



Understanding ArcSDE

The Gateway to Your RDBMS

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ESRI - Washington, D.C.



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Twentieth Annual ESRI International User Conference • June 26-30, 2000

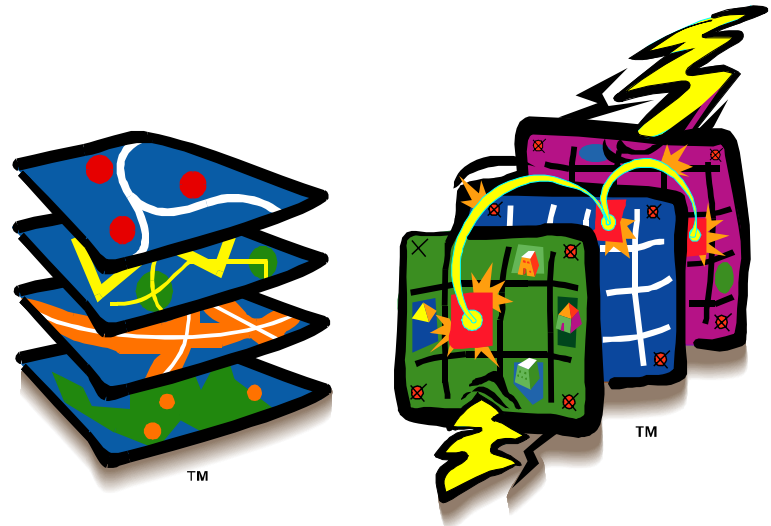
Outline

- **Overview**
- **ArcSDE in the System Architecture**
- **Variations of ArcSDE**
- **Spatial Data Model**
- **The Geodatabase**
- **Data Loading Options**
- **Implementation**
- **Q&A and Questionnaire**



What is ArcSDE?

- A **gateway** that allows you to store and manage spatial data with other business data in an **RDBMS.**



Why Use ArcSDE?

- **Powerful benefits from Relational Database Management Systems (RDBMS)**
 - Leverage scalable architecture
- **Integrated data model**
 - Store GIS and tabular data together
 - Coordinated transactions
- **Multi-user Geodatabase technology**
 - Take advantage of feature intelligence



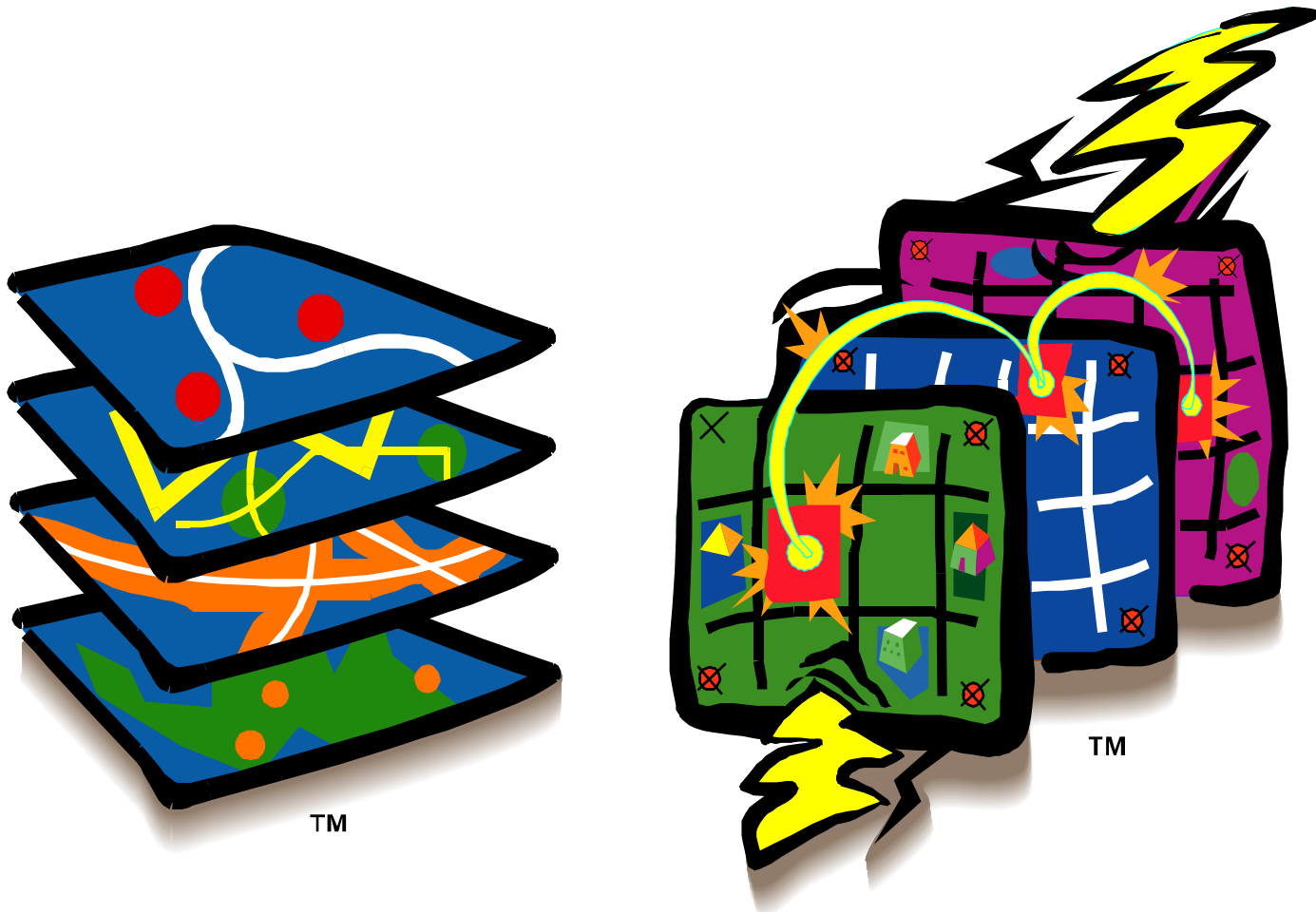
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Why Use ArcSDE? (con't)

- **Centralized database**
 - Facilitates data sharing
- **Support for Windows and Unix**
 - Client and server
- **Industry Standards**
 - Conforms to Open GIS Feature Specifications
 - Has open, documented architecture and APIs
- **Modern networking solution**
 - Uses TCP/IP protocol

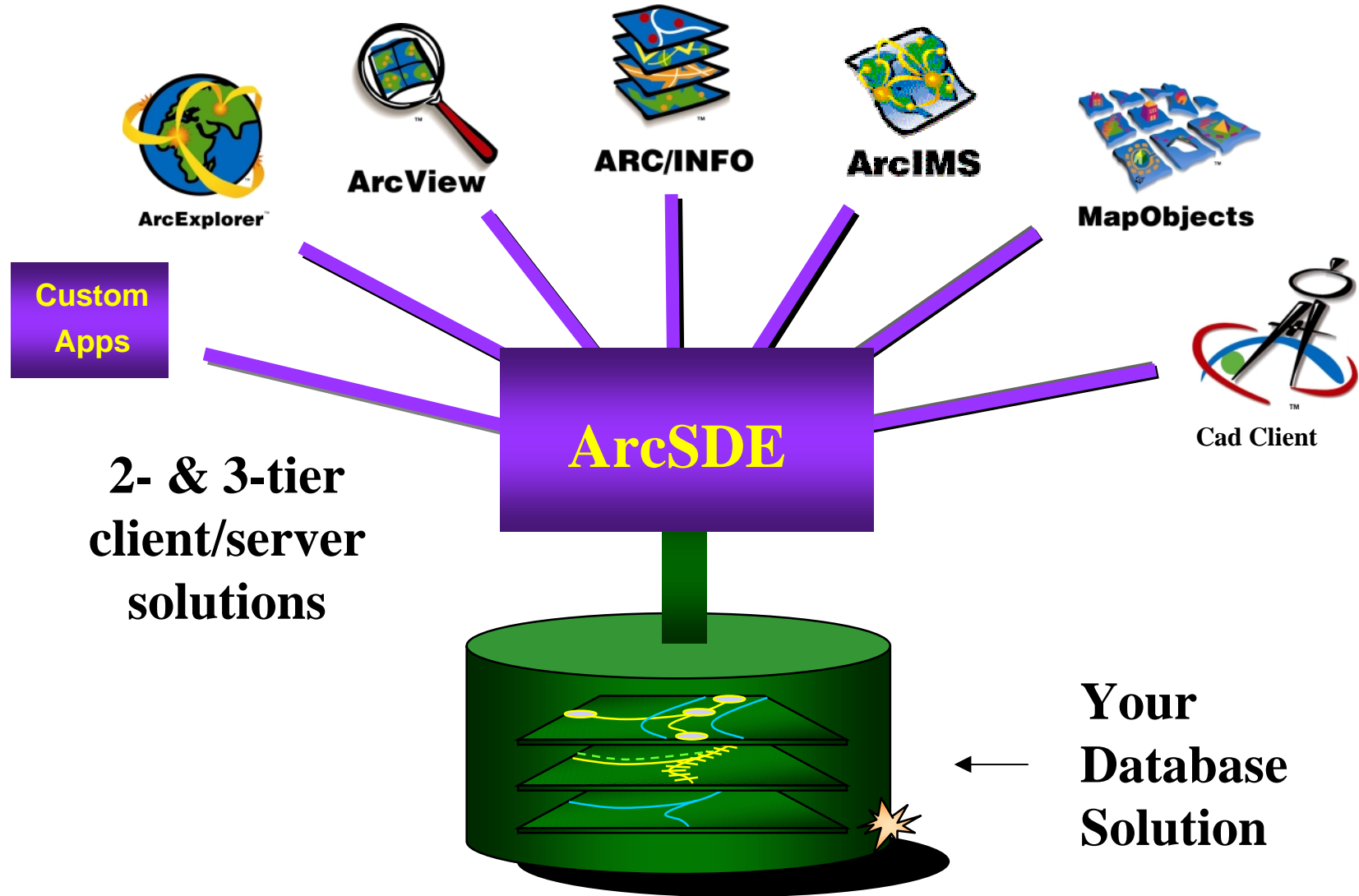


ArcSDE in the System Architecture



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ArcSDE Architecture

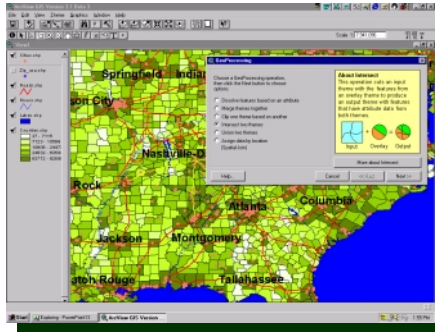


What does ArcSDE do?

