Administration for Oracle Advanced

Jim Mcabee
Travis Val
Goals of this presentation:

• Present some of most common issues effecting Oracle users of SDE technology as they effect Administration, Diagnostics and working with the Spatial Type.

• Provide the application steps for implementing these solutions.
Pre-requisites

- Oracle Administration Intro
- Basic knowledge of database terminology
- Working knowledge of ArcSDE Technology Basics
- Overview of working knowledge of the SDE.ST_Geometry Spatial Type in Oracle
Agenda

• Administration Topics
  - Installation, Migration and Upgrade Scenarios
  - Oracle Parameters
  - Managing Performance in 11g
  - Advanced Configurations

• Loading, Backup and Spatial Types
  - Loading Considerations
  - Export/Import/Backup Options Available
  - Leveraging the Spatial Operators

• What’s new at 10.1
Administration Topics : Migration and Upgrade

- Review Typical Scenarios
  - New Installation of Oracle 11g using Default settings vs.
  - Migration or Upgrade of Existing Geodatabase
Administration Topics : New Installation

• New installation of Oracle 11g using Defaults.
  - Known external Data source for loading.
  - 20 Editors, 5 Editor/Analysts
  - 10 connections in use by ArcGIS Server Website.

• Some issues to consider
  - Typically no baseline = use standard configuration recommendations
  - Consider architecture
    - single geodatabase or multiple geodatabases (editing vs. publishing)
  - Plan for Growth and Scalability
    - editing workflows and version architectures
    - data synchronization and replication
    - maintenance tasks and schedule
**Administration Topics: Upgrade of Existing GDB**

- **Migration or Upgrade of Existing Geodatabase**
  - Existing Oracle Database in place
  - Will be upgrading the Oracle then upgrading ArcSDE
  - Is it a major or minor upgrade/migration
    - Oracle 9i/ArcGIS 8.3 to 11g and 10, or
    - Oracle 10g/ArcGIS 9.2 to 11g and 10

- **Some Issues to consider**
  - Check Oracle initialization parameters
    some may not apply to newer version.
  - Don’t import old DBTUNE without
    reviewing possible new DBTUNE parameters
  - ArcGIS Server Application Server needs and impacts
  - New applications or load (number of users, new applications) changes
    - Must be carefully estimated/planned for

---

Review Parameter Settings

- open_cursors = 2000
- session_cached_cursors = 50
- star_transformation_enabled = false
- _push_join_predicate = false
- _push_join_union_view = false
Administration Topics : Planning for New Configuration

• What are some of the more advanced issues?
  - Long Raw to BLOB
  - Geodatabase Administrative schema changes
  - Differences between Oracle versions
    - 10.2.0.3 to 10.2.0.5 (st_geometry references)
    - Oracle parameter/optimizer changes (cursor_sharing - exact vs. similar)

• Default Oracle settings are a good starting point except:
  - Database Cache / Memory, Max number of cursors a session can use,
    Data Storage

• Estimate or measure load and storage:
  - Need to define a sample data, MXD and operations when possible
  - Oracle Enterprise Manager (OEM), Oracle Remote Diagnostic Agent (RDA)
Setup “Basics”: Oracle Parameters

- **8K block size is optimal for most systems**
- **Memory: Oracle processes, PGA, and SGA (11g AMM)**
  - SGA
    - Don’t swap SGA, Shared Pool – minimum 128Mb
    - PGA - 20% of memory allocated to Oracle
- **Cursors**
  - open_cursors = 2000 on average (or larger as there is no harm)
  - session_cached_cursors = 50+
  - cursor_sharing = exact (similar for custom applications)
- **Configure for OLTP**
  (Geodatabase and ArcSDE technology typically produce OLTP activity)
ESRI KB and Help Articles for Parameters/Upgrade

- FAQ: What is an appropriate value for the Oracle init.ora parameter 'open_cursors'? http://resources.arcgis.com/content/kbase?fa=articleShow&d=27024
- Error: ORA-01000: maximum open cursors exceeded http://resources.arcgis.com/content/kbase?fa=articleShow&d=28861
- HowTo: Identify a cursor leak in Oracle http://resources.arcgis.com/content/kbase?fa=articleShow&d=35090
- SQL Statements using st_geometry operators experience decreased performance in Oracle 11g http://resources.arcgis.com/content/kbase?fa=articleShow&d=35236
Administration Topics: Capturing Metrics

