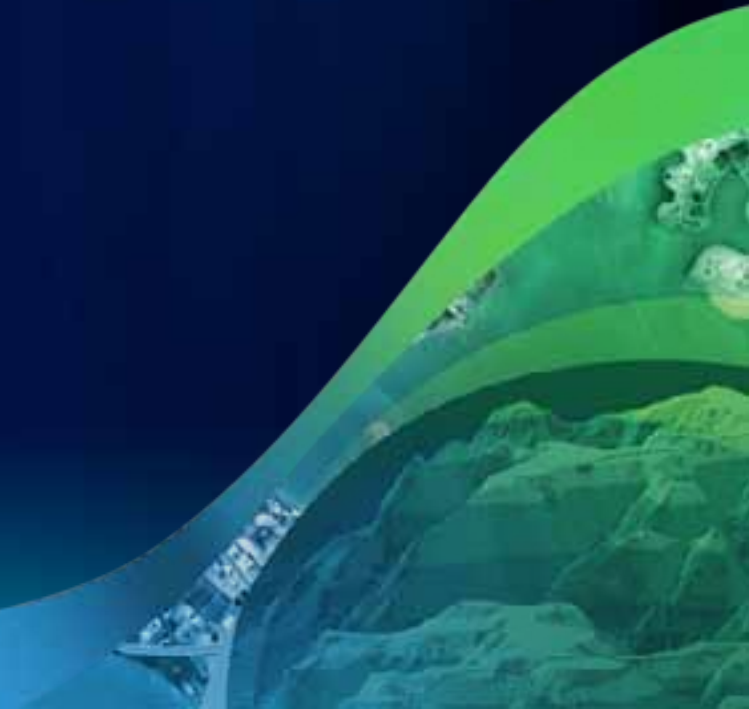


Esri International User Conference | San Diego, CA
Technical Workshops | July 12 and 13, 2011

Administration for Oracle – An Introduction

Amit Kesarwani

Forrest Jones



Objectives/Scope

- Understand
 - The role of ArcSDE technology
 - ArcSDE installation and configuration process – Oracle DBMS
 - ArcSDE connections
- Perform basic ArcSDE administration tasks



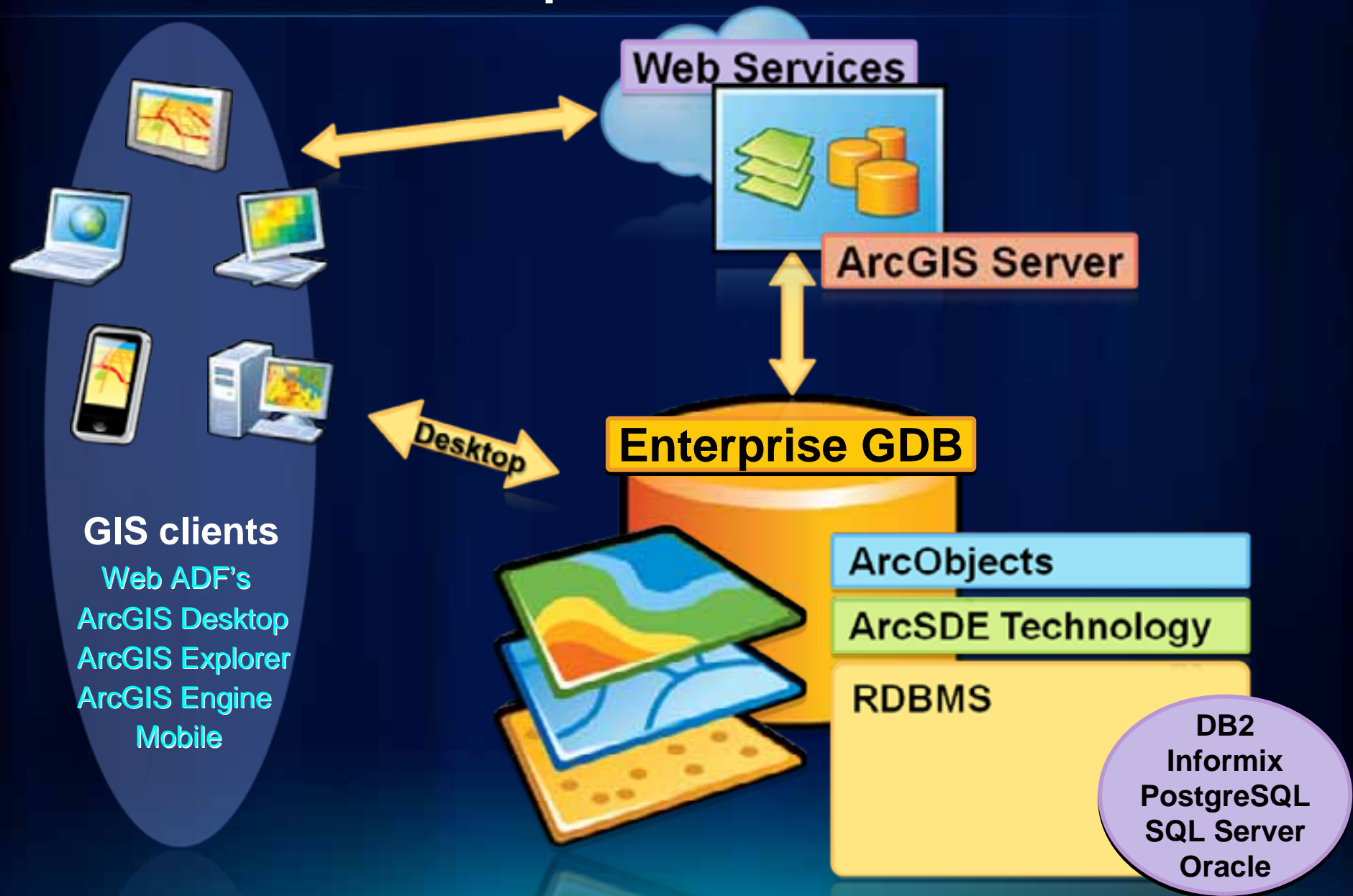
Agenda

- **System Architecture**
- **Installing and Configuring ArcSDE**
- **Users and Privileges**
- **Connecting to the Geodatabase**
- **Geodatabase Maintenance**
- **Storage Types**
- **Troubleshooting**
- **Resources**
- **Questions**

Agenda

- **System Architecture**
 - **ArcGIS Server / Enterprise GDB Software Stack**
- Installing and Configuring ArcSDE
- Users and Privileges
- Connecting to the Geodatabase
- Geodatabase Maintenance
- Storage Types
- Troubleshooting
- Resources
- Questions

ArcGIS Server Enterprise



Agenda

- System Architecture
- **Installing and Configuring ArcSDE**
 - **Pre-installation tasks**
 - **Configuration of Oracle instance and database**
 - **Install ArcSDE and run Post-Installation**
 - **Upgrade Considerations**
- Users and Privileges
- Connecting to the Geodatabase
- Geodatabase Maintenance
- Storage Types
- Troubleshooting
- Resources
- Questions

Pre-installation Tasks

- Verify the system requirements are met



<http://resources.arcgis.com>



Pre-installation Tasks

- Verify the system requirements are met

The screenshot shows the ArcGIS Resource Center website. The top navigation bar includes links to ArcGIS.com, Support.esri.com, esri.com, and a Sign In button. Below this is a search bar and a version indicator for 10.0.9.3. The main content area is titled 'ArcGIS Server' and lists various resources available for users, including GIS Services, Web APIs, Applications, and Data Management. A sidebar on the left provides a quick navigation menu. The right side of the page features a map visualization and a list of online resources accessible from the site.

