



Enterprise Geodatabase: Topics in Oracle Administration

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SEE
WHAT
OTHERS
CAN'T

Intended Audience

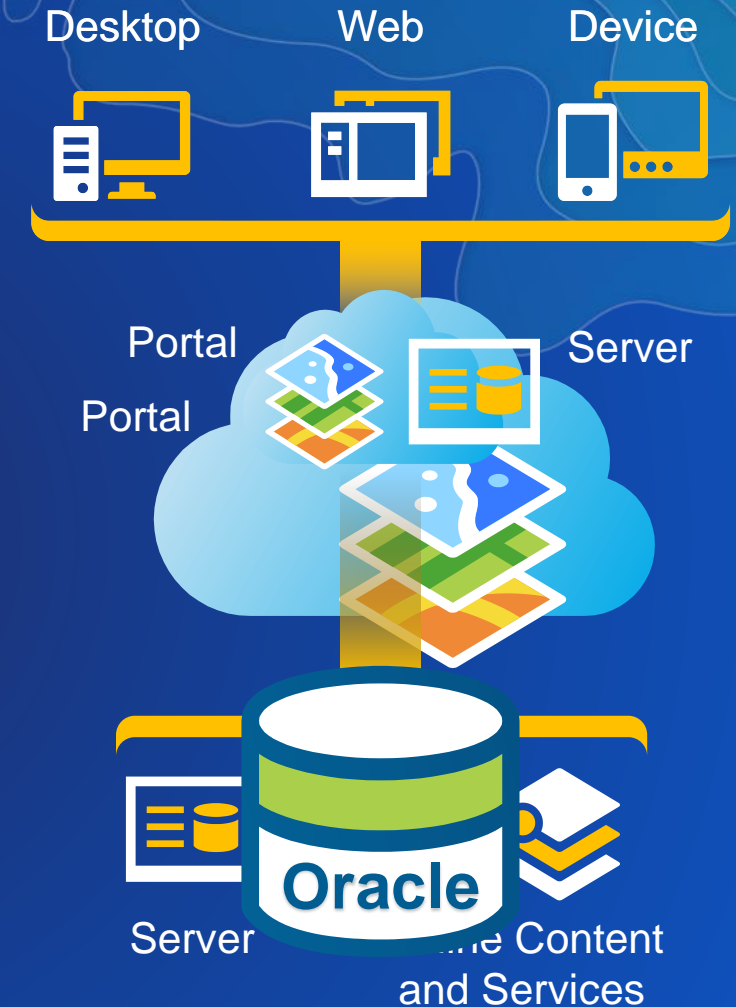
You are.....

- A geodatabase administrator
- An accidental DBA
- A deliberate DBA

And you...

- Store your data in an Oracle database
- Are thinking about using Oracle

This is your session!



Agenda

How do I ...

- Configure Oracle to support geodatabases?
- Use spatial data types?
- Demo - Configure Oracle and Connect from ArcGIS
- Make sure that my data is safe?
- Maintain good performance?

What's New in 10.7.x



How Do I ...

Configure Oracle to support geodatabases?

How do I configure Oracle to support geodatabases?

- **Install a supported version of Oracle**
- **Configure Oracle**
 - Initialization and Memory parameters
 - Other parameters
- **Configure 64 bit and/or 32 bit Oracle Client as needed**



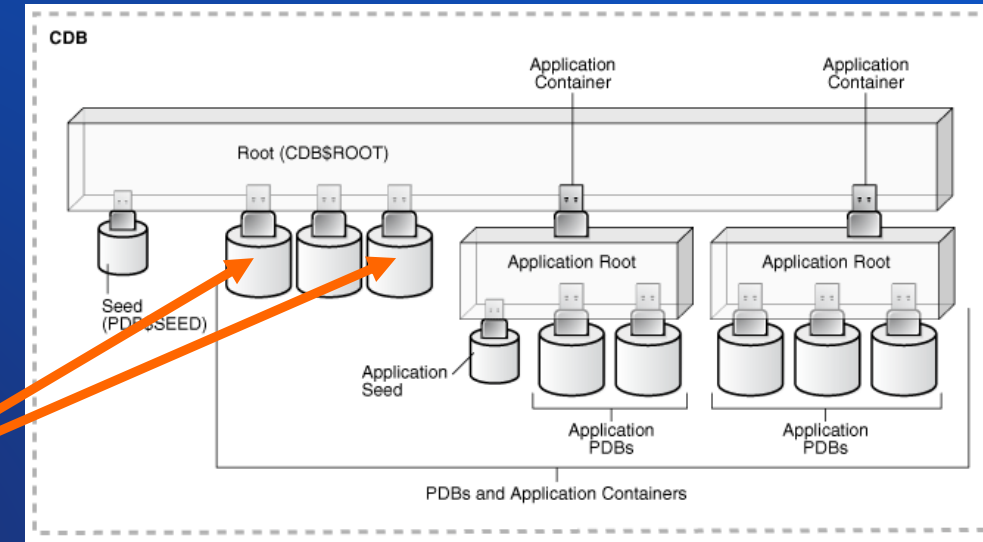
Install a supported version of Oracle database

