



# Administering Your Oracle Geodatabase

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## A few questions...

- How many were at last year's User Conference and attended this session?
- How many are using Oracle 10g, 11g, 12c?
- How many installing arcsde and using application server – port 5151?
- Who are you? DBA's, GIS Manager's
- Experience – brand new?

# Agenda

- Where do I start...
  - Configure Oracle to support geodatabases?
  - Create geodatabases?
  - Control access to my data?
  - Store spatial data?
  - Make sure that my data is safe?
  - Maintain good performance?
- News since the last UC



# How do I...?

Common questions when working with  
Oracle databases and geodatabases



**How do I...  
configure Oracle  
to support geodatabases?**

# How do I configure Oracle to support geodatabases?

- **Install a supported version of Oracle**  
Oracle database requirements for ArcGIS 10.3.x
- **Install Oracle Text Option**
- **Execute privileges on packages**
  - dbms\_lob, dbms\_lock, dbms\_pipe, dbms\_utility, dbms\_sql, utl\_raw, dbms\_crypto (sde user only)...
  - after Geodatabase is enabled some privileges can be restricted



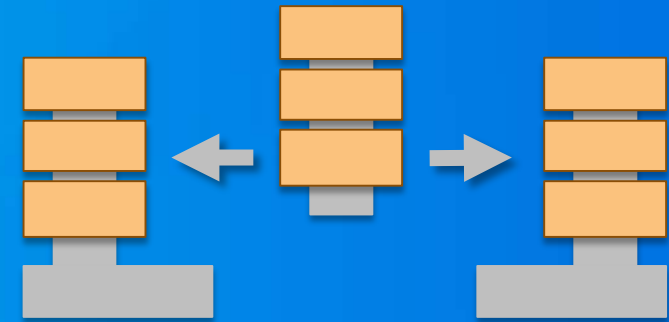
## Supported versions at 10.3/10.3.x

- **Standard/Standard One/Enterprise Editions:**
  - Oracle 10g R2 (64-bit) 10.2.0.3
    - 10.3.x does not support use of 10g Oracle Client
    - 10.3.x last release to support 10g
  - Oracle 11g R2 (64-bit) 11.2.0.3
  - Oracle 12c R1 (64-bit) 12.1.0.1
  - Oracle Text Component must be installed
- **Operating System Support (as supported by Oracle version)**
  - Windows 2008R2, 2012
  - Redhat and Oracle Linux 5,6,7
  - SUSE Linux 10,11
  - Solaris 10,11
  - AIX 6.1, 7.1

# Oracle 12c Multitenant

## Pluggable databases

- At 12c Geodatabase can be in
  - Traditional 12c instance or
  - 12c pluggable database not container
- Can provide
  - Rapid provisioning and cloning
  - Staging for patching and upgrades
  - Consolidation and unified management
- Does require additional licensing if Container Database (CDB) contains more than two Pluggable Databases (PDB)
- Up to 252 PDB's in a single CDB
- e.g. `create pluggable database pdbgdb_clone from pdbgdb;`





## Additional Requirements Notes

- Oracle 11g R2 or Oracle 12c database client must be used to connect to Oracle 10g R2.
- Oracle Linux supported based on source and binary compatibility with Redhat Enterprise Linux
- Exadata support based on Oracle Linux and RAC compatibility.
- While 11.2.0.3 is the 11g base supported version, there are several issues customers have encountered. Therefore, Esri recommends moving to 11.2.0.4.
- Oracle 10.2.0.3 ST\_GEOMETRY users need to apply Oracle Patch that fixes Oracle bug 6756089.

# Memory and Initialization Parameters

- **Memory Tuning**

- SGA must not swap (2/3 RAM or less)
- Avoid excessive paging (SGA too large)
- Configure enough virtual memory (3-4 times RAM), avoid excessive paging
- Explicit quotas on tablespaces (avoid running out of space)

- **Initialization Parameters**

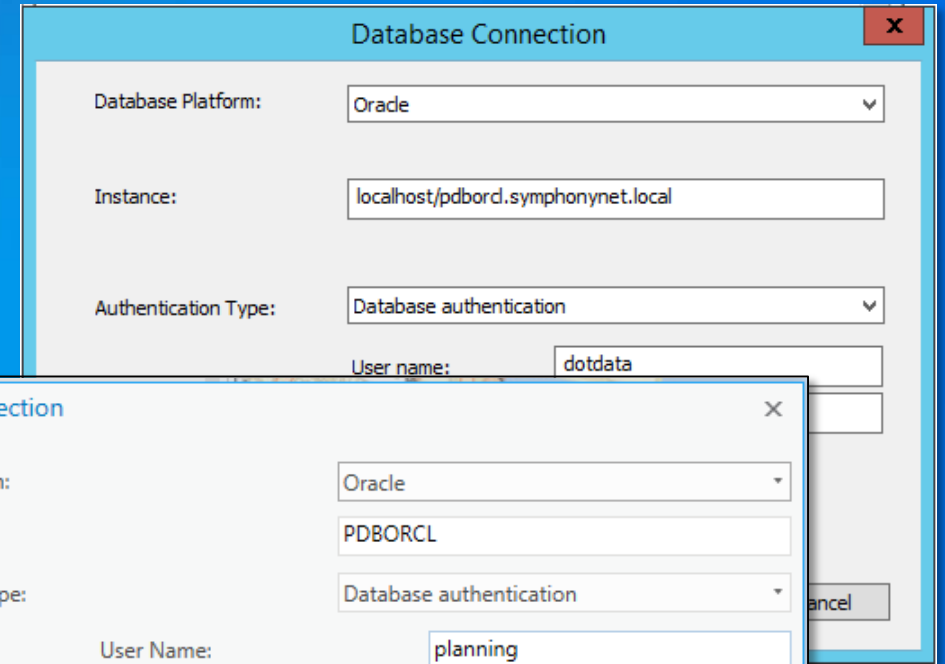
- OPEN\_CURSORS (2000 or higher - consult ArcGIS online help)
- SESSION\_CACHED\_CURSORS (minimum of 50, 50-150)
- SESSIONS and PROCESSES  
(Geodatabase Connections parameter not applicable at 10.3 and higher)

- **UNDO\_POOL**

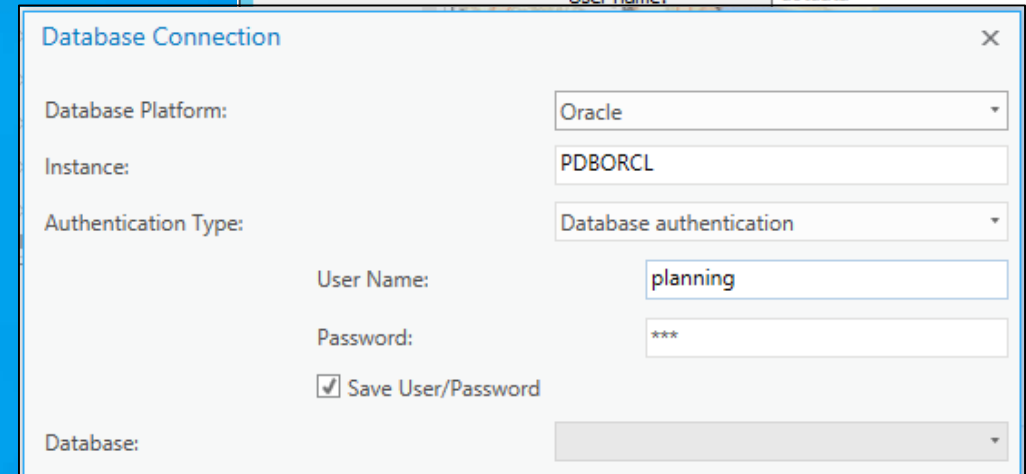
- Resource manager plan directive, can be set to allow for unlimited undo pool for SDE user (set up a consumer group) for large compress operations

# Oracle Client Notes

- 32 bit or 64 bit as needed
  - Desktop and Engine 32 bit
  - Server and Pro 64 bit
- Instant, Runtime or Admin client
- Set PATH to client libraries
- TNSNAMES.ora file
- SQLNET.ora file
  - Important for Easy Connect configurations



A screenshot of the Oracle Database Connection dialog box. The title bar reads "Database Connection". The fields are: Database Platform: Oracle (dropdown); Instance: localhost/pdbordc.symphony.net.local; Authentication Type: Database authentication (dropdown); User name: dotdata.

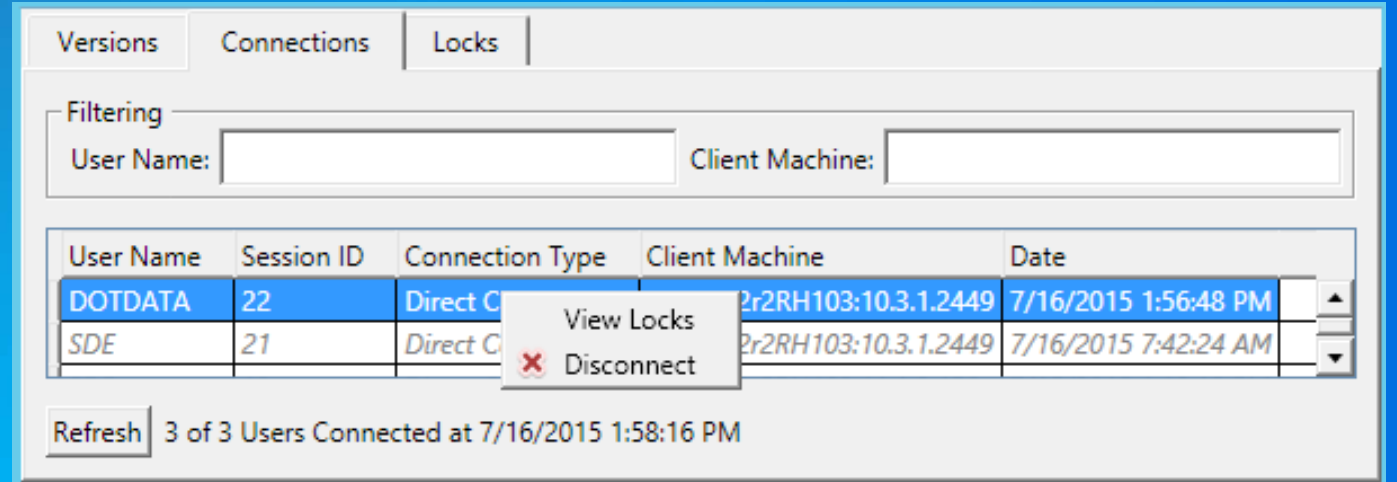


A screenshot of the Oracle Database Connection dialog box. The title bar reads "Database Connection". The fields are: Database Platform: Oracle (dropdown); Instance: PDBORCL; Authentication Type: Database authentication (dropdown); User Name: planning; Password: \*\*\*; Save User/Password: checked; Database: (dropdown).

server name/service name (or ID)	<code>dbserver/orcl</code>
IP address of server/service name (or ID)	<code>10:10:10:10/orcl</code>
server name:port/service name (or ID)	<code>dbserver:60000/orcl</code>
service name if default instance in listener	<code>orcl</code>

# Managing Connections

- ArcGIS Desktop
- Python



```
arcpy.ListUsers("c:\\temp\\oragdb.sde")
```

```
[user(ClientName=u'PC4', ConnectionTime=datetime.datetime(2014, 2, 18, 8, 30, 19),  
ID=18, IsDirecConnection=True, Name=u'publisher1')]
```

```
[user(ClientName=u'PC25', ConnectionTime=datetime.datetime(2014, 2, 21, 14, 10, 43),  
ID=33, IsDirecConnection=True, Name=u'editor2')]
```

