Loading large volumes of raster data into a geodatabase

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Target audience

- This session is very technical and geared towards those of you who have been charged with loading up a large amount to image data into ArcSDE

What you should expect to learn

- This session provides a cradle-to-grave run through of how to load a large amount of image source data into a raster dataset or raster catalog
- The focus is on preparation and planning to avoid pitfalls that can interrupt the load or force you to start over again

Raster document

- The material presented in this session is from a document that it under construction.
- The document is an ongoing project and will be released with 9.1.

Other raster sessions

- **ArcGIS Raster Data Management: Introduction to ArcGIS Raster**
  - Offered on Tuesday 3:30 – 5:00 and Wednesday 10:30 – 12:00
  - A good overview
- **ArcGIS Raster Data Management: Building an Enterprise Geodatabase Raster Data Management System**
  - Offered on Wednesday 8:30 – 10:00 and Thursday 1:30 – 3:00
  - An intensive look at raster property management
- **ArcGIS Data Models: Raster Data Model**
  - Offered on Wednesday 10:30-12:00

Basic steps to creating large raster objects

1. Configuring your system
2. Creating the DBMS storage space
3. Preparing your source data
4. Creating the raster object
5. Loading the image data into the raster
6. Building the DBMS statistics
7. Building the raster statistics
8. Viewing the finished product
9. Transferring the data

Configuring your system for write performance

- Configuring your O/S (AIX only)
- Configuring your DBMS parameters
- Configuring the ArcSDE server

Configuring your O/S (AIX only)

- If your DBMS is installed on an AIX platform, set the following O/S parameters for best network I/O performance:
  - Set the following ifconfig parameters:
    set tcp_delay to 1
    set rfc1323 to 0 if you are using a gigabit network card.
  - Check to see if the following parameters exist and change them as follows:
    - Set RX checksum offload to yes.
    - Set TCP large send offload to yes.

Configuring your DBMS for data loading

- Is the server dedicated to loading raster data?
- You may need to load data during the off hours
- You may not be able to disable the archived logging for DBMS that allow you to do so
- You may need to create a separate installation of the DBMS to load the raster data.

Configuring your DBMS parameters (SQLServer)

- Govern the resources consumed by SQLServer only if there are other applications running on the server
- Use lightweight pooling to reduce the number of thread context switches

Configuring your DBMS parameters (Oracle)

- Use a large data block size to store the raster blocks.
  - At least 16 Kilobytes
  - 32 Kilobytes are probably better
- Configure the checkpoint interval to occur only when the redo logfile switches
  - Set the LOG_CHECKPOINT_INTERVAL and LOG_CHECKPOINT_TIMEOUT to 0
- Increase the size of the online redo logfiles
- Increase the buffer cache size to hold the dirty block buffers
  - Increase the size of the DB_BUFFER_CACHE

Configuring your DBMS parameters (DB2)

- Create separate buffer pools for the raster tablespaces.
- Create a large buffer pool for the tablespace storing the raster blocks table.
- If DB2 is installed on an AIX platform set the following parameters:
  - db2set DB2_MMAP_READ=OFF
  - db2set DB2_MMAP_WRITE=OFF

Configuring your DBMS parameters (Informix)

- Configure the onconfig parameters:
  - Set BUFFERS large enough to stay ahead of the cleaners
  - Set the LOGSIZE to 100000
  - Make sure that the physical log is not created in the rootdbs dbspace
  - Set the LOG_BACKUP_MODE to continuously backup the logical logs.
  - Set the LOGSMAX to 100
  - Set RA_PAGES to 125
  - Set RA_THRESHOLD to 85
  - Set RESIDENT to -1
  - Set the NETTYPE parameter to favor remote connections if you intend to use direct connections.

A note about direct connections

- Direct connections to the DBMS should be used whenever:
  - The client CPU is faster that the server CPU
  - The gsrvr process builds the pyramids, a CPU intensive operation
  - You need to distribute the processing load by moving the gsrvr process off the server
- Setting up a direct connection is detailed in the appendices of the ArcSDE Configuration and Tuning Guides.
- You can also obtain information from the DBMS training technical sessions.