- **See ArcGIS system requirements for supported OS versions and levels**
 - Additional requirements for the ST_Geometry shape library
- <http://desktop.arcgis.com/en/system-requirements/latest/database-requirements-oracle.htm>
- <https://support.esri.com/en/other-resources/product-life-cycle>

	10g	11g	12c	18c	19c
10.3.x	✓	✓	✓		
10.4.x		✓	✓		
10.5.x		✓	✓		
10.6.x		✓	✓	10.6.1 patch	
10.7.x		✓	✓	✓	?

Oracle 12c Database and later ...

- At 12c, a database can be
 - Multitenant 12c database
 - Geodatabase supported only in pluggable databases
 - NOT in a container database
 - Traditional 12c database (Deprecated starting at 12.2)
- Multitenant architecture provide:
 - Rapid provisioning and cloning
 - Staging for patching and upgrades
 - Consolidation and unified management
 - Up to 4096 PDB's (252 in 12.1.0.2) in a single CDB with Oracle enterprise licensing



Memory and Initialization Parameters

- In most situations use default parameters
- Memory Tuning
 - SGA should not swap. Configure enough virtual memory and place quotas on tablespaces
 - Use Automatic Memory Management except for special cases
- Initialization Parameters
 - **OPEN_CURSORS: Set to 2000 or higher**
 - <https://pro.arcgis.com/en/pro-app/help/data/geodatabases/manage-oracle/update-open-cursors.htm>
 - **SESSION_CACHED_CURSORS: Minimum of 50, 50-150**
- <http://desktop.arcgis.com/en/arcmap/latest/manage-data/gdbs-in-oracle/initialization-parameters-oracle.htm>



Other Parameters ...

- **UNDO_POOL**
 - If you use traditional versioning, allow unlimited undo pool for SDE user (set up a consumer group) for large compress operations
- **Oracle Text Option (installed by default typically)**
- **Execute privileges on packages**
 - dbms_lob, dbms_lock, dbms_pipe, dbms_utility, dbms_sql, utl_raw,
 - dbms_crypto (*sde user only*)
 - After you enable a geodatabase some privileges can be revoked from SDE user
 - <https://pro.arcgis.com/en/pro-app/help/data/geodatabases/manage-oracle/privileges-oracle.htm>



How do I...

Use Spatial Data Types?

