

Today, spatial data is more readily available than ever before because of e-government initiatives, commercial spatial data vendors, and improvements in technologies such as remote sensing, surveying, global positioning systems (GPS), and fast scanning devices that can quickly turn paper map-based data into digital data sets. Historically, this data has been isolated and, to some extent, outside the information technology (IT) environment of most organizations. However, this is changing. Advancements in geographic information system (GIS) technology now make it possible to store and manage spatial data in a standards-based database management system (DBMS) and enable enterprisewide dissemination of spatial data that can be accessed from the desktop, Web, or mobile client.

GIS Data Management for the Enterprise

ArcSDE® software is part of the ESRI® ArcGIS® family of software products that integrates geographic information query, mapping, spatial analysis, and editing within a multiuser enterprise DBMS environment. ArcSDE enables organizations to move from a traditional approach—managing a separate collection of geographic data files—to a new, integrated environment in which spatial data is managed as a continuous database that is accessible to the entire organization and easily published on the Web.

This change enables the integration of GIS technology with an organization's standard information technology infrastructure. As a core component of the information infrastructure, spatial data is finally available to every member of an organization for fundamental business activities such as mapping customer

locations, selecting sites, routing and logistics, managing and designing facilities, market research, customer services and customer care, territory planning, and spatial-based data mining.

What Is ArcSDE?

ArcSDE is an application server that facilitates storing and managing spatial data (raster, vector, and survey) in a DBMS and makes the data available to many kinds of applications. ArcSDE allows you to manage spatial data in one of four commercial databases (IBM® DB2®, Informix®, Microsoft® SQL Server™, and Oracle®). ArcSDE serves data to the ArcGIS Desktop products (ArcView®, ArcEditor™, and ArcInfo®), the ArcGIS development products (ArcGIS Engine and ArcGIS Server), and ArcIMS® and is a key component in managing a multiuser GIS.

An E-Government Case Study

City of Portland's GIS Hub

In Oregon, the city of Portland's solution to the problem of sharing data among a "rich mix" of GIS systems is the Enterprise Hub (GIS Hub). The GIS Hub provides for applications and data sharing among city bureaus, regional agencies, and the public and saves Portland money through improved processes and the elimination of redundancy.

The GIS Hub stores enterprise data within an ArcSDE software-enabled database hosted by Microsoft's SQL Server. The GIS Hub has been used in a variety of ways. For example, the GIS Hub is integrated with building permitting functions, allowing users to quickly access site maps, street layouts, development plans, and other jurisdictions' databases. In addition,

more casual users of the GIS Hub are able to use applications that permit them to get data that was not available before through the city's incompatible databases. Projects, such as map development, are now being more easily created through information sharing on the GIS Hub.

"The advantages of bringing together our different systems that

ArcSDE enables a DBMS to store and manage all of an organization's spatial data including vector, raster, address, and survey.

ArcSDE Provides a Number of Key Benefits Including

Database Portability

ArcSDE provides a common model for spatial data. Using ArcSDE data import and export utilities, you can move data from one DBMS to another without loss of information. This portability safeguards your data investment and is especially important in a heterogeneous database environment. This capability allows the most advanced geodatabase designs to be moved.

Application Portability

ArcSDE defines a single logical model for spatial data that is independent of the physical data representation in the DBMS. Since how the data is stored is transparent to the end application, applications developed with ArcObjects™ or ArcSDE C or Java™ application programming interface (API) will run with little or no modification regardless of the underlying DBMS spatial data schema.

ESRI's Data Models

GIS users need common standards to build and share data. ArcSDE supplies both a simple relational model of points, lines, and polygons and a sophisticated object model with support for intelligent features, rules, and relationships—the geodatabase. The geodatabase can be combined with the ArcGIS data models (templates for implementing GIS projects for specific industries

and applications). Data models enhance implementation of GIS solutions by streamlining data migration.

Data Integrity

ArcSDE manages the integrity of the point, line, and polygon information added to the database and will not allow ill-formed feature geometry to be inserted. In addition, you can use ArcSDE with ESRI's ArcEditor and ArcInfo client software to implement real-world behaviors for features that would not be practical to implement in the DBMS itself (e.g., connectivity rules for utility networks).