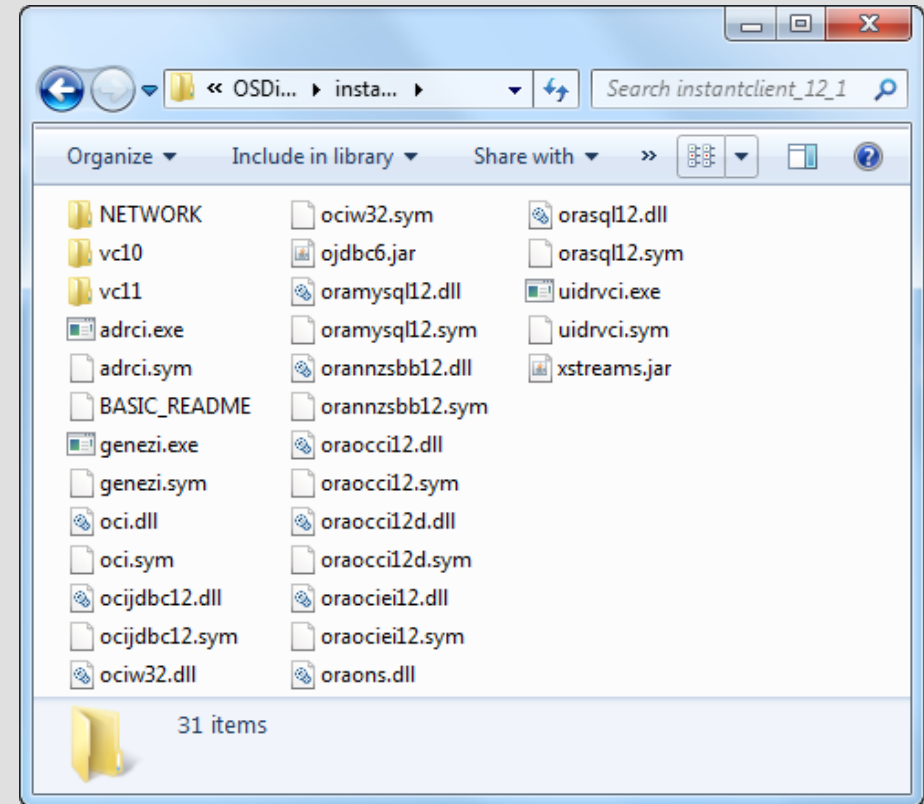
```
arcpy.DisconnectUser("c:\\temp\\oragdb.sde",33)
```

The user session will be immediately dropped from the geodatabase.

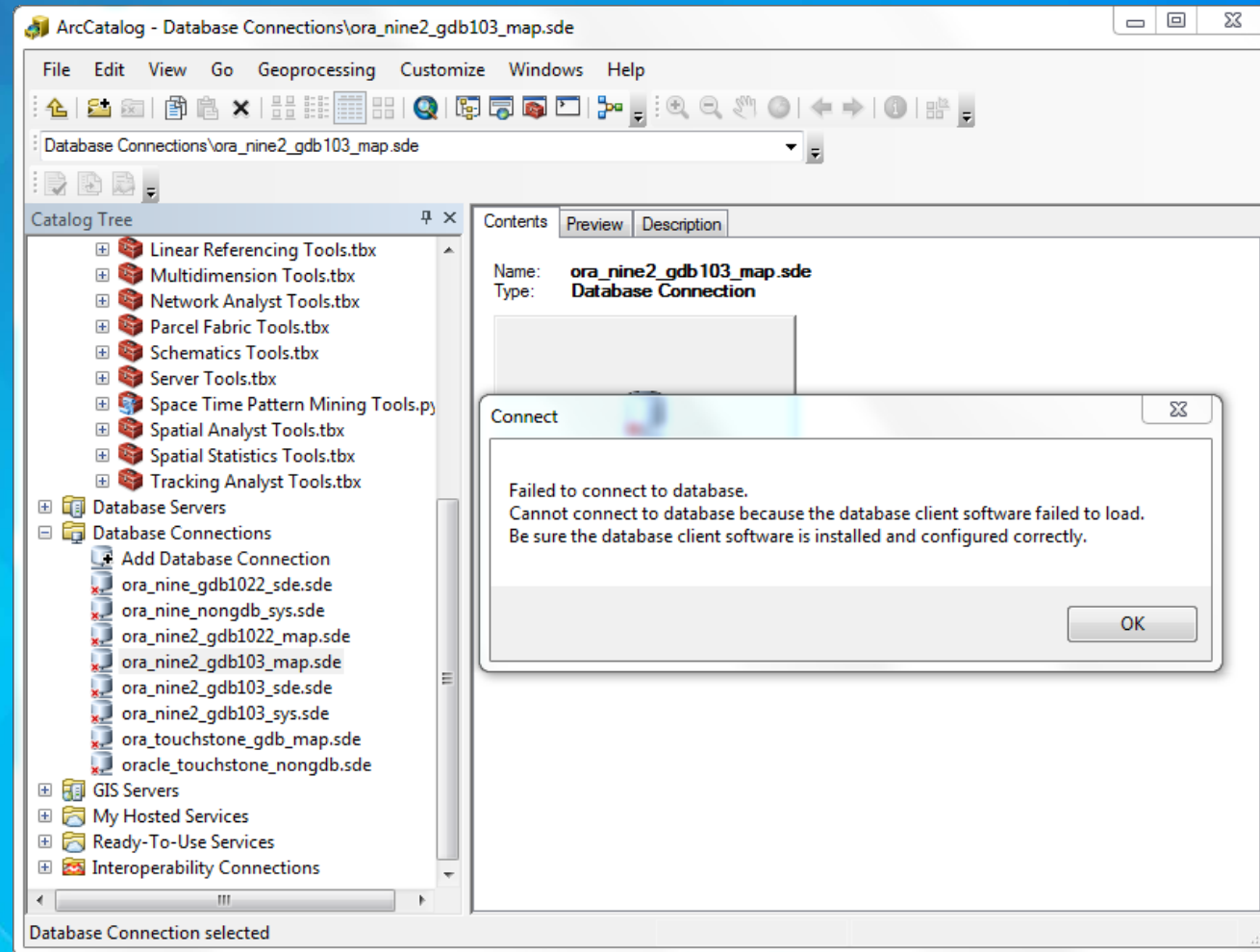
Demo

# Configuring the Oracle Instant Client

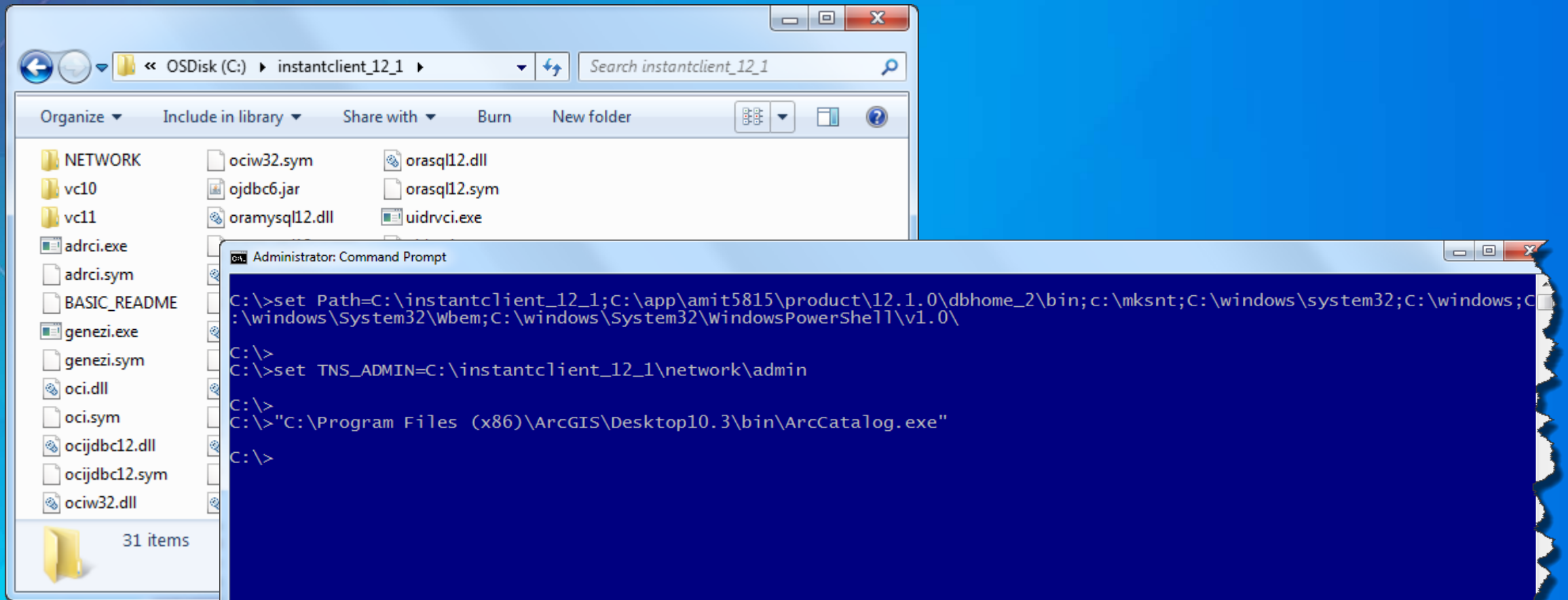
Amit Kesarwani



# Connection failed



# Add instant client directory location to “Path” environment variable and “Tns\_admin” env variable



The image shows a Windows file explorer window displaying the contents of the directory `C:\instantclient_12_1`. The file list includes:

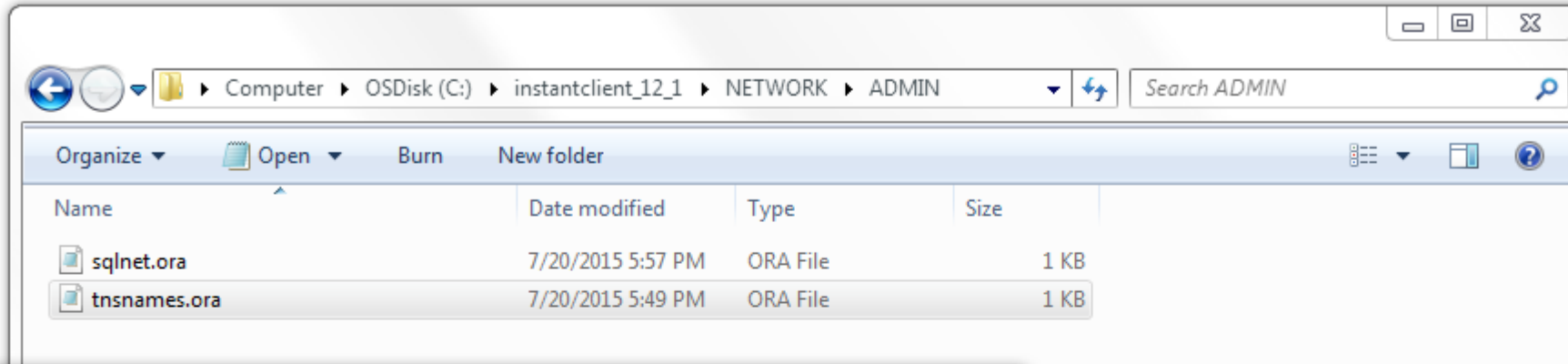
- NETWORK
- vc10
- vc11
- adrci.exe
- adrci.sym
- BASIC\_README
- genezi.exe
- genezi.sym
- oci.dll
- oci.sym
- ocijdbc12.dll
- ocijdbc12.sym
- ociw32.dll
- ociw32.sym
- oradbc6.jar
- oramysql12.dll
- orasql12.dll
- orasql12.sym
- uidrvci.exe

Below the file explorer, an Administrator Command Prompt window is open, showing the following commands and their output:

```
C:\>set Path=C:\instantclient_12_1;C:\app\amit5815\product\12.1.0\dbhome_2\bin;c:\mksnt;C:\windows\system32;C:\windows;C:\windows\System32\wbem;C:\windows\System32\WindowsPowerShell\v1.0\
C:\>
C:\>set TNS_ADMIN=C:\instantclient_12_1\network\admin
C:\>
C:\>"C:\Program Files (x86)\ArcGIS\Desktop10.3\bin\ArcCatalog.exe"
```