ST_Geometry – ESRI spatial data type

- Esri spatial type to store geographic features
 - Default in geodatabases since 9.3
- Created with a geodatabase
- Allows access to spatial data through SQL functions
- Efficiency - Automatic geometry validation
- Conforms to ISO and OGC standards
- Can be used in Oracle databases even if geodatabase isn't enabled

```
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 needed for
 - executing ST_Geometry SQL functions from SQL clients.
 - query layer in ArcMap or ArcGIS Pro that executes SQL functions on ST_Geometry columns
- **Obtain the st_shapelib library**
 - Delivered with ArcMap and ArcGIS Server or download from MyEsri
 - If using for a geodatabase, ensure library and geodatabase versions match
- **On Windows, requires Microsoft Visual C++ Redistributable Package**
 - <http://desktop.arcgis.com/en/system-requirements/latest/database-requirements-oracle.htm>
 - **Versions needed for Desktop / Pro are different**

ST_Geometry Spatial Type Configuration

- **Edit extproc.ora**
 - 11g and 12c 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)
- **To enable and upgrade the ST_Geometry spatial type in an Oracle database (not geodatabase), run the Create Spatial Type geoprocessing tool**
 - <https://pro.arcgis.com/en/pro-app/tool-reference/data-management/create-spatial-type.htm>

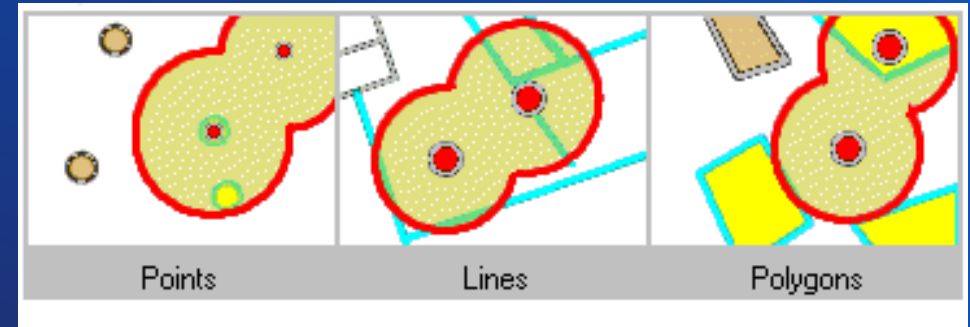


SQL and geodatabases in Oracle

If spatial data is stored in ST_Geometry or SDO_Geometry type, you can:

- Create simple tables using SQL
- Perform spatial analysis through SQL

Geodatabase behavior is 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

Configure Oracle Client

- **Install 64 and/or 32-bit Oracle client on ArcGIS client machines**
 - ArcGIS Desktop & ArcGIS Engine require 32 bit
 - ArcGIS Server & ArcGIS Pro require 64 bit
 - When both installed on the same machine, place 64 bit before 32 bit in PATH
- **Instant, Runtime or Admin client supported**