Configuring the ArcSDE server

- Increase the size of the RASTERBUFSIZE parameter during the load process
  - Default size is 100KB
  - Increase it to 10MB
  - Use the sdeconfig command to update the parameter
  - Set it back to the default value once loading is complete

Setting the RASTERBUFSIZE

- Use the sdeconfig command to increase the size of the RASTERBUFSIZE parameter to 10M.

  sdeconfig –o alter –v RASTERBUFSIZE=10240000 –N

Creating the DBMS storage space

- Estimating the storage space requirement
- Creating the space
- Updating the ArcSDE DBTUNE table

Estimate the required DBMS storage space

- Load the sample image into ArcSDE
  - The sample raster should have the same properties of the end result
    - Compression
    - Pixel depth
    - Number of bands
    - Tile size

Estimate the required DBMS storage space

- Use the DBMS tools to determine the storage space occupied by raster blocks table
  - First obtain the raster column ID

```
select rastercolumn_id
from sde.raster_columns
where table_name = 'EARTH';
```

  - Then obtain the storage occupied by the blocks table

```
select blocks
from user_tables
where table_name = 'SDE_BLK_40';
```

Estimate the required DBMS storage space

- Alternatively, use the sderaster command with the -storage option to obtain the space occupied the sample raster.

  sderaster –o list –l earth,raster –storage –v 1

- Requires time to run because it scans the entire raster dataset

sderaster –o list -storage

```
sderaster -o list -l earth,raster –storage –v 1

Connecting to server jolex, port 10000, as user mark

ArcSDE 9.0 Mon Jul  5 16:06:16 PDT 2004
----------------------------------------------------------------

Raster ID .....: 1
Raster Dimension .....: 3000, 2001, 3
Raster Tile Dimension .....: 128, 128
Pixel Type .....: uchar
Compression .....: jpeg
Image Pyramid .....: 2, false, nearest
Raster Tile Storage .....:
                 min    max      mean   std dev      count              total
Level  0:
  Band  1   1211   4659   3162.21    725.35        384              1,186 KB
  Band  2   1242   4601   3163.65    684.17        384              1,187 KB
  Band  3   1223   4656   3193.58    715.03        384              1,198 KB
Level  1:
  Band  1   2206   5807   4100.91    981.99         96               385 KB
  Band  2   2308   5570   4104.73    881.96         96               385 KB
  Band  3   2295   5781   4164.60    944.25         96               391 KB
Level  2:
  Band  1   2596   6509   5090.00   1183.63         24               120 KB
  Band  2   3120   6244   5120.96   1003.13         24               121 KB
  Band  3   3014   6416   5199.00   1093.77         24               122 KB

                                                                     5095 KB
```

Calculating the raster blocks table size

- Using the size of the sample, estimate the size of the raster blocks table using the following formula.

raster blocks table size =
(<sample raster DBMS size> /
<sample image file size>)
* (total size of all image files)

6,418,285 KB = 5095 KB / 50820 KB * 64,019,091 KB

~6.12 GB

Calculating the raster blocks table index size

- Estimate the size of the raster blocks table index by the row count returned by sderaster list operation

block table rows =
(<total size of all image files>
/ <sample file size>)
* <sample raster row count>

1,904,700 total rows = 64,019,091 KB / 50820 KB * 1512

raster block table index size = block table rows * 24 bytes/row

raster block table index size = 1,904,700 * 24

= 45,712,800 bytes

= 43 MB

Properties that affect the storage size of a raster blocks table

- Compression
- Pyramid
- Number of bands
- Pixel depth
- DBMS storage parameters
- Number of raster datasets within a raster catalog

Compression

- The following table offers a relative comparison of the storage savings by the various types of compressions and their quality settings

Compression Type:	Quality	Relative Compression:	
LZ77	N/A	50%	
JPEG	75%	85%	
	50%	90%	<= relative visual quality line
	25%	93.3%	
JPEG2000	200/255	64%	
	150/255	85%	
	140/255	89%	
	130/255	93%	
	120/255	94%	<= relative visual quality line
	110/255	96%	
	100/255	97%	
	50/255	99%	

The Reduced Resolution Pyramid

- A full pyramid increases the size of the raster blocks table by 33 percent.

Pyramid Level:	Percent Increase Of Level 0:	Size On Disk:
0	0.0%	100GB
1	25.0%	125GB
2	6.25%	131.3GB
3	1.56%	132.8GB
4	0.4%	133.2GB
5	0.1%	133.3GB
6	0.024%	133.32GB
7	0.006%	133.33GB

Pixel Depth

- The larger the pixel depth does not necessarily mean a proportionate increase in storage. JPEG compression can be applied to 8-bit data and JPEG 2000 compression can be applied to 8 and 16 bit data.