ArcGIS Resource Center Help Blogs Forums

Home » ArcGIS Server 10 Version: 10.0 9.3

ArcGIS Server

The ArcGIS Server system includes:

- Geospatial services and tasks
- Powerful frameworks for creating Web applications
- Out-of-the-box applications for using GIS services
- Online basemaps and geospatial services that you can use in your applications
- Enterprise geodatabase support, transaction management, and geodata services

What Can I find Here?

From this site, you can access the following online resources:

- Web APIs for building applications
- A sample GIS Server that demonstrates the various resources
- Online content that you can include in your ArcGIS Server applications

Get Support

Pre-installation Tasks

- Verify the system requirements are met

Version: 10.0 9.3

ArcGIS Server 10 System Requirements

Need info for earlier versions? Please [click here](#).

Server

System requirements for running ArcGIS Server and its services.

Browsers and Mobile Devices

Listing of supported web browsers and mobile devices that are clients that connect to ArcGIS Server.

Developer Solutions

Requirements for developing solutions with ArcGIS Server.

Geodatabase and ArcSDE

Requirements for installing and using ArcSDE for supported relational database management systems.

<http://resources.arcgis.com/content/arcscde/10.0/oracle-system-requirements>

Version: **10.0** 9.3

ArcSDE 10 Oracle Database Requirements

Supported Database Versions

Standard One/Standard/Enterprise Editions:

- Oracle 10g (32 bit) 10.2.0.3
- Oracle 10g (64 bit) 10.2.0.3
- Oracle 11g (32 bit) 11.1.0.6
- Oracle 11g (64 bit) 11.1.0.6
- Oracle 11g (64 bit) 11.1.0.7
- Oracle 11g R2 (64 bit) 11.2.0.1.0

Express Edition:

- Oracle 10g (32 bit) 10.2.0.2 - Windows Only (For development and testing only, not for production deployment)

Supported Operating Systems

Database	Supported Operating System(s)
Oracle 10g R2 (32 bit) 10.2.0.3	Red Hat Enterprise Linux AS/ES 4.0 Update 2 (32-bit) Windows 2003 SP2 (32-bit) Server Standard, Enterprise & Datacenter Windows 2008 SP1 (32-bit) Server Standard, Enterprise & Datacenter

Oracle configuration parameters

- Oracle Memory:
 - System Global Area (SGA) and Program Global Area (PGA)
 - Memory areas used for - Interpreting SQL statements, Fetching data and Submitting edits to database
- Use Automatic Shared Memory Management (ASMM)
 - Set **SGA_TARGET** through Oracle Enterprise Manager (OEM)
- Cursor Configuration:
 - Cursor: Points to rows returned by a SQL statement
 - Used to avoid re-parsing similar statements with bind variables
 - Stored in PGA and used extensively by ArcSDE
 - **open_cursors = 2000** (or larger to avoid ORA-1000 error)
 - Tech Article #27024 – What is an appropriate value for the Oracle init.ora parameter 'open_cursors'?

Installing ArcSDE

- **Two parts**
 - Install software (binaries)
 - Setup geodatabase repository
- **Install guide is included with the media or available online:**
 - <http://resources.arcgis.com/content/geodatabases/10.0/arcade-installation-guides>
- **Included with ArcGIS Server Enterprise Media**

Install ArcSDE Software GUI - Windows

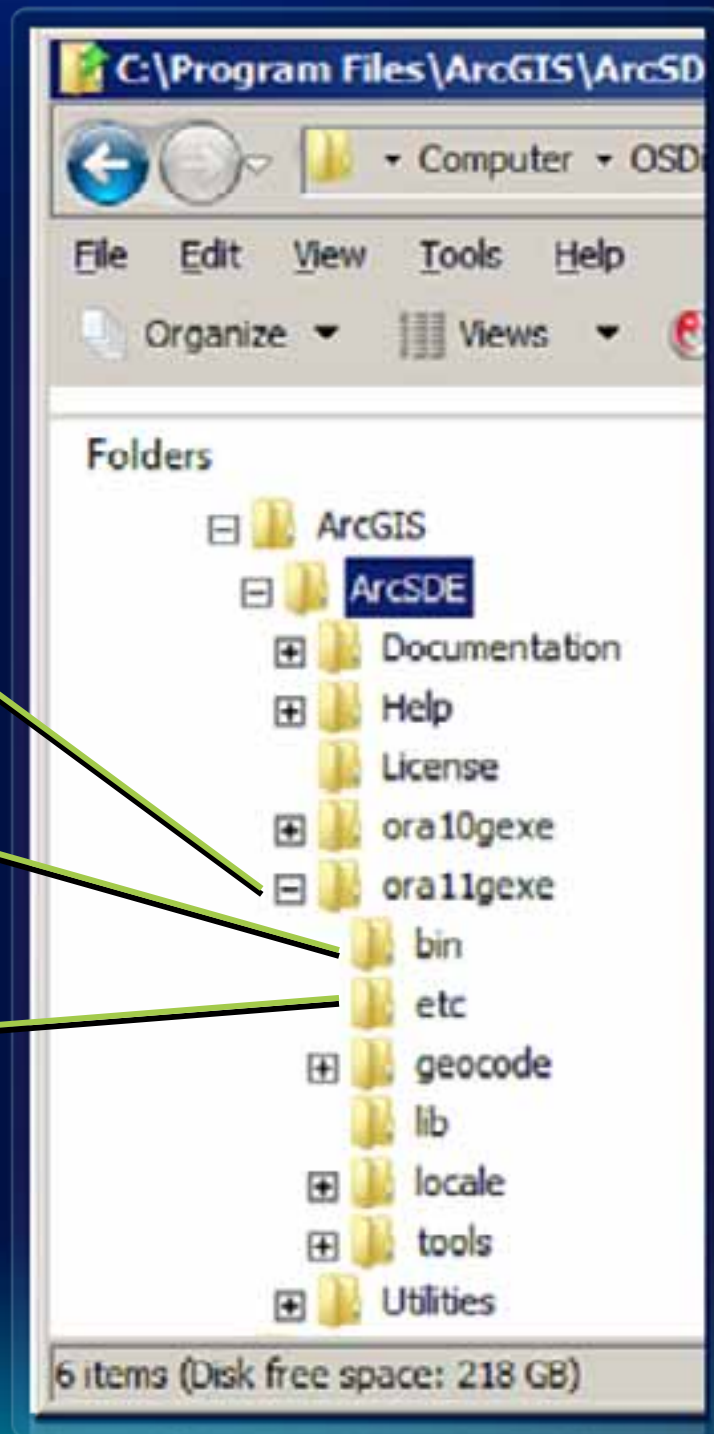
The first part of the ArcSDE installation

1. Writes software files in the SDEHOME directory
2. Modifies system environment variables (Win)
 - Creates %SDEHOME% - location of ArcSDE files
 - Default: "C:\Program Files\ArcGIS\ArcSDE\ora<10g/11g>exe"
 - Another location can be specified
 - Appends %SDEHOME%\bin to %PATH%

SDEHOME

**Server libraries
and executables**

**Configuration and
log files**



ArcSDE Post-Installation GUI - Windows

- **Defines SDE DBA user**
 - **Creates SDE users and Grants appropriate privileges**
- **Creates geodatabase repository**
 - **Creates ArcSDE metadata tables (the ArcSDE repository) and packages in the database, thus creating a geodatabase**
- **Authorizes ArcSDE**
 - **With software license**
- **Creates ArcSDE service**

Install on UNIX

- Set environment manually
 - Run **install -load** command
 - Installs libraries
- Post installation
 - Run **sdesetup -o install** command
 - Creates the ArcSDE repository and packages
 - Need to create SDE user and grant privileges manually
- Install guide included w/media or available online:
 - <http://resources.arcgis.com/content/geodatabases/10.0/arcscde-installation-guides>

DBMS_PIPE / DBMS_LOCK

- What are they?
 - DBMS_PIPE: allows sessions to communicate through memory
 - DBMS_LOCK: Oracle's api to create locks in DB from SQL
- For ArcSDE granted execute to public
- Remove privileges from public?
 - Tech Article #35408 – Can the public privilege be removed from Oracle's dbms_pipe and dbms_lock packages?