- **Update TNSNAMES & SQLNET files**

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

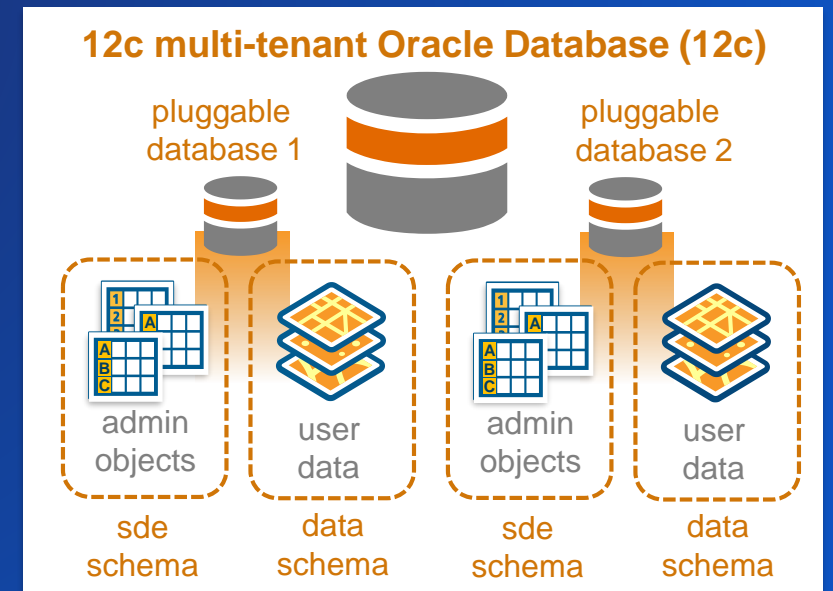
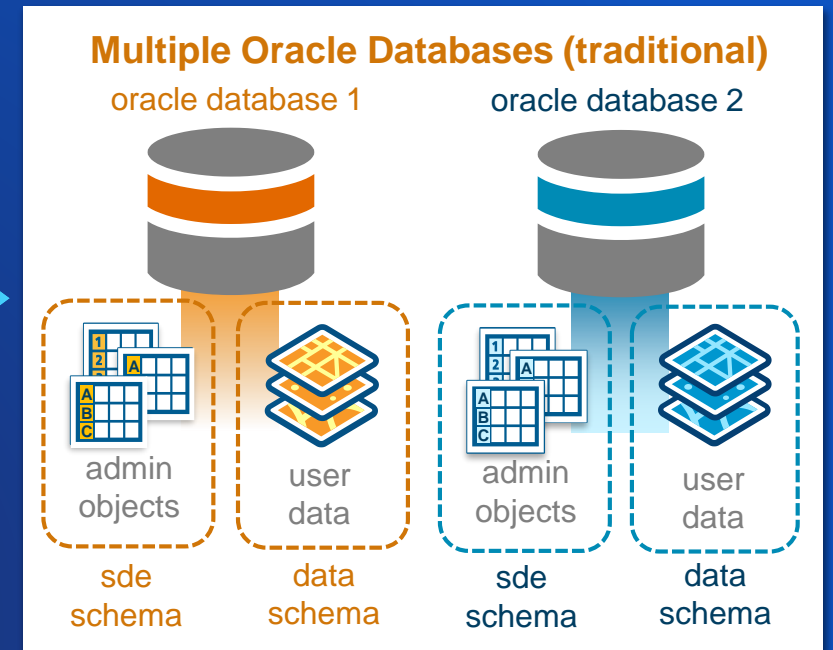
Create a Geodatabase

Two geoprocessing tool options. Use the one that meets your needs.

Create Enterprise Geodatabase	Enable Enterprise Geodatabase
Requires sys user credentials	Requires SDE user credentials
Creates <ul style="list-style-type: none">• SDE user• Tablespace for sde user (sde_tbs) using default tablespace location (“%ORACLE_HOME%/DATABASE” directory) and parameters• Grants necessary privileges to packages and SDE user	Requires the dba to <ul style="list-style-type: none">• Create the SDE user• Tablespace for sde user• Grant necessary privileges to packages and SDE user <p>Allows flexibility for customizing tablespaces, as they are created before the tool is run</p>
Creates database objects and ST_Geometry spatial type that compose a geodatabase	
Oracle cloud requires Wallet configuration - Needed for creating tablespaces	

Multiple Geodatabase in Oracle

- Multiple traditional Databases
- 12c Pluggable Database
(Check licensing options with Oracle)
- User Schema Geodatabases
 - Deprecation plan
 - Desktop 10.6.x / Pro 2.3 is last supported version for creation of user schema geodatabases
 - Upgradable for next few release cycles



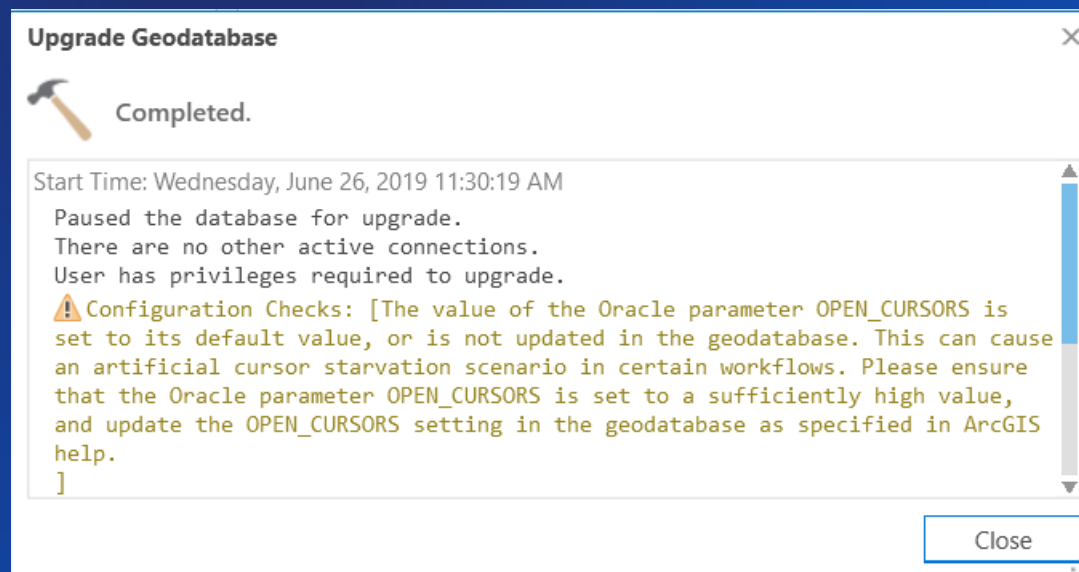
Upgrade a geodatabase

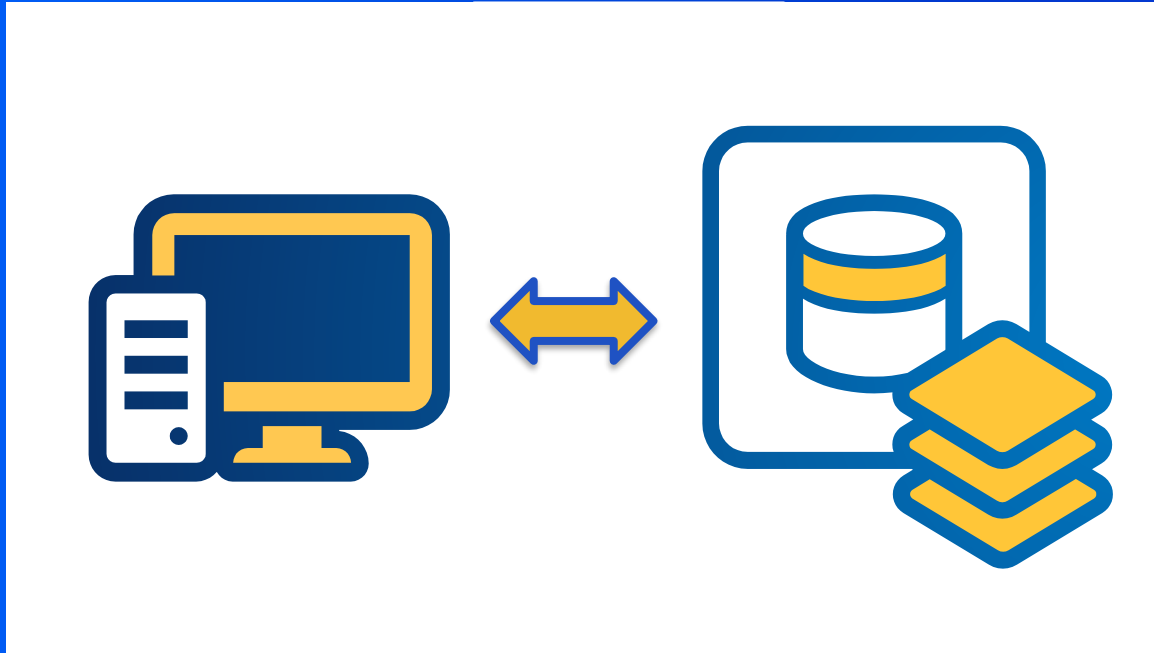
- **Review pre-requisites and requirements**
 - <https://pro.arcgis.com/en/pro-app/help/data/geodatabases/manage-oracle/upgrade-geodatabase-oracle.htm>
- **Test first (staging or test environment)**
- **Order of operations when upgrading both geodatabase and Oracle**
 - One at a time: OS->Database->Geodatabase
 - **Oracle needs to be at supported release for target geodatabase version**
 - **Applies to geodatabase AND ALL connecting clients**
 - User-schema geodatabases
 - Other schemas (Data Reviewer, Workflow Manager)

Upgrade a geodatabase