• Why are the metrics important?
• Only way to understand:
  - How to configure database
  - Changes in performance or scalability for
    - Upgrades, service packs and increased usage
    - Deployment of new applications
  - Data Storage needs
• Establish a performance baseline
  - Oracle tools, ESRI tools, Other tools
• Capture organizational workflows and processes also…
  - For planning GDB Administrative maintenance workflows
  - For planning system resource requirements (peak vs. off-peak)
Capturing Metrics: Session Information

- Check Performance Metrics
- Review Statistics
- Search Sessions
- Select the Correct Session
  sde.process_information
  v$session, v$process

KB30394 – HowTo: Enable extended Oracle tracing for an ArcGIS connection
http://resources.arcgis.com/content/kbase?fa=articleShow&d=30394
### Oracle Session Statistics

- **Tools available in 11g – Manager Session Statistics**

<table>
<thead>
<tr>
<th>Name</th>
<th>Connection One</th>
<th>Connection two</th>
<th>Connection three</th>
<th>Connection four</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open cursors</td>
<td>34</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Session Logical Reads</td>
<td>69254</td>
<td>45054</td>
<td>45049</td>
<td>45039</td>
</tr>
<tr>
<td>Physical Reads Total Bytes</td>
<td>44,687,360</td>
<td>1,671,168</td>
<td>1,679,360</td>
<td>1,679,360</td>
</tr>
<tr>
<td>Parse Count (Total)</td>
<td>1965</td>
<td>178</td>
<td>178</td>
<td>178</td>
</tr>
<tr>
<td>Parse Count (Hard)</td>
<td>196</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Measuring and Monitoring Memory

- Tools available in 11g – Manager Advisor Central - Memory Advisors

- SGA Size Advice

- Current Allocation
  - Total SGA Size (MB) 336
  - SGA Component Current Allocation (MB)
    - Shared Pool 196

- PGA Memory Usage Details

- Workarea Size

- Chart should show: Execution percentages, Number of Execution

Show memory usage details for PGA target: [ ] MB
11g Advisors and Checkers - Automation

• 11g Advisors
  - ADDM, Memory, SQL, Automatic Undo, MTTR, SQL Performance, Data Recovery, Segment, Streams Performance

• 11g Checkers
  - DB Structure, Data Block, Transaction, Redo, Dictionary, Undo, CF Block – Integrity Checks
Measuring Storage Space

- Tools available in 11g – Measure Storage of data source.

Show the actual database storage

- select sum(bytes) from dba_data_files – OS allocated space
- select sum(bytes) from dba_segments - allocated to segments
- select sum(bytes) from dba_free_space - unused segment space

- Example shows a lot of allocated free space by truncating or coalescing segments

<table>
<thead>
<tr>
<th>Tablespace</th>
<th>Status</th>
<th>Size (MB)</th>
<th>Used (MB)</th>
<th>Used (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENT</td>
<td>ONLINE</td>
<td>10.000</td>
<td>0.063</td>
<td></td>
</tr>
<tr>
<td>GBR</td>
<td>ONLINE</td>
<td>10.000</td>
<td>0.063</td>
<td></td>
</tr>
<tr>
<td>ROB</td>
<td>ONLINE</td>
<td>19,362.000</td>
<td>3,222.250</td>
<td></td>
</tr>
</tbody>
</table>

dba_data_files : 29,245,374,464
dba_segments  : 25,579,814,912
dba_free_space: 22,187,802,624
Upgrade Process

• Backup, Backup, Backup!
  - It is NOT a Backup unless it has been tested to make sure it works.

• Check existing GDB for any errors or redundancies

• Clean DBMS_PIPE - Values in the database pipe can cause connection problems

• Upgrade to 10 requires use of ArcObjects GP tool
  - New Geodatabase Administrative schema changes

• “Flatten” Geodatabase if possible
  - reconcile, compress and drop versions and replica pairs this helps to reduce complexity during upgrade if possible, it is not required.
Installation, Migration, Upgrade Summary

• Start with recommended minimum parameters for New and monitor Existing
  • Cursors and Memory (OPEN_CURSORS, SGA, etc..)
  • Check connections parameter in server_config table via sdeconfig export/import command or sql
• Monitor usage, or ask DBA’s to monitor and adjust as necessary
• Establish a performance baseline so future growth and changes can be measured
  • OEM, mxdperfstat, Windows performance monitor, ASH
Managing Performance in 11g