Upgrade Considerations

- Always perform any upgrades in a test environment
- Always backup your database(s) (**TEST RESTORE!**)
- Backup any custom files in %SDEHOME%\etc directory
 - dbinit.sde
 - dbtune.sde
- Upgrade OS and Oracle first, if needed, then test
- Upgrade ArcSDE, then test

Upgrade Workflow

- Backup database
- Stop any ArcSDE services
 - Use `sdeservice -o list` for description of existing services (Win)
- Uninstall existing ArcSDE software
 - Allow installer to delete services, which must be recreated after software is upgraded
- Install new version of ArcSDE
- Use ArcCatalog or Python script to run Upgrade Geodatabase
 - This replaces repository upgrade from Post-Installation wizard or `sdesetup -o upgrade` command
- Recreate ArcSDE services

Upgrade Geodatabase

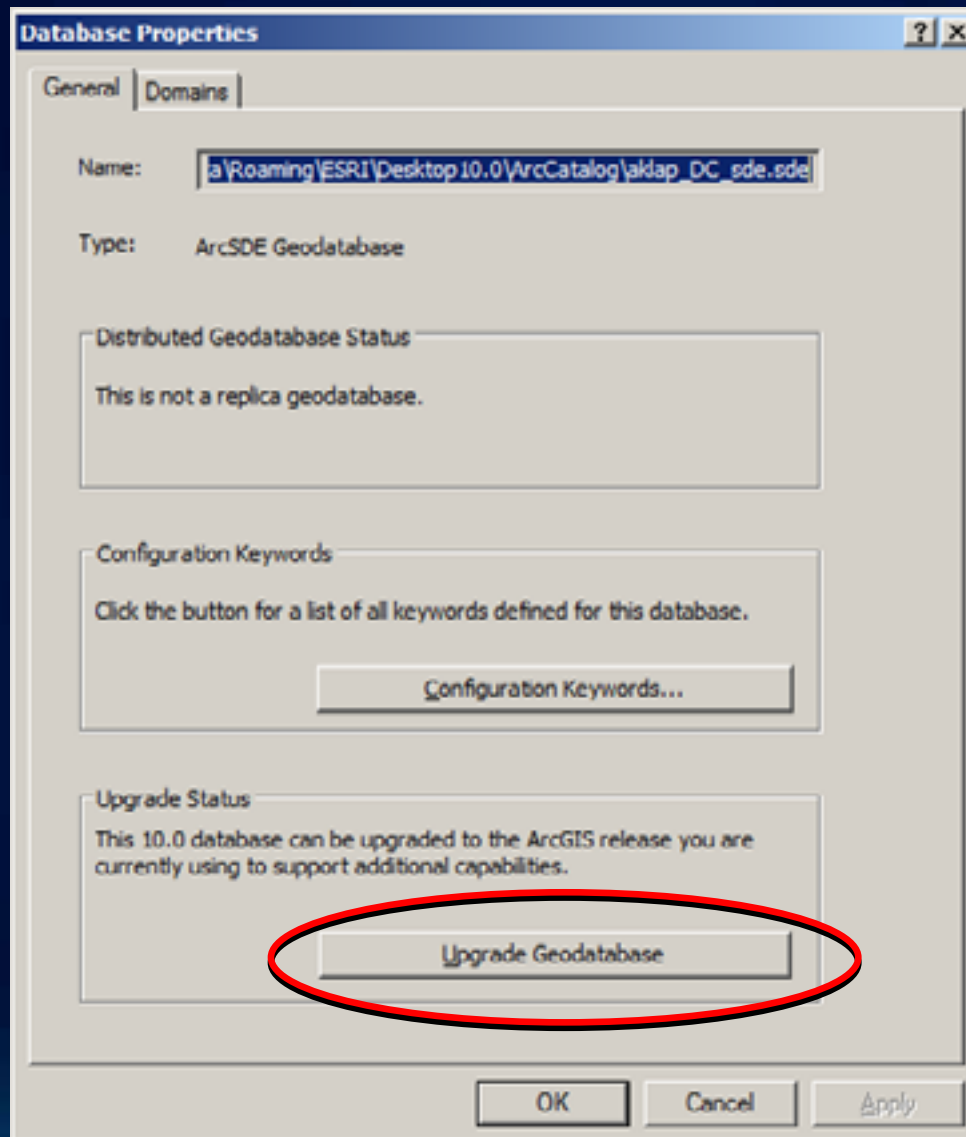
- Requires **sde** user **upgrade** permissions
- Requires a direct connection to geodatabase
- Pre-requisite check determines if geodatabase is upgradable
 - See “Preparing to upgrade a geodatabase in Oracle” topic for a full list of requirements

```
# Process: Upgrade Geodatabase  
arcpy.UpgradeGDB_management(<Connection file>,  
                             "PREREQUISITE_CHECK", "UPGRADE")
```

Also see: Technical Workshop 20 Minute
Upgrading to ArcGIS 10.0 Geodatabases

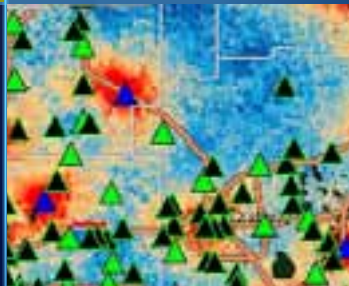
Thursday 1:30pm Room 23B

Upgrade Geodatabase – from ArcCatalog



Demonstration

- Set Oracle parameters*
- View SDE repository*



Agenda

- System Architecture
- Installing and Configuring ArcSDE
- **Users and Privileges**
 - **Creating users**
 - **Granting / revoking privileges**
- Connecting to the Geodatabase
- Geodatabase Maintenance
- Storage Types
- Troubleshooting
- Resources
- Questions

Creating Users

- Create Users manually in OEM OR using a script in SQLPLUS

The screenshot shows the 'Create User' page in Oracle Enterprise Manager 11g Database Control. The page title is 'ORACLE Enterprise Manager 11g Database Control'. The breadcrumb navigation is 'Database Instance: 11gsde > Users > Create User'. The user is logged in as SYS. The page has tabs for 'General', 'Roles', 'System Privileges', 'Object Privileges', 'Quotas', and 'Consumer Group Privileges'. The 'General' tab is selected. The form fields are: Name (UC2010), Profile (DEFAULT), Authentication (Password), Enter Password (masked with dots), Confirm Password (masked with dots), Default Tablespace (USERS), and Temporary Tablespace (TEMP). There is a checkbox for 'Expire Password now' which is unchecked. The status is set to 'Unlocked' with a radio button. At the bottom, there are buttons for 'Show SQL', 'Cancel', and 'OK'.

```
SQL> CREATE USER UC2010 IDENTIFIED BY PASSWORD DEFAULT  
TABLESPACE USERS TEMPORARY TABLESPACE TEMP;
```