- Review

- ST_shapelib library version
- The open_cursor parameter must match the Oracle parameter value
 - Starting at 10.7.1 and ArcGIS Pro 2.4, a warning is thrown if these values do not match
 - <https://pro.arcgis.com/en/pro-app/help/data/geodatabases/manage-oracle/update-open-cursors.htm>





DEMO

Configure Oracle and Connect from ArcGIS

Mandar Purohit

Configure Geodatabase Storage

- **SDE.DBTUNE** - Mostly legacy and defaults work well
- **Configuration keyword and parameters for storage type and location**
 - Can adjust for backup requirements, activity, size of segment (table, index)
- **Geometry storage**
- **VARCHAR2 vs. NVARCHAR2**
 - **UNICODE_STRING**

<https://pro.arcgis.com/en/pro-app/help/data/geodatabases/manage-oracle/configuration-parameters-oracle.htm>

SDO_Geometry

- Native Oracle spatial type
- Only Oracle Locator needed to use SDO_Geometry spatial type with ArcGIS
- Geometry validation is not the same between ArcGIS and SDO_Geometry
- All data in column must be same coordinate system
- Modifications of complex features only through ArcGIS



SDO_Geometry – Pre-Requisites

To register an existing Oracle table that contains an SDO_Geometry column requires that the table...

- Be owned by the user registering the table
- Contains a single SDO_GEOMETRY column
- Contains no other columns of a user-defined type
- Has a valid entry in the view USER_SDO_GEOM_METADATA
- Stores a single type of geometry (points, lines, or polygons), can be multipart
- Contains 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
- Spatial records must have not-NULL valid number values in the SDO_ORDINATES array



How do I...

... make sure my data is safe?

BACKUP YOUR DATA NOW !!!

(and practice restoring it)



Backup Options

- **Methods**
 - Recovery Manager (RMAN)
 - User Managed Backups – 3rd 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.
 - UTL_RECOMP.RECOMP_SERIAL('SDE')

Points to remember