Long Transactions and Versions

Although a DBMS can provide multiuser read and write access on tables, editing GIS data in a multiuser environment requires managing concurrent access to data—access that can span hours, days, or weeks. ArcSDE supports long transaction editing as well as modeling “what if” scenarios by creating versions. Versioning lets users create multiple, persistent representations of the database without making copies of the data. More than one user can modify the same data. At the end of an editing session, edited features are merged into a target version and conflicts are reconciled.

use geographical reference data are enormous,” says Mitch Vanderperren, Portland's GIS Hub manager. “The GIS Hub will help our bureau staff to be more responsive to our customers—the individuals and businesses that depend on city services.”



Heterogeneous IT Environments, Standards, Interoperability, and Data Sharing

ArcSDE enables the integration of spatial data and analysis in the mission critical business processes and workflows of the enterprise. In addition, ArcSDE facilitates data sharing and interoperability that increases an organization's return on investment in its existing GIS technology.

"The geodatabase data format is the best part of ArcGIS."

Ingo Michels
WASY, Ltd.

Open, Scalable Environments

ArcSDE works with commercial DBMSs from leading vendors including IBM, Microsoft, and Oracle. ArcSDE supports popular server hardware/operating system environments including Microsoft Windows NT®, 2000, and 2003; Red Hat® Linux®; and leading UNIX® platforms including HP® True64™ UNIX, HP-UX®, IBM AIX®, and Sun™ Solaris™. ArcSDE operates over any local area, wide area, or wireless Transmission Control Protocol/Internet Protocol (TCP/IP) network and can connect concurrently to multiple databases. It also allows access to the databases on the desktop, Web, and mobile clients.

Standards Based

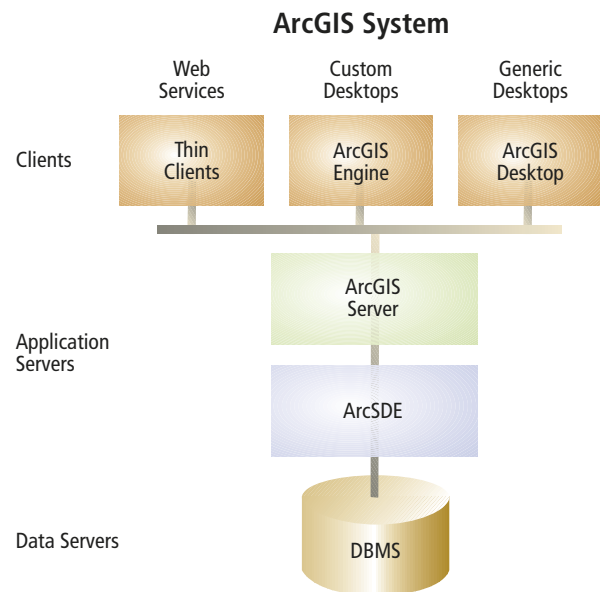
ESRI has been actively participating in the definition of spatial standards for interoperability and data sharing by working with organizations such as the U.S. Federal Geographic Data Committee, the Open GIS Consortium (OGC), and the International Standards Organization (ISO), particularly the SQL/MM Multimedia (Spatial) Committee and ISO TC 211, two of the primary ISO technical committees involved in spatial standards.

ESRI supported the development of the National Spatial Data Infrastructure (NSDI) and the OpenGIS® Simple Features Specification.

ESRI was the first GIS vendor to successfully complete OGC's conformance testing and become certified with products that conform to the OpenGIS Simple Features for SQL Specification (see OGC's Conforming Products Web page for more details at www.opengis.org/testing/product). The ArcSDE binary schema—the default schema used for ArcSDE for Oracle and SQL Server—is not only fully compliant with the OpenGIS Simple Features for SQL Specification's Binary Geometry but provides additional GIS data types such as z values, measures, annotation, and support for raster and survey data that extend beyond the OGC specification.