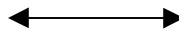
- **Supports spatial and non-spatial queries from clients**
- **Interacts with RDBMS server for data storage and retrieval**
- **Performs GIS operations on data**



ArcSDE Operations



Client



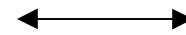
ArcSDE

“Work with my RDBMS to store and retrieve data.”

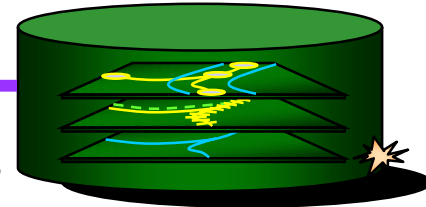
**“Fetch features for this map window and use
this attribute constraint”**

“Fetch features and project them on the fly.”

“Process this Geocoding Request”



RDBMS



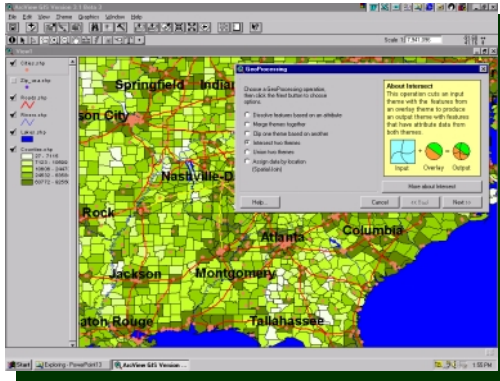
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ArcSDE In Client/Server Architecture

- a server-side application data server in a **3-tier** system architecture
- an application-side software component in a **2-tier** system architecture



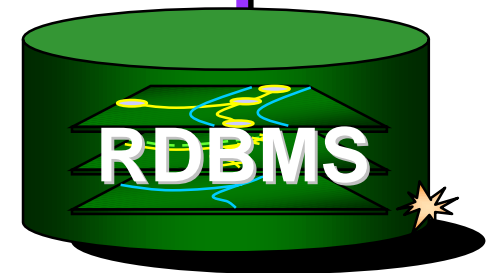
ArcSDE 3-tier Client/Server Architecture



Client Application

TCP/IP Network

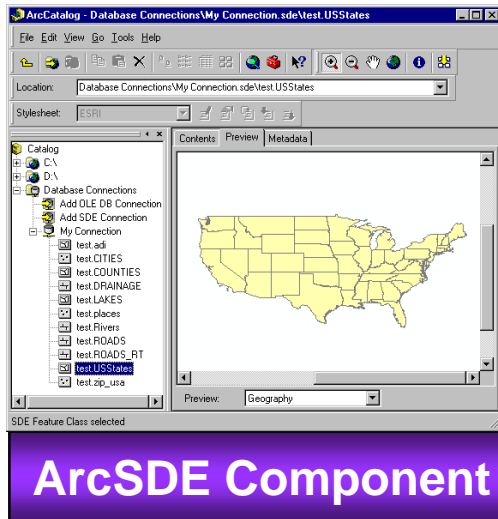
Server Process



ArcSDE server is an application server for GIS clients.



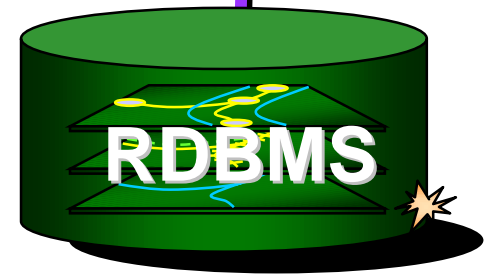
ArcSDE 2-tier Client/Server Architecture



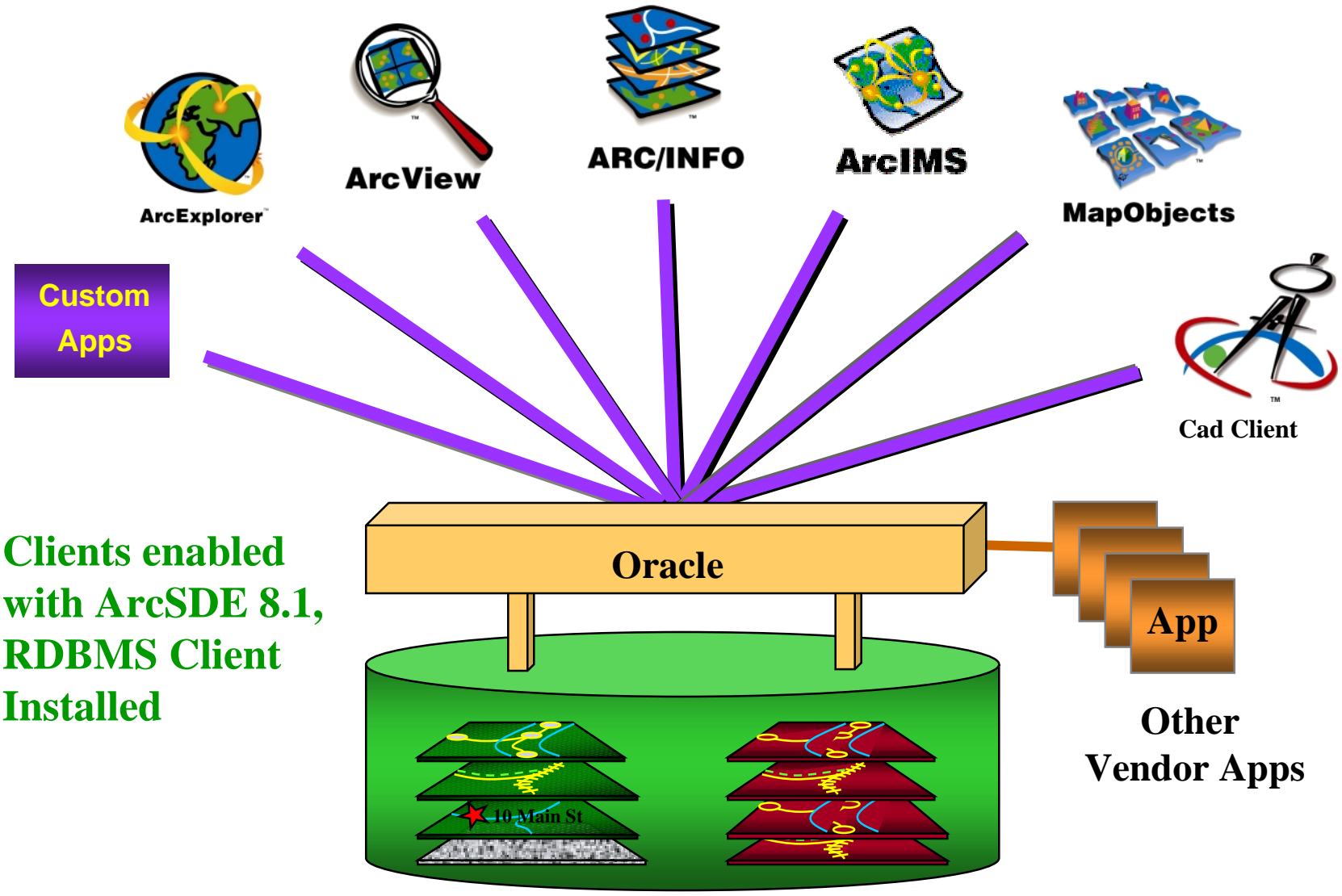
**Client
Application**

TCP/IP Network

Client uses ArcSDE component for **direct access** to RDBMS. RDBMS client is required.