# Manually add tnsnames.ora and sqlnet.ora in the Instant client

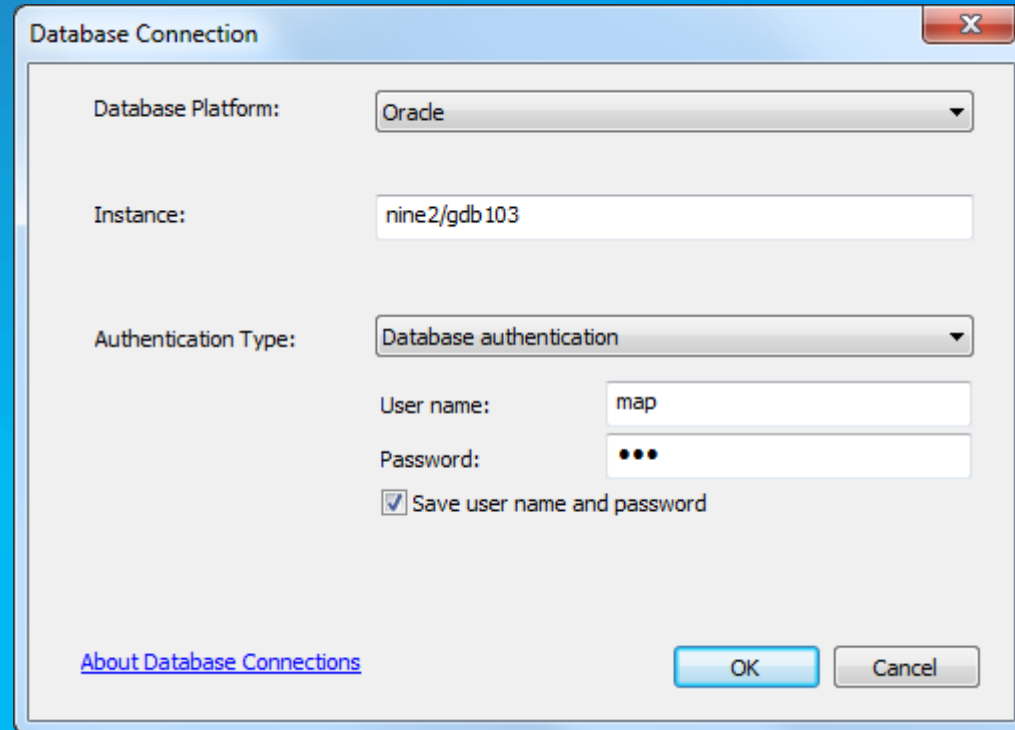


```
tnsnames.ora - Notepad
File Edit Format View Help
)
)
GDB103_instant =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = NINE2.esri.com)(PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = gdb103)
    )
  )
)
GDB1022 =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = NINE2.esri.com)(PORT = 1521))
    (CONNECT_DATA =
```

```
sqlnet.ora - Notepad
File Edit Format View Help
SQLNET.AUTHENTICATION_SERVICES = (NTS)
```



# Connection using Ezconnect syntax – “server/instance”



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

- Database Platform:** Oracle
- Instance:** nine2/gdb103
- Authentication Type:** Database authentication
- User name:** map
- Password:** (masked with three dots)
- Save user name and password

At the bottom left, there is a link: [About Database Connections](#). At the bottom right, there are 'OK' and 'Cancel' buttons.

# Connection using Tns name

Database Connection

Database Platform: Oracle

Instance: GDB103\_instant

Authentication Type: Database authentication

User name: map

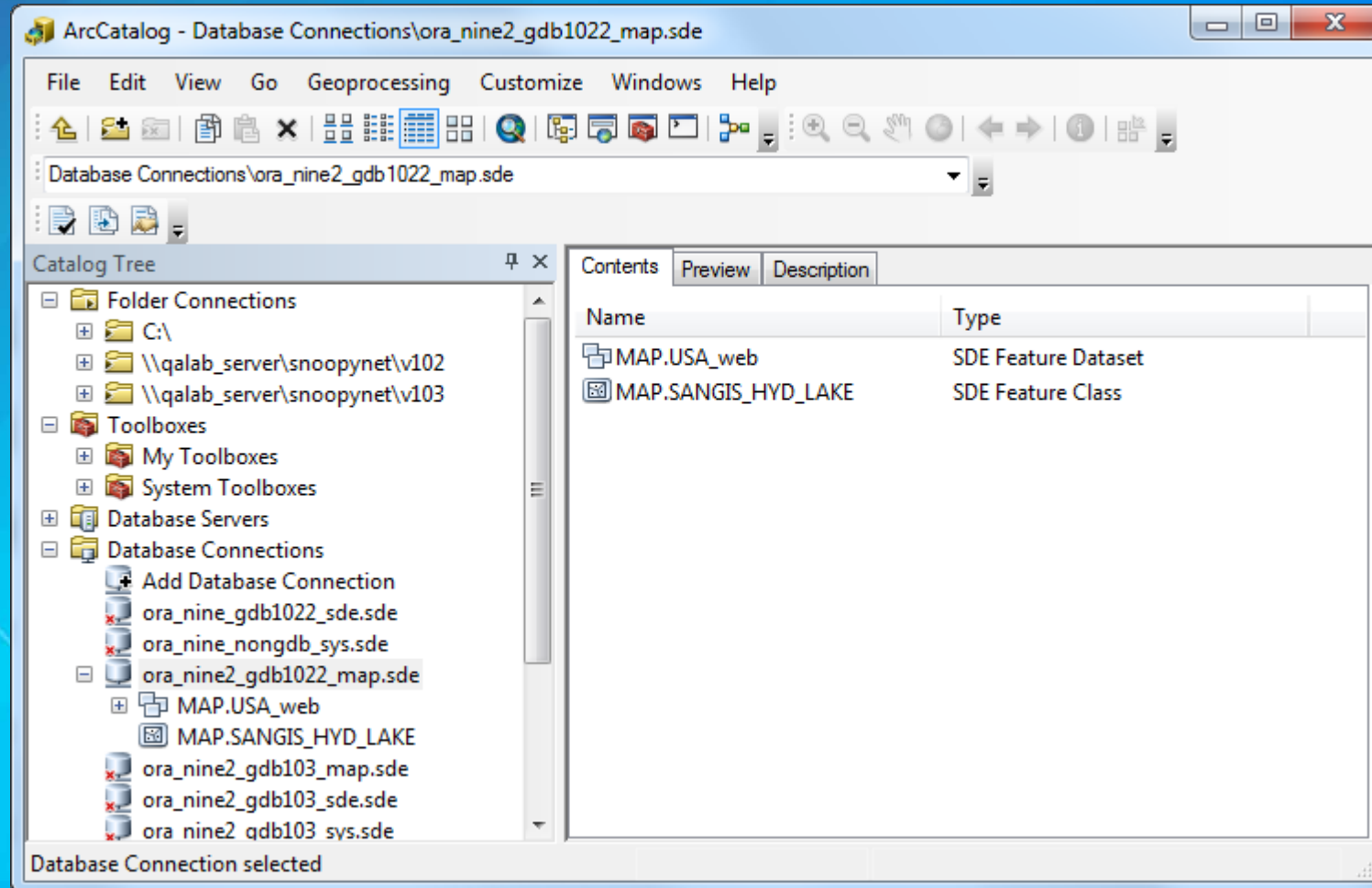
Password: ●●●

Save user name and password

[About Database Connections](#)

OK Cancel

# Connection successful





**How do I...  
create geodatabases?**

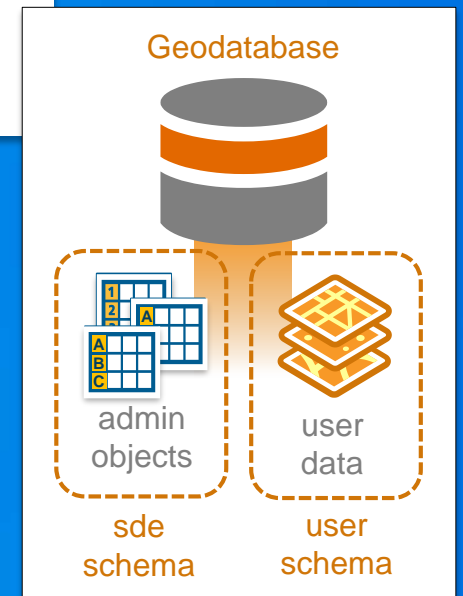
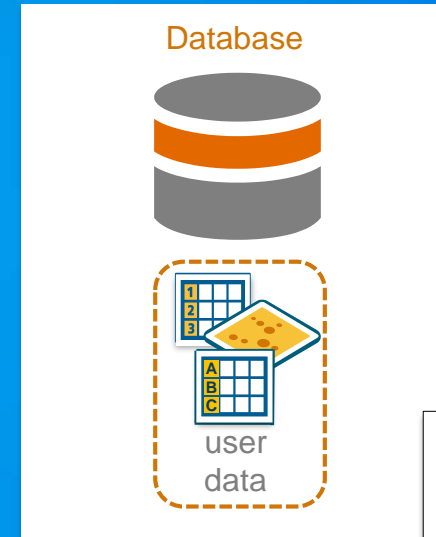
# Databases and Geodatabases

- **An Oracle database lives in an Oracle instance**
  - 10g and 11g there is a single database per instance
  - 12c introduced multi-tenant with pluggable databases (additional cost if more than 1)
- **A geodatabase is an ArcGIS construct hosted in a database**

# Database vs. Geodatabase

Behaviors, Complex Features, Versioning and Distributed Data

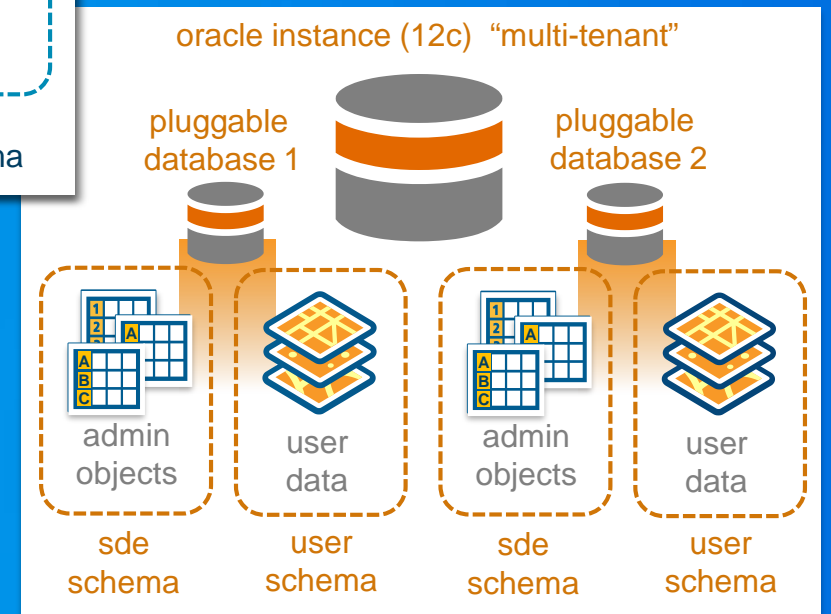
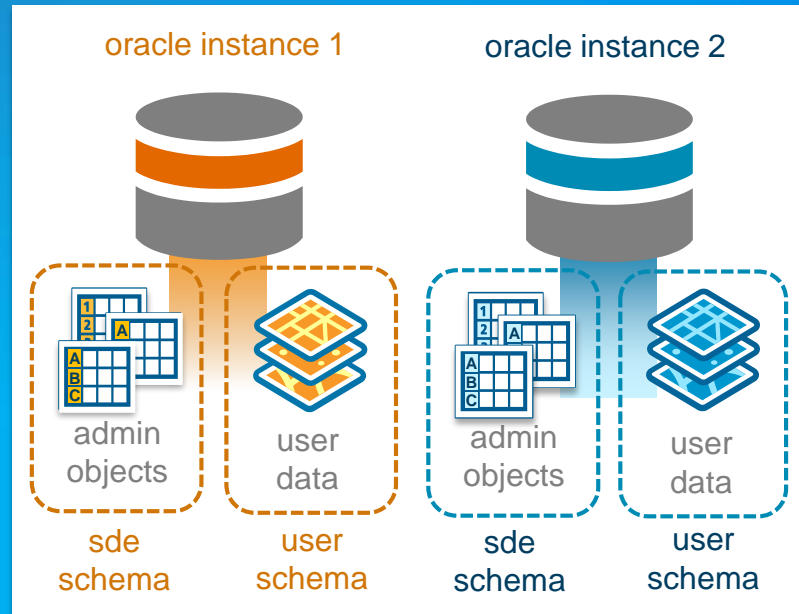
- **Database provides**
  - Transaction Management
  - Authorization/Security
  - Data Management
  - Spatial Types
  - Backup
- **Enterprise Geodatabase is an Oracle Database with an Administrative Schema providing**
  - Behaviors
  - Complex Features (Topologies, Networks, Parcel Fabrics, etc...)
  - Versioning (Long Transactions)
  - Distributed Data
  - Archiving