GIS Data in the DBMS

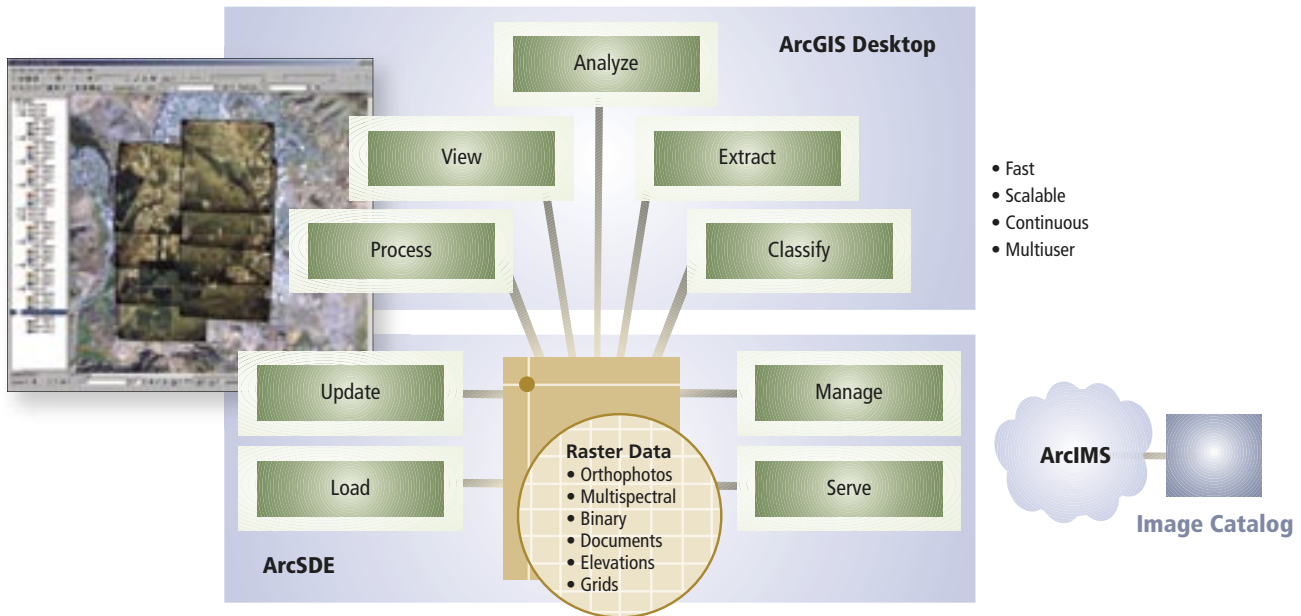
A spatial data management solution should be engineered to take advantage of the most advanced offerings from each DBMS vendor. ArcSDE manages the physical storage of spatial features using the standard data types provided by the DBMS. If the DBMS provides for native spatial types, ArcSDE will use them. The table below lists the data formats supported in each DBMS. For example, ArcSDE can read and write data using Oracle Spatial, the IBM Spatial Extender for DB2 Universal Database, and the Informix Spatial DataBlade® Dynamic Server.



DBMS	Geometry Storage	DBMS Type
Oracle	ArcSDE Compressed Binary, Oracle 9i Spatial and 9i Locator, Oracle 10g Locator and 10g Spatial	Long Raw, BLOB, SDO_Geometry, SDO_Geometry
Microsoft SQL Server	ArcSDE Compressed Binary	Image
Informix	Informix Spatial DataBlade	ST_Geometry
IBM DB2	DB2 Spatial Extender	ST_Geometry

Manage, Store, and Publish Image Data

Enterprise Geodatabase Image Data Management System



As organizations make greater use of imagery, many struggle to manage and maintain their raster data collections. They are under pressure to provide a greater return on their data investments and are looking to implement cost-effective solutions for managing, storing, and publishing their growing data collections. ESRI's ArcGIS software provides a solution for working with raster data as evidenced by the many organizations in the GIS user community that have already successfully implemented an image data management solution based on ArcGIS.

The combination of ArcGIS Desktop products with ArcSDE and ArcIMS provides an out-of-the-box solution to store, manage, update, access, analyze, and distribute collections of photos, aerial photographs, satellite images, and digital elevation models as well as other types of raster data such as scanned documents and maps.

This image management solution also provides

- Storage and management of vector and other core data in a DBMS
- Quick searches based on geographic extent, content type, data format, or keyword
- LZ77 lossless compression or lossy compression
- JPEG and JPEG 2000 lossy compression
- Raster pyramids for improved display performance

ArcSDE—Access and store rasters.

ArcSDE is a core component of ESRI's enterprise geodatabase raster data management system, enabling organizations to store their raster data and the related metadata in any commercial (IBM DB2, Informix, Microsoft SQL Server, and Oracle) relational DBMS for fast, online, multiuser access to continuous raster data.

ArcGIS Desktop—Manage rasters.