Managing Users



Data Owners/Creators

- CREATE table, CREATE procedure
- Manage permissions through Oracle
- Dedicate user(s) to own/create data

Managing Users



Data Viewers/Editors

-CREATE SESSION to connect w/OEM

-Manage object permissions through ArcGIS

Viewers



-Grant SELECT

Editors



-Grant SELECT,
INSERT, UPDATE,
DELETE

Geodatabase users

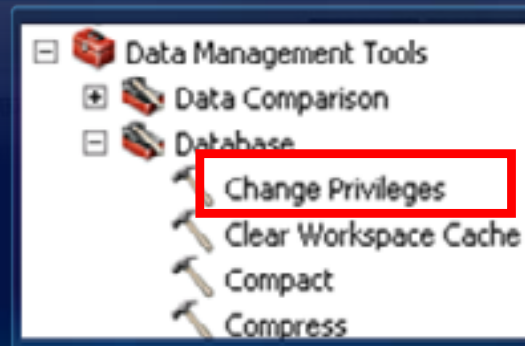
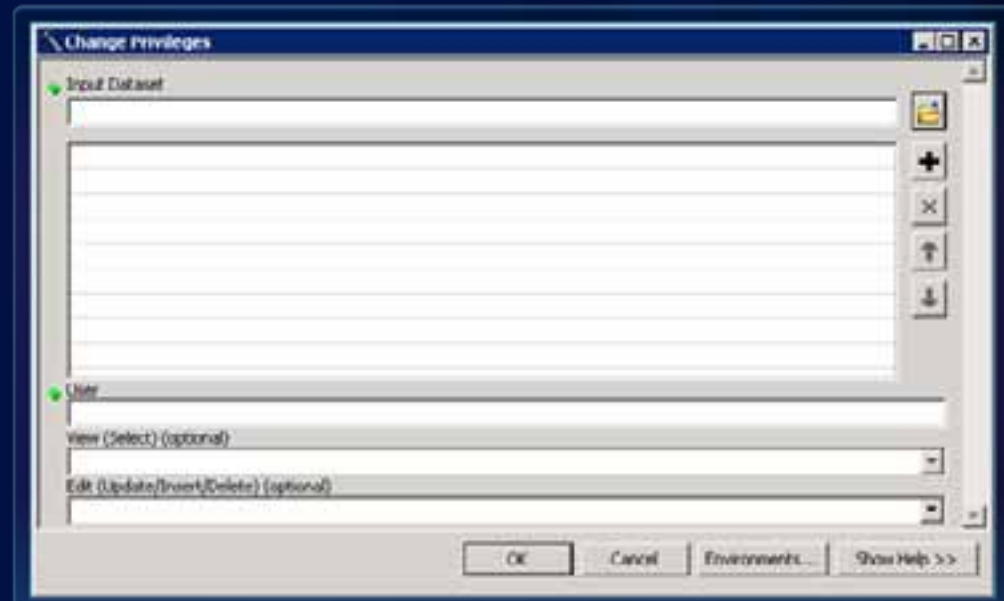
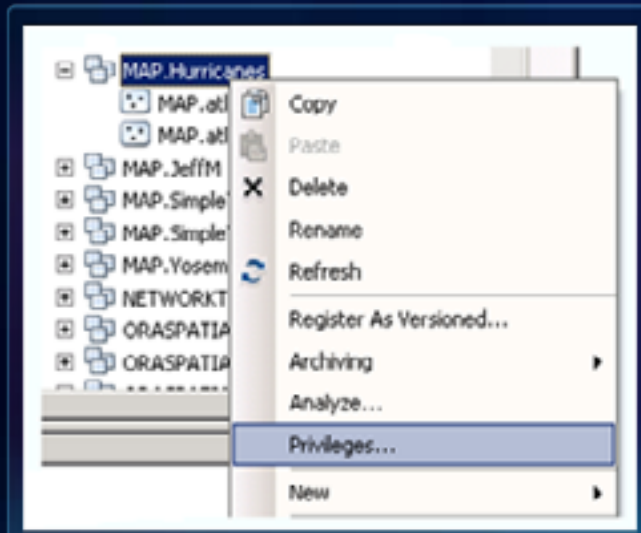
Must have Read or Read/Write access to geodatabase data	End user	GIS analysis Map production Maintain edits
Must have data Ownership and Management rights	Manager	Data QA/QC Versioning workflow Geodatabase design Data ownership
Owns ArcSDE repository and has access to all geodatabase data	SDE Admin	Configure DBTUNE for storage Manage ArcSDE configuration Compress Manage data statistics Monitor and rebuild indexes
Has DBMS Administrative access	DBA	Backup and recovery Configure storage Create users/roles Grant database permissions

Database Roles

- **Facilitate management of data permissions**
- **Group users with similar database access**
- **Can be created for each type of user, for example:**
 - **Owner, editor, reader**
 - **Departmental role (e.g., planners, analysts, etc.)**
 - **Project teams**

Managing data permissions with ArcGIS

- Connect as data owner
- Specify user or role
- Grant/Revoke
 - SELECT
 - SELECT, INSERT, UPDATE, DELETE



Agenda

- System Architecture
- Installing and Configuring ArcSDE
- Users and Privileges
- **Connecting to the Geodatabase**
 - **Direct Connection**
 - **Application Server connection**
- Geodatabase Maintenance
- Storage Types
- Troubleshooting
- Resources
- Questions

Connection Choices

- **Direct Connection: Recommended choice**
 - NO ArcSDE service
 - SDE processing load on client
 - Connects directly to database using an oracle client
 - Drivers now provided for previous versions
- **Application Server Connection:**
 - ArcSDE service, giomgr
 - Increased server load – gsrvr spawned for every connection

Direct Connection Syntax - *Starting at ArcGIS 10*

Append oracle service name to service

The screenshot shows the 'Spatial Database Connection' dialog box. It has a title bar with a question mark and a close button. The main area contains three text input fields: 'Server:' with the placeholder '<Server name>', 'Service:' with the placeholder 'sde:oracle11g:< SQL_Net_alias >', and 'Database:' which is empty. Below the 'Database:' field is the text '(If supported by your DBMS)'. There is a section titled 'Account' with two radio buttons. The first is 'Database authentication' which is selected. Below it are 'Username:' and 'Password:' fields with placeholders '<Username>' and '<Password>' respectively. There is a checked checkbox labeled 'Save username and password'. The second radio button is 'Operating system authentication'.

Spatial Database Connection ? X

Server: <Server name>

Service: sde:oracle11g:< SQL_Net_alias >

Database:

(If supported by your DBMS)

Account

☒ Database authentication

Username: <Username>

Password: <Password>

☒ Save username and password

☐ Operating system authentication

Direct Connection Syntax

Connecting to a USER schema in multiple GDB setup

The image shows a screenshot of a 'Spatial Database Connection' dialog box. The dialog has a title bar with a question mark and a close button. It contains several input fields and a section for account authentication.

Spatial Database Connection

Server:

Service:

Database:

(If supported by your DBMS)

Account

☒ Database authentication

Username:

Password:

☒ Save username and password

☐ Operating system authentication

Direct Connection Syntax

Append oracle service name to password

The screenshot shows a 'Spatial Database Connection' dialog box with the following fields and options:

- Server:** <Server name>
- Service:** sde:oracle<db client version>
- Database:** (Empty field)
- (If supported by your DBMS)**
- Account:**
 - ☒ Database authentication
 - Username:** <Username>
 - Password:** <Password>@<SQL_Net_alias>
 - ☒ Save username and password
 - ☐ Operating system authentication

Direct Connection Syntax

Append oracle service name to service

The screenshot shows a Windows-style dialog box titled "Spatial Database Connection". It contains several input fields and a section for account authentication.