Direct Access Example: Oracle Spatial Option



Clients enabled with ArcSDE 8.1, RDBMS Client Installed



Configuration Choices

- **3-tier (ArcSDE Server Process)**
 - Minimizes network traffic with server-side data filtering, performance can be faster



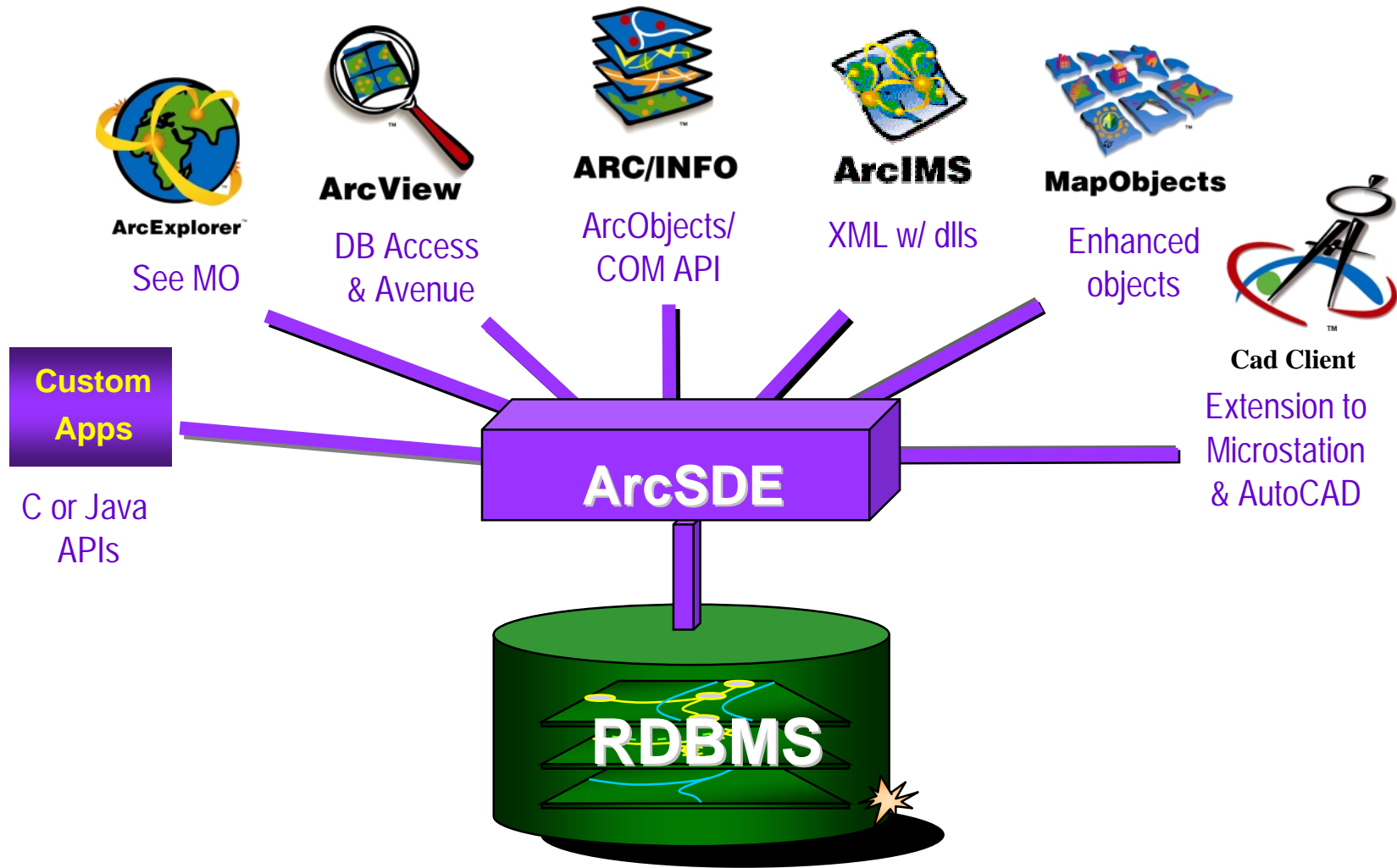
Configuration Choices

- **2-tier (Client direct to RDBMS)**
 - No need for ArcSDE server management
 - Simpler client configuration
 - Available for all clients built with ArcSDE 8.1 client software
 - Supported in 8.1 with Oracle 8i and SQL Server 7, later version of ArcSDE will support Informix and DB2



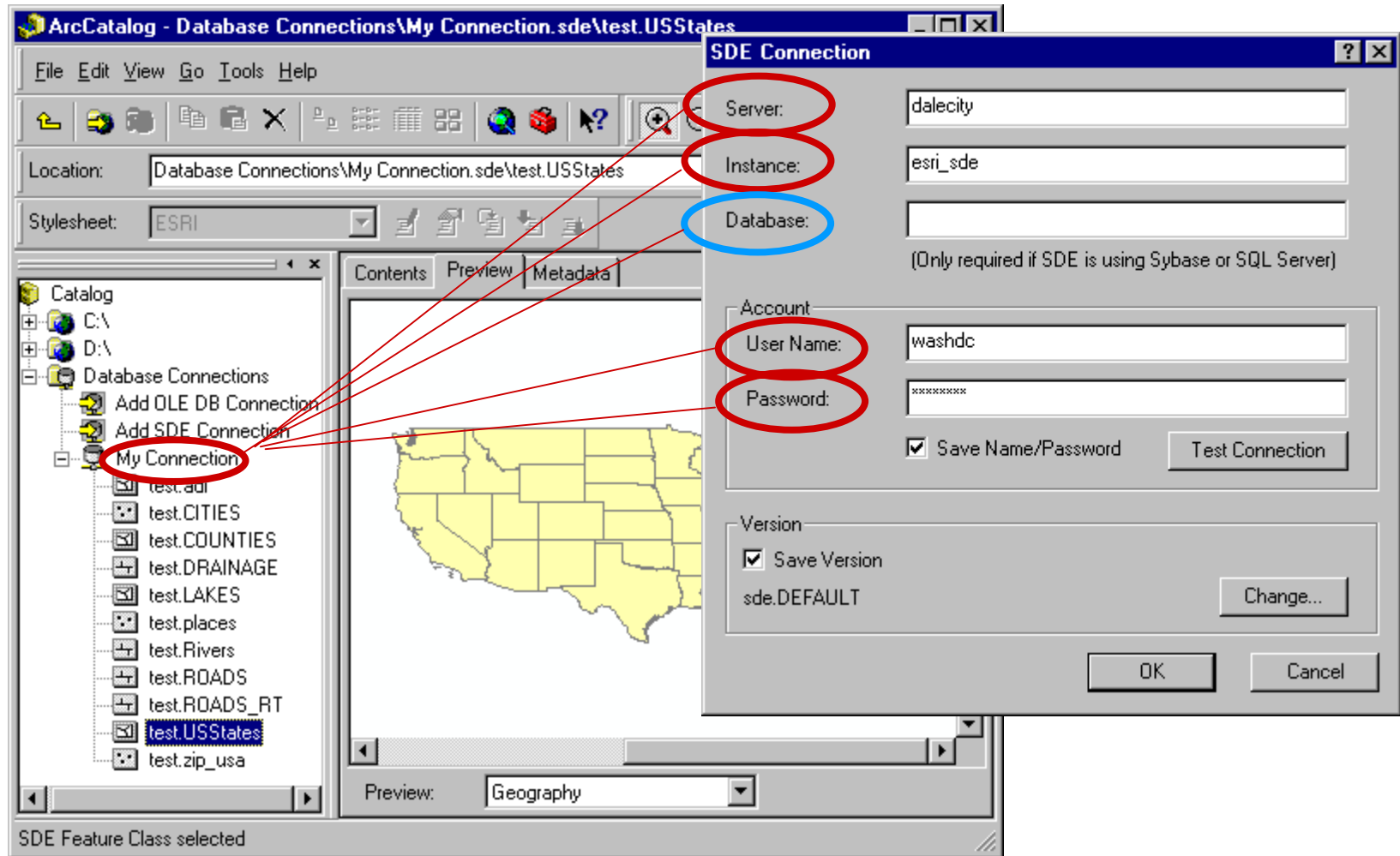
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Client Access



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Creating a Connection to ArcSDE



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ArcSDE and The RDBMS



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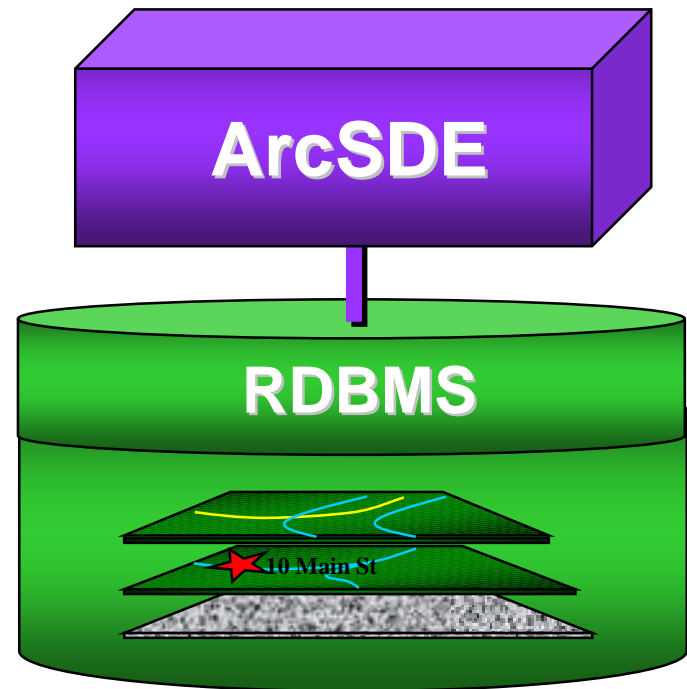
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ArcSDE Support for RDBMS's

- Oracle
- SQL Server
- Informix
- IBM DB2



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ArcSDE Leverages RDBMS

- Integrated data model (spatial and tabular data together)
- Scalable, robust system architecture
- Multi-user access
- Backup and Security
- Performance tuning
- Additional RDBMS functionality, i.e. replication, fail-over, etc



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What if you don't have an RDBMS?