# Multiple Geodatabase in Oracle

Multiple Instances, 12c Multi-Tenant, Schema Geodatabase

- Multiple Instances
- 12c Pluggable Database
- Schema (*special cases*)



## Enabling (or Creating) Geodatabase

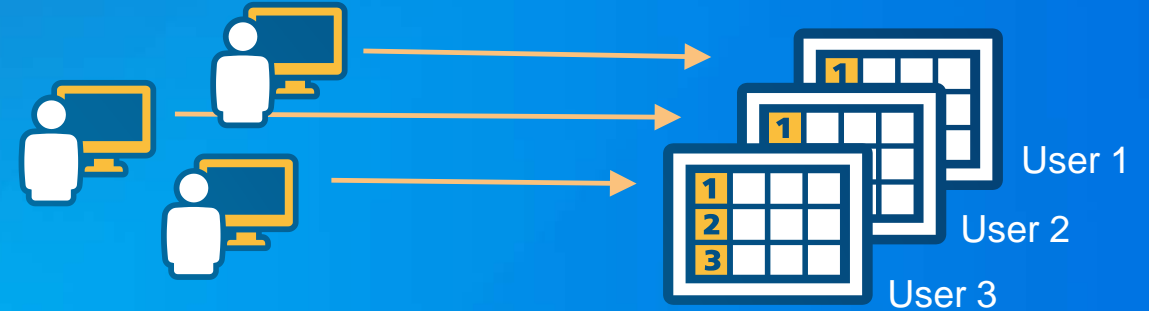
- **Use GP Tools (or python) to enable (or create) geodatabases**
- **It is more typical with Oracle that instance/database will already be present**
- **Enable geodatabase tool**
  - **Create a geodatabase in an existing database, without sysadmin privileges**
- **Create geodatabase tool**
  - **Creates SDE user and tablespace, requires SYS**



# Logfile Table Architecture

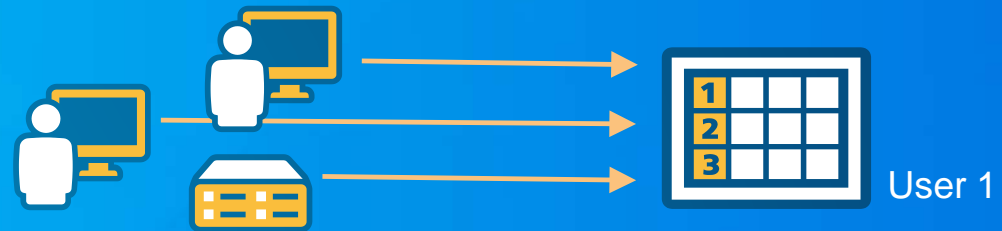
- Architectures

- Shared
- Session
- Pools owned by GDB admin
- Configure Geodatabase Log File tool



- Shared is default for Oracle

- User must have create table, create session and create sequence
- Could be contention if many users connect with same name.



- Pool owned by GDB admin

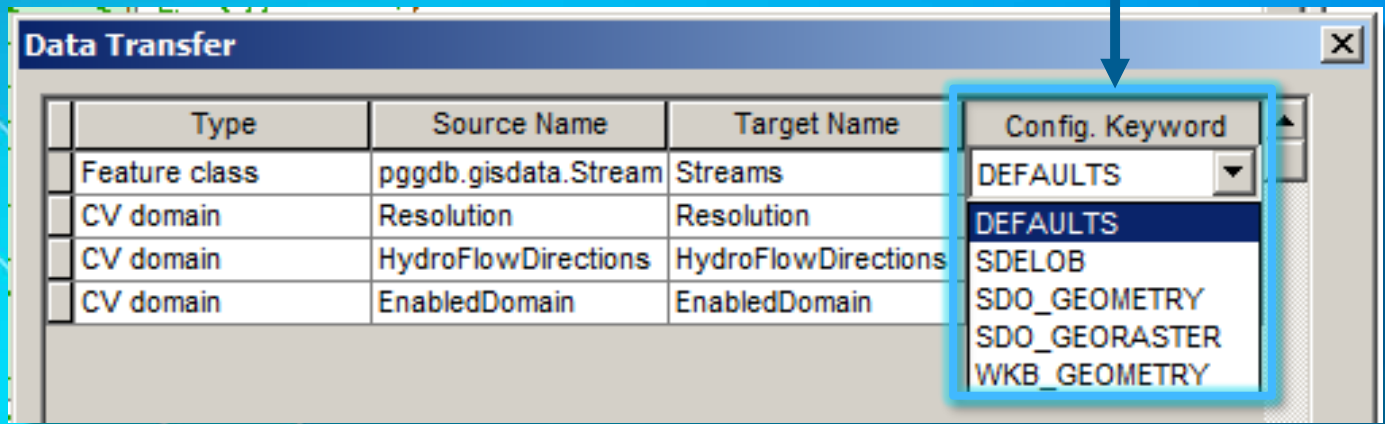
- good if users are read-only
- many users connect with same user name (e.g. publication server)



# Controlling Storage

- Configuration keyword and parameters storage type, location, etc...
  - adjust for backup requirements, activity, size of segment (table, index)
- To create a keyword:
  - Export DBTUNE table to a file, edit it and import back
  - sdedbtune -o export/import or alter
- VARCHAR vs. NVARCHAR
  - UNICODE\_STRING

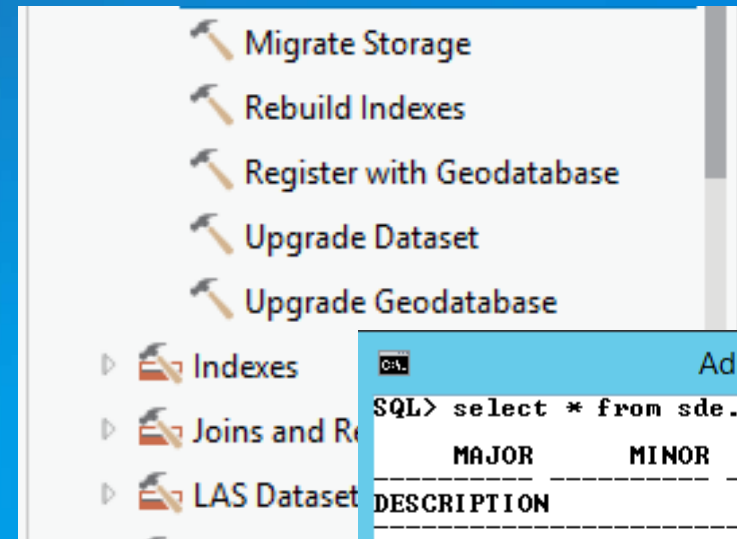
**SDE.SDE\_DBTUNE**  
table for storing keywords  
and associated parameters



Type	Source Name	Target Name	Config. Keyword
Feature class	pggdb.gisdata.Stream	Streams	DEFAULTS
CV domain	Resolution	Resolution	DEFAULTS
CV domain	HydroFlowDirections	HydroFlowDirections	SDELOB
CV domain	EnabledDomain	EnabledDomain	SDO_GEOMETRY
			SDO_GEORASTER
			WKB_GEOMETRY

# Upgrading the Geodatabase

- Test in a staging or test environment first
- New st\_shapelib library
- Upgrade
  - ArcGIS GP tool or Python script
- Backup configuration – dbinit.sde and dbtune.sde
  - Server\_config and dbtune tables in sde schema
  - compare previous version to new
- Check geometry storage type, consider migration
- OS – Oracle – GDB – test between if possible
- Existing GDB check automatic
- Clean DBMS\_PIPE - Values in the database pipe can cause connection problems
- Review existing workflow, application and service impacts



```
Administrator: Comma
SQL> select * from sde.version;
      MAJOR      MINOR      BUGFIX
-----
DESCRIPTION
-----
RELEASE SDESUR_REL_LOW
-----
      10          3          0
10.3 geodatabase
      103005          93001

SQL> connect sys/oracle12c@pdborcl as s
Connected.
SQL> grant dba to sde;

Grant succeeded.

SQL> select * from sde.version;
      MAJOR      MINOR      BUGFIX
-----
DESCRIPTION
-----
RELEASE SDESUR_REL_LOW
-----
      10          3          0
10.3.1 geodatabase
      103007          93001

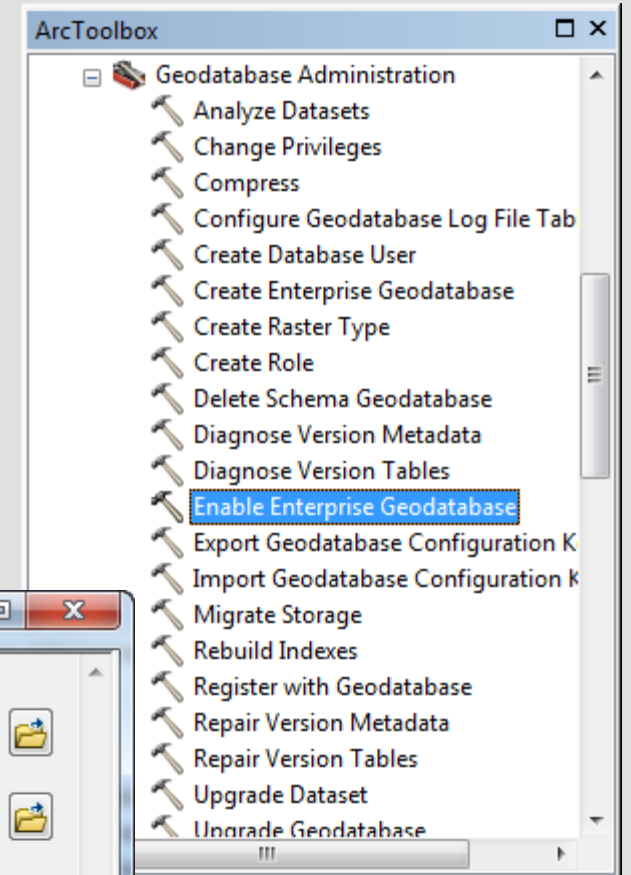
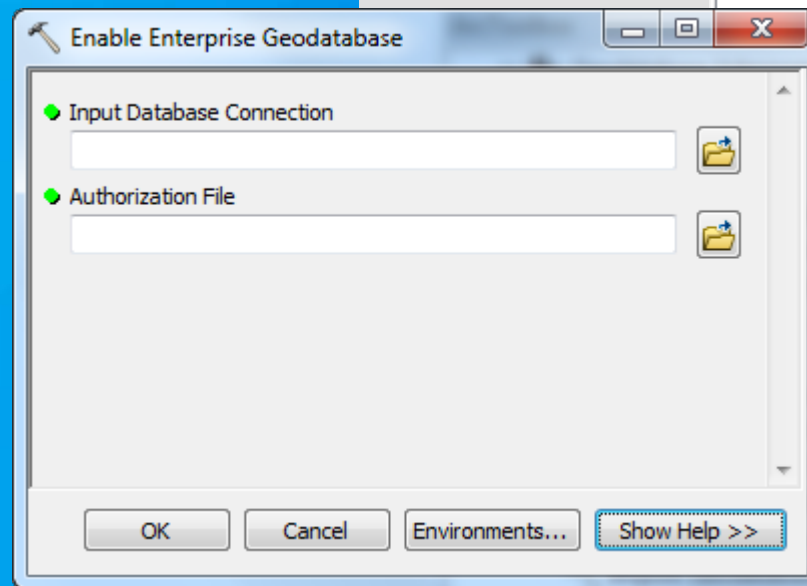
SQL> _
```

Demo



# Enabling a Geodatabase

Amit Kesarwani



# Example – Create Enterprise Geodatabase

**Create Enterprise Geodatabase**

Database Platform  
Oracle

Instance  
nine2/gdb103

Database (optional)

Operating System Authentication (optional)

Database Administrator (optional)  
sys

Database Administrator Password (optional)  
.....