Pixel Depth	Byte Factor
1-bit	0.125
4-bit	0.5
8-bit	1
16-bit	2
32-bit	4
64-bit	8

DBMS storage parameters

- Certain DBMS parameters can affect how efficiently the data is stored within the granular unit of the database.
- Minimize the storage overhead and pack the pixel data in as tightly as possible
- Minimize the footprint on disk

Number of bands/Number of raster datasets

- The size of a raster dataset is determine as the sum of its bands.
  - Typically bands are rather homogeneous in size
- The size of a raster catalog is determined as the sum of its raster datasets.
  - Typically raster datasets are heterogeneous in size

Creating the DBMS storage space

- How you create the DBMS storage space depends on how you need to manage it
  - Some DBMS allow you to move the data files of a database, so you may want to store all the raster tables and indexes into a single space.
  - If transporting the data is not a concern, create storage space according to size
    - A large space for the blocks table and its index
    - A smaller space for the other raster tables and their indexes

Creating the DBMS storage space

- Pre-allocate the DBMS space
  - Some DBMS allow you to auto grow the DBMS space
  - However you should preallocate the space to insure that you will not encounter problems during the load
  - Since you have gone to the trouble of estimating the space requirements of the data, you might as well allocate space for it.

Creating the DBMS storage space (oracle)

- Create the non raster blocks tablespace

```
create tablespace earth
datafile ‘d:\oradata\earth.dbf’
size 500M
extent management local
uniform size 1M;
```

- Create the raster blocks tablespace

```
create tablespace earth_blocks
datafile ‘e:\oradata\earth_blocks.dbf’
size 32000M
extent management local
segment space management manual
uniform size 100M;
```

Creating the DBMS storage space (SQLServer)

- Create the SQLServer database large enough to store the entire raster object.

Creating the DBMS storage space (DB2)

- Create a tablespace to store all the non-raster blocks data in.

  create tablespace earth managed by database
  using (file ‘d:\earth.dat’ 500000);

- Create a tablespace to store the raster blocks table data.

  create long tablespace earth_blocks managed by database
  using (file ‘e:\earth_blocks.dat’ 50000000);

Creating the DBMS storage space (Informix)

- **Create the dbspace to store all no raster blocks tables**

  onspaces -c -d earth -p d:\earth.dbs -o 0 -s 5000

- **Create the dbspace(s) to store the raster blocks table**

  onspaces -c -d earth_blocks -p e:\earth_blocks.dbs -o 0 -s 5242880

Editing the SDE.DBTUNE table

- The SDE.DBTUNE table holds the storage parameters used by ArcSDE to create DBMS tables and indexes.
  - ArcSDE appends DBTUNE storage parameter to the CREATE TABLE and CREATE INDEX SQL statements
- Edit a file (SDEHOME/etc/dbtune.sde) by default.
- Use sdedbtune import operation to update the SDE.DBTUNE table.

Raster DBTUNE table parameters

B_STORAGE - Business table
B_INDEX_ROWID - Business table row id

RAS_STORAGE - Raster table
RAS_INDEX_ID - Raster table index on the raster_id integer column

BND_STORAGE - Raster band table
BND_INDEX_ID - Raster band table index on the rasterband_id column
BND_INDEX_COMPOSITE - Raster band table composite on the sequence_nbr and raster_id columns

AUX_STORAGE - Raster auxiliary table
AUX_INDEX_COMPOSITE - Raster auxiliary table index

BLK_STORAGE - Raster block table
BLK_INDEX_COMPOSITE - Raster block table composite index

Raster DBTUNE (SQLServer)

```
##EARTH_15M
RAS_STORAGE       ""
RAS_CLUSTER_ID   1
RAS_INDEX_ID    "WITH FILLFACTOR = 95"
BND_STORAGE       ""
BND_CLUSTER_ID   0
BND_INDEX_ID    "WITH FILLFACTOR = 95"
BND_CLUSTER_COMPOSITE   0
BND_INDEX_COMPOSITE    "WITH FILLFACTOR = 95"
AUX_STORAGE       ""
AUX_CLUSTER_COMPOSITE   1
AUX_INDEX_COMPOSITE    "WITH FILLFACTOR = 95"
BLK_STORAGE       ""
BLK_CLUSTER_COMPOSITE   1
BLK_INDEX_COMPOSITE    "WITH FILLFACTOR = 95"
##END
```

Raster DBTUNE (Oracle)

```
##EARTH_15M
RAS_STORAGE        "PCTFREE 0 INITRANS 4 TABLESPACE EARTH“
RAS_INDEX_ID       "PCTFREE 0 INITRANS 4 TABLESPACE EARTH"
BND_STORAGE        "PCTFREE 0 INITRANS 4 TABLESPACE EARTH”
BND_INDEX_COMPOSITE "PCTFREE 0 INITRANS 4 TABLESPACE EARTH"
BND_INDEX_ID       "PCTFREE 0 INITRANS 4 TABLESPACE EARTH"
AUX_STORAGE        "PCTFREE 0 INITRANS 4 TABLESPACE EARTH”
AUX_INDEX_COMPOSITE "PCTFREE 0 INITRANS 4 TABLESPACE EARTH"
BLK_STORAGE        "PCTFREE 0 INITRANS 4 TABLESPACE EARTH_BLOCKS
                    STORAGE (INITIAL 500M MINEXTENTS 10)”
BLK_INDEX_COMPOSITE "PCTFREE 0 INITRANS 4 TABLESPACE EARTH“
##END
```