Server: <Server name>

Service: sde:oracle11g:/;LOCAL=< SQL_Net_alias >

Database: (If supported by your DBMS)

Account

☒ Database authentication

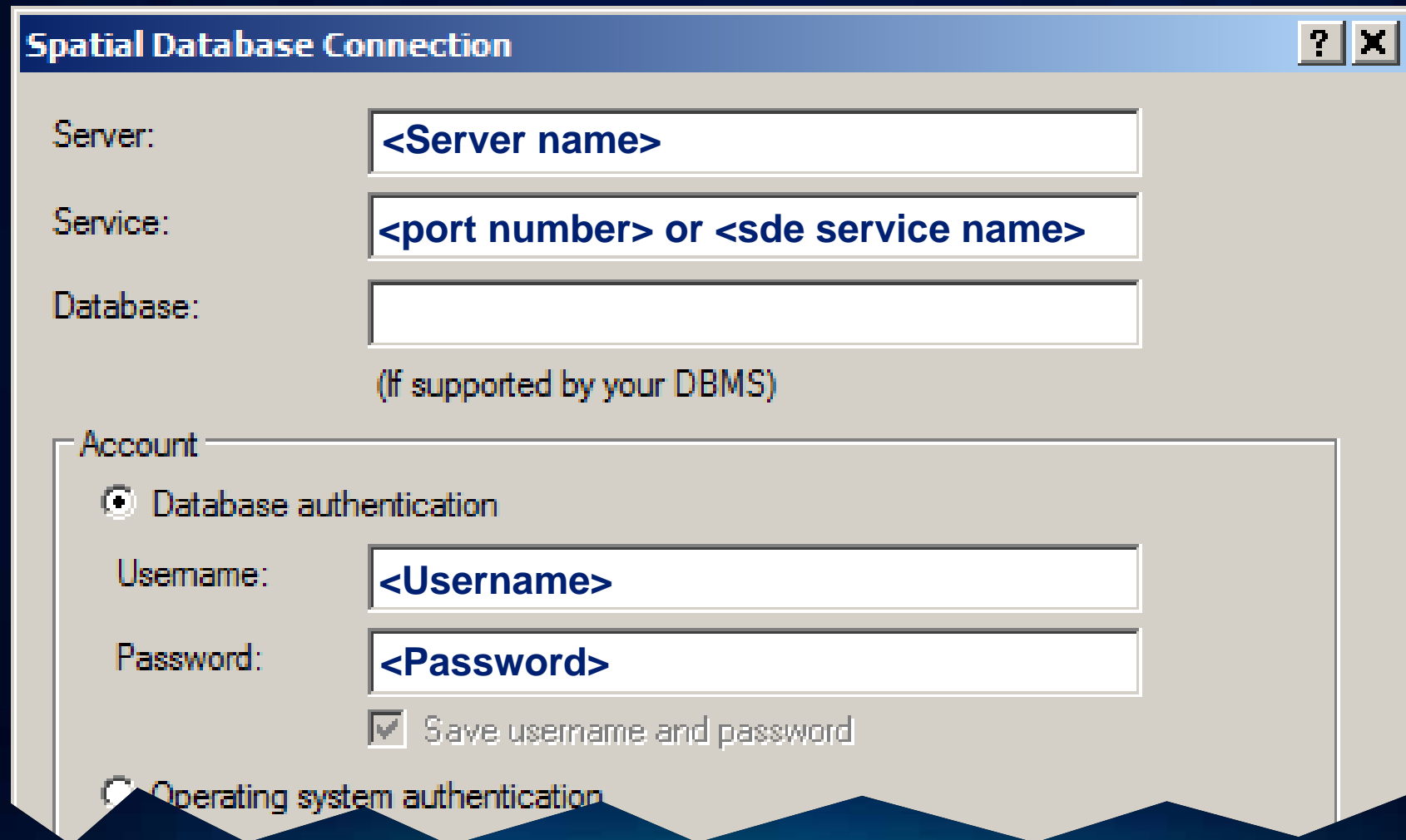
Username: <Username>

Password: <Password>

☒ Save username and password

☐ Operating system authentication

Application Server Connection



The image shows a 'Spatial Database Connection' dialog box. It has a title bar with a question mark and a close button. The main area contains three input fields: 'Server:' with the placeholder '<Server name>', 'Service:' with the placeholder '<port number> or <sde service name>', and 'Database:' which is empty. Below the 'Database:' field is the text '(If supported by your DBMS)'. There is a section titled 'Account' which contains two radio buttons. The first is 'Database authentication' which is selected. Below it are 'Username:' and 'Password:' fields with placeholders '<Username>' and '<Password>' respectively. Below these is a checked checkbox labeled 'Save username and password'. The second radio button is 'Operating system authentication'.

Spatial Database Connection ? X

Server: <Server name>

Service: <port number> or <sde service name>

Database:

(If supported by your DBMS)