- Backups are the ONLY way to reliably prevent data loss
- Decide how much time you can afford to lose during a restore
- Create a restore plan that will achieve that goal
- Create a backup plan that supports your restore plan
- **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
 - Update Statistics
- **Layer scale dependencies**
 - Set layers on/off based on the scale
- **Database Statistics**
- **Indexing**
- **Spatial data performance - Spatial Index**



Performance Tips

- **Make sure you maintain properly for the various workflows**
 - Traditional versioned editing, branch versioned editing, short-transaction editing, bulk data loads, read-only
- **No editing, bulk data loads quarterly – statistics should be good**
- **SQL level ST_Geometry functions, tune as needed for specific workflow and data characteristics (e.g. complex polygons, etc...)**

Performance Tips - continued

- **Make sure indexing is good for queries.**
 - **Make sure index optimizer configuration parameters are at default settings**
(optimizer_index_caching = 0, optimizer_index_cost_adj = 100)
- **Log File tables**
 - **Global temp tables are default starting at 10.7.1**
 - Created when “add database user GP tool” is used
 - OR when a selection of over 100 features happens for the first time
 - **Pre 10.7.1 option of using shared or session based**
- **Many times performance issues are outside the database...**
 - Related workshop - Enterprise Geodatabase: Performance Troubleshooting

News

ArcGIS and Oracle changes since last year

What's new ..

- **Changes in Oracle release cycle**
- **Support for long table names (128 characters) for Oracle 12.2 and later releases**
- **Changes Related to Logfile tables implementation**
 - Create Database User tool creates log file tables for new users at 10.4
 - Logfile tables for SDE user created as global temporary tables at 10.5
 - Used by read only user
 - Logfile tables for all users created as global temporary tables at 10.7.1

