal agencies seem more willing to share and enter into cooperative ventures because they can simultaneously reach nearly all affected players in the state.
- Better Decisions: The state and its federal and local partners have used GIS for many land management and planning projects resulting in more credible decisions and better acceptance by the public.
- Cost Savings: For instance, an analysis by the Department of Environmental Quality, Division of Environmental Response and Remediation, indicated that the assessment maps required for potential Superfund sites took approximately 35 hours to complete traditionally and 1.5 hours with GIS—with data available through the SGID.
- Income Generation: 400,000 acres of federal and state lands were exchanged in 1999. As part of the swap, the state also received $200 million for the School Trust Fund. Brad Barber, who helped negotiate the agreement, said, "Without good tools and data, this deal would not have happened."

Continued from page 3

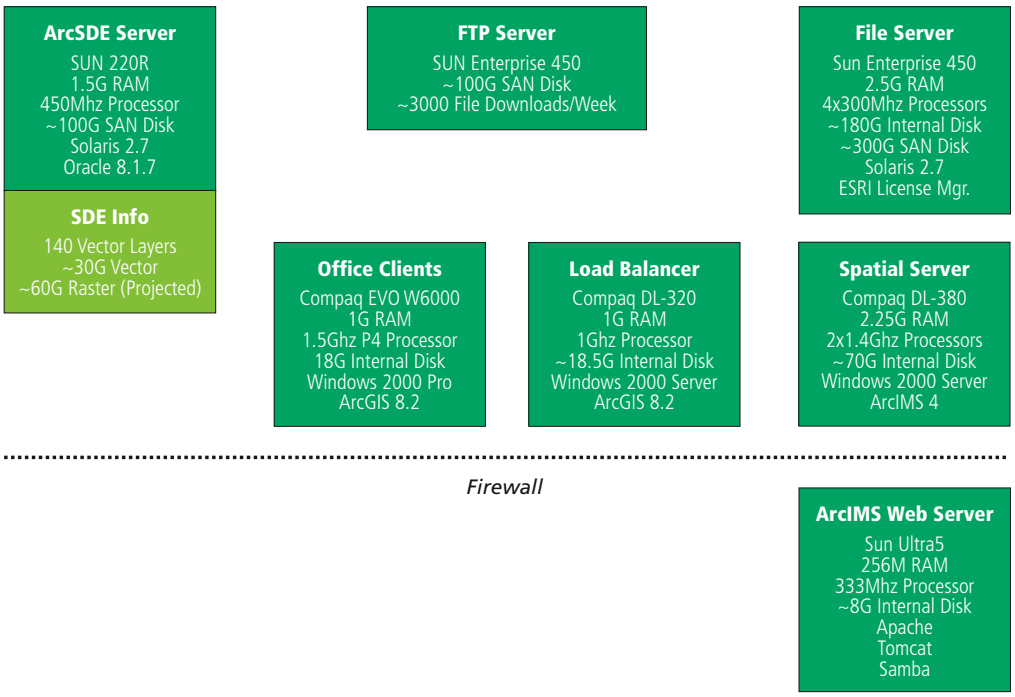
SGID to edit the data for which he or she is responsible and post updates to the ArcSDE database. This process will allow end users of the SGID to have access to the most current data, as opposed to the yearly or semiannual update formats that were previously available. ArcMap Server will also be used to access live, dynamic data so users always have the most up-to-date information.

The enterprise GIS solution in Utah has been implemented at the broadest possible level. The SGID is maintained as an enterprise resource and is architecturally structured to provide easy access to users and easy loading of data by creators. All state agencies are involved through various executive branch requirements; a number of these agencies participate at a high level including the Department of Natural Resources, the Department of Community and Economic Development, and the Department of Environmental Quality. All 29 counties are involved through the state's County GIS Assistance Program. Most federal agencies are involved through data sharing agreements and other activities. And eight Native American tribes are involved through a newly formed Utah Inter-Tribal GIS Group.

AGRC has been working with the State Board of Education through the Social Studies and Educational Technologies Departments to introduce both spatial information and the use of GIS into the K–12 classroom. In the fall of 2002, ArcView will be installed in every school in the state, to be used in a new Technology, Life, and Careers course. Coordinating the coursework are Utah State University and the Utah Geographic Alliance. AGRC is also working with the Salt Lake Community College and the College of Eastern Utah to develop an associate's degree program in GIS.