Account

☒ Database authentication

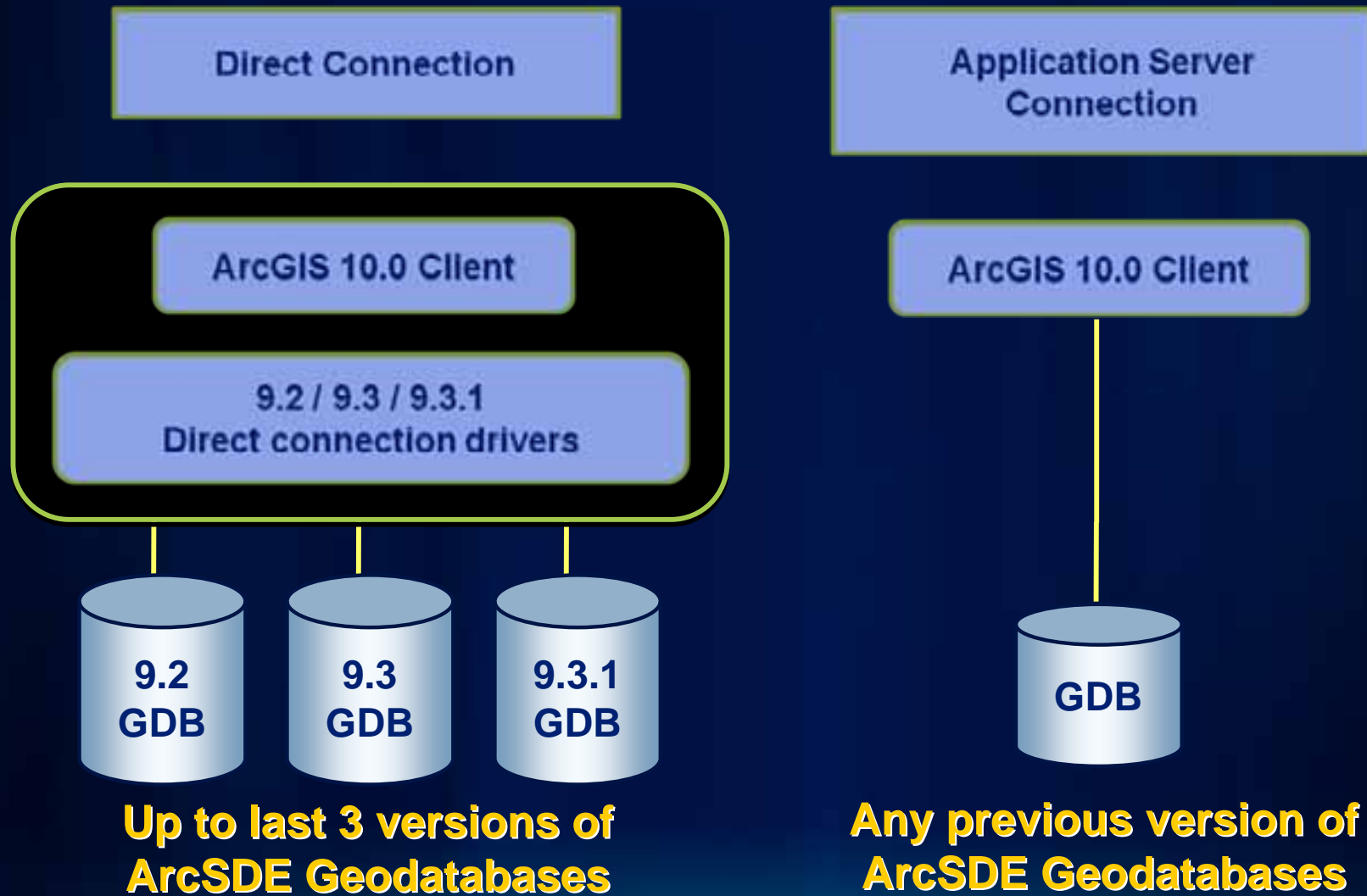
Username: <Username>

Password: <Password>

☒ Save username and password

☐ Operating system authentication

Backwards Compatibility



Direct Connection Drivers

Compatibility Matrix

	10 GDB	9.3.1 GDB	9.3 GDB	9.2 GDB	9.1 GDB	9 GDB
10 client	Y	Y	Y	Y		
9.3.1 client		Y	Y	Y*	Y*	Y *
9.3 client		Y+	Y	Y*	Y*	Y *
9.2 SP5+ client		Y*+	Y*+	Y		
9.2 SP 1–4 clients				Y		
9.1 client					Y	
9 client						Y

*** Additional Drivers need to be installed**

+ Forward compatibility to version indicated

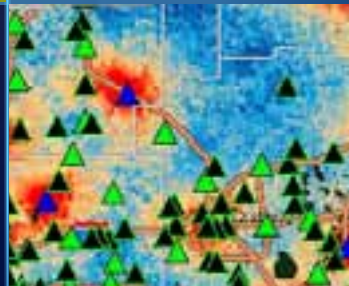
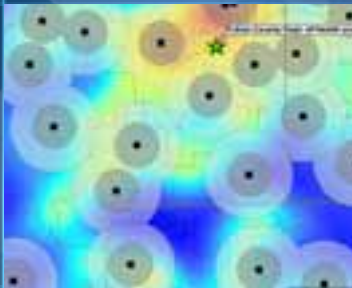
Webhelp - [Making a direct connection from ArcGIS Desktop to a geodatabase in Oracle](#)

DeKalb County Board of Health

Fulton County Dept. of Health and Wellness/District 3, Unit 2: C

Demonstration

- Create User
- Making a connection



Agenda

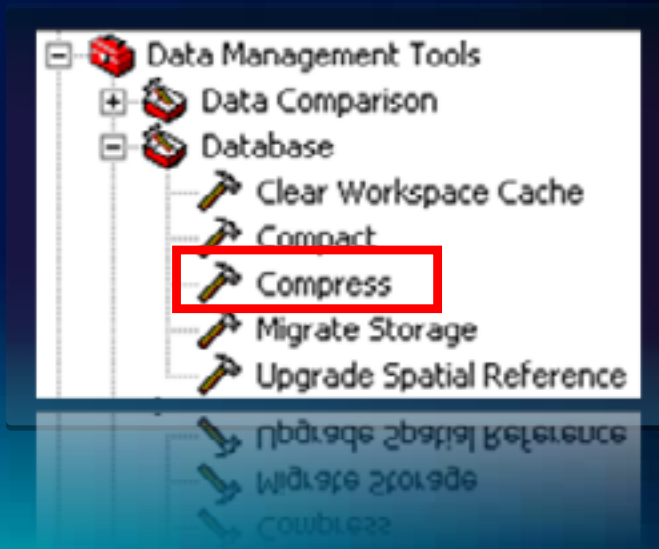
- System Architecture
- Installing and Configuring ArcSDE
- Users and Privileges
- Connecting to the Geodatabase
- **Geodatabase Maintenance**
 - **Backup Recommendations**
 - **Compressing the Geodatabase**
 - **Statistics & Indexes**
- Storage Types
- Troubleshooting
- Resources
- Questions

Backup Recommendations

- Information stored in the SDE Repository
 - Registration of tables spatial and non-spatial
 - Tracking of Versioned Edits
 - ArcObject behaviors
- In a **Read/Write** database
 - Best to work with a point in time restores
 - Enable ARCHIVELOG mode
 - Test restore to a point in time on a test system

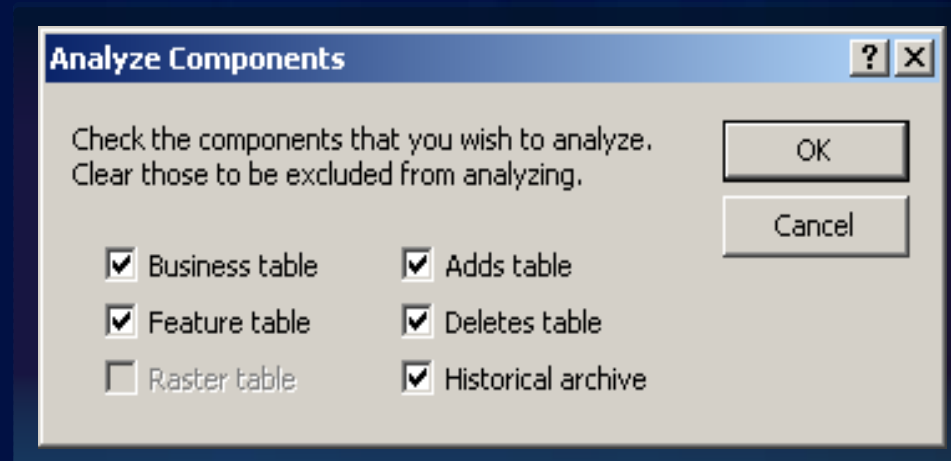
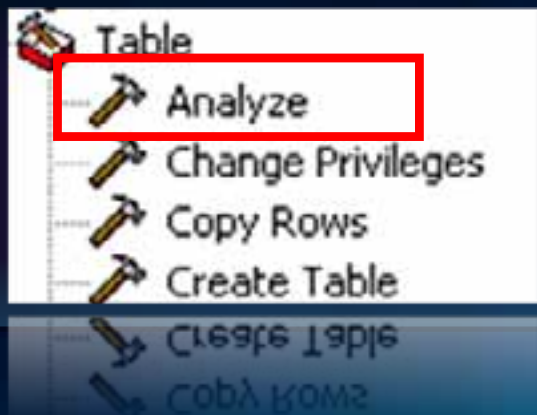
Compressing the Geodatabase

- Improves performance
 - Removes unnecessary rows related to versioned edits
 - Reduces overall retrieval times
- Critical to compress regularly
 - Nightly or weekly depending on number of edits
 - Update database statistics after running compress
 - Users connected during a compress will be excluded
- Must be performed by SDE user by using
 - ArcCatalog
 - Geoprocessing Tool
 - `sdeversion -o compress`