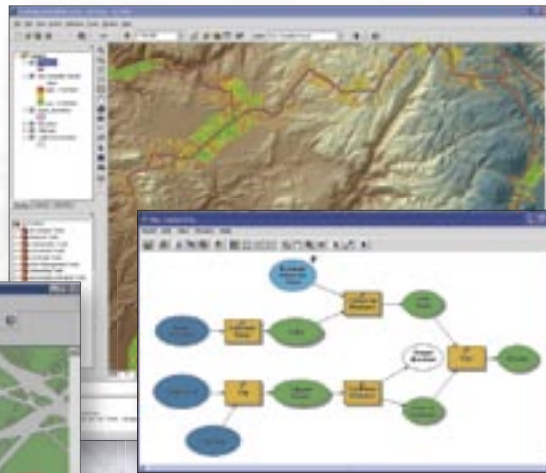
ArcGIS Desktop software (ArcView, ArcEditor, and ArcInfo) allows organizations to create, manage, and publish rasters. They can also create image footprints that enable users to quickly search large raster data collections based on any combination of geographic extent, content type, data format, or keyword. Custom applications built with ArcObjects can also use ArcSDE to manage spatial data.

ArcIMS—Distribute rasters.

ArcIMS provides a solution for distributing raster data over Intranets and the Internet, and it also provides the core building blocks for creating e-government and e-commerce spatial distribution portals. The combination of ArcGIS Desktop, ArcSDE, and the ArcIMS Metadata Server provides powerful tools to allow organizations to manage, store, and publish metadata along with subsampled thumbnail images and full data access.

A Broad Range of Application Solutions

ArcInfo



ArcEditor

ArcReader™, ArcView, ArcEditor, and ArcInfo are collectively known as ArcGIS Desktop and comprise a suite of desktop software products for geographic data creation, visualization, integration, and analysis.



ArcView



ArcPad is a mobile GIS technology.



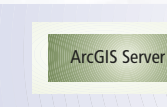
ArcGIS extensions add specialized tools and functionality to ArcGIS Desktop.



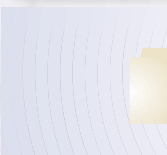
Mobile GIS



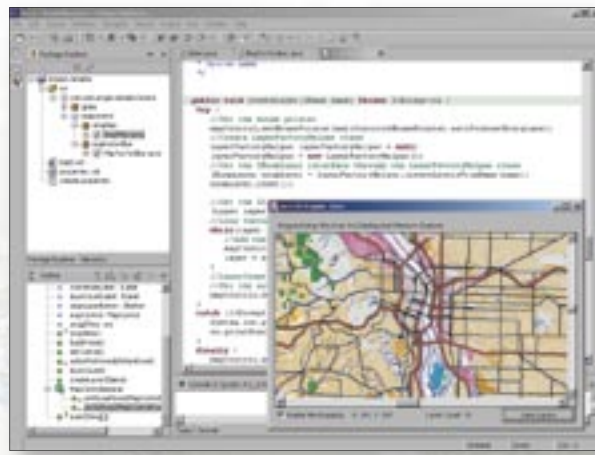
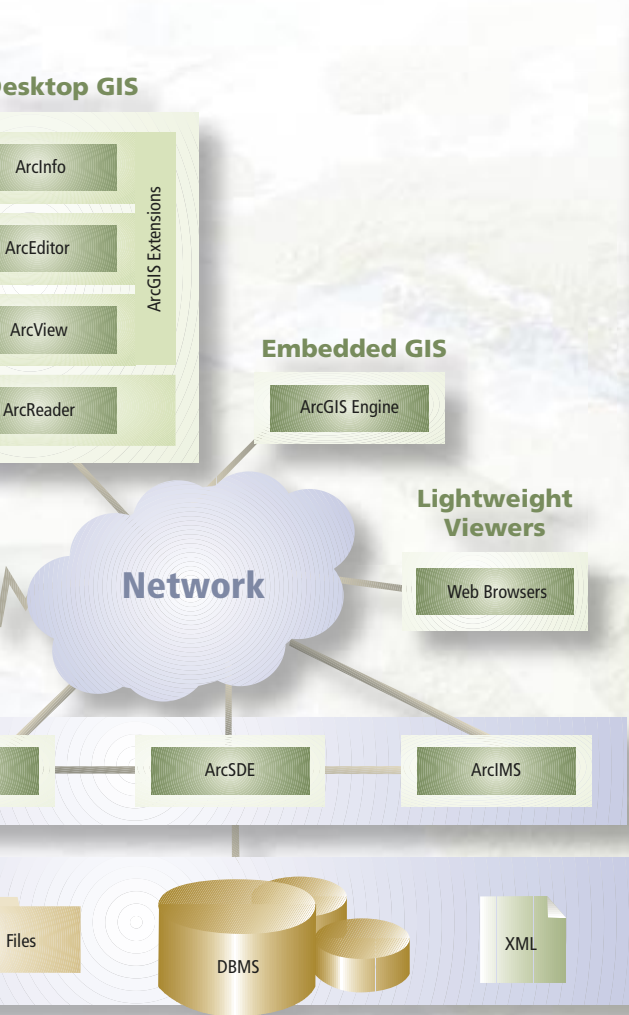
Server GIS



Geodatabase



From the desktop to the enterprise, from the Internet to custom applications, ArcSDE complements ESRI's full range of client applications, ensuring maximum flexibility and scalability in implementing the best solution for your needs.