ArcSDE for Coverages



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ArcSDE for Coverages

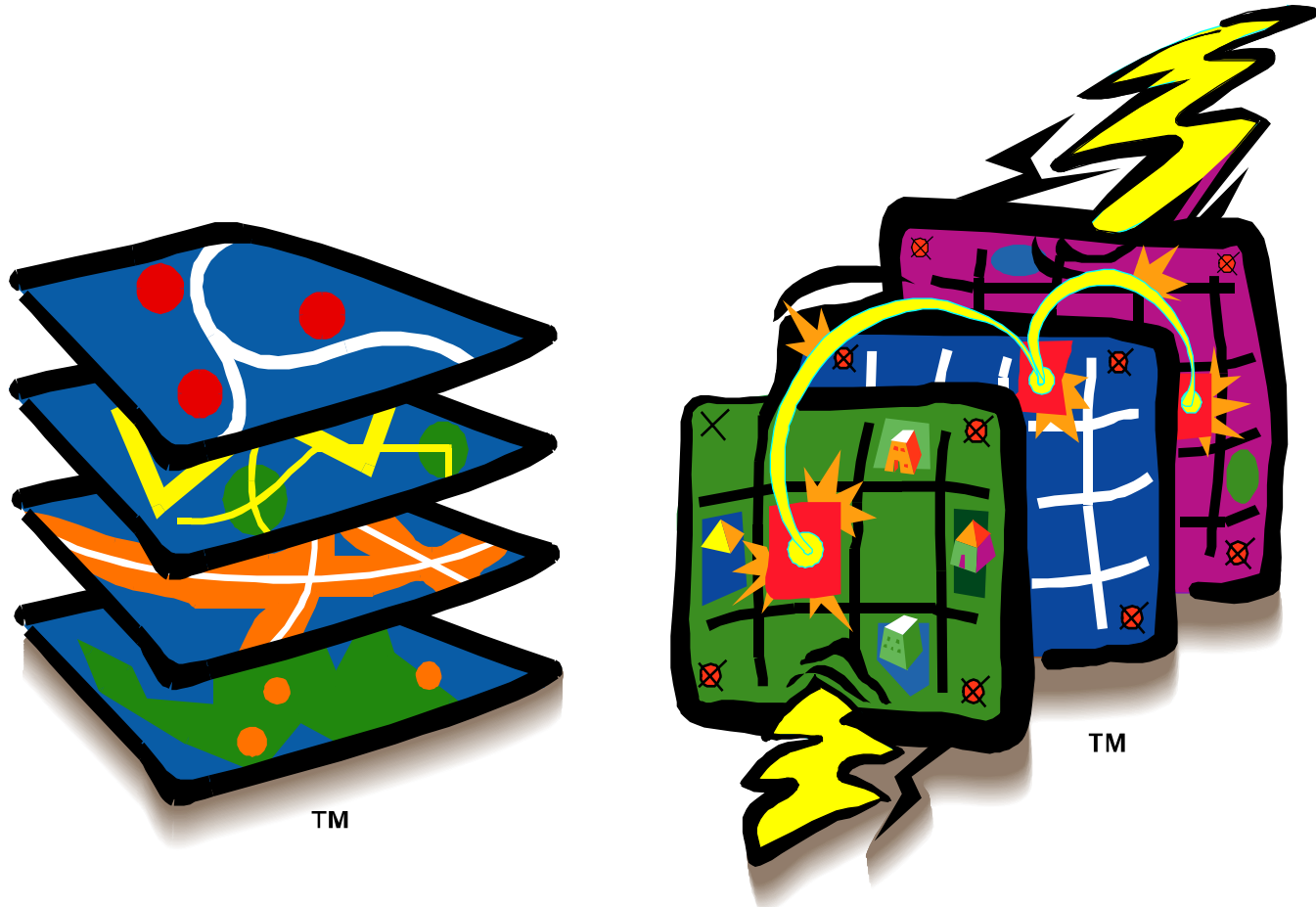


Why Use ArcSDE for Coverages?

- TCP/IP access (no need for NFS)
- Client access is extended to all ESRI data formats
 - ex: ArcMap access to ArcStorm layers
- Applications developed now can be re-used* when migrating to ArcSDE for RDBMS
 - *SQL and INFO syntax will be different.



ArcSDE Data Model

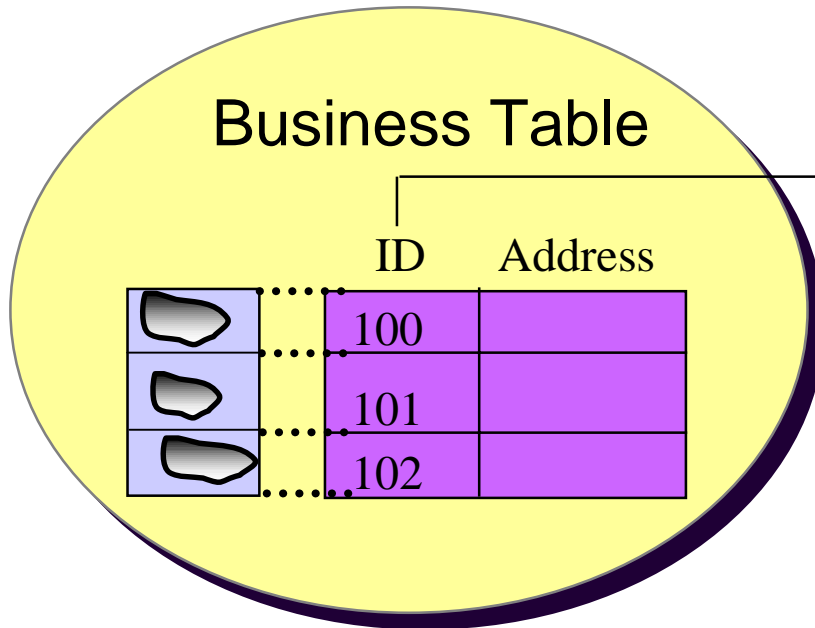


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Integrated Data Model

A layer (feature class) is a collection of tables




Visible to User



ArcSDE Users can spatially enable their business data.

Not Visible to User

Feature table

ID	Geometry	Creation date ...
100		...
101		...
102		...

* Spatial Indexing

100
101
102



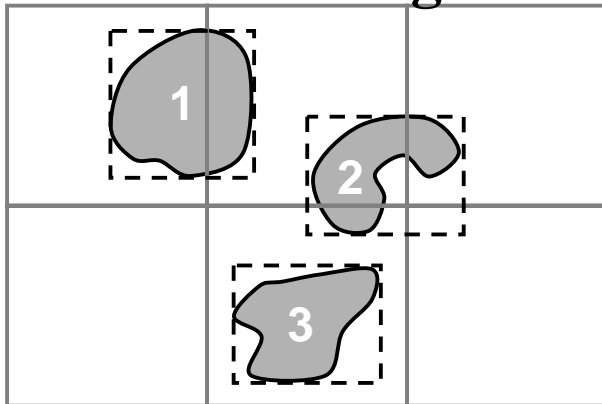
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Spatial Indexing

- **Spatial indexes are an essential construct to support efficient spatial data queries**

Spatial indexing example used with ArcSDE binary data type in Oracle and SQL Server