Sde Owned Schema (optional)

Geodatabase Administrator (optional)  
sde

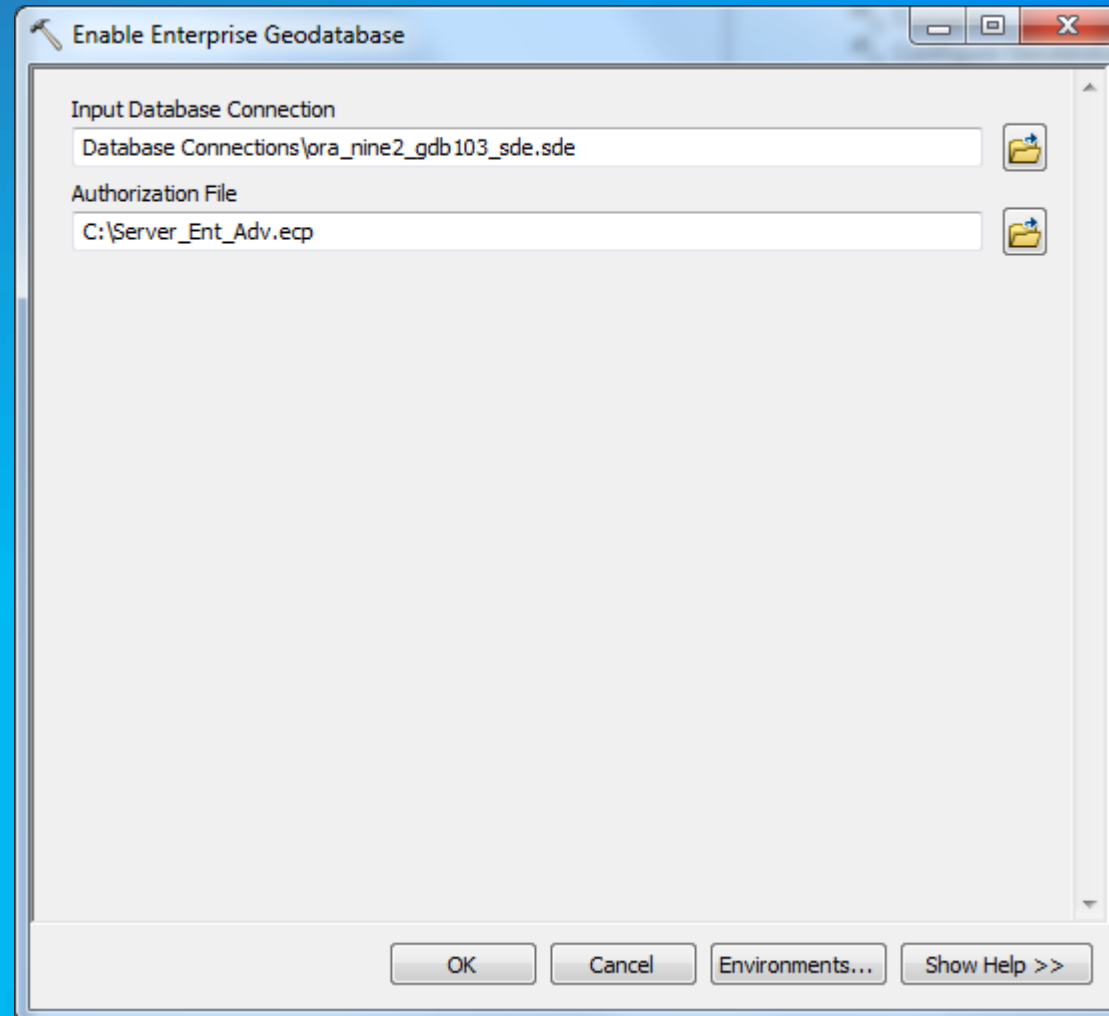
Geodatabase Administrator Password (optional)  
...

Tablespace Name (optional)  
sde

Authorization File  
C:\Server\_Ent\_Adv.ecp

OK Cancel Environments... Show Help >>

## Example – Enable Enterprise Geodatabase



## Using Python

### Enable -

```
import arcpy
```

```
arcpy.EnableEnterpriseGeodatabase_management("C:\\Users\\amit5815\\AppData\\Roaming\\Esri\\Desktop10.3\\ArcCatalog\\ora_nine2_gdb103_sde.sde",  
"C:\\Server_Ent_Adv.ecp")
```

### Create -

```
arcpy.CreateEnterpriseGeodatabase_management("ORACLE", "nine2/gdb103", "",  
"DATABASE_AUTH", "sys", "manager", "", "sde", "supersecret", "sdetbs",  
"C:\\Server_Ent_Adv.ecp")
```





# How do I... store spatial data?

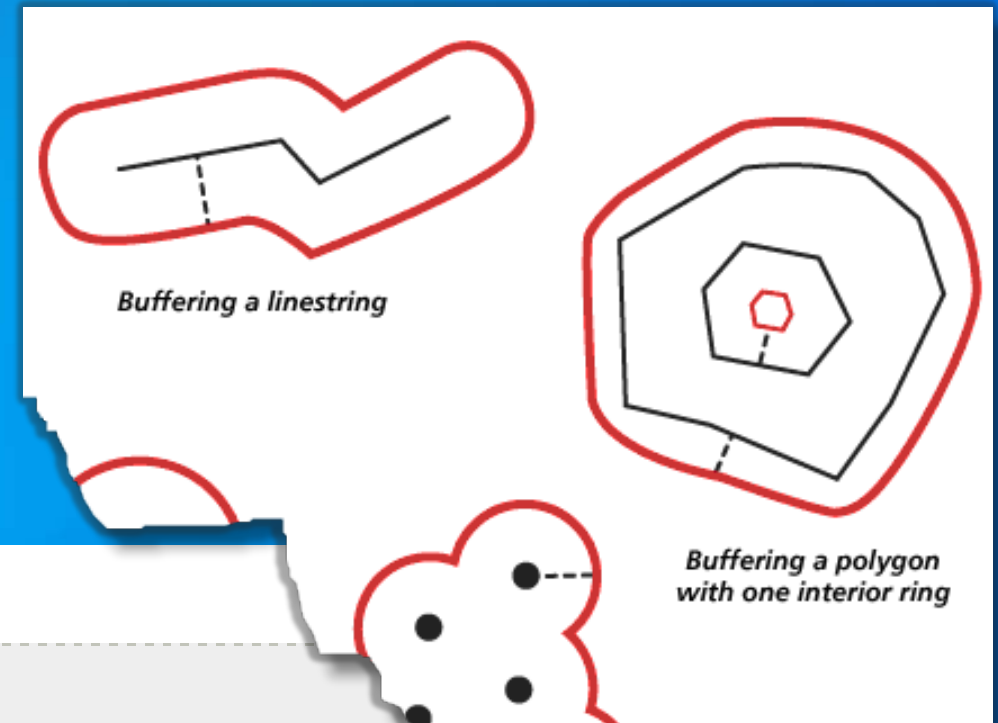
And take advantage of spatial data types...



# Geometry Storage

## Spatial Types and Functions

- Creation of Features through SQL
- Analysis through SQL
- Geodatabase behavior not supported through SQL



### Oracle

```
SELECT sa.id SA_ID, hs.id HS_ID
FROM SENSITIVE_AREAS sa, HAZARDOUS_SITES hs
WHERE sde.st_intersects (sde.st_buffer (hs.site, .1), sa.shape) = 1
ORDER BY sa.id;
```

SA_ID	HS_ID
1	5
2	5

# Geometry Storage

Default Storage Type – ST\_GEOMETRY

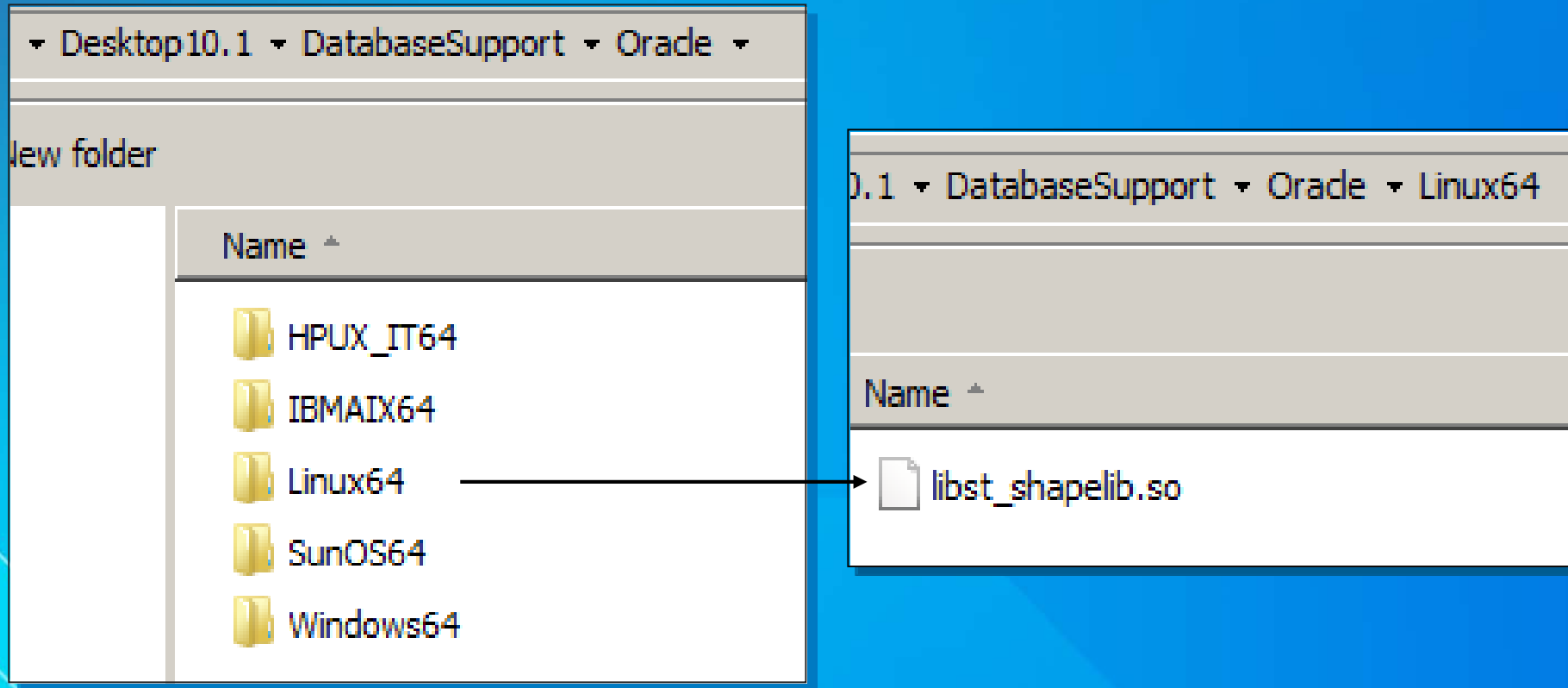
- ST\_Geometry – ESRI Spatial Type
- User Defined Type (UDT) used to store geographic features
- Allows access to spatial data through SQL functions
- Efficiency - Automatic geometry validation
- Conforms to ISO and OGC standards
- Available since ArcSDE 9.2, became default at 9.3