ArcGIS Engine is a set of embeddable cross platform objects used to build custom GIS and mapping desktop applications or add GIS functionality to existing applications.



ArcIMS is the solution for publishing dynamic maps, data, and metadata via the Web.



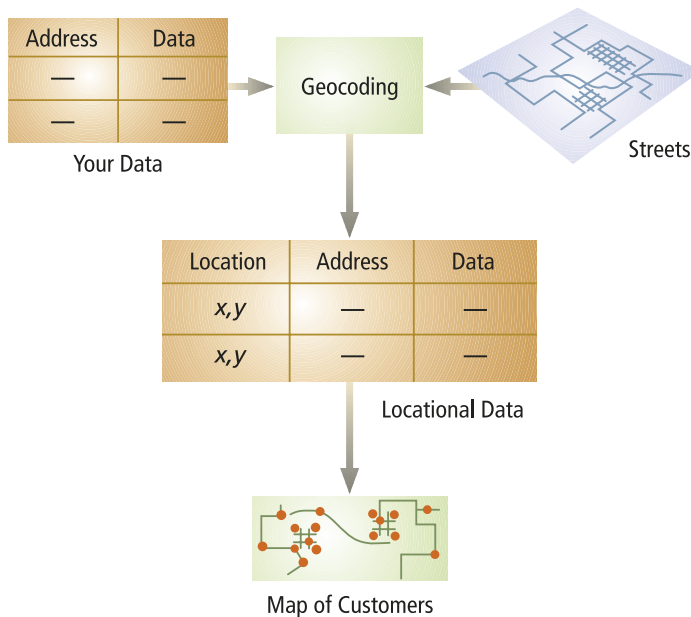
ArcSDE is an advanced spatial data server for managing large multiuser geographic databases.



ArcGIS Server is a platform for delivering centrally managed enterprise applications with advanced GIS functionality.

Spatially Enable the Enterprise

Four emerging trends are increasing the demand for greater access to spatial data. First, there is a growing realization that location is central to how people organize and relate to their world. Second, the convergence of the Internet and GIS is facilitating data sharing and distribution to a degree that was unimaginable a few years ago. Third, commercial organizations are beginning to use spatial location in the integration of their core business data and in business processes for applications such as location-based services, enterprise resource planning, and supply chain management. Finally, many government agencies are under pressure to provide increased public access to geographic data.



Leverage Your GIS With DBMS-Based Data Management

Managers and users of geographic data have long recognized that interorganizational collaboration requires that people share spatial information. Centralized storage and management of spatial data can provide cost-effective data management by reducing data duplication and enhancing accuracy. ArcSDE meets the key goal of managing spatial data in a DBMS by allowing you to only enter the data once while enabling access to the data by many users. ArcSDE, operating in the client/server and distributed computing environments, provides a scalable, multiuser solution that uses a single data model to store vector, raster, and survey data. In addition, ArcSDE maintains a continuous database (i.e., not tiled) that can model features and real-world behaviors and supports long transactions and versioning.

A Business Partner Case Study

Network Engineer From Telcordia Technologies, Inc., a SAIC Company

Using ESRI's industry-standard GIS platform, Telcordia Technologies, in conjunction with MESA Solutions, has designed and developed Telcordia Network Engineer, a revolutionary engineering and facilities management solution for the communications industry. This solution is ideal for professional network engineers, combining the

most advanced network design and management functions with an architecture for enterprisewide access to data and tools.

Telcordia Network Engineer allows users to integrate administrative network design, documentation, and maintenance with physical location. Geography, network attribution, and connectivity information can be stored in the same

industry-standard database. Integration of communication network facilities and customer data provides an excellent source of intelligence for customer care, sales support, decision support, and other "downstream" applications.