Features on grid



Feature table

1	
2	
3	

Spatial Index

1	
1	
2	
2	
2	
2	
3	



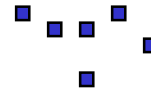
ArcSDE Feature Types

Feature Type

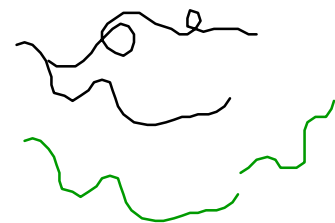
Single Part

Multi-Part

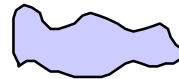
Point



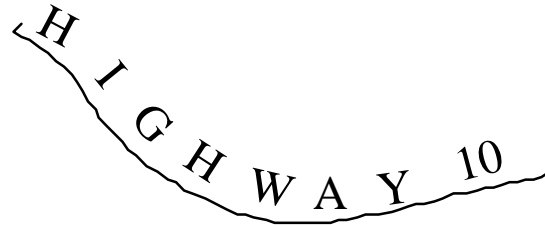
Line



Area



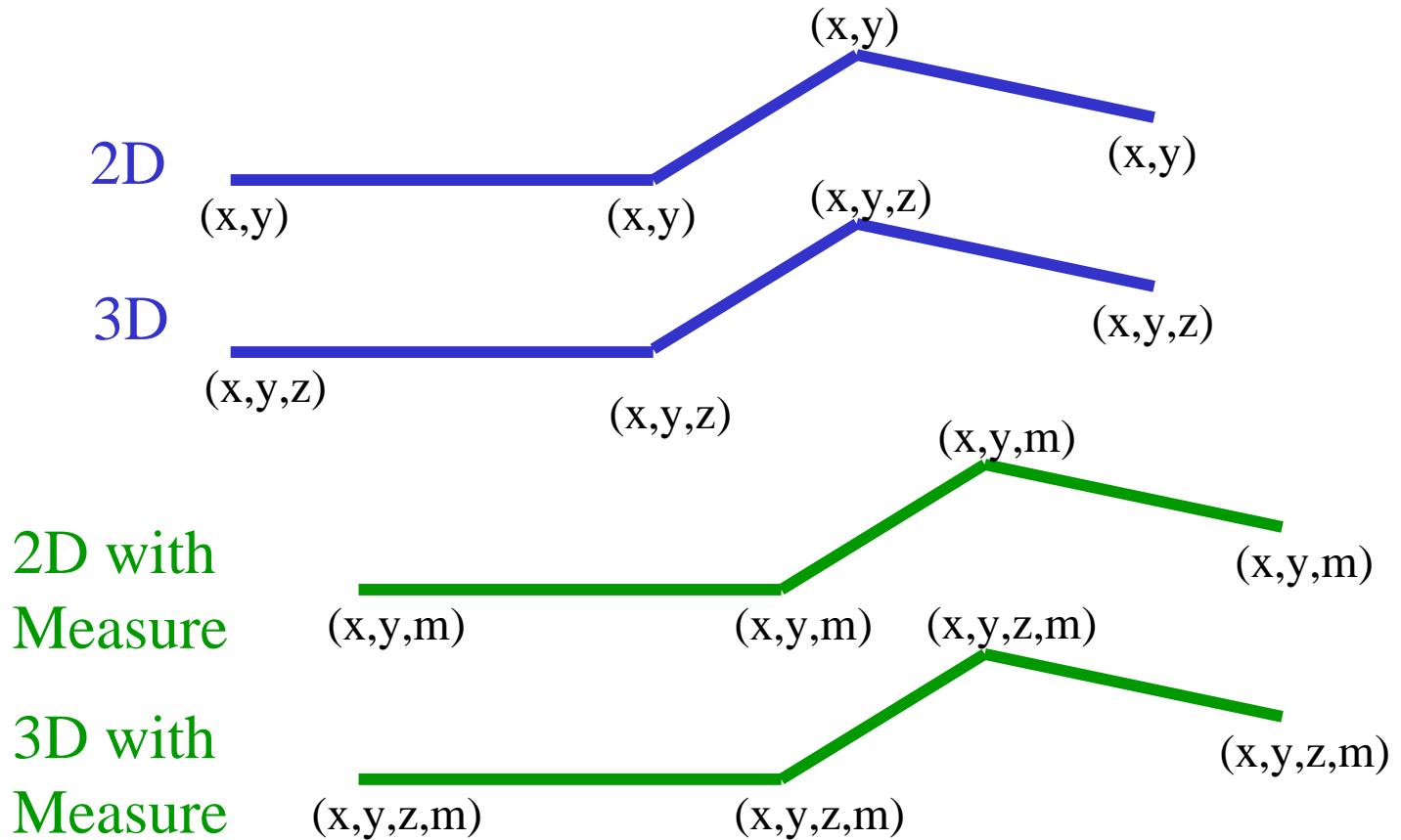
Annotation



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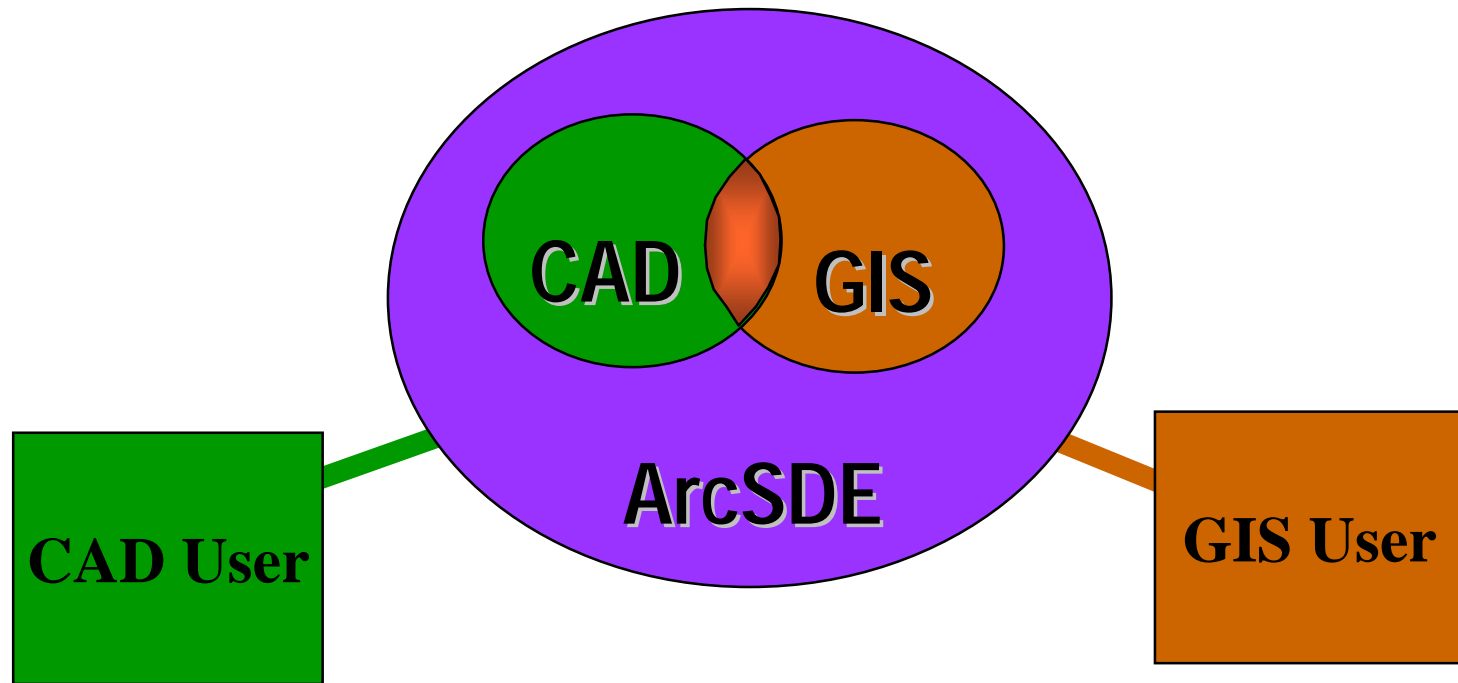
ArcSDE Feature Attributes

- 2D or 3D features and Measures



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ArcSDE CAD Client

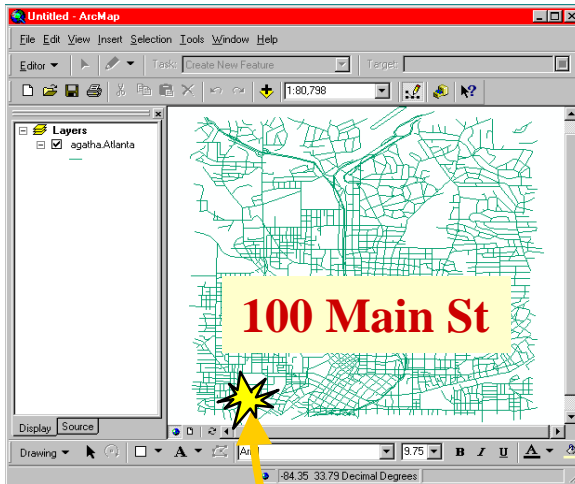


- Data is shared between GIS and CAD users
- Data maintained in single environment
- Supports both AutoCAD and MicroStation



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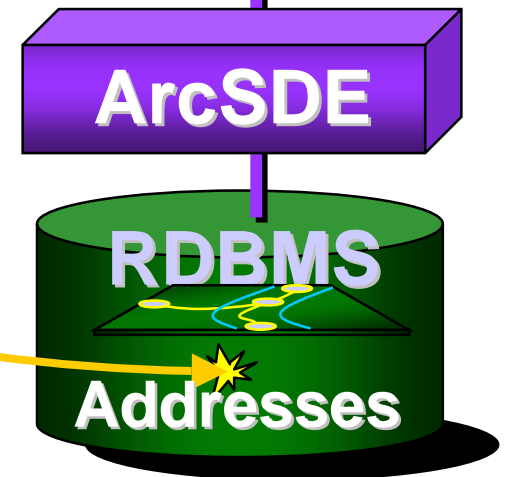
ArcSDE and Addresses



- User defines a geocoding service

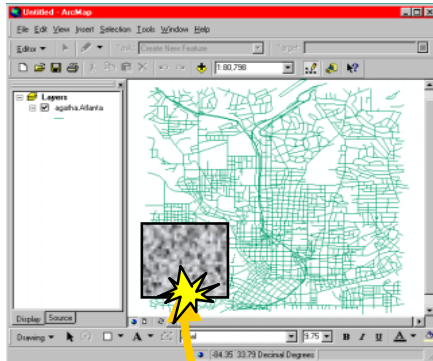
TCP/IP Network

- Address data (site and range) are stored in the RDBMS
 - Can use proprietary or StreetMap data
- ArcSDE processes geocoding requests



ArcSDE Raster Layers

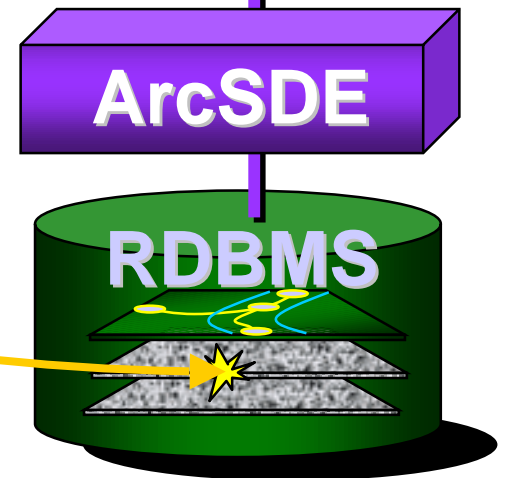
... are just like other ArcSDE feature classes



**Client
Application**

TCP/IP Network

- **Virtually all formats can be imported (40+)**
- **Raster pyramid layers supported**



ArcSDE 8.0 and the Geodatabase

Introducing Intelligent Features...