• Things that must be maintained:
  - Statistics
  - Indexes

• Tools available for maintaining the Database:
  - RDBMS
  - ArcObjects
Managing Performance in 11g: Statistics

- **Table statistics**
  - The distribution and contents of rows
  - What the optimizer uses to make execution plans

- **Index statistics**
  - Information about the rows stored in IOTs, and other index metadata

- **System statistics**
  - Internal object statistics
Managing Performance: Table and Index Statistics

<table>
<thead>
<tr>
<th>LEAF_BLOCKS</th>
<th>DISTINCT_KEYS</th>
<th>NUM_ROWS</th>
<th>CLUSTERING_FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>3836</td>
<td>405184</td>
<td>422227</td>
<td>92580</td>
</tr>
<tr>
<td>5355</td>
<td>423584</td>
<td>423584</td>
<td>0</td>
</tr>
<tr>
<td>2901</td>
<td>316800</td>
<td>319292</td>
<td>45950</td>
</tr>
<tr>
<td>2761</td>
<td>319292</td>
<td>319292</td>
<td>0</td>
</tr>
<tr>
<td>3838</td>
<td>410912</td>
<td>422418</td>
<td>93151</td>
</tr>
<tr>
<td>5565</td>
<td>424989</td>
<td>424989</td>
<td>0</td>
</tr>
<tr>
<td>1374</td>
<td>97404</td>
<td>97404</td>
<td>0</td>
</tr>
</tbody>
</table>

```
select index_name, leaf_blocks, distinct_keys, num_rows, clustering_factor, sample_size, last_analyzed 
from dba_ind_statistics where owner='PARCEL' and leaf_blocks > 1000;
```
Oracle 11g – Automatic Maintenance

Optimizer Statistics Collection – statistics collection
Segment Advisor – segment reorganization
SQL Tuning Advisor – attempts to tune high-load SQL

- Tasks Automated at 11g

Oracle Database 11g provides the ability to automatically manage maintenance tasks such as optimizer statistics collection and proactive advisor reports. These tasks are run in a predefined maintenance window and their CPU consumption is throttled to prevent them from interfering with normal user work. The default maintenance windows are 10:00 PM - 2:00 AM on weekdays, and all weekend long. These defaults can be changed using Enterprise Manager at any time.

- Enable automatic maintenance tasks
Managing Performance in 11g: Statistics

- Oracle automatic statistics gathering 10g vs. 11g
- Utilize optimizer_dynamic_sampling (KB32005)
  [http://resources.arcgis.com/content/kbase?fa=articleShow&d=32005](http://resources.arcgis.com/content/kbase?fa=articleShow&d=32005)
- Other options
  - ArcCatalog and GP Tools
  - `sdetable -o update_dbms_stats -t roads -m estimate`
- Temporary Tablespace - increase size for compute
  - Consider increasing the size of your temporary table space to compute statistics rather than estimate them because it provides more accurate statistics for the optimizer.
11g Auto Statistics Gathering

- Setting Stale Percentage

![Gather Optimizer Statistics Default Options](image)
Other Configuration Tips

- **D-Table indexes**
  - need to be checked for errors and redundancy in the IDX (KB31081) and PK (KB24925) indexes

- **A-Table Index**
  - Performance gains by altering the Adds table indexes (KB32184)

- **Cache the lobs**
  - Most lobs can be cached to reduce trips to disk ST(KB33428), Network(34485), Raster(35521)

- **Index rebuild**
  - Sweeper Indexes need to be rebuilt to reduce their number of blocks (KJ35409)

- **ST_GEOMETRY Spatial index shrink**
  - Reduce the number of blocks used by the spatial index (KB33341)

- **Re-gather Stats**
  - Do not build stats on the logfile tables
  
  Note: Scripts to perform these tasks are included at the end of slide deck
Advanced Configuration Topics

• Some not formally supported – must test
• External Authentication – Direct Connect
  - OS Authentication
  - Advanced Security
  - Encryption
  - Must use Direct Connect
• Oracle RAC – clusters
  - Must use Direct Connect
• Oracle DataGuard – replication
  - Physical – “stand by”
  - Logical
Oracle RAC

- Use Direct Connect architecture
- Extproc configuration for ST_Geometry spatial type
  - Windows ST_ShapeLib.dll is dependent on dlls found in the Visual C++ Redistribution Package.
  - Installed by SDE setup program automatically, or can be installed using redistribution package
- Cursors
  - Cursors don’t failover, reconnect either must be done or takes place depending upon application and configuration.
Oracle Dataguard