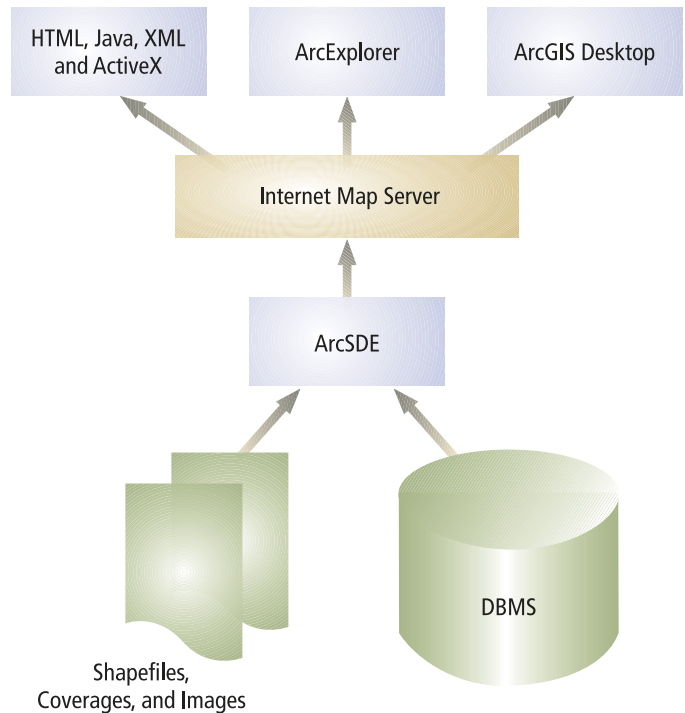
Network Engineer is workflow-centric. The program's data storage and distribution engine, ArcSDE, can incorporate a wide variety of data sources, such as capacity planning,

“The ability to perform direct editing of the geo-database using ArcSDE is extremely appealing to us. Versioned editing and long transactions could fit very well into our map revision process.”

Byron Taylor
USDA Forest Service

ArcSDE works with ESRI’s ArcGIS Desktop clients (ArcView, ArcEditor, and ArcInfo), development environments (ArcGIS Engine and ArcGIS Server), and ArcIMS—ESRI’s technology for Internet mapping and distributed GIS—to provide a single, integrated, scalable, secure, and standards-based family of solutions. ArcSDE works with the ArcReader Publisher extension, providing dynamically updated, high-quality maps that can be read by anyone with ArcReader, a free map viewer. This comprehensive framework lets organizations of all sizes effectively create, manage, and share spatial information over private Intranets or the Internet.

ArcSDE and ArcIMS provide the foundation for e-government and e-commerce based portals. This architecture has the proven ability to handle the hit rates of large commercial Web sites and is the basis for ESRI’s own Geography Network™. ArcIMS supports ArcGIS Desktop, Web browser clients, and the free ArcExplorer data viewer.

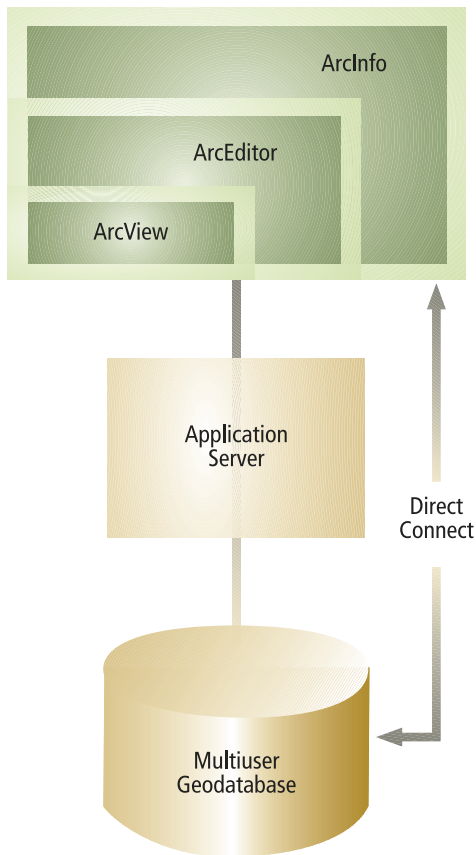


market segmentation, and legacy CAD data, as design input. Moreover, Network Engineer can be easily put to use on every desktop in the enterprise. ESRI’s easily deployed thin clients and Internet mapping technologies ensure that everyone can take advantage of Network Engineer’s facilities database. Moreover, as this is a shared database, all desktops have access to the latest, most accurate data.