Other notes from previous releases..

- **SSL connections are supported starting at 10.6.1**
- **Register views with the geodatabase – 10.5.x**
 - Register with Geodatabase GP extended to views
- **New Default Raster Storage Type – 10.5.x**
 - Rasterblob (BLOB) implements storage in business table for improved i/o
not supported by ArcGIS client versions prior to 10.5 or ArcGIS Pro prior to 1.4
- **SDO_GeoRaster can be viewed, but not created at 10.5**
- **10.5 Oracle Insufficient Permission Error Patch**
 - <http://support.esri.com/Products/Desktop/arcgis-desktop/arcmap/10-5#downloads?id=7504>



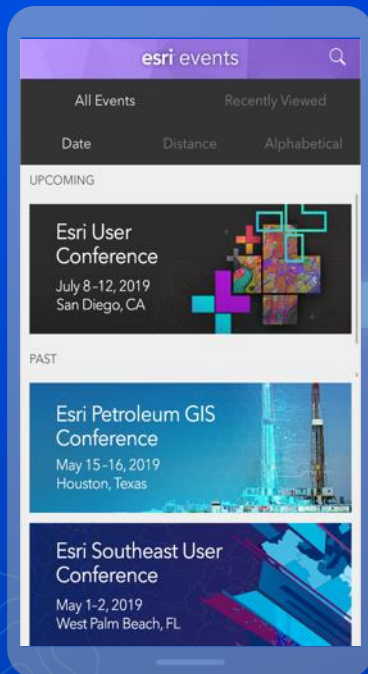
Other Geodatabase Related Workshops

Workshop	Location	Time Frame
Geodatabase: An Overview	SDCC - Room 05 B	Tue - 08:30 AM - 09:30 AM
	SDCC - Room 14 A	Wed - 08:30 AM - 09:30 AM
Enterprise Geodatabase: Introduction to Multi-User Geodatabases	SDCC - Room 05 B	Tue - 10:00 AM - 11:00 AM
	SDCC - Room 14 A	Wed - 10:00 AM - 11:00 AM
Enterprise Geodatabase: Introduction to Multi-User Editing	SDCC - Room 30 D	Tue - 04:00 PM - 05:00 PM
	SDCC - Room 30 E	Wed - 01:00 PM - 02:00 PM
Enterprise Geodatabase: Performance Troubleshooting	SDCC - Room 16 A	Tue - 01:00 PM - 02:00 PM
	SDCC - Room 9	Wed - 01:00 PM - 02:00 PM
Esri Best Practices: Implementing an Enterprise Geodatabase	SDCC - Room 31 A	Wed - 02:30 PM - 03:30 PM
Geodatabase: Ensuring Data Quality with Attribute Rules and Contingent Values	SDCC - Room 31 B/C	Tue - 01:00 PM - 02:00 PM
	SDCC - Ballroom 06 E	Thu - 04:00 PM - 05:00 PM
Geodatabase: Ensuring Data Quality with Topology	SDCC - Room 14 A	Wed - 01:00 PM - 02:00 PM

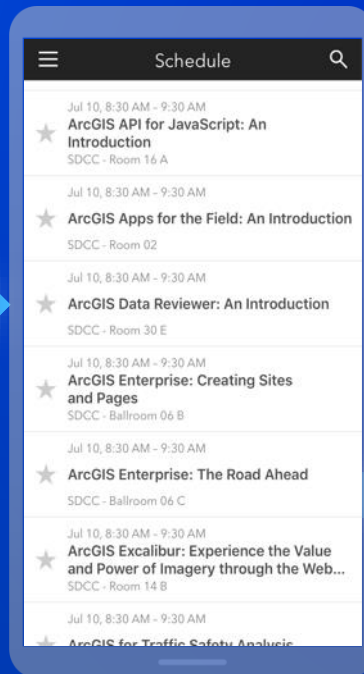
Thank you
Questions?

Please Share Your Feedback in the App

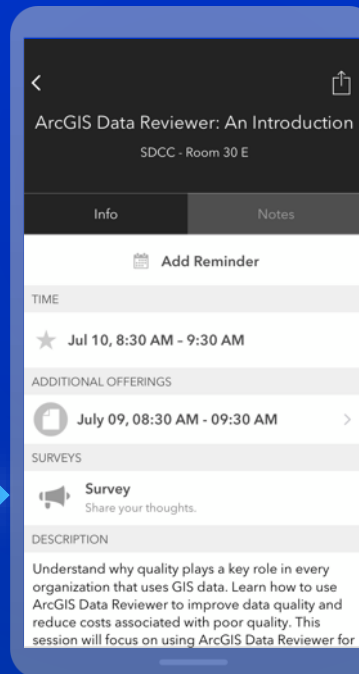
Download the Esri Events app and find your event



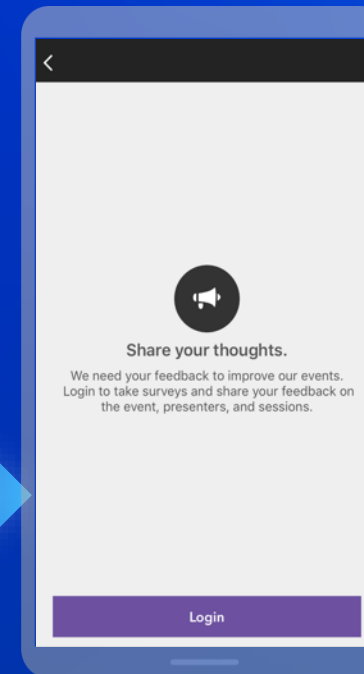
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Log in to access the survey



Complete the survey and select "Submit"