- Physical – standby database – commonly used
- Logical – RDBMS replication - rare in Geodatabase configurations
  - Users can connect to “standby” database, but should be treated as “read-only”.
  - Not supported, and configuration complex due to SQL exclusion required.
• Multiple Geodatabase for Different Tasks
  - At least two Geodatabases should be present typically – production and test
  - Other reasons for multiple geodatabases
    - Editing and publishing (web)
    - Production and test/development
    - Different application needs
  - Methods for configuring multiple Geodatabases in Oracle
    - Multiple instances on same server
    - Multiple instances on different servers
    - Project/Schema Geodatabase
Choosing Multiple Geodatabase Configuration

• Oracle configuration needs
  - Archive log mode /Bulk data loading
  - Custom applications (cursor_sharing – similar)

• Scenarios
  - Major configuration differences required by application workflows
    - Multiple Oracle instances (multiple geodatabases)
  - DBA’s want to manage only a single instance AND no major configuration differences for applications
    - project/schema geodatabase
Views, Spatial Views and Types

• **Spatial Functions can be used in Spatial Views**
  - Can provide “dynamic” feature classes on map

```sql
CREATE VIEW san_berdoo_quakes_v AS SELECT a.objectid, a.location, b.name FROM quakes4 a, st_counties b WHERE b.name = 'San Bernardino' AND sde.st_intersects(a.location,b.boundary);
```

• **Also Materialized Views**

• **May require registration with ArcSDE and Geodatabase**
  - Depending upon creation method used
    - sdetable –o create_view vs. SQL
  - Depending upon intended use
    - Display in arcmap or for sql query only, Query Layer (10.x)
select /* FIRST_ROWS */ service_point_id, shape, ckt_id, job_id, poly_id, prev_energ_poly_id, lock_status, xfr_tag, point_type, account_priority, customer_count, replace_flag, clue_cd, pri_call_type, priority, topcall, symbol
From (select g.*, gc.clue_cd, m.pri_call_type,
ROW_NUMBER() OVER (PARTITION BY g.service_point_id ORDER BY m.priority) topcall, m.priority, m.symbol
from gator_service_points g, gator_calls gc, master_lut m
Where g.service_point_id = gc.service_pt_id And CASE when g.job_id is null then 0 else 1 end = m.assign
And gc.clue_cd = m.clue and g.account_priority = macct and
(CASE When ROUND((sysdate - gc.last_chng_datetime) * 1440) = 0 then '0'
When ROUND((sysdate - gc.last_chng_datetime) * 1440) > 0 and
ROUND((sysdate - gc.last_chng_datetime) * 1440) <= 120 then '120'
When ROUND((sysdate - gc.last_chng_datetime) * 1440) > 120 and
ROUND((sysdate - gc.last_chng_datetime) * 1440) <= 240 then '240'
When ROUND((sysdate - gc.last_chng_datetime) * 1440) > 240 then '241'
Else '9999' End) = m.age_class) where topcall = 1 and pri_call_type IN ('PF','LD','LO')
Agenda

• Administration Topics
  - Scenario 1: New Setup with 11g
  - Scenario 2: Upgrading to 11g from 9i/10g
  - Managing Performance in 11g
  - Advanced Configurations

• Loading, Backup and Spatial Types
  - Loading Considerations
  - Export/Import/Backup Options Available
  - Leveraging the Spatial Operators

• What’s new at 10.1
Connection Type Review

- Two types
  - Direct connection (2 Tier)
    - Connection directly from client to server
    - Requires database client installation on all desktop clients
  - Application connection (3 Tier)
    - Connection from client application to ArcSDE service
    - Does no require database client installation on desktop clients
Application Connection – ArcSDE Technology

ArcGIS Client
- Desktop
- Server
- Engine

ArcSDE
- gsrvr.exe services
- giomgr.exe service

DBMS
- Oracle
- SQL Server
- Postgres

SDE API

SQL

Client
Server
(may be same machine)
Direct Connection – ArcSDE Technology

ArcGIS Client
- Desktop
- Server
- Engine

ArcSDE
- sde.dll
- gsvr101ora11.dll

DBMS
- Oracle
- SQL Server
- Postgres

Client
Server (may be same machine)
Direct Connection – ArcSDE Technology

Web Server
- IIS
- Apache

ArcGIS Server
- sde.dll
- gsrvr101ora11.dll

ArcSDE

DBMS
- Oracle
- SQL Server
- Postgres
Diagnostic tools

• **System tools**
  - Windows, use task manager and event viewer

• **Tools available from ESRI**
  - SDE logfiles in the `%SDEHOME%/etc` folder
  - SDE Intercept, SDE Trace, set as environment variables
  - DC log files
  - Server Logs