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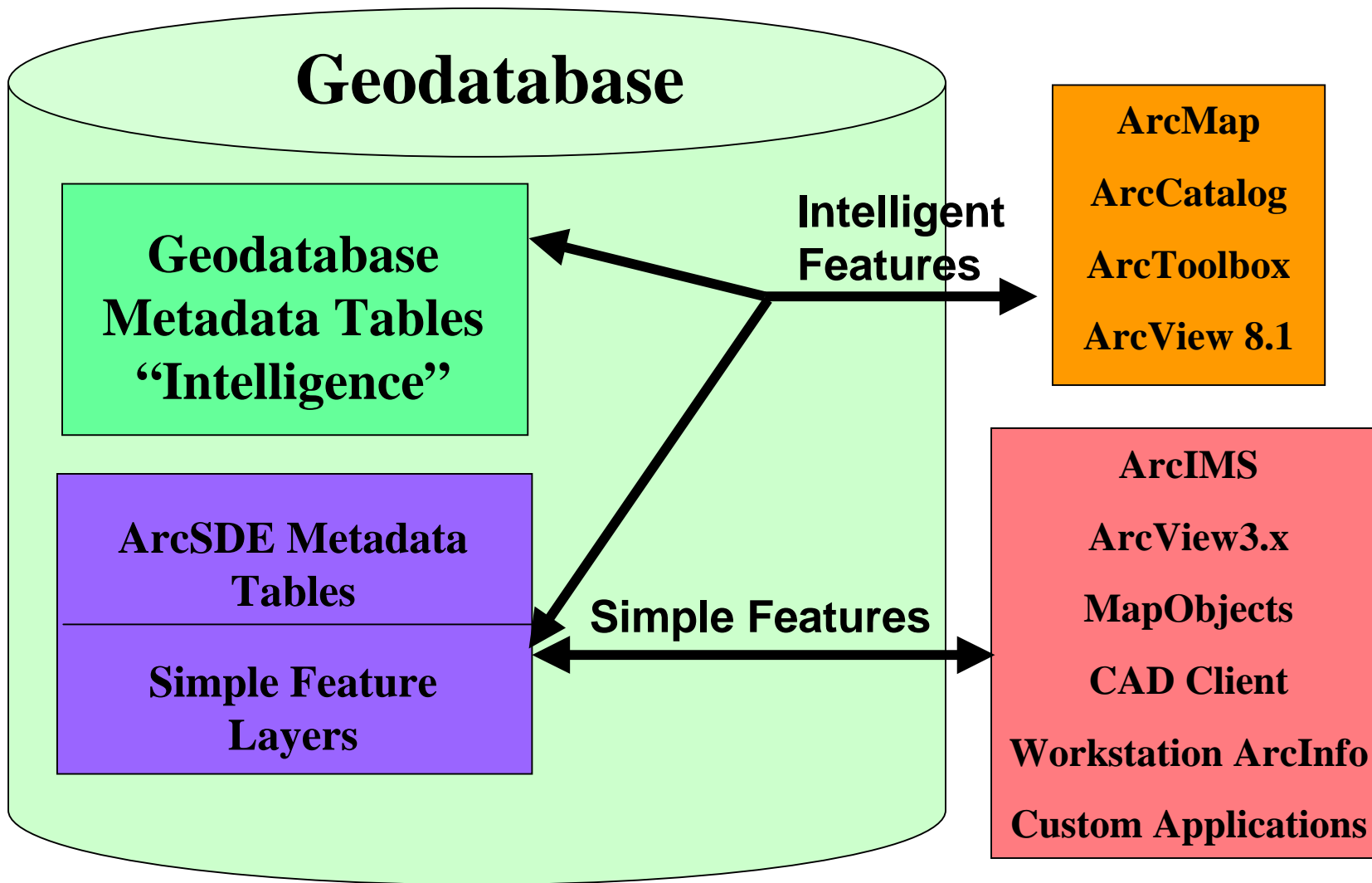
ArcSDE and the Geodatabase

The Geodatabase is an object-relational data model whose purpose is to allow storage of intelligent features and enhanced editing functionality.

Intelligent features can have properties, behaviors, and relationships with other features.

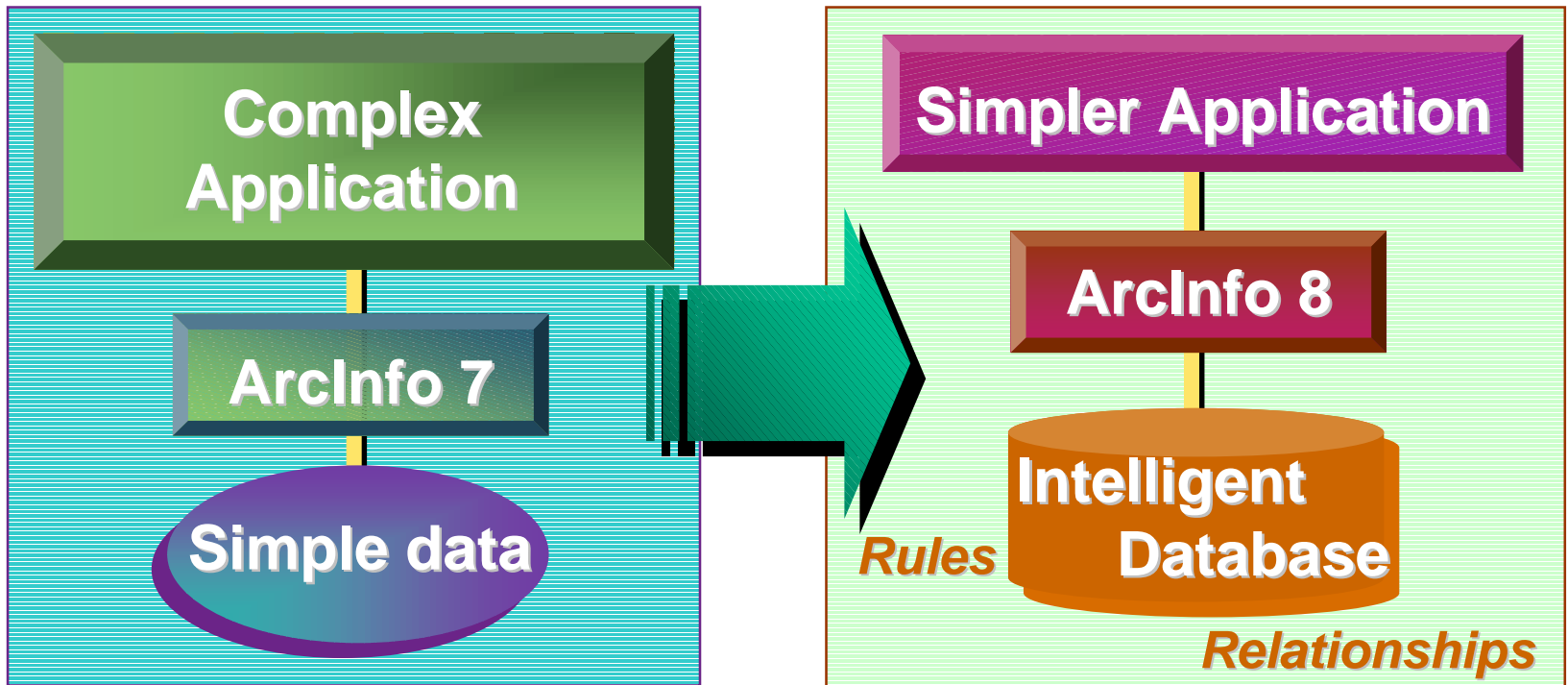


Geodatabase Access



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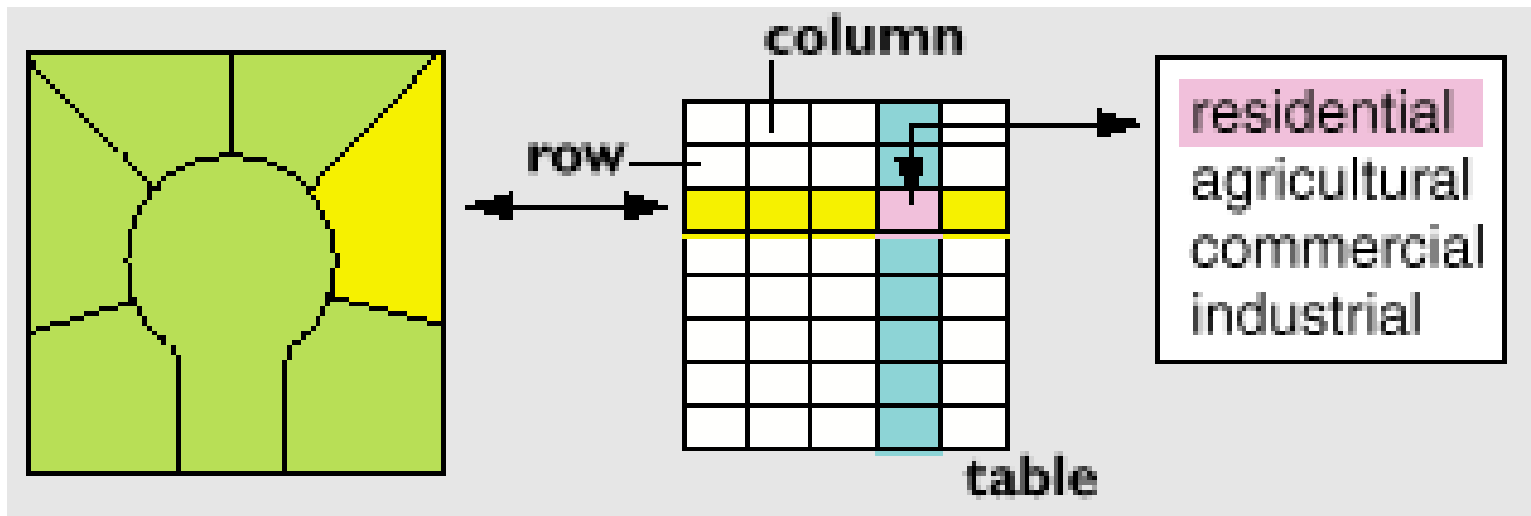
Why use a Geodatabase with ArcInfo 8?