Spatial Dimension for Everyday IT

ArcSDE is a core component of ESRI's vision of an integrated scalable GIS platform that meets all of an organization's spatial data needs. It stores data in a common data model, leverages industry standards, and uses a loosely coupled distributed architecture that can serve data to any client. ArcSDE allows the storage of vector GIS data, raster data, and survey data within the leading commercial DBMSs, which results in simple database design and administration. By conforming with industry standards, ArcSDE ensures interoperability, facilitates data distribution, and promotes data sharing.



Integrated With the Enterprise

Spatially enabled data stored in a DBMS benefits businesses by allowing spatial query, aggregation, and display of information in tabular databases (i.e., geometric searches on records that have spatial coordinate association). Adding location information to existing business applications reveals patterns and trends in the data that might otherwise have been missed. Linking location to information (or bringing “the where” to bear on “the what”) is a process that applies to many aspects of business such as choosing a site, targeting a market, drawing up sales territories, or allocating resources.

ArcSDE allows users to query, analyze, and view various geographic layers using different client software programs. ArcSDE is also critical to applications in the telecommunications market where operators and network managers need to provide location services in association with other telecommunication or Internet services and in transportation and logistics for the optimization of the flow of goods and services across a geographic network.

An Integrator Case Study

AQUA and Hanslik Software Laboratory

AQUA, a water company in Bielsko-Biala, Poland, that offers services to more than 250,000 users, has implemented a software package based on ESRI software and designed by Hanslik Software Laboratory (HSL), an ESRI Polska business partner.

The final architecture of the system is based on ArcSDE, Oracle i™, and a set of transactional GIS editing and analysis tools developed specifically for water companies by HSL.

Facilitating efficient interaction between spatial data and business data systems requires integration with enterprise

resource planning systems. AQUA's system was designed to integrate with SAP™ R/3® using ArcSDE 8 for accessing SAP functionality. The design also offers GIS viewing from the SAP system. The use of the system over the Internet also greatly facilitates access to the system among AQUA staff.

Flexible Architecture

N-tier environment support provided by ArcSDE allows connection to the host DBMS through an application server (three-tier architecture) or through a connect driver where the client application is connected directly to the DBMS (two-tier architecture).

Two- and three-tier configurations can work separately or together, providing maximum flexibility in system design.

A database administrator can choose between centralized management or distributed processing load. ArcSDE can also easily be combined with ArcIMS for applications requiring stateless Web deployment of Web-based mapping and distributed GIS.

Whether you configure your system with an application server, direct connect drivers, or a mixture of the two, the same client functionality is available with all of ESRI's core client applications or any application developed with ArcObjects or MapObjects® software. In addition, all of ESRI's core client applications are delivered with out-of-the-box capability for a read-only direct connection to an existing spatial database.

Developer Opportunities

ESRI provides developers with many options for creating new desktop or server applications or extending existing applications with focused spatial solutions. Developers can use ArcGIS Engine and ArcGIS Server to provide APIs for COM, .NET, Java, and C++. Developers can also use MapObjects and MapObjects—Java Edition to build custom applications or to add spatial functionality to existing applications. In addition, ArcSDE provides organizations with open, low-level C and Java APIs for fast data loading or data manipulation and for advanced application development.

The ESRI Business Partner Program offers a variety of software and services to help you implement GIS. Within the United States, please send information about your company, including a mailing address, to buspartner@esri.com. Outside the United States, please contact your local distributor.

The expanding database market, combined with the universal spatial server concept of ArcSDE and high growth in the use of GIS, means an abundance of opportunities for application developers.

ArcSDE Support

To ensure you get the most from your investment in ArcSDE, ESRI provides the following support services:

- End user and developer technical support from a team of trained personnel with years of experience in database management systems and implementing enterprise GIS
- Training for database administrators and developers
- Start-up consulting support for both end users and developers
- Web-based self-help including the Knowledge Base and a user support forum at support.esri.com

For more information, download the ArcSDE white paper at

www.esri.com/arcscde

Demonstration

For a demonstration of ArcSDE, call your U.S. regional office or international distributor.

The GIS system will continue to be a strategic investment for AQUA because of its integration with not only SAP R/3 but also billing, modeling maintenance, and customer care with each of these systems related to a single spatially enabled database. This interoperability allows AQUA maximum GIS functionality amid a variety of systems.





For more than 30 years ESRI has been helping people manage and analyze geographic information. ESRI offers a framework for implementing GIS technology in any organization with a seamless link from personal GIS on the desktop to enterprisewide GIS client/server and data management systems. ESRI GIS solutions are flexible and can be customized to meet the needs of our users. ESRI is a full-service GIS company, ready to help you begin, grow, and build success with GIS.