• **Tools available from Oracle**
  - Alert log, SQL tracing
Direct Connection: Logging

- ArcGIS Client
  - Desktop
  - Engin

- ArcSDE
  - sde.dll
  - gsrvr101ora11.dll

- DBMS
  - Oracle
  - SQL Server
  - Postgres

SDE API

Client
- DC Log
- SDE Trace
- SDE Intercept

Server
- Database Log
- SQL Trace

SQL

Client (may be same machine)
SDE Logfiles

• Three types
  - giomgr_<service>.log
    - giomgr process information, startup/shutdown, connections
  - sde_<service>.log
    - gsrvr process information, event, errors
    - Setting %SDEVERBOSE% to true increase the amount of information logged, but slows performance
  - sde_setup.log
    - Information about the setup process

• To enable for direct connections, set %SDEHOME%, or check the user %TEMP% directory
SDE DC Log

- Information that is similar to the sde_<service>.log file.
  - This file is only present during direct connections
- This file will automatically be generated and placed in the %SDEHOME%/etc or %TEMP% directories.
SDE Trace

- This logfile lists all the calls that are made to the ArcSDE client API.
- Not all of these calls result in a round trip to the server.
- To enable set %SDETRACELOC% to the path name. Files are named %SDETRACELOC%.001, %SDETRACELOC%.002...
SDE Intercept

• A list of all calls between the SDE client and the SDE server.
  - If using DC, will have two files that mirror each other.
• To enable set:
  - `%SDEINTERCEPT%` to the required values
    - set SDEINTERCEPT=cwrfT
  - `%SDEINTERCEPTLOC%` to the path name
    - Files are named `%SDEINTERCEPTLOC% .001`, `%SDEINTERCEPTLOC% .002`...
Oracle DBMS Log

• **Oracle Alert Log,**
  - “The Alert file is a log file that records information about internal errors and administrative activities, such as backups.”
  [http://download.oracle.com/docs/cd/E11882_01/server.112/e17766/intro.htm#i10817](http://download.oracle.com/docs/cd/E11882_01/server.112/e17766/intro.htm#i10817)

• **Automatically enabled, location can be found by issuing the following SQL**
  - `SQL> select value from v$parameter where name = 'background_dump_dest'`
Oracle SQL Trace

- Description of every SQL statement that was executed per session
  - Very useful in analysis of slow running queries and operations, TKProf results much more readable

- Activate by altering session
  - As DBA user, tracing a different session:
    - SQL> DBMS_SYSYEM.SET_ENV(<session id>, <session serial>, 10046, 12, '')
  - Tracing the current session, additional privileges required:
    - SQL> alter session set events '10046 trace name context forever, level 12'
Bulk Loading Considerations

• Exception to the rule
  Versioning
    - Do a reconcile and post of the version to default before you load
    - Highly recommended that you do a compress before the load
    - No other editing during a load
  Indexes
    - Bulk loads are faster without indexes
    - Put feature classes in load only mode (drop indexes) before loading
    - Do not forget to take them out again of load only mode (recreate indexes)
Why to export/import using RDBMS tools?

- Copying non-versioned data without GDB functionality
- Copying the complete database to a test instance

Logical Rules:

<table>
<thead>
<tr>
<th>Source Has SDE</th>
<th>Target has SDE – without GDB functionality</th>
<th>Target Has SDE – with GDB functionality</th>
<th>Target Doesn’t have SDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use database tools</td>
<td>Use GDB replication</td>
<td>Use database tools</td>
<td></td>
</tr>
</tbody>
</table>
What to Export?

• No GDB functionality: SDE.ST_GEOMETRY and SDO_GEOMETRY data, or tables without spatial data, with no GDB functionality (Domains, Relationship Classes, Feature Dataset)
  - Only need to export the table
  - Drop SDE.ST_Geometry spatial prior to export

• GDB functionality need the SDE schema.
  - The User, all related data and SDE schema
  - May be easier to export entire Oracle Instance
How to export?

- Data pump (Oracle), SDEExport (ArcSDE)
  - Oracle tools, work well with ST_Geometry starting at 9.3

- Simple data only. Advanced object types have to be exported using the ArcGIS, GP tools, python or ArcObjects.

