

**IT Infrastructure:**

*Systems and network hardware and software that support applications; Network Operation Systems, File and Print Services, Internet/Network Appliances, Messaging, Standards & Support, Backup and Recovery*

**Category:** Geographic Information Systems (GIS)

**Definition(s):**Geographic Information Systems (GIS):

In the simplest terms, a Geographic Information System (GIS) is a decision making tool consisting of computers capable of storing and using data describing and analyzing places on the earth's surface. Geospatial data consists of points, lines, polygons, or raster grids having a geospatial location and linked to database attributes. Geographic location is identified by location hooks, such as geographic coordinates, geographic name, zip code, street address, Parcel Identification number, and Global Positioning System (GPS). GIS requires an organized collection of computer hardware, software, geographic data, and trained personnel designed to efficiently capture, store, update, manipulate, analyze, model, and display all forms of geographically referenced information both digitally and as hardcopy maps.

A GIS answers questions such as (but not limited to):

- What is found at a location?
- Where is something located?
- What has changed at this location?
- What spatial patterns and trends exist?
- What happens if some other geographic feature is introduced?
- How are features distributed?

A GIS can be used for:

- Property Tax Assessment
- Emergency Response
- Political Redistricting
- Environmental Monitoring
- Natural Resource Management
- Suitability Analysis
- Site Selection
- Routing (school buses, ambulance, fire, etc.)
- Change Analysis
- Demographic Analysis
- Crime Assessment

The following information corresponds to four GIS user categories developed by the Louisiana Geographic Information Systems Council (LGISC):

1. GIS Viewer – Organizational members who utilize GIS end products for display/presentation purposes. Minimal desktop requirements and a minimal level of GIS knowledge characterize this group's needs.
2. GIS Analyst – Organizational members with the knowledge, skills, and abilities of the GIS Viewer and are responsible for, but not limited to conversion, integration, interpretation, manipulation, analysis, presentation, and development of specific geospatial information. This group's needs are characterized by specialized workstation configuration requirements, application specific hardware and software knowledge, and highly qualified level of expertise.

3. GIS Data Compiler – Organizational Units with the knowledge, skills, and abilities of the GIS Analyst category and are responsible for, but not limited to, the acquisition (capture), compilation, conversion, quality control, and product generation of digital geospatial data. Specialized workstation requirements, application specific hardware and software knowledge, availability to mobile information technology, and a highly qualified level of expertise characterize this group's needs.
4. GIS Data/Applications – Organizational Units with the knowledge, skills, and abilities of the GIS Analyst category and are responsible for, but not limited to, applications development; data management, development and distribution, quality assurance/quality control, and maintenance of digital geospatial data sets utilized in GIS. Broadband and stable network infrastructure, large (terabyte and greater) data storage requirements, application specific hardware and software knowledge, and a highly qualified and broad level of expertise characterize this group's needs.

These categories determine the hardware and software selection necessary to accomplish specific GIS tasks. Imposing a single GIS software selection for all state GIS applications would jeopardize or significantly delay the ability of some agencies to complete their mission and negate the training of hundreds of GIS personnel.

Remote Sensing (RS):

Remote Sensing is used for analysis for the study of remote objects from great distances. Remote Sensing denotes the joint effects of modern sensors, data-processing equipment, information theory and processing methodology, communications theory and devices, space and airborne vehicles, and large-systems theory and practice for the purpose of carrying out spatial surveys of the earth's surface. Remote Sensing incorporates information from a number of resources such as satellite and aerial photography, RADAR, and Global Positioning Systems to name a few. Remote Sensing is an important resource for GIS and geospatial analysis.

Relational Database Management System (RDBMS):

A relational database is a computer database that is organized and accessed according to relationships between data items. In a relational database, files are referred to as tables, records are called rows, and fields or data elements are called columns. In its simplest form, a relational database is a collection of data files or tables that relate to each other through at least one common field, such as street address, zip code, or Federal Information Processing Standard (FIPS) code. Relational databases are typically packaged and sold by software vendors as relational database management systems (RDBMS). Relational database technology has several inherent advantages over the previous hierarchical and proprietary platforms.

**Rationale:**

Internet and Intranet based dissemination and distribution of digital geospatial data requires an extensive network cabling infrastructure and workgroup serving capabilities. Local Area Network (LAN) and Wide Area Networks (WAN) application and data servers will require fault-tolerant connections and broadband (100GigaBit or greater) configurations.

GIS applications use multiple data sources for project development and implementation, and require a scalable IT infrastructure. Many of the terabyte and greater data sources are accessed by private and governmental agencies across the state. Utilizing workgroup servers can alleviate associated WAN and LAN traffic problems.

**Approved Standards:**

Geographic Information Systems must support the following features/standards:

Data Interchange Standards

- RS 49:1051-1057 created the Louisiana Geographic Information Systems Council (LGISC) - LGISC will exercise its authority over the use and implementation of GIS hardware and software including, but not limited to:
  - Linear Modeling
  - Spatial Analysis
  - Raster Processing
  - Database Development using Geospatial Referencing (including but not limited to addresses, geospatial coordinates, parish, or FIPS code).
- Federal Geographic Data Committee (FGDC) *Standard Reference Model* - digital geospatial data standards for geospatial data development, management, distribution and sharing.
- LA GIS Council Data Lineage Guidelines (LGISC-RC-19990818-00): requires data developers to recognize the source contributors of data development.
- Open GIS Consortium (OGC) Standards for geospatial application and database development, distribution, and use.