Oracle table statistics

- Describe segment characteristics for optimizer and DBA
 - Critical for maintaining performance
 - Current statistics increase Oracle IO performance
- Update when data changes significantly:
 - Loading
 - Major editing
- Analyze through ArcGIS



**Create statistics on attributes,
geometry, versioning delta
tables and historical archive**

Agenda

- System Architecture
- Installing and Configuring ArcSDE
- Users and Privileges
- Connecting to the Geodatabase
- Geodatabase Maintenance
- **Storage Types**
 - **Storage Options**
 - **Controlling Storage**
- Troubleshooting
- Resources
- Questions

ESRI Spatial Type – ST_GEOMETRY

- User Defined Type (UDT) used to store geographic features
- Allows access to spatial data through SQL functions
- Efficiency - Automatic geometry validation
- Conforms to ISO and OGC standards
- Available since ArcSDE 9.2

```
SQL> desc gdb.streets_st_geom
```

Name	Null?	Type
OBJECTID	NOT NULL	NUMBER(38)
CFCC		NVARCHAR2(3)
SHAPE		SDE.ST_GEOMETRY

ESRI Spatial Type – ST_Raster

- **New at 10.0**
- **Must be installed separately**
 - `sdesetup -o install_st_raster`
- **SQL Raster Functions**
 - Load and edit raster data
 - Export raster data to GeoTIFF File
 - Build raster pyramids and mosaic

Using SQL with ST_GEOMETRY

- Needs an external dll
- Extproc needs to be set up for
 - Executing SQL commands on a ST_GEOMETRY column
 - For using ST_GEOMETRY operators
 - Definition and label queries inside ArcMap
- With SQL and ST you can
 - Create tables with a spatial attribute
 - Read and Analyze the spatial data
 - Insert, update and delete simple geometry data
- Geodatabase behavior not supported through SQL

Setting up the ExtProc

tnsnames.ora file:

```
EXTPROC_CONNECTION_DATA =  
  (DESCRIPTION =  
    (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1))  
    (CONNECT_DATA =  
      (SID = PLSExtProc)  
      (PRESENTATION = RO))  
  )
```

Key must match

listener.ora file:

```
LISTENER =  
  (DESCRIPTION_LIST =  
    (DESCRIPTION =  
      (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1))  
      (ADDRESS = (PROTOCOL = TCP)(HOST=AKLAP.esri.com)(PORT=1521))  
    )  
  )
```

New Entry

Original Entry

Setting up the ExtProc

listener.ora file:

```
LISTENER =  
  (DESCRIPTION_LIST =  
    (DESCRIPTION =  
      (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1))  
      (ADDRESS = (PROTOCOL = TCP)(HOST=AKLAP.esri.com)(PORT=1521))  
    )  
  )  
  
SID_LIST_LISTENER =  
  (SID_LIST =  
    (SID_DESC =  
      (SID_NAME = PLSExtProc)  
      (ORACLE_HOME = C:\oracle\product\10.2.0\db_1)  
      (PROGRAM = extproc)  
      (ENVS="EXTPROC_DLLS=C:\Program Files\ArcGIS\ArcSDE\  
            ora10gexe\bin\st_shapelib.dll")  
    )  
  )  
)
```

Oracle ExtProc - for St_geometry

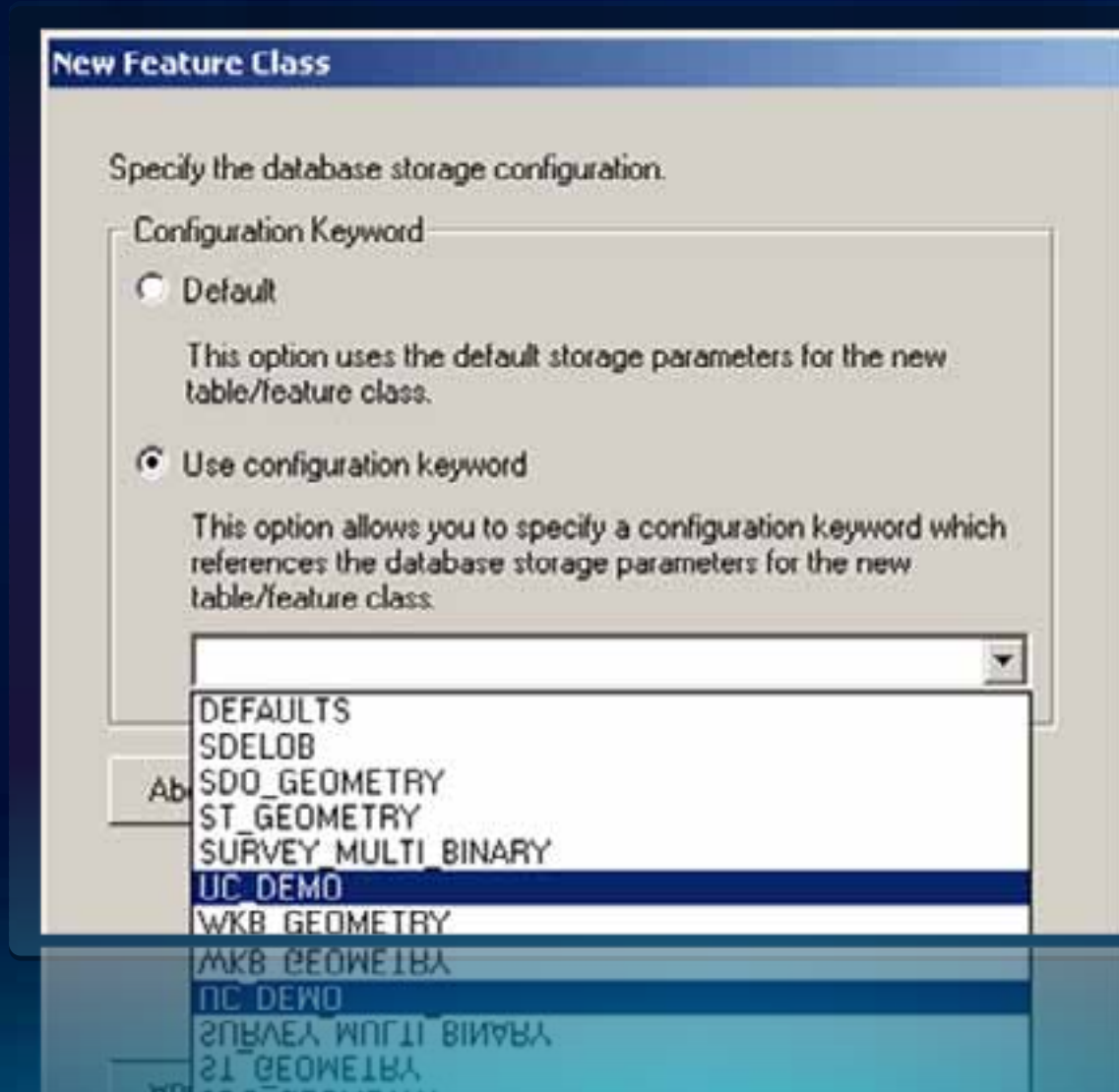
- **Modify the listener.ora and tnsnames.ora files**
 - Oracle Documentation
 - Webhelp topic - [Configuring the Oracle listener to access the geodatabase with SQL](#)
 - Technical articles:
 - [32188](#) - Error: ORA-28595: Extproc agent : Invalid DLL Path
 - [33003](#) - Error: ORA-06522: libsg.so: cannot open shared object file: No such file or directory
 - [33004](#) - Bug: ORA-06522: (path)\st_shapelib.dll: cannot open shared object file: No such file or directory
 - [38043](#) – Bug: Configure ST_GEOMETRY for use in Oracle 11G Release 2 on Windows
 - [39119](#) – How to: Check if the Oracle extproc is set up correctly for direct ST_GEOMETRY SQL queries