- KB34342 Index: Working with ST_Geometry and Oracle export/import
Data pump setup

D:\>mkdir D:\CMDWork\DATAPUMP_DIR

SQL> create directory "DATAPUMP_DIR" As 'D:\CMDWork\DATAPUMP_DIR';

SQL> grant read on Directory "DATAPUMP_DIR" to sde_user;

SQL> grant write on Directory "DATAPUMP_DIR" to sde_user;
Export Examples

- Oracle datapump

  D:\>expdp gdb/*** DIRECTORY=DATAPUMP_DIR DUMPFILE=UC2009_country.dmp tables=(COUNTRY)

- SDE Export

  D:\>sdeexport -o create -l country,shape -u gdb -p *** -f D:\CMDWork\UC2009\SDEExportCountry.exp
Import Examples

• Oracle datapump

D:>impdp gdb/*** DIRECTORY=DATAPUMP_DIR
DUMPFILE=UC2009_country.dm

D:>sdelayer -o register -l country,shape -u gdb -p *** -e nac+ -P HIGH -t ST_GEOMETRY -C Objectid,sde

• SDE Import

D:>sdeimport -o create -l country,shape -u gdb -p *** -f D:\CMDWork\UC2009\SDEExportCountry.exp
Backup Options

• Backup all schemas, including SDE

• Make sure you test your recovery scripts/backups before you need to use them.

• On restore, may have to compile SDE schema packages.
  - DBMS_UTILLiTY.COMPILE_SCHEMA(‘SDE’)

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

- Eases integration
  - The geodatabase can create spatial type data
  - The geodatabase can consume spatial type data
- Enhances your efficiency
  - Leverage processing power of the DBMS
- Adheres to standards
  - Industry standard SQL access
  - Simple features
  - Standard Functions
  - Well-known interchange formats
Spatial Types and Functions

- **Creation of Features**
  - through SQL
- **Analysis**
  - Buffering Geometry
  - Convex Hull
  - Difference of Geometries
  - Intersection of Geometries
  - Symmetric Differences
  - Union
  - Minimum Distance
  - Aggregates
- **Feature Information**
Agenda

• Administration Topics
  - Scenario 1: New Setup with 11g
  - Scenario 2: Upgrading to 11g from 9i/10g
  - Managing Performance in 11g
  - Advanced Configurations

• Architectures, Loading and Spatial Types
  - Connection Architectures and Diagnostics
  - Loading Considerations, Export/Import and Backup
  - Leveraging the Spatial Type

• What’s new at 10.1
What’s new at 10.1

- Stand alone SDE.ST_Geometry install
  - Implementing a static list of common spatial references
- Connection to none Geodatabase Oracle instance
  - Connect and query simple features from a SDE.ST_Gometry or SDO_Geometry layer for read only access
  - Ability to copy a feature class to database
- Geodatabase/Database administration tools
  - Version hierarchy, permissions, locking and statistics all exposed through ArcCatalog
Related Documentation Resources

• Geodatabase Resource Center
  - http://resources.esri.com/geodatabase/

• Inside the Geodatabase Blog
  - www.esri.com/geodatabaseblog

• ArcGIS Desktop Help topics
  - Registering tables to be used by ArcGIS Desktop
  - Enhancing ArcGIS functionality using spatial types
  - Using multiversioned views
Other Sessions

Technical Workshops

• Managing Distributed Data with Geodatabase Replication
  - Tuesday 3:15pm Room 6D
  - Thursday 10:15am Room 4

• Editing Strategies for Enterprise Geodatabases
  - Thursday 10:15am Room 5A/B

Demo Theatre Presentations

• Using Oracle Trace to Troubleshoot
  - Wednesday 11:30am Geodatabase Management Demo Theatre
  - Thursday 11:30am Geodatabase Management Demo Theatre

• Using SQL with your Geodatabase
  - Thursday 10:30am Geodatabase Management Demo Theatre
Other Sessions

Technical Workshop 20 Minute

• **Database Security Tips**
  - Thursday 10:15am Room 23B

• **Troubleshooting Performance Issues with Enterprise Geodatabases**
  - Thursday 10:40am Room 24A

• **Upgrading to ArcGIS 10.0 Geodatabases**
  - Thursday 1:30pm 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
Questions?

- **Please fill out the evaluation**
  - [http://www.esri.com/sessioneval](http://www.esri.com/sessioneval)

- **Thank you for attending**