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geographic information systems

SDE CAD Client An Introduction

An ESRI White Paper • March 1997

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SDE CAD Client— An Introduction

SDE CAD Client is the link between CAD software and the Environmental Systems Research Institute, Inc. (ESRI), Spatial Database Engine™ (SDE™) software. SDE CAD Client adds functionality to the CAD software to allow storage and retrieval of spatial data via the SDE server. It also provides an application programming interface (API) to allow application developers to access the SDE software's powerful spatial tools from the CAD client.

The Role of SDE

SDE is ESRI's client/server technology for storing and managing spatial data in a relational database management system (RDBMS). It provides an open API that allows client applications to perform fast, efficient spatial operations against large, shared, geographic data sets. Storing CAD spatial data in an SDE server offers significant advantages over other methods.

- Logically continuous spatial object model
- Shared multi-user environment
- Support for very large spatial data sets
- Storage of both native CAD objects and SDE geometric features accessible to many clients
- Efficient spatial data retrieval
- High-performance spatial searches
- Open systems client/server architecture that employs cooperative processing
- Powerful application development environment

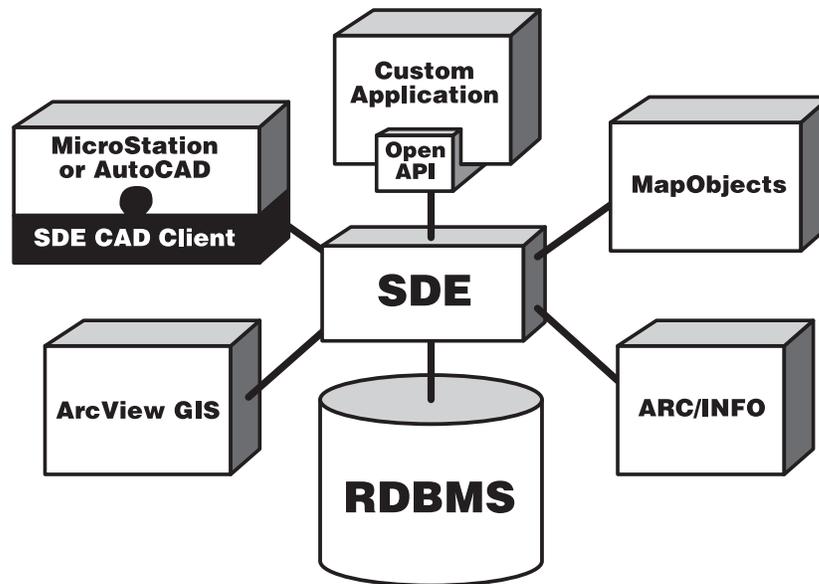
The Role of the RDBMS

The RDBMS provides the underlying relational structure, security, and power for SDE. Feature locking, privileges, table creation, and management are all handled by the RDBMS. Each RDBMS implements SDE differently. For example, SDE is a DataBlade for Informix Universal Server, while IBM embeds SDE technology within DB2.

Three-Tiered Architecture

SDE is a middleware software that brokers requests between a client and server. The three-tiered architecture of a server, middleware, and client solves many of the problems inherent in storing multiple copies of data. There is one warehouse to query and one warehouse to back up. Three-tier architecture allows any of the three parts to be updated independently—meaning new technology can be implemented with limited disruption. The cost of client seats drops as casual users tap into simple low priced clients avoiding the need for full CAD or geographic information system (GIS) seats.

SDE CAD Client is one of the many clients available for SDE.



CAD in the Enterprise

Many of the traditional markets for GIS use CAD for specific tasks. In transportation, CAD and related engineering software is used to design roadways, but GIS is used to manage them. In oil and gas pipeline management, CAD tools create alignment sheets while GIS is used to explore environmental impacts. In telecommunications, CAD creates schematics while GIS is used to explore regional cell phone coverage and blackout areas.

Because groups inside these organizations have grown up as much around the tools they use as the roles they play, a typical enterprise will likely have a CAD group, a GIS group, a planning group, a marketing group, a management information system (MIS) group, and so on. Each one has its suite of tools to do its job—GIS software, CAD software, spreadsheets, word processing, time management, and so forth. It is in the best interest of the organization to have each group perform as efficiently as possible with the right tool to reap the benefits of their collaboration.