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

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

# ST\_Geometry spatial type configuration

- st\_shapelib library
- extproc.ora (11g) or listener.ora/tnsnames.ora configuration



# Configure External Library – st\_shapelib

## Configuring the Oracle extproc to access the geodatabase with SQL

Geodata » Administering geodatabases » Geodatabases in Oracle

- 11g use extproc.ora located in ORACLE\_HOME\hs\admin directory
  - EXTPROC\_DLLS=ONLY:C:\\mylibraries\\st\_shapelib.dll (Windows)
  - EXTPROC\_DLLS=ONLY:/user/esrilibs/libst\_shapelib.so (Unix)

- 10g – Listener.ora and Tnsnames.ora

```
SID_LIST_LISTENER =  
  (SID_LIST =  
    (SID_DESC =  
      (SID_NAME = PLSExtProc)  
(ORACLE_HOME = /servit/oracle/product/10.2.0/db_1)  
      (PROGRAM = extproc)  
      (ENVS="EXTPROC_DLLS=/servit/ArcSDE/sdeexe/lib/libst_shapelib.so")  
    )  
  )
```

Demo



# Configuring the ST\_Geometry External Library

Amit Kesarwani

The image shows a screenshot of a software dialog box titled "Create Spatial Type". The dialog box has a standard Windows-style title bar with minimize, maximize, and close buttons. The main content area contains several input fields:

- Input Database Connection:** A text field with a folder icon to its right.
- SDE User Password:** A text field.
- Tablespace Name (optional):** A text field.
- ST\_Geometry Shape Library Path (optional):** A text field with a folder icon to its right.

At the bottom of the dialog box, there are four buttons: "OK", "Cancel", "Environments...", and "Show Help >>".

# Simple sql to query a point – Fails , st\_geometry alias points to MDSYS.SDO\_GEOMETRY

```
Administrator: Command Prompt - sqlplus sde/sde@nine2/nongdb

C:\>sqlplus sde/sde@nine2/nongdb

SQL*Plus: Release 12.1.0.2.0 Production on Mon Jul 20 16:48:47 2015

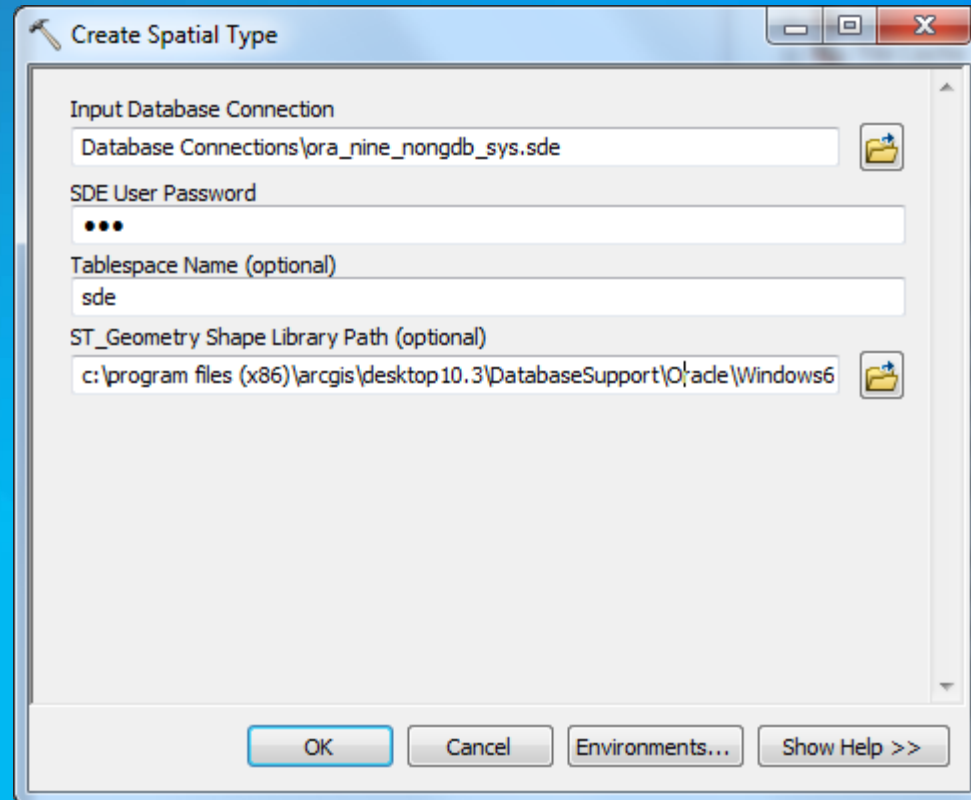
Copyright (c) 1982, 2014, Oracle. All rights reserved.

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

SQL> set pages 9999
SQL> Select sde.st_geometry('point (1 1)', 4326) from dual;
Select sde.st_geometry('point (1 1)', 4326) from dual
*
ERROR at line 1:
ORA-00904: "SDE"."ST_GEOMETRY": invalid identifier

SQL> desc sde.st_geometry
ST_GEOMETRY is NOT FINAL
Name                                     Null?    Type
-----
GEOM                                     MDSYS.SDO_GEOMETRY
METHOD
-----
MEMBER FUNCTION GET_SDO_GEOM RETURNS SDO_GEOMETRY
METHOD
```

# Create spatial type in the oracle database using geoprocessing tool





## Or Create spatial type in the oracle database using python

```
C:\>set ORACLE_HOME=C:\instantclient_11_2
C:\>set path=%ORACLE_HOME%;%PATH%
C:\>c:\python27\arcgis10.3\python.exe
Python 2.7.8 (default, Jun 30 2014, 16:03:49) [MSC v.1500 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> ##Import Arcpy module
... import arcpy
>>> arcpy.CreateSpatialType_management("C:\\Users\\amit5815\\AppData\\Roaming\\ESRI\\Desktop10.3\\ArcCatalog\\ora_nine_nongdb_sys.sde", "sde", "sde", "C:\\Program Files (x86)\\ArcGIS\\Desktop10.3\\DatabaseSupport\\Oracle\\Windows64\\st_shapelib.dll")
<Result 'C:\\Users\\amit5815\\AppData\\Roaming\\ESRI\\Desktop10.3\\ArcCatalog\\ora_nine_nongdb_sys.sde'>
>>>
>>>
```



## After installing Spatial Type – sde owns st\_geometry spatial type

```
ca. Select Administrator: Command Prompt - sqlplus sde/sde@nine2/nongdb
C:\>set ORACLE_HOME=C:\app\amit5815\product\12.1.0\dbhome_2
C:\>set path=%ORACLE_HOME%\bin;%PATH%
C:\>sqlplus sde/sde@nine2/nongdb
SQL*Plus: Release 12.1.0.2.0 Production on Mon Jul 20 16:56:29 2015
Copyright (c) 1982, 2014, Oracle. All rights reserved.
Last Successful login time: Mon Jul 20 2015 16:51:51 -07:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
SQL> set pages 9999
SQL> desc sde.st_geometry
sde.st_geometry is NOT FINAL
Name                                     Null?    Type
-----
ENTITY                                   NUMBER(38)
NUMPTS                                   NUMBER(38)
MINX                                      FLOAT(64)
MINY                                      FLOAT(64)
MAXX                                      FLOAT(64)
MAXY                                      FLOAT(64)
MINZ                                      FLOAT(64)
MAXZ                                      FLOAT(64)
MINM                                      FLOAT(64)
MAXM                                      FLOAT(64)
AREA                                      FLOAT(64)
LEN                                       FLOAT(64)
SRID                                      NUMBER(38)
POINTS                                   BLOB
METHOD
```

## Error showing extproc agent doesn't know the path

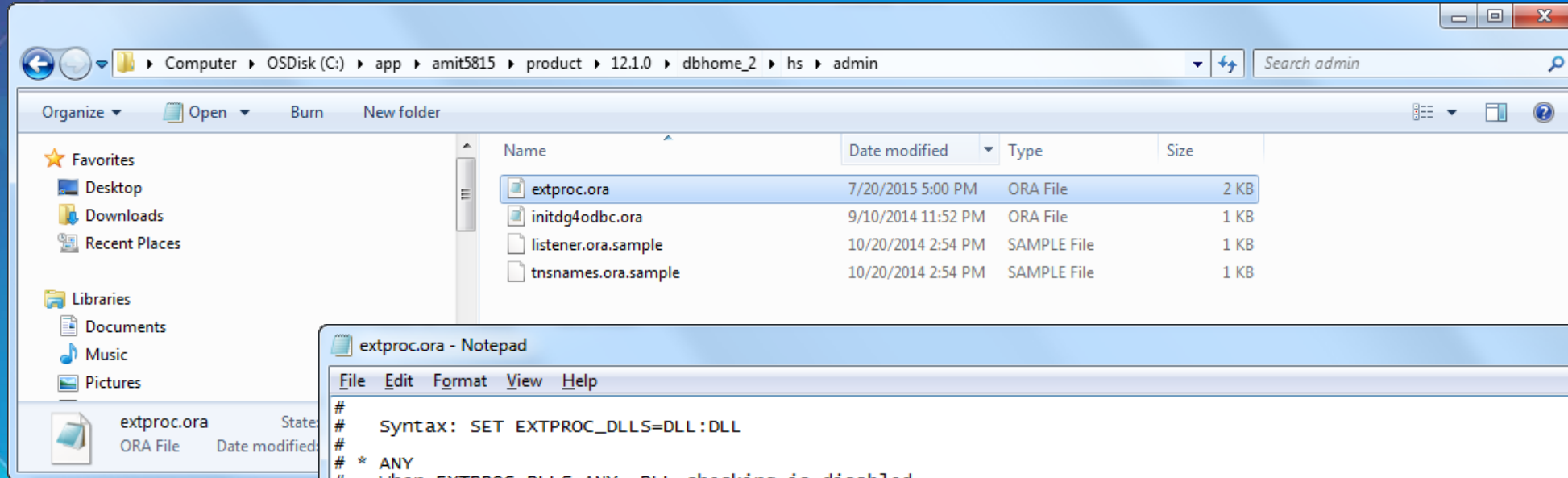
```
Administrator: Command Prompt - sqlplus sde/sde@nine2/nongdb
SQL> Select sde.st_geometry('point (1 1)', 4326) from dual;
Select sde.st_geometry('point (1 1)', 4326) from dual
*
ERROR at line 1:
ORA-28595: Extproc agent : Invalid DLL Path
ORA-06512: at "SDE.ST_GEOMETRY_SHAPELIB_PKG", line 12
ORA-06512: at "SDE.ST_GEOMETRY", line 55

SQL> select * from user_libraries;

LIBRARY_NAME
-----
FILE_SPEC
-----
D STATUS
-----
AGENT
-----
LEAF_FILENAME
-----
ORIGIN_CON_ID
-----
ST_SHAPELIB
C:\Progra~2\ArcGIS\Desktop10.3\DatabaseSupport\Oracle\windows64\st_shape1ib.dll
Y VAL ID

6
```

# Add path to extproc.ora



A screenshot of a Notepad window titled 'extproc.ora - Notepad'. The text content is as follows:

```
File Edit Format View Help
#
# Syntax: SET EXTPROC_DLLS=DLL:DLL
# * ANY
# When EXTPROC_DLLS=ANY, DLL checking is disabled.
# Syntax: SET EXTPROC_DLLS=ANY
#
SET EXTPROC_DLLS=ONLY:c:\\progra~2\\arcgis\\desktop10.3\\DatabaseSupport\\oracle\\windows64\\st_shapelib.dll
|
```