Raster DBTUNE (DB2)

```
##EARTH_15M
AUX_STORAGE "IN EARTH INDEX IN EARTH"
BLK_STORAGE "IN EARTH INDEX IN EARTH LONG IN EARTH_BLOCKS"
BND_STORAGE "IN EARTH INDEX IN EARTH"
RAS_STORAGE "IN EARTH INDEX IN EARTH"
##END
```

Raster DBTUNE (Informix)

```
##EARTH_15M
RAS_STORAGE             "EXTENT SIZE 16 NEXT SIZE 16
                         LOCK MODE ROW IN EARTH"
RAS_INDEX_ID            "FILLFACTOR 90 IN EARTH"
BND_STORAGE             "EXTENT SIZE 16 NEXT SIZE 16
                         LOCK MODE ROW IN EARTH"
BND_INDEX_COMPOSITE       "FILLFACTOR 90 IN EARTH"
BND_INDEX_ID            "FILLFACTOR 90 IN EARTH"
AUX_STORAGE             "EXTENT SIZE 16 NEXT SIZE 16 LOCK
                         MODE ROW IN EARTH"
AUX_INDEX_COMPOSITE       "FILLFACTOR 90 IN EARTH"
BLK_STORAGE             "EXTENT SIZE 1000 NEXT SIZE 1000
                         LOCK MODE ROW IN EARTH_BLOCKS"
BLK_INDEX_COMPOSITE       "FILLFACTOR 90 IN EARTH“
##END
```

ArcSDE binary spatial column

- The footprint of the raster dataset and raster catalog are stored in the spatial column. If the spatial column is created as an ArcSDE binary type you will also need to configure the following DBTUNE storage parameters.

F_STORAGE - Feature table
F_INDEX_FID - The feature table fid column index
F_INDEX_AREA - The feature table area column index
F_INDEX_LEN - The feature table length column index

S_STORAGE - The spatial index table
S_INDEX_ALL - The coverage index which indexes all the spatial index table columns.
S_INDEX_SP_FID - The spatial index table's fid column index.

Arranging the source data

- Logically group the data by operation.
  - For example, group files into folders that will be used in the same mosaic operation.
- Group image files that will be loaded into the same object into one folder, allowing you to use wild card access.
  - O/S restrictions on the number of files that can be simultaneously opened by wildcard access
    - May need to create several folders

Preparing your source data

- You may need to preprocess your data prior to inserting/mosaicking it into an ArcSDE raster
  - The sderaster mosaic operation requires pixels of the images to align perfectly. You can do this by adjusting the world files of the images.
  - At ArcSDE 9.1 sderaster will shift the images within a ½ pixel to align them automatically.

Determining the pyramid reference point

- The pyramid reference point is the point from which the reduced resolution pyramid is constructed.
- If it is moved, the pyramid must be reconstructed.
  - It is moved when images are mosaicked above or left of the current raster object.
- It is determined as the minimum X and maximum Y coordinate from the image world files.
  - Examine the world file to determine the minimum X and maximum Y
- Set the pyramid reference point
  - Set the pyramid reference point explicitly
  - Import the upper left image and mosaic to it
- Don’t be fooled by the curviture of the earth.