The ArcIMS server is offered as an enterprise resource to support agencies providing interactive maps to the public. Data is also available to the general public through standard static downloads of data layers over the Internet. The Utah map access portal, http://maps.utah.gov, which is featured on Utah's official Web site, provides the public with a single point of access to maps pertaining to Utah, both static and interactive. The maps are indexed by category, area, and creator to make it easy for the public to find the maps they are looking for. A dynamic list of "frequently requested" maps creates another category for users to find maps quickly. The public can also access digital data maintained in the SGID from this site.

AGRC System Details



CASE STUDY

The State of Utah

System Design

ESRI software and extensions

- **ArcGIS 8.2** (20 ArcInfo seats, 11 ArcView seats)
  - *Extensions*
    - ArcTIN/ArcGIS 3D Analyst
    - ArcGrid/ArcGIS Spatial Analyst
    - ArcPress
    - ArcCOGO
    - ArcNetwork
- **ArcView 3.x**
  - *Extensions*
    - 3D Analyst
    - ArcView Spatial Analyst
    - ArcPress
- **ArcSDE 8.2**
- **ArcIMS 4 with Metadata and ArcMap Servers**
- **ArcExplorer**
- **ArcTIN/3D Analyst**
- **ArcGrid/ArcGIS Spatial Analyst**
- **ArcPress**
- **ArcCOGO**
- **ArcNetwork**

DBMS: Oracle8i (8.1.7)

Operating System: SunOS 5.7

ArcSDE Server Configuration:
Sun 220R, 450 MHz Processor, 1.5 Gigabytes of RAM, 100 Gigabytes SAN Connected Storage Space

Number of Layers: 140 Vector Layers

Type of Data: Land Use, Demographics, Environmental Infrastructure, Historical, and Political Features

Size of Database: ~30 GB Vector, ~60 GB Raster (Projected)

ArcIMS Web Server Configuration:
Sun Ultra 5,333 MHz Processor, 256 Megabytes of RAM, 8 Gigabytes of Internal Disk Capacity

Software: Apache Web Server, Jakarta Tomcat Application Server, SAMBA

ArcIMS Application Server Configuration:
Compaq DL-320, 1 GHz Processor, 1 Gigabyte of RAM, 18.5 Gigabytes of Internal Disk Capacity

Software: ArcGIS 8.2 (ArcInfo)

ArcIMS Spatial Server Configuration:
Compaq DL-380, Two 1.4 GHz Processors, 2.25 Gigabytes of RAM, 70 Gigabytes of Internal Disk Capacity

Software: ArcIMS 4, Metadata Server

Office Client Machines:
Compaq EVO W6000, 1.5 GHz Processor, 1 Gigabyte of RAM, 18 Gigabytes of Internal Disk Capacity

Software: ArcGIS 8.2 (ArcInfo and ArcView), ArcExplorer

Office File Server: Sun Enterprise 450, Four 300 MHz Processors, 2.5 Gigabytes of RAM, 180 Gigabytes of Internal Storage Capacity, 300 Gigabytes of SAN Connected Storage Capacity

Software: ArcGIS 8.2 (ArcInfo Workstation), SAMBA, Office License Server for ESRI Products

AGRC Enterprise GIS Partnerships

Automated Geographic Reference Center

State

Tax Commission
Dept. Environmental Quality
State & Institutional Trust Land Adm.
Public Safety/Homeland Security
Natural Resources
Utah Geological Survey
Utah Olympic Public Security Command
Attorney Generals Office

Coordinating Groups

GIS Advisory Committee
Utah Geographic Information Council
Technical Interchange Group
Canyon Country Partnership
Utah Metadata Discussion
Utah Mapping Group
Utah Aerial Photography Consortium
Intermountain Hydro User Group
Colorado Plateau Data Committee
Uinta Basin Users Group

Federal

Bureau of Land Management
Forest Service
Park Service
Natural Resource Conservation Service
US Dept. of Transportation
US Geological Survey
Bureau of Census
Bureau of Indian Affairs

Local Government

Counties
Cities
Utah Assn. Counties
League of Cities & Towns
Association of Governments

Education

Higher Education
Utah Geographic Alliance
K-12

Tribal

Goshute Indian Tribe
Navajo Nation
Navajo Nation EPA
Northern Ute Indian Tribe
Northwestern Band of Shoshoni Nation
Paiute Indian Tribe of Utah
San Juan Southern Paiute Tribe
Skull Valley Band of Goshute Indians
White Mesa Ute Tribe

Please Note: These lists are not all inclusive.