Controlling Storage

- Tablespace Management based on
 - Backup requirements
 - Activity
 - Size of segment
- SDE.DBTUNE table
 - Specifies **configuration keyword**, storage type, storage parameters
 - Dbtune entries store text for CREATE statements
- To create a keyword:
 - Export DBTUNE table to a file, edit it and import back to DBTUNE table
- To alter a keyword:
 - `sdedbtune -o alter`

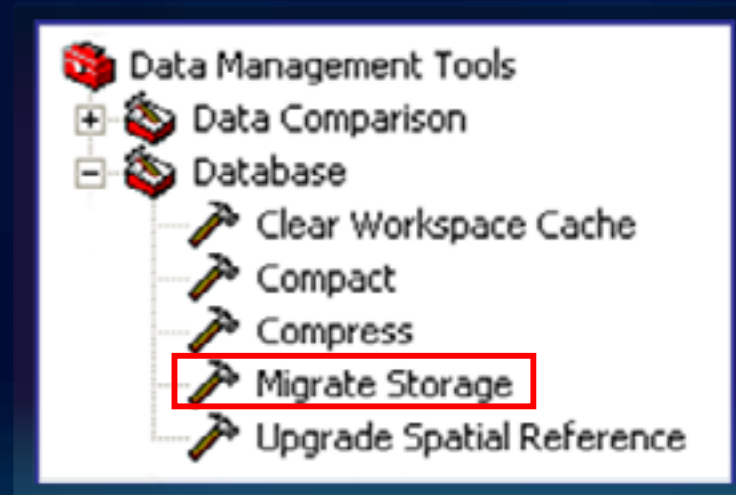
Accessing DBTUNE keyword in ArcGIS

- DBTUNE keyword must contain a UI_TEXT parameter



Migration Tool

- **LONG RAW** data type being deprecated at Oracle 11g
- **Migrate Storage GP tool**
 - Easily convert GIS datasets from a different storage format to **ST_GEOMETRY** in Oracle
 - Changes data “in place”, no new datasets are created
 - Must be the data owner to execute
 - Supports versioned & archived datasets



Agenda

- System Architecture
- Installing and Configuring ArcSDE
- Users and Privileges
- Connecting to the Geodatabase
- Geodatabase Maintenance
- Storage Types
- **Troubleshooting**
 - **SDE log files**
 - **DBMS log files**
 - **DBMS tracing**
- Resources
- Questions

Diagnostic Files

- Log files are ArcSDE output about what SDE is doing
- Useful when encountering a problem such as
 - Service will not start, log file will tell you why
- ArcSDE logs stored in SDEHOME\etc
 - giomgr_<service>.log – Client connection info
 - sde_<service>.log – Application Server error messages
 - sdedc_Oracle.log – Direct Connect error messages
- Oracle log files, contain DBMS logged information
 - System alert log: alert_<sid>.log
 - Background process logs

Oracle Trace Output – using tkprof

The output contains SQL execution paths, row counts and wait events

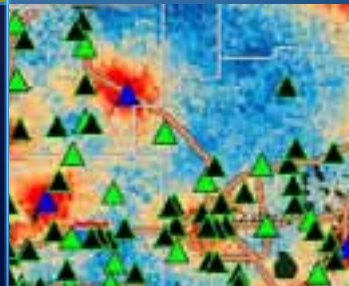
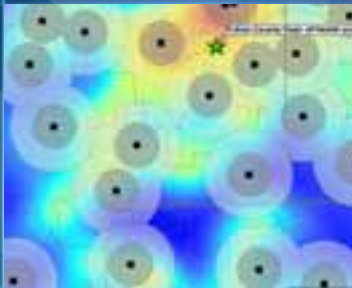
Demo theatre – **Wednesday 11:30 am to 12:00 pm - Using Oracle Trace to Troubleshoot**

OVERALL TOTALS FOR ALL NON-RECURSIVE STATEMENTS							
call	count	cpu	elapsed	disk	query	current	rows
Parse	0	0.00	0.00	0	0	0	0
Execute	16	0.17	0.19	0	0	0	0
Fetch	189	2.96	3.53	0	1605	0	17820

	205	3.14	3.72	0	1605	0	17820
Misses in library cache during parse: 0							
Elapsed times include waiting on following events:							
Event waited on	Times		Max. Wait	Total Waited			
	Waited						
SQL*Net message to client	200		0.00	0.00			
SQL*Net message from client	199		0.52	2.50			
SQL*Net more data to client	923		0.00	0.09			
direct path read	44		0.05	0.15			
log file sync	12		0.00	0.00			

Demonstration

- Set up extproc*
- Show keywords*
- Show Logfiles*



Agenda

- System Architecture
- Installing and Configuring ArcSDE
- Users and Privileges
- Connecting to the Geodatabase
- Geodatabase Maintenance
- Storage Types
- Troubleshooting
- Resources
 - Product Information
 - UC Events and Workshops
- Questions

Resources:

- **Product Information**

- <http://resources.arcgis.com/>
- <http://support.esri.com/>

- **User forums and groups**

- <http://forums.arcgis.com/forums/32-Geodatabase-amp-ArcSDE>
- <http://forums.esri.com/forums.asp?c=158> (read only)

- **UC events and Workshop**

Exhibit Hall C - Geodatabase Island

Tuesday and Wednesday - 9:00 am – 6:00 pm

Thursday 9:00 am – 1:30 pm

Training resources

<http://www.esri.com/training>

- **Instructor-Led Courses**

- **Building Geodatabases**
- **Introduction to the Multiuser Geodatabase**
- **Data Management in the Multiuser Geodatabase**
- **ArcGIS Server Enterprise Configuration and Tuning for Oracle**

- **Free Web Training Seminars**

- **Understanding ArcSDE Table Relationships**
- **Introduction to ArcGIS Data Models**

Agenda

- System Architecture
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- **Questions?**

***Please fill out the
evaluation
& Thanks for attending!***

Other Sessions

Technical Workshop 20 Minute

- Road Ahead – GDB Admin
Thursday 3:40 Room 27B
- Road Ahead – Geodatabase
Thursday 9:20am Room 6B

www.esri.com/sessionevals

Technical Workshops

- **Administration for Oracle – Advanced**

Tuesday 10:15am Room 4

Wednesday 3:15pm Room 4

Geodatabase Management Demo Theatre Presentations

- **Using Oracle Trace to Troubleshoot**

Wednesday 11:30am

Thursday 11:30am

- **Using SQL with your Geodatabase**

Thursday 10:30am

Technical Workshop 20 Minute

- **Migrating Data to the Geodatabase**

Wednesday 3:40pm Room 6B

www.esri.com/sessionevals

Technical Workshop 20 Minute

- **Troubleshooting Performance Issues with Enterprise Geodatabases**

Thursday 10:40am Room 24A

- **Upgrading to ArcGIS 10.0 Geodatabases**

Thursday 1:30pm Room 23B

- **Using Spatial Data in ArcGIS with Query Layers**

Thursday 1:55pm Room 23B

- **Implementing Database Roles in the Enterprise Geodatabase**

Thursday 3:15pm Room 3

- **Enterprise Geodatabase Administration – Tips and Tricks**

Thursday 3:40pm Room 3