**More intelligent data means
less application development**



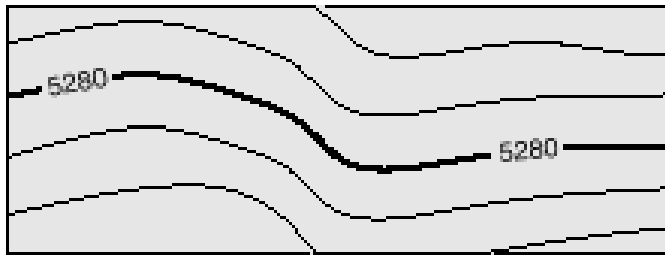
Attribute Domains



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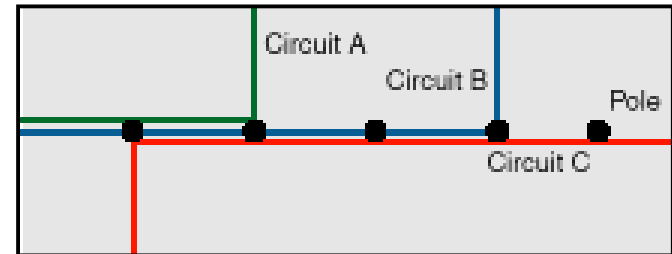
Object Display Behavior

More Control Over How Features are Drawn



Behavior is...

Annotation displayed along a straight section of contour



Behavior is...

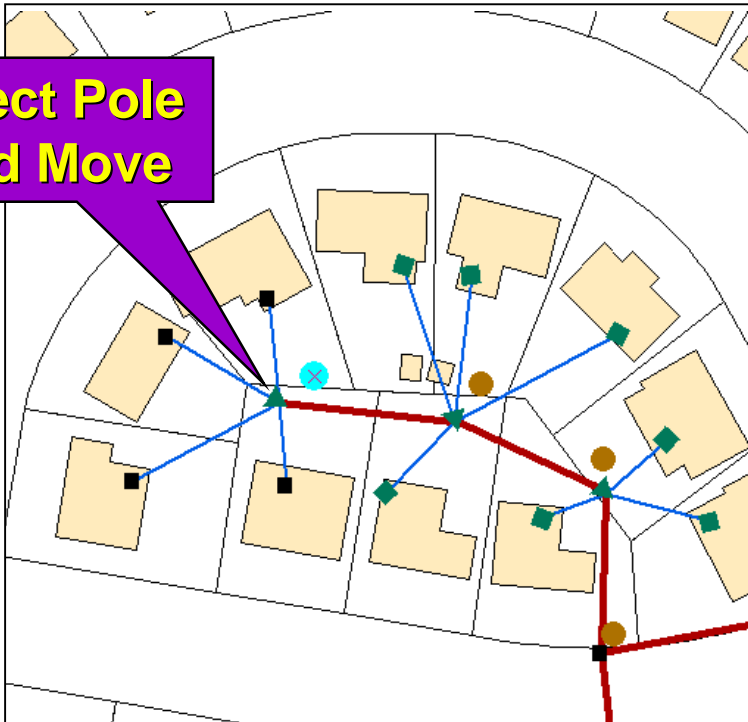
Multiple coincident wires depicted as a set of parallel lines with standard offset



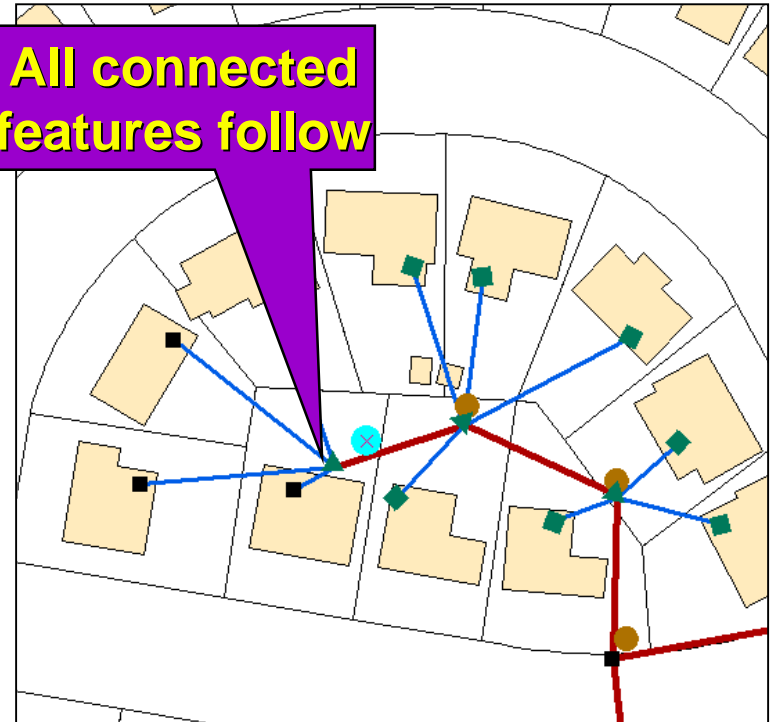
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Network Relationships

Select Pole
and Move



All connected
features follow



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Long Transactions...

- **Are database changes that are not immediately committed**
- **Are supported by versions in the database; version management is carried out by ArcSDE**



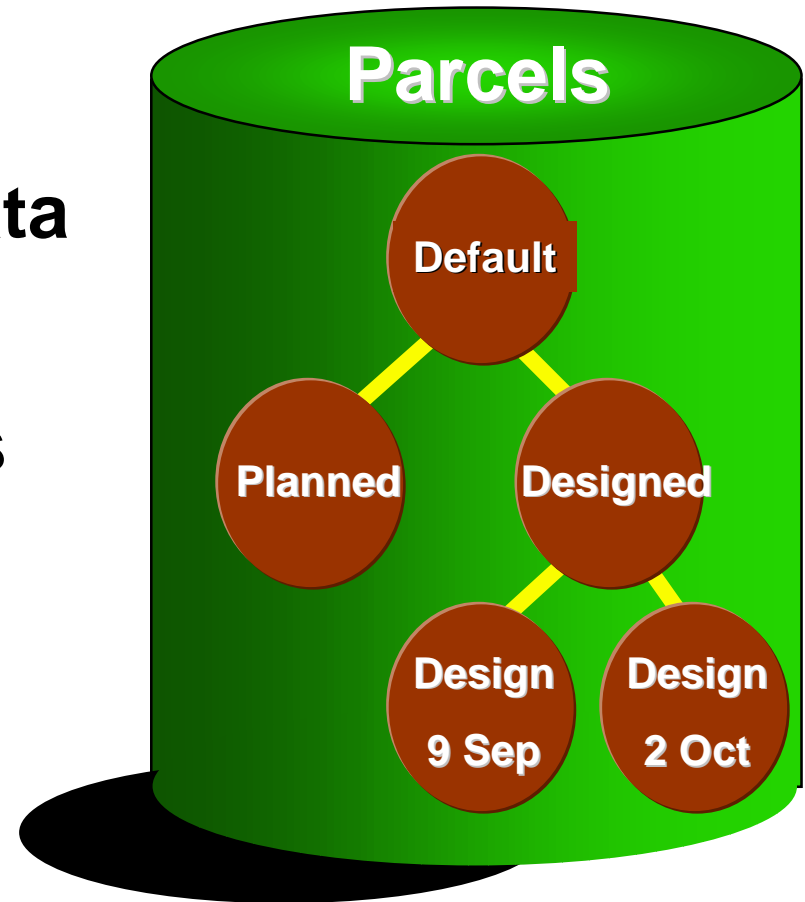
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Versions...

are multiple logical representations of data

contain only changes

are required for geodatabase editing



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Getting Data into the Geodatabase



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Data Loading Options

- **Simple Feature Layers**
 - **Command line loading utilities**
 - shp2sde, cov2sde, tbl2sde,....
 - **Workstation ArcInfo LAYERIMPORT**
 - **Microstation/AutoCAD with CAD Client**
 - **Custom application using API**
- **Geodatabase Feature Classes**
 - **ArcCatalog and ArcToolbox**
 - Can register simple feature layers as feature classes
 - GUI for importing various data formats



Data Loading with ArcCatalog

The screenshot shows the ArcCatalog Database Connections window. The 'test.states' connection is selected in the tree view. A context menu is open, showing options like Copy, Paste, Delete, Rename, Refresh, New, Import, Versions..., Disconnect, Connection Properties..., and Properties... The 'Import' option is highlighted, and a sub-menu is open showing options like Raster to Geodatabase..., Raster to Geodatabase Wizard..., CAD to Geodatabase..., Table to Geodatabase..., Coverage to Geodatabase..., Shapefile to Geodatabase Wizard..., Shapefile to Geodatabase..., and Coverage to Geodatabase Wizard... The 'test.states' connection is highlighted in blue in the tree view.