# Query works now

```
Administrator: Command Prompt - sqlplus sde/sde@nine2/nongdb
C:\>sqlplus sde/sde@nine2/nongdb
SQL*Plus: Release 12.1.0.2.0 Production on Mon Jul 20 17:05:46 2015
Copyright (c) 1982, 2014, Oracle. All rights reserved.
Last Successful login time: Mon Jul 20 2015 17:05:39 -07:00

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

SQL> set pages 9999
SQL> Select sde.st_geometry('point (1 1)', 4326) from dual;

SDE.ST_GEOMETRY('POINT(11)',4326)(ENTITY, NUMPTS, MINX, MINY, MAXX, MAXY, MINZ,
-----
ST_GEOMETRY(1, 1, 1, 1, 1, 1, NULL, NULL, NULL, NULL, 0, 0, 4326, '0c00000001000
00080A8B3D7AB1780A8B3D7AB17')

SQL>
SQL>
```

# Extproc for a another version of Geodatabase – Path to shape lib is different

```
Administrator: Command Prompt - sqlplus sde/sde@nine2/gdb1022
C:\>sqlplus sde/sde@nine2/gdb1022
SQL*Plus: Release 12.1.0.2.0 Production on Mon Jul 20 17:08:59 2015
Copyright (c) 1982, 2014, Oracle. All rights reserved.
Last Successful login time: Mon Jul 20 2015 16:36:18 -07:00

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

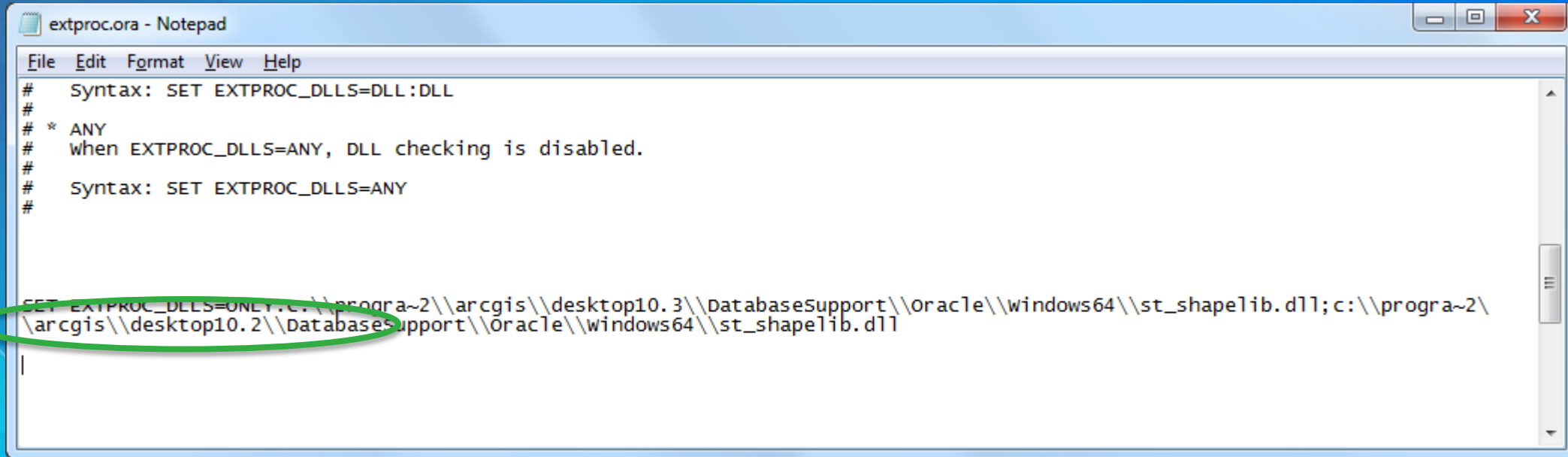
SQL> set pages 9999
SQL> select sde.st_geometry('point (1 1)', 4326) from dual;
Select sde.st_geometry('point (1 1)', 4326) from dual
*
ERROR at line 1:
ORA-28595: Extproc agent : Invalid DLL Path
ORA-06512: at "SDE.ST_GEOMETRY_SHAPELIB_PKG", line 12
ORA-06512: at "SDE.ST_GEOMETRY", line 55

SQL> select * from user_libraries;

LIBRARY_NAME
-----
FILE_SPEC
-----
D STATUS
-----
AGENT
-----
LEAF_FILENAME
-----
ORIGIN_COLUMN
-----
ST_SHAPELIB
c:\progra~2\arcgis\desktop10.2\DatabaseSupport\Oracle\Windows64\st_shape1ib.dll
Y VALID
```



## Add path to 10.2.2 version of shape lib to extproc.ora



```
extproc.ora - Notepad
File Edit Format View Help
# Syntax: SET EXTPROC_DLLS=DLL:DLL
#
# * ANY
# When EXTPROC_DLLS=ANY, DLL checking is disabled.
#
# Syntax: SET EXTPROC_DLLS=ANY
#
SET EXTPROC_DLLS=ONLY:C:\progra~2\arcgis\desktop10.3\Datbasesupport\oracle\windows64\st_shape1ib.dll;c:\progra~2\
\arcgis\desktop10.2\Datbasesupport\oracle\windows64\st_shape1ib.dll
```

# Query works now

```
Administrator: Command Prompt - sqlplus sde/sde@nine2/gdb1022
C:\>sqlplus sde/sde@nine2/gdb1022
SQL*Plus: Release 12.1.0.2.0 Production on Mon Jul 20 17:12:39 2015
Copyright (c) 1982, 2014, Oracle. All rights reserved.
Last Successful login time: Mon Jul 20 2015 17:12:12 -07:00

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

SQL> set pages 9999
SQL> Select sde.st_geometry('point (1 1)', 4326) from dual;

SDE.ST_GEOMETRY('POINT(11)',4326)(ENTITY, NUMPTS, MINX, MINY, MAXX, MAXY, MINZ,
-----
ST_GEOMETRY(1, 1, 1, 1, 1, 1, NULL, NULL, NULL, NULL, 0, 0, 4326, '0c00000001000
00080A8B3D7AB1780A8B3D7AB17')

SQL>
```

# SDO\_Geometry: native Oracle spatial type

- Locator or Spatial
- Validation is not the same between ArcGIS and SDO\_Geometry
- Spatial reference metadata synchronization between SDE and MDSYS administrative schemas
- SDO\_ETYPE 0 data
- All data in column must be same coordinate system
- LRS implementations differ
- Modifications of complex features only through ArcGIS
- Test any custom programming carefully



# SDO\_Geometry prerequisites

- be owned by the user registering the table.
- have a single SDO\_GEOMETRY column.
- have no other columns of a user-defined type.
- have a valid entry in the view USER\_SDO\_GEOM\_METADATA.
- have a single type of geometry (points, lines, or polygons), can be multipart.
- have an integer, unique, not-NULL column suitable as a registered row ID column.
- should have a spatial index.
- should pass Oracle's geometry validation tests.
- All spatial records must have not-NULL valid number values in the SDO\_ORDINATES array.



# How do I... control access to my data?

Access to Oracle objects are managed with  
permissions granted to users and roles

# Oracle Users and Roles

- **Authentication**

- Oracle User vs. External Authentication



- **Authorization – Privileges**

- What can a user do in the database?
- Admin (SDE) & Data Owner (DDL)
  - Use ArcGIS to grant object level privileges in Geodatabase
- Editors (DML), Viewers
- Roles

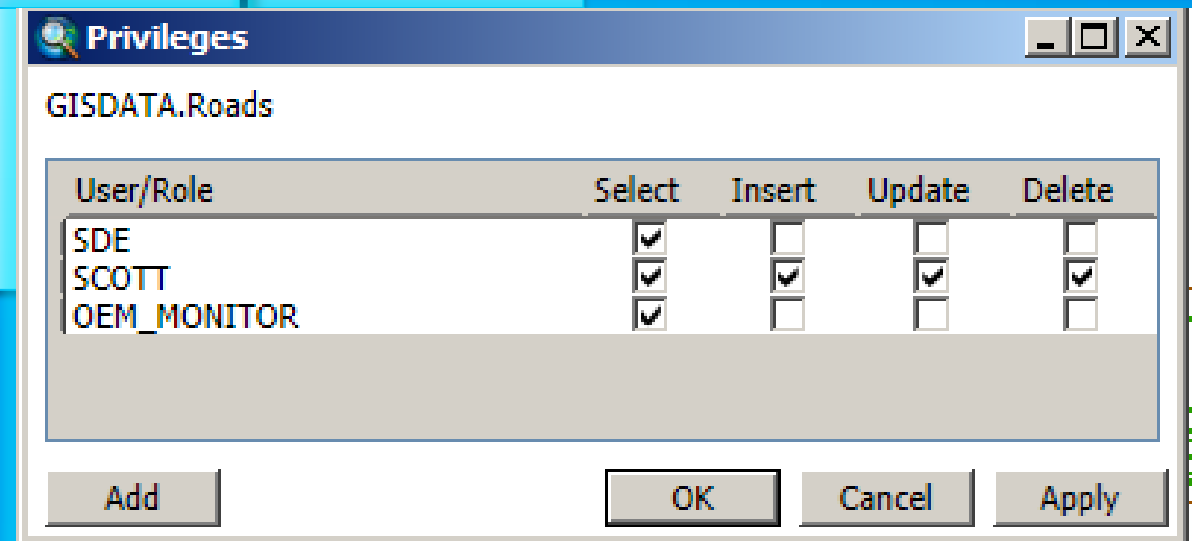


- **Schemas (Data Owners) = Containers**

- What are logical groups of database objects that should be managed as a whole?

# User Privileges

Type of user	Database privileges	Dataset privileges
Data viewer	CREATE SESSION	SELECT on database objects
Data editor	CREATE SESSION	SELECT, INSERT, UPDATE, and DELETE on other users' datasets
Data creator	CREATE SESSION CREATE SEQUENCE CREATE TRIGGER CREATE VIEW CREATE TABLE	
Geodatabase administrator	CREATE SESSION CREATE SEQUENCE CREATE TABLE CREATE TRIGGER CREATE PROCEDURE	



# Additional Privileges

- review online help – search “Oracle Privileges”
- SDE user
  - to create GDB in SDE and upgrade master GDB
- Other users
  - to create and upgrade user-schema GDB
- Optional Privileges to
  - enable SQL tracing
  - monitor Oracle and basic troubleshooting
  - integrate with other non-spatial databases
  - manage connections

## Points to remember



- **Creating a user does not give access to data in the database**
  - It must be granted by the data owner
- **ArcGIS tools manage permissions on all parts of a feature class**
- **Creating a user with the Create User tool will grant permissions sufficient for creating data**

Demo



# Managing Permissions: Roles and Object Permissions

Amit Kesarwani



# Create User

The screenshot shows a dialog box titled "Create Database User" with a standard Windows-style title bar (minimize, maximize, close buttons). The dialog contains several input fields and a checkbox:

- Input Database Connection:** A text field containing "Database Connections\ora\_nine2\_gdb103\_sys.sde" with a folder icon to its right.
- Checkbox:** An unchecked checkbox labeled "Create Operating System Authenticated User (optional)".
- Database User:** A text field containing "user 1".
- Database User Password (optional):** A text field containing five dots, indicating a masked password.
- Role (optional):** A text field containing "editor".
- Tablespace Name (optional):** A text field containing "world\_data".

At the bottom of the dialog, there are four buttons: "OK", "Cancel", "Environments...", and "Show Help >>".