Corporate

ESRI
380 New York Street
Redlands, California
92373-8100, USA
Telephone: 909-793-2853
Fax: 909-793-5953

For more information
on ESRI, call

1-800-447-9778

(1-800-GIS-XPRT)

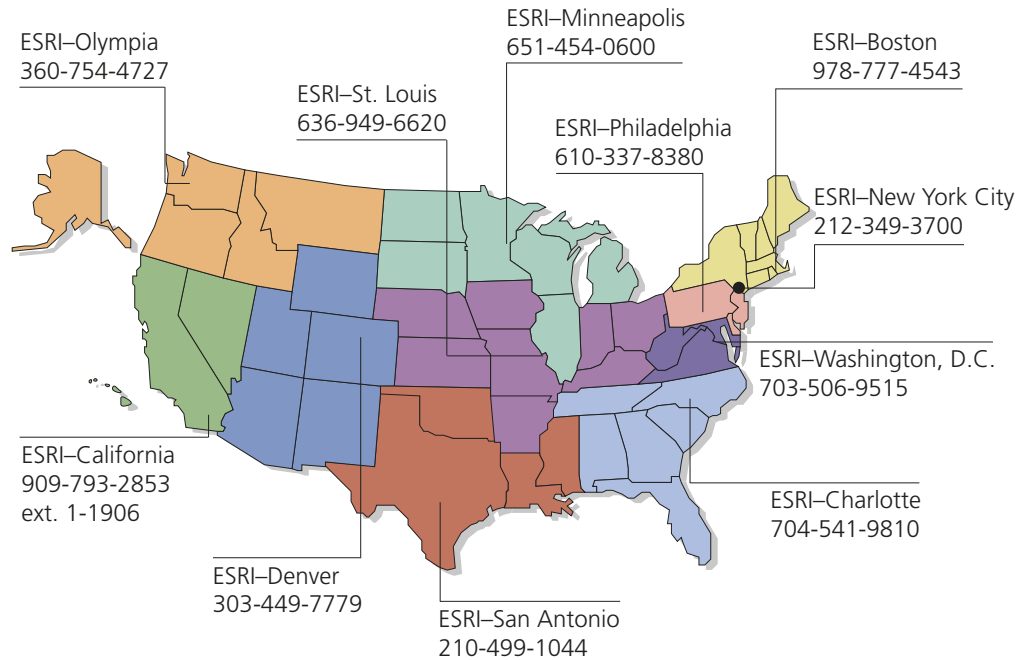
or contact an ESRI value-added
reseller near you.

Send e-mail inquiries to
info@esri.com

Visit ESRI's Web page at
www.esri.com

Outside the United States,
contact your local ESRI distributor.
For the number of your distributor,
call ESRI at 909-793-2853,
ext. 1235,
or visit our Web site at
www.esri.com/international

Regional Offices



International Offices

Australia
www.esriaustralia.com.au

Finland
www.esri-finland.com

Italy
www.esriitalia.it

Romania
www.esriro.ro

Belgium/Luxembourg
www.esribelux.com

France
www.esrifrance.fr

Japan
www.esrij.com

Singapore
www.esrisa.com

Bulgaria
www.esribulgaria.com

Germany/Switzerland
www.esri-germany.de
www.esri-suisse.ch

Korea
www.esrikr.co.kr

Spain
www.esri-es.com

Canada
www.esricanada.com

Hungary
www.esrihu.hu

Netherlands
www.esrinl.com

Sweden
www.esri-sweden.com

China (Beijing)
www.esrichina-bj.cn

India
www.esriindia.com

Poland
www.esripolska.com.pl

Thailand
www.esrith.com

China (Hong Kong)
www.esrichina-hk.com

Indonesia/Malaysia
62-21-527-1023
603-7874-9930

Portugal
www.esri-portugal.pt

United Kingdom
www.esriuk.com

Venezuela
www.esriven.com



Place ESRI business partner or distributor address here.

Copyright © 2004 ESRI. All rights reserved. ESRI, GIS by ESRI, ArcView, ArcIMS, ArcMap, ArcObjects, MapObjects, ArcPad, ArcReader, ArcExplorer, the ArcGIS logo, the ESRI globe logo, ArcInfo, ArcEditor, ArcSDE, ArcGIS, @esri.com, www.esri.com, and Geography Network are trademarks, registered trademarks, or service marks of ESRI in the United States, the European Community, or certain other jurisdictions. Other companies and products mentioned herein are trademarks or registered trademarks of their respective trademark owners.



No. GS-35F-5086H