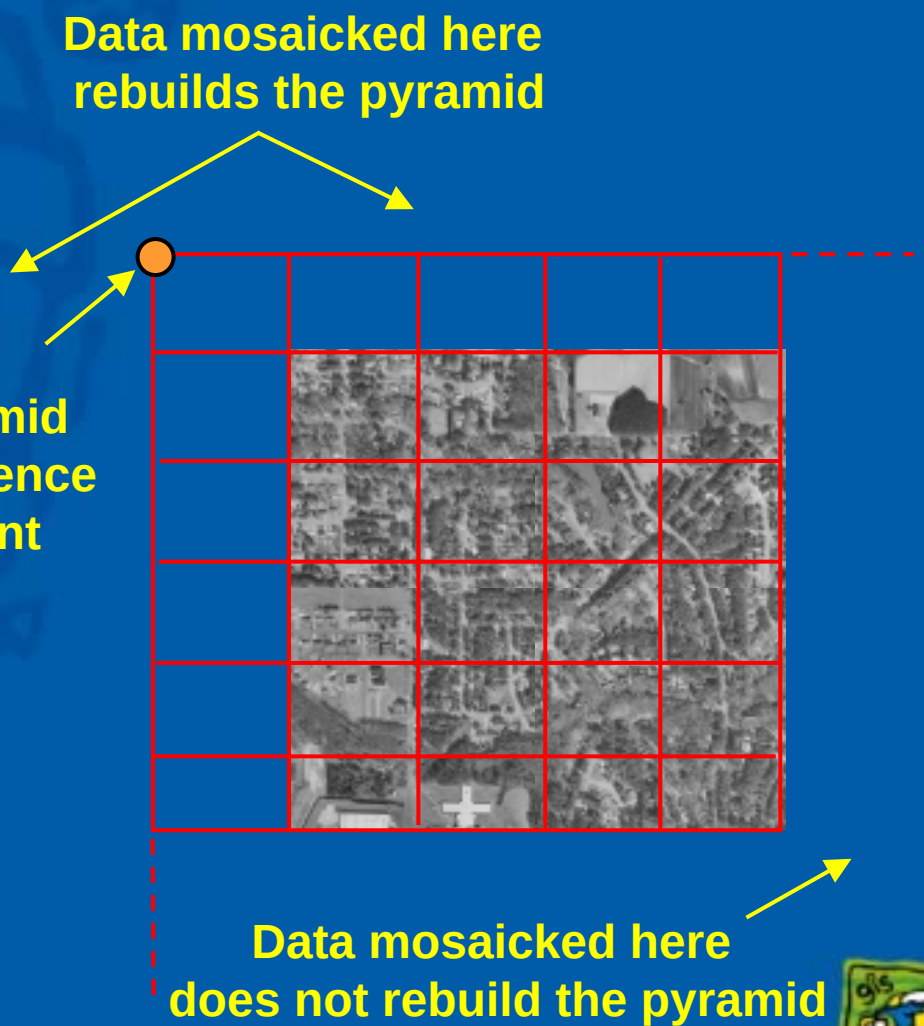
*.tfw TIFF world file

- The TIFF world file has the .tfw extension
- According to the TIFF standard, the 5th and 6th line hold the images minimum X coordinate and the maximum Y coordinate.

```
0.0001388888920000     <- Horizontal cell size
0.0000000000000
0.0000000000000
-0.0001388888920000    <- Vertical cell size
50.99861225348         <- X Minimum coordinate
32.50138961692         <- Y Maximum coordinate
```

Pyramid reference point

- Adding data to above or to the left of the pyramid reference causes the pyramid to rebuild.
- Determine the left-most, upper-most point from the world files and enter it as the pyramid origin when you create the raster dataset.



Creating the raster object

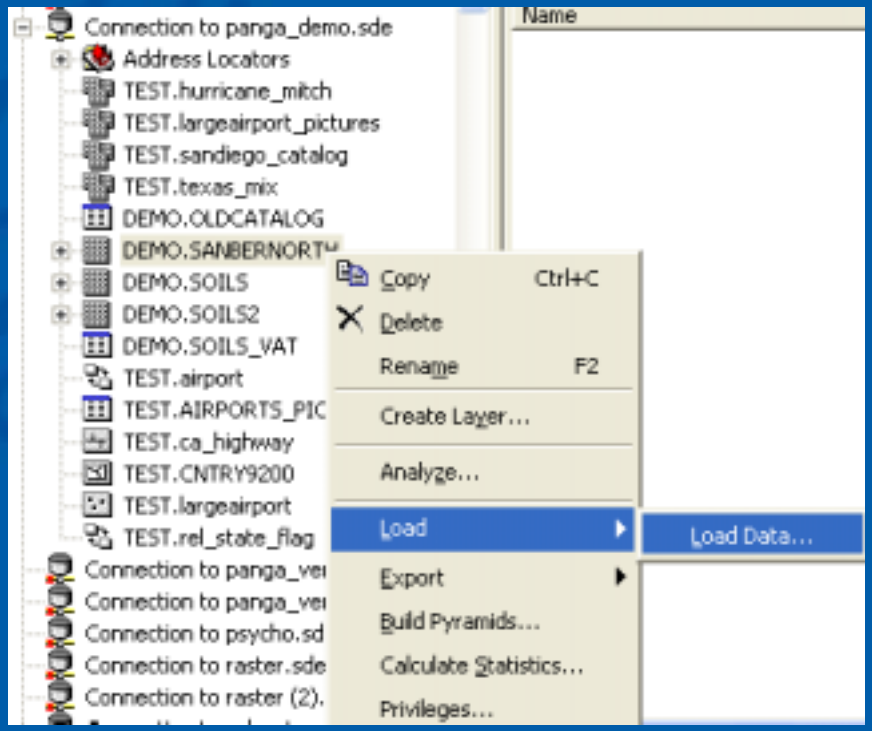
- Raster objects create by the geoprocessing tools
  - are empty; they have properties but contain no pixel data.
  - are geodatabase aware.
- Raster objects created by sderaster
  - always contain pixel data.
  - are not geodatabase aware.
  - lack the footprint column.
  - For the mosaic operation the world files must align perfectly.