Context Menu Options:

- Copy (Ctrl+C)
- Paste (Ctrl+V)
- Delete
- Rename
- Refresh
- New
- Import**
- Versions...
- Disconnect
- Connection Properties...
- Properties...

Import Sub-menu Options:

- Raster to Geodatabase...**
- Raster to Geodatabase Wizard...
- CAD to Geodatabase...
- Table to Geodatabase...
- Coverage to Geodatabase...
- Shapefile to Geodatabase Wizard...
- Shapefile to Geodatabase...
- Coverage to Geodatabase Wizard...



Geometry Storage Options

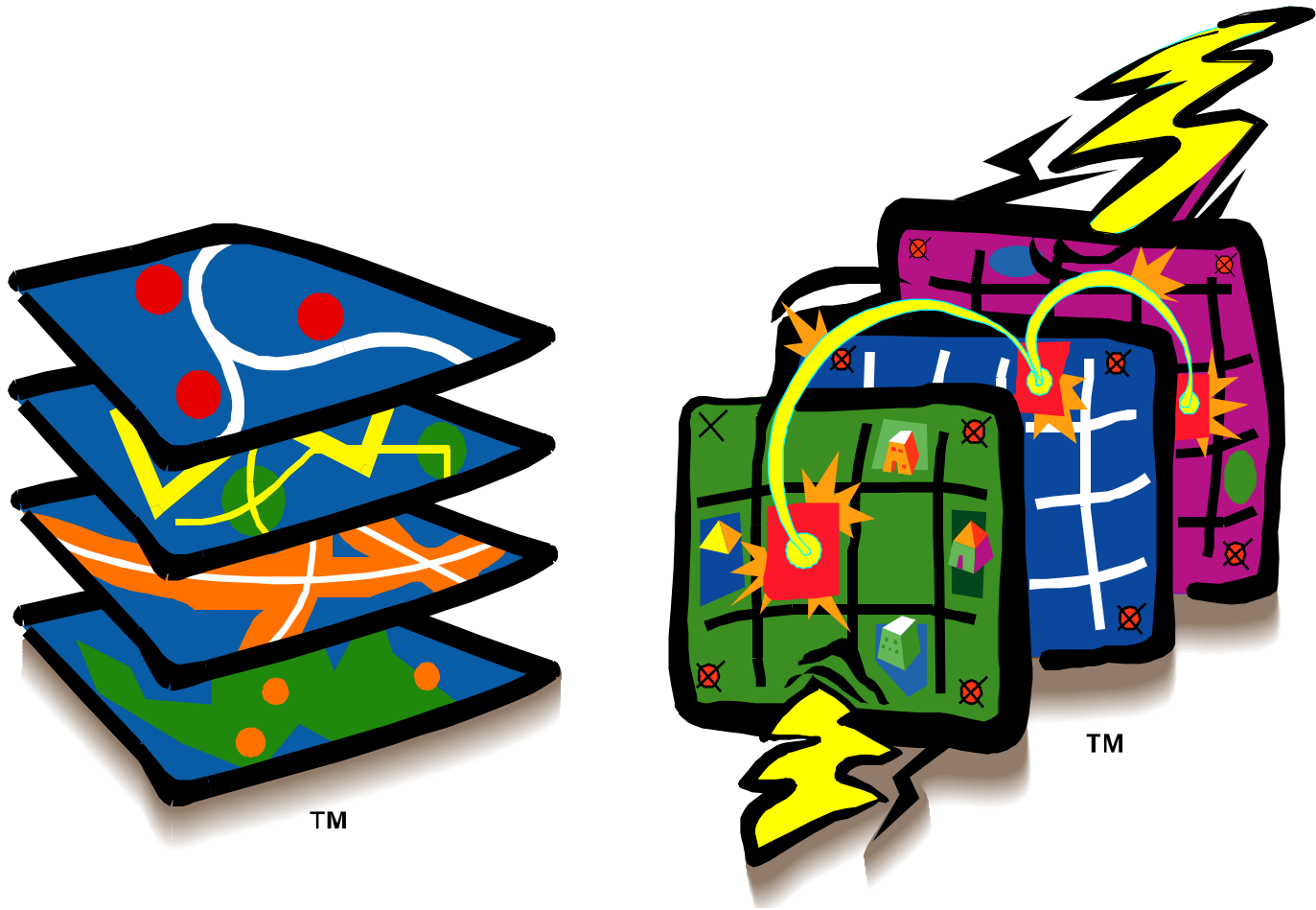
RDBMS	Geometry	Column Type
Oracle	ArcSDE Compressed Binary	Long Raw, LOB
	* Spatial Cartridge Normalized schema	Number
	* Oracle8i Spatial Object	SDO_Geometry
SQL Server	ArcSDE Compressed Binary	Image
Informix	Geometry Object	ST_Geometry
IBM DB2	Geometry Object	ST_Geometry

* requires Oracle Spatial



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Implementing ArcSDE Technology



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Implementing... The RDBMS

- RDBMS software install and configuration
- Database Design
- Administration Tasks
- Performance Tuning
- Backup and Recovery

**Implementing ArcSDE is really
Implementing an RDBMS with spatial data;
therefore RDBMS skills are important.**



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Implementing...

ArcSDE

- **Geodatabase design**
- **ArcSDE instance configuration**
 - Data storage type(s)
 - 2- or 3- tier (or combination)
- **Feature class loading, spatial indexing, administration, etc.**



Implementing...

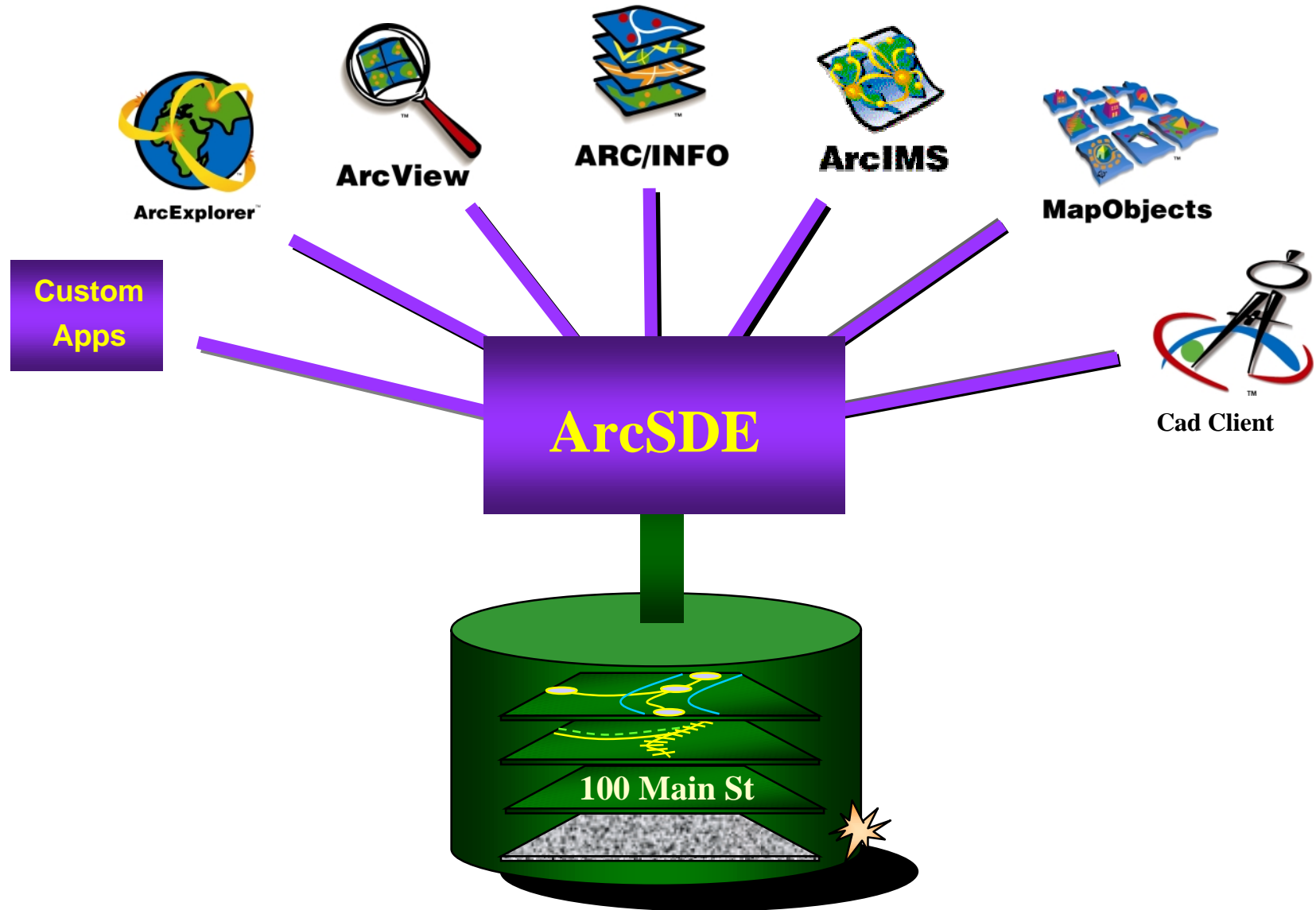
System Configuration

- **The Server**
 - Processing power
 - Memory
 - Disk arrays
 - Resource requirements
- **The Network**
 - Bandwidth requirements
 - Intranets and Internets



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Enterprise GIS



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