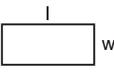
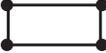
SDE is an enterprise solution designed for just that. Implementation involves matching a client/server solution to the existing frameworks of the organization. The CAD group, the GIS group, planning, and marketing still do their jobs and still use their core tools (perhaps with a new one thrown in), but store and use spatial data from the central repository of an RDBMS.

How SDE CAD Client Works

SDE CAD Client essentially extends the CAD software to work with SDE. The SDE administrator will work with the information services (IS) department to set up data sets, layers, and standards for the system. Once an SDE database is available for loading, the CAD Client connects to the SDE server, identifies a layer in a data set, selects the CAD objects in existing CAD files to be loaded, and sends them to SDE. A network connection over an Ethernet or other internal network, a modem, or the Internet can be used to link client to server. Each CAD object is stored in a single record of an RDBMS table. What is stored is the object itself: the complete definition as created by the CAD

software. When it is retrieved, the exact CAD object is returned: no translation and no simplification. At storage time, that object is indexed and stored as a geometric RDBMS spatial feature in a second column of the table. The spatial operations, searches, and analysis are performed on this feature while the corresponding CAD object is returned for use by the CAD program.

SDE CAD Client stores CAD objects, related spatial features, and attributes into an RDBMS table.

ID	CAD Object	Spatial Feature	Layer	Color	...
14			1	Blue	...
15			3	White	...
16			6	Red	...
...



Perfect CAD Object



GIS Representation of CAD Object

CAD programs store not only the geometry of an object, but also property information—layer, color, elevation—as well as links to database records. Sometimes related descriptive information is stored with the geometry in the CAD file as block attributes, tags, object data, or attribute linkages. This information can be stored in the RDBMS tables and can be used as the basis for queries when the data are retrieved. The RDBMS creates and maintains the connections between the spatial features and its corresponding attribute record from the time of its addition to the data set.

An SDE CAD Client session creates a new CAD file from data stored in the RDBMS allowing the CAD user to perform whatever functions are necessary with the newly created file. The SDE CAD Client will be actively "using" the queried data to create output or run analysis or even take advantage of a third party application working in conjunction with the CAD software.

Querying from the RDBMS to the CAD client involves the user preparing a query, either spatial or attribute or both, and executing it. A spatial query (find all the features within this window) is applied like this: the spatial query is applied to the spatial features to find those that match the criteria; the corresponding CAD objects are selected, then sent back in a stream to the CAD client.

While storage, queries, and updates are performed by the CAD client against the SDE database, many other clients may also be accessing the data. These range from custom applications built with MapObjects™ software, to analysis packages such as ArcView® software to high-end data manipulation clients such as ARC/INFO® software. Each client can fill a unique role within the organization in support of a variety of tasks.

Using CAD Data from the RDBMS

SDE CAD clients can work with retrieved data along with data from other sources. The user can retrieve all the data that are needed for a project drawing or application via a query to SDE, or use a combination of SDE retrieved data, local reference files, and other data available on the LAN. This new file from one or many sources can then be used in conjunction with a third party program that runs with the host CAD software.

Alternatively, the SDE API allows a developer to produce applications that take advantage of the SDE spatial tools including functions like buffers. The API is exposed through the native CAD package's own programming environment.

Data Management and Security

Security and systems integrity are maintained by monitoring all client and server connections while tapping into the RDBMS's own internal security scheme. SDE is built upon a strict client/server model. For every client application using SDE, such as SDE CAD Client, a unique server process is running on the SDE host computer that services all data requests. This provides a great deal of flexibility as well as performance when querying or retrieving data in an open systems environment.

SDE Unifies the Organization

SDE CAD Client is one of a number of tools for connecting the enterprise around the central core of SDE. SDE CAD Client enables a CAD client, AutoCAD, or MicroStation to load data into SDE and query it back. Further, it enables the CAD client to query back any spatial data stored in SDE by other clients. SDE allows the organization to better leverage its spatial data. SDE CAD Client brings the CAD users access to that spatial data and in turn permits the CAD data to be shared across the organization.

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