Mosaic operations

- Mosaics to the same raster dataset must be performed serially.
- If partial pyramid construction is used, be careful not to move the pyramid reference point
  - For large rasters, it will appear as if the data load has stalled

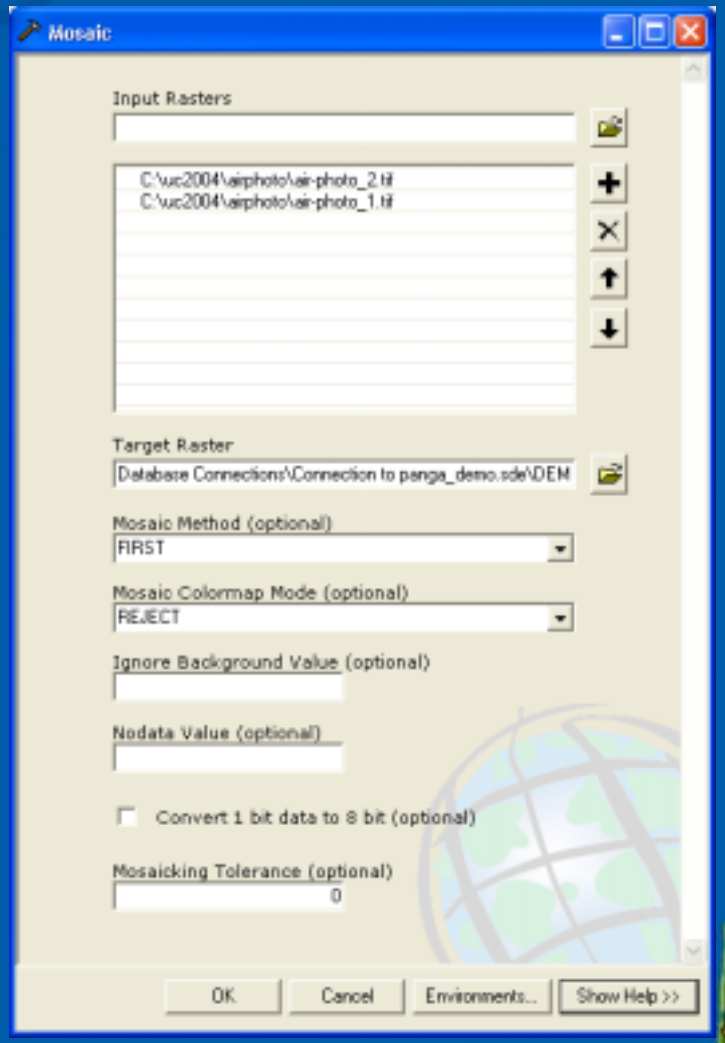
Mosaic operations

- Right click on the raster dataset and select Load, and Load Data...



Mosaic operations

- Navigate to the folder containing the image files
- Select the image files to be mosaicked
- Click OK



sderaster –o mosaic

- Take care to use the same pyramid interpolation and level options during the mosaic operation. Otherwise a pyramid reconstruction will be triggered.
  - Fixed at 9.1.
- First create the raster using the import operation

  sderaster –o import –f somewhere.tif –O -180.0,90.0 –L -1 –I bilinear
- Check it, make sure it has the correct properties
- Mosaic the remainder of the images with the mosaic operation