Data Sharing Standards

- The LGISC has established a procedure for “Recognized Digital Geospatial Datasets” (LGISC-RC-20001115-00) that requires all “recognized” datasets to include the FGDC Content Standard for Digital Geospatial Metadata (CSDGM), which identifies appropriate and recommended use of the geospatial data set(s).
- Geospatial Data Sharing Resolution (LGISC-RS-19960125-00): Digital geospatial data and metadata shall be provided by custodian agencies in any readily accessible, compatible format and on any readily available, compatible medium.
- LA GIS Council Resolution: Metadata Development Resolution (LGISC-RC-19980928-00).

Data Use

- As defined by the Use statements in a dataset’s accompanying geospatial metadata documentation.

**Approved Products***SOFTWARE / SUPPORTED PLATFORMS*

## Minimum Recommended Configurations

Operating Systems:

- Microsoft Windows 95/98/NT/2000
- All UNIX Platforms
- LINUX

Database Management Systems:

- IBM DB2
- Oracle Enterprise Edition
- Microsoft SQL

Data Storage/ Data Access Services

- Oracle with geospatial option
- Microsoft SQL and Microsoft Access
- IBM DB2
- Environmental Systems Research Institute, Inc. (ESRI) ArcSDE - Spatial Database Engine
- Integrate Terrabase
- Power Builder

Application Services, Internet & Intranet Applications

NOTE: All applications are connected to the data sources through DSNs, DAO or ODBC connections. Applications also run off network application servers so that individual PC configuration issues are at a minimum. (Have these acronyms been spelled out?)

- Microsoft Internet Information Server
- Netscape Web Server
- Apache Web Server
- Cold Fusion
- Environmental Systems Research Institute, Inc. (ESRI) Arc product line (ArcView, ArcInfo, ArcIMS, ArcData, etc), MapObjects, extensions and plug-ins.
- Intergraph product line (GeoMedia, GeoMedia Pro, GeoMedia Webmap & Web Enterprise, MGE, etc.)
- MapInfo product line
- ERDAS product line
- Lizardtech MrSID Image Server
- Terrabase
- Web Trends
- Geoconnect SMMS or similar metadata development software
- TCP/IP printing services (example: HP Jet Direct)
- Java Servlet Engine (JRun / ServletExec)
- Web Development Scripting Software (XML, HTML, JavaScript, VBScript, SGML, DHTML, etc)
- Microsoft FrontPage & Server Extension
- Microsoft Office Suite
- FileMaker Pro
- Disk Keeper
- Partition Magic

*PROTOCOLS:*

Minimum desktop configuration includes:

- TCP/IP Network protocol

*HARDWARE:*

Minimum Recommended Configuration

*Spatial Data Servers*

- INTEL Pentium III, Pentium III Xeon, and Pentium 4
- AMD Athlon (or greater)
- 800 MHz (or greater)
- Multi-Processor Support
- 512MB RAM or greater
- 40GB (or greater) System Disk
- 40GB (or greater) RAID-5, independent channels
- 10X (or greater) CD-ROM drive
- FAST Ethernet With Internet & Intranet Access (100 GB recommended)
- Tape Backup Unit
- FAULT TOLERANCE POWERSUPPLY
- FAULT TOLERANCE DATA STORAGE
- Large Format Scanners
- Large Format Plotting Solutions
- STORAGE AREA NETWORK (SAN) CAPABLE OF PROVIDING 1.5TB WITH GROWTH POTENTIAL

*Analytical Servers*

- INTEL Pentium III, Pentium III Xeon, and Pentium 4
- AMD Athlon (or greater)
- 800 MHz (or greater)
- Multi-Processor Support
- 512MB RAM (or greater)
- 40GB (or greater) System Disk
- 40GB (or greater) RAID-5, independent channels

- 10X (or greater) CD-ROM drive
- FAST Ethernet with Internet & Intranet Access (100 GB recommended)
- Tape Backup Unit
- FAULT TOLERANCE POWERSUPPLY
- FAULT TOLERANCE DATA STORAGE

Application Servers

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Misc. Hardware Applications

- TCP/IP Printing Capabilities
- Virtual Private Network Hardware
- Workgroup Storage Area Network Servers (SANS)
- CD-Recorders
- DVD Drives

### **Guidelines / Technical Considerations:**

The LGISC has developed a list of standards, guidelines, and policies for GIS data development as it pertains to internal systems and databases. Furthermore, agencies need to consider the following when implementing geospatial data development:

- Database conversion to GIS
- Creation of Metadata
- Data Capture (Source Data)
- Remote Sensing (Global Position Systems (GPS), surveying, photogrammetry, etc.)
- Applications Development Workstations
- Product Generation
- Temporary file swapping/storage space
- Bandwidth support to 100GB or better (Network file capacity for large raster file formats).
- Multiple path access to data warehouses
- Workgroup Servers
- Redundant data sources (enterprise wide fault tolerance)
- Distributed Resource Access

GIS technical consultants specializing in GIS and RS application and solutions are often utilized for unique and special geospatial application development. GIS consultants possess specific knowledge, skills, and abilities that expand beyond normal, non-geospatial application development.

### **Review Cycle:**

Annual

**Timeline:**

Issued March 2001

**Transition:**

Agencies utilizing GIS should participate in the Louisiana Geographic Information Systems Council (LGISC) resource inventory by June 30, 2001. The LGISC participates in all policy affecting Geographic Information Systems in Louisiana.

Transition period to software and hardware releases will be dictated by the method of deployment to end-users. Deployment of the most current configurations should be available within one year of its release to the general public and subject to funding and departmental needs.