# Create Role

Create Role

Input Database Connection  
Database Connections\ora\_nine2\_gdb103\_sys.sde

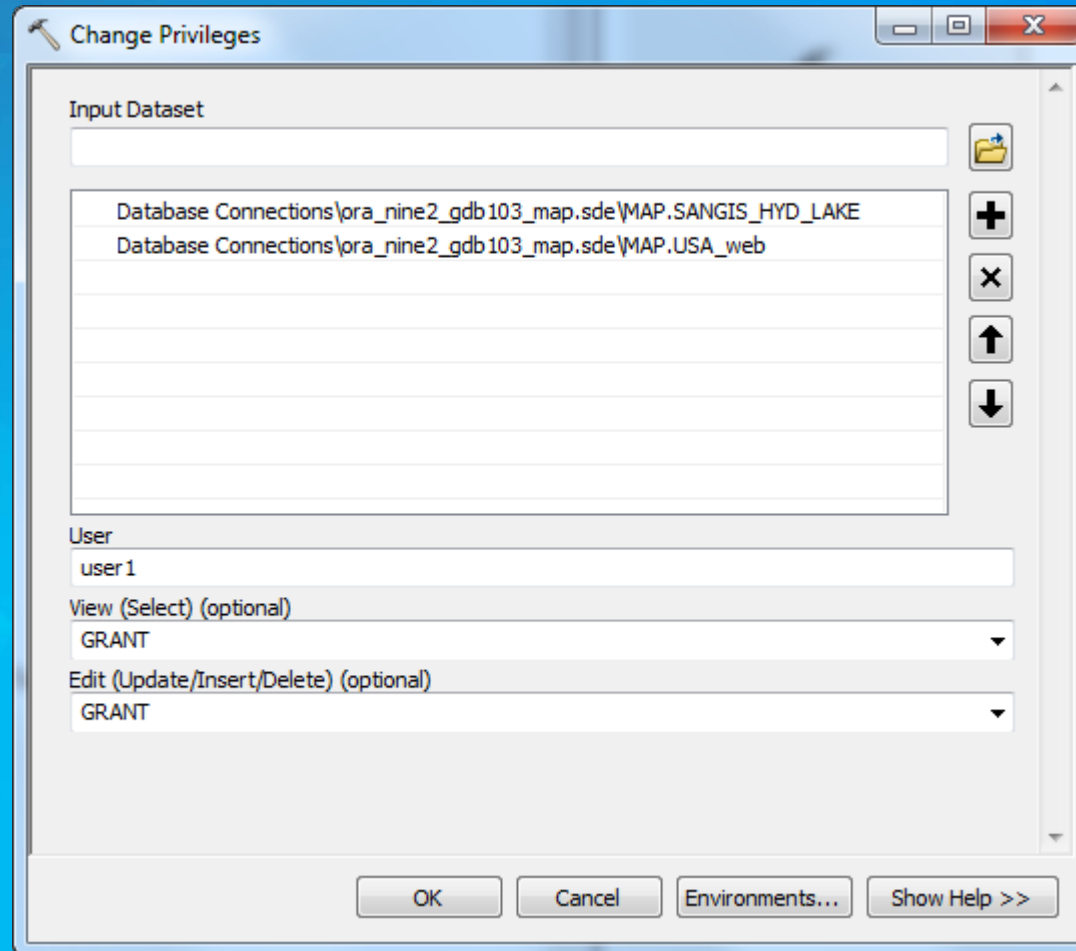
Role  
editor

Grant To or Revoke From User(s) (optional)  
GRANT

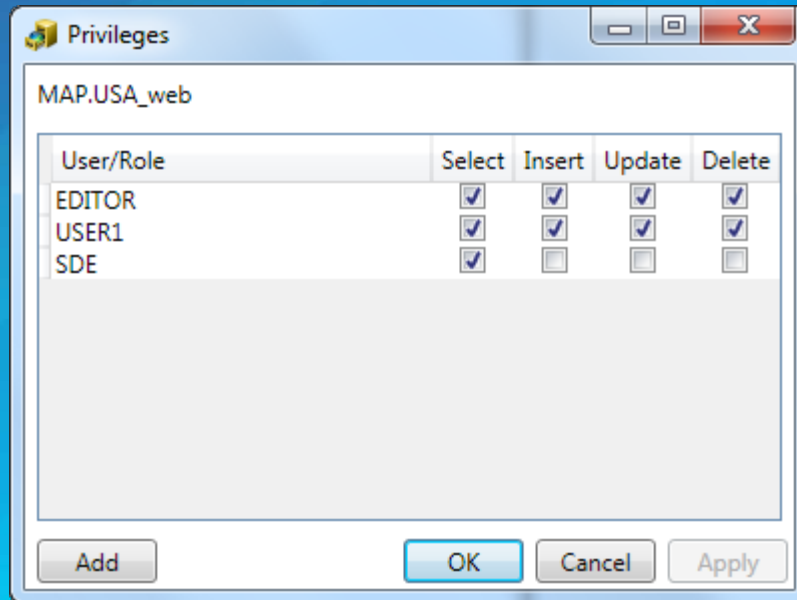
User Name(s) (optional)  
user1,user2

OK Cancel Environments... Show Help >>

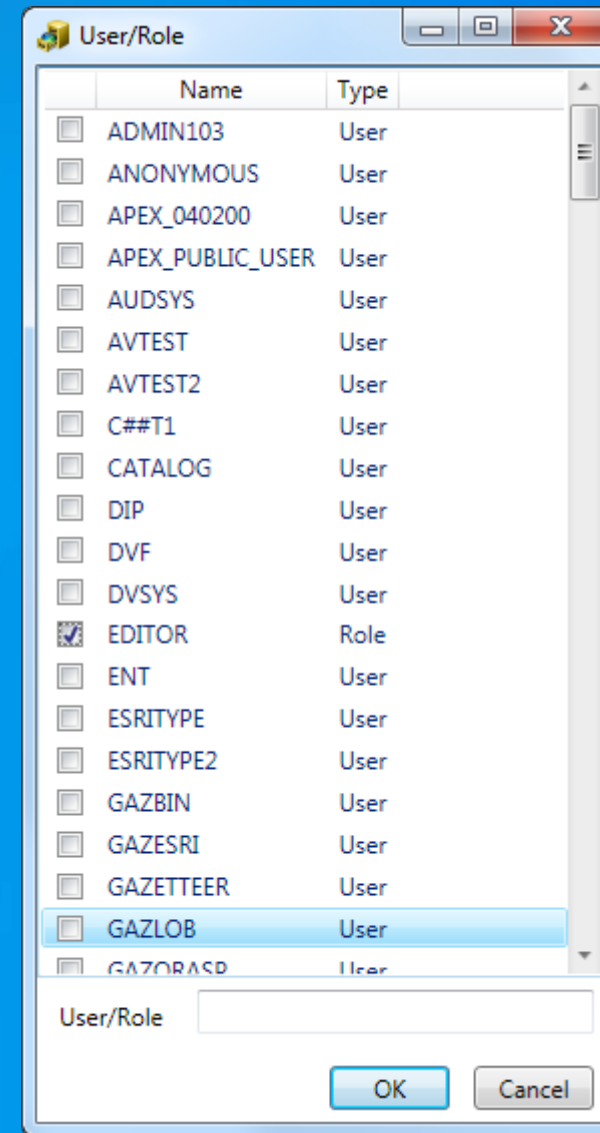
# Change Privileges



# Object Privileges



When done using ArcGIS –  
Privileges are granted to related tables too





**How do I...  
make sure my data is safe?**

# Backup

Backup – has it been tested?

# Backup Options

- **Methods**
  - Recovery Manager (RMAN)
  - User Managed Backups – 3<sup>rd</sup> party
  - Data Pump Export/Import
- Backup all schemas, including SDE
- Test backup, use to refresh staging
- On restore, may have to compile SDE schema packages.
  - `DBMS_UTILITY.COMPILE_SCHEMA('SDE')`

**Note:** It is worthwhile to backup dbinit file and dbtune settings whenever they change.

## Points to remember



Backups are the **only** way to reliably protect your data

1. Decide how much time you can afford to lose when disaster strikes and data must be restored
2. Create a restore plan that will achieve that goal
3. Create a backup plan that supports your restore plan
4. Implement your plan
5. Test your recovery plan regularly by using real backup media to restore to a system capable of being used in production



**How do I...  
maintain good performance?**



# How do I maintain good performance?

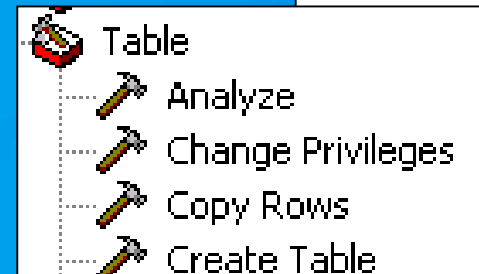
- **Standard maintenance**
  - Reconcile/Post/Compress
  - Rebuild Indexes
  - Calculate Statistics
- **Layer scale dependencies**
- **Other Best Practices**

# Some of Top Discussion Topics and Directions

- **Performance**
  - Analyze if lots of transactional editing workflows
    - Watch certain tables and their growth during the day – state\_lineages, etc...
- **Upgrades and Migrations**
  - Clone vs. export/import
    - Check Geometry Storage type and consider migrating to default ST\_Geometry spatial type. Test first.
  - Direct Connect
- **Deprecation of ArcSDE app server and command line tools @ 10.2.2**
  - SDE installs (app server, command line tools) ending at 10.2.2, not present in 10.3
  - Direct Connect will be used 10.3 forward, SDE libraries still present
- **Advanced Configurations and Topics**
  - Exadata
  - Oracle RAC and Dataguard

# Managing Performance : Statistics

- Table and Index statistics
  - The distribution and contents of rows
  - What the optimizer uses to make execution plans
  - Information about the rows stored in IOTs, and other index metadata
- System statistics
  - Internal object statistics
- Update using Oracle or ArcGIS
- Update after editing and data loading



### Gather Optimizer Statistics Default Options

Oracle recommends that you use the Gather Auto choice for the you use the Gather Optimizer Statistics process for Database an use Gather Auto, the defaults for the other options are set here impact the automated Optimizer Statistics Gathering task and us

Estimate Percentage	<input checked="" type="radio"/> Auto (Oracle recommen
Degree of Parallelism	<input checked="" type="radio"/> Table default <input type="radio"/> Auto
Granularity	Auto <input type="button" value="v"/>
Cursor Invalidation	<input checked="" type="radio"/> Auto (Oracle recommen
Cascade	<input checked="" type="radio"/> Auto (Oracle recommen
Object Class (Auto Job)	<input checked="" type="radio"/> Auto (Oracle recommen
Stale Percentage	<input type="text" value="10"/>

# Monitoring: Why monitor?

- **Establish performance benchmarks to measure impacts:**
  - upgrades and patches
  - new applications or workflows
  - new server resources or deployment patterns
- **Assist in troubleshooting**
  - assist in isolating a problem when one takes place

# Oracle RAC and Dataguard

- See updated KB Article 42292 – “FAQ: Does ArcGIS support Oracle RAC and TAF for highly available geodatabases?”
- Use Direct Connect architecture
- Extproc configuration for ST\_Geometry spatial type
  - Install on each node
- Cursors
  - Cursors don't failover
- Dataguard – standby database
  - Physical – “standby” typically
  - 10.3.1 – read-only Geodatabase connections
  - Logical – should be treated as read-only
    - Not supported, configuration complex due to SQL exclusion required.

## Since last user conference...

- **Read-Only Connection capability at 10.3.1 – Dataguard**  
*(Connection information not recorded, but any attempts on an operation that would result in a write, such as selecting more than 100 features in ArcMap, or querying more than 1000 OID's within a map service query would fail)*
- **New Geodatabase Administration Geoprocessing Tools**  
*(ArcSDE Application Server, ArcSDE Command Line Tools and ArcSDE API's no longer available at 10.3)*
- **October 2014 Oracle Security patch issue**  
*Esri KB 43293 – can not connect after patch, 11.2.0.3, 11.2.0.4, 12.1.0.2*

*Thank you...*



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Paper – pick up and put in drop box





Understanding our world.