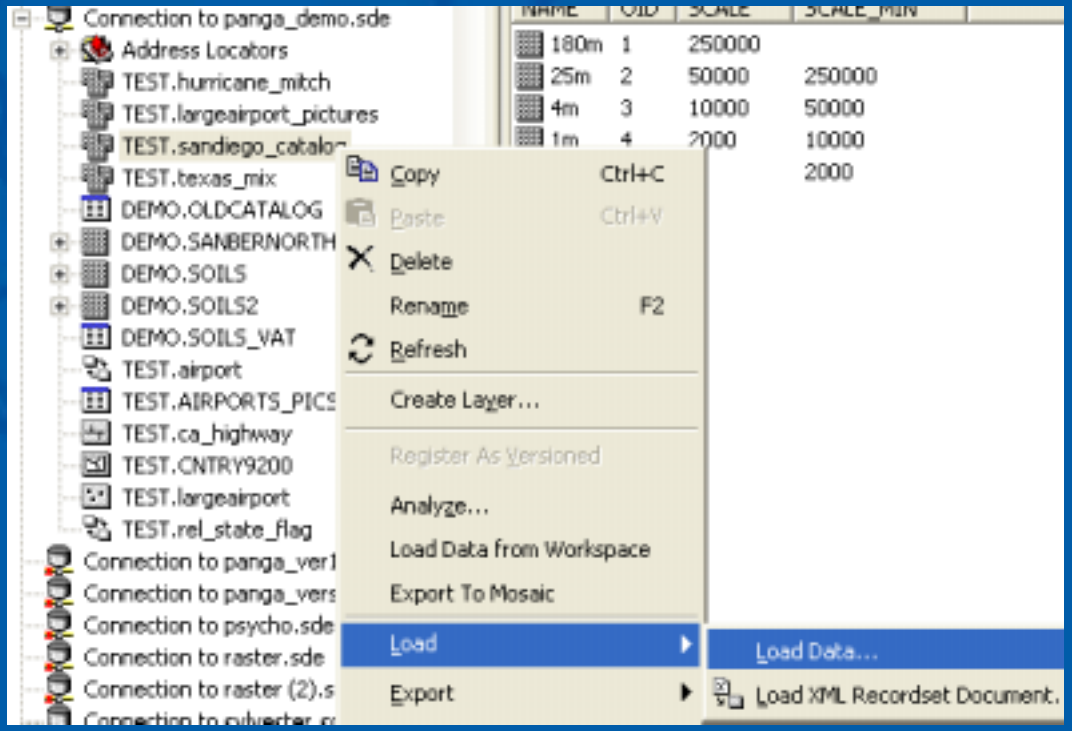
  sderaster –o mosaic –v 1 –L -1 –I bilinear e:*.tif f:*.tif

Insert operations

- Inserts to the same raster catalog can be done in parallel.
- The geoprocessing tools will accept a wide array of image files as input
- The sderaster command accepts TIFF and BSQ files.

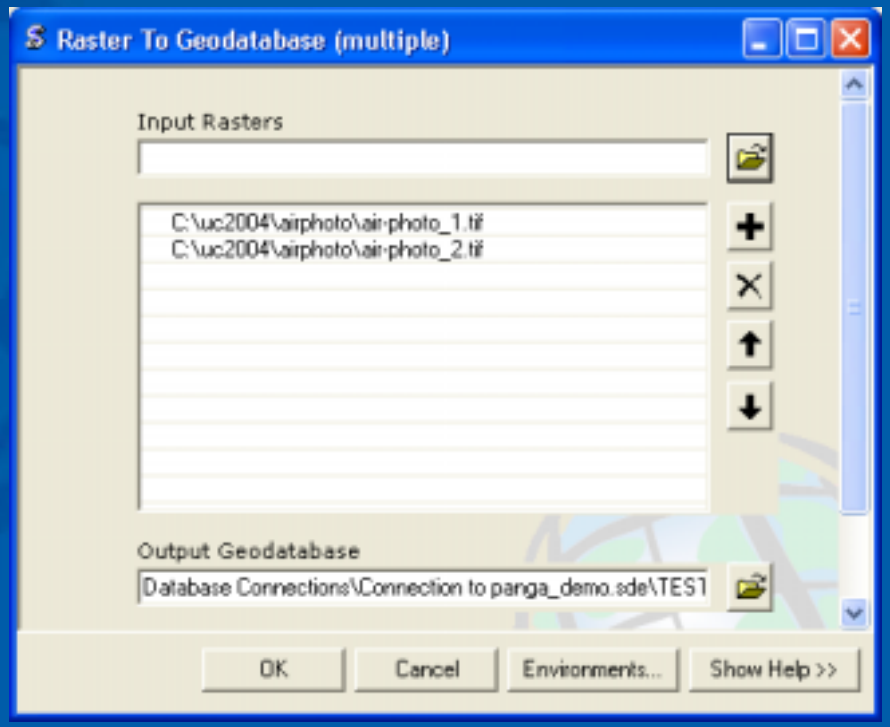
Insert operations

- In ArcCatalog right click on the raster catalog and select load and load data... from the menu.



Insert operations

- Navigate to the folder containing the images.
- Select the images
- Click OK



sderaster –o insert

- Import the first image to create the raster catalog.

  sderaster –o import –f whereever.tif

- Insert the remaining images to add raster datasets to the raster catalog

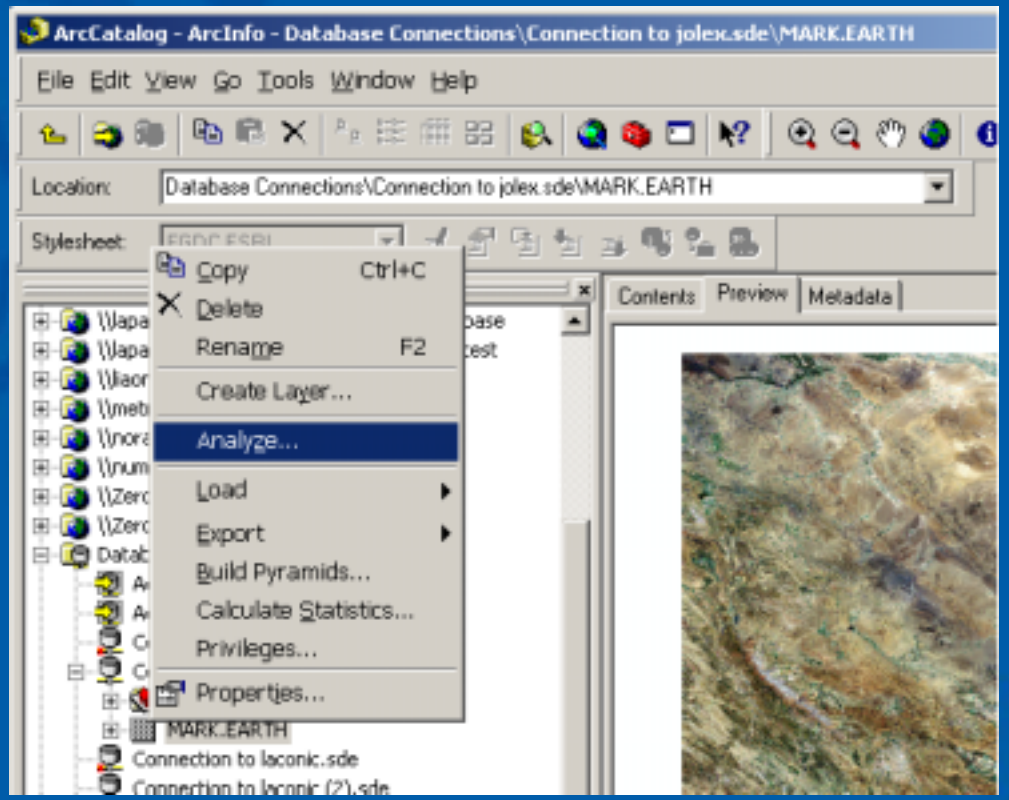
  sderaster –o insert c:\images1*.tif c:\images2*.tif

Build the DBMS statistics (if necessary)

- All of the supported ArcSDE DBMS use cost based optimization.
- Cost based optimization uses statistics previously gathered from the DBMS objects to determine the best execution plan.
- SqlServer gathers statistics automatically as the data is loaded.
- For all other DBMS you must generate DBMS statistics at least on the blocks table.

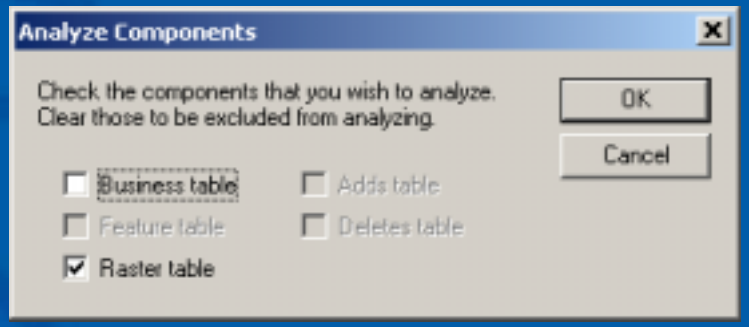
Build the DBMS statistics (if necessary)

- In ArcCatalog, right click on the raster object and select analyze from the menu.



Build the DBMS statistics (if necessary)

- Make sure that at least the Raster Table component is checked and click OK on the Analyze Components menu.



Build the DBMS statistics (if necessary)

- The sdetable update_dbms_stats operation also generates statistics

```
C:\>sdetable -o update_dbms_stats -t earth -m estimate
      -u mark -p mark -i 9000


ArcSDE 9.0 Oracle9i Fri Mar 19 13:28:50 PST 2004
Attribute       Administration Utility
-------------------------------------------------
DBMS statistics for table earth updated.
DBMS statistics for raster tables updated.

C:\>
```

Build the DBMS statistics (if necessary)

- **This is an Oracle example that quickly generates the statistics on the blocks table.**

```
SQL> select rastercolumn_id from sde.raster_columns
      where table_name = 'EARTH';

RASTERCOLUMN_ID
---------------
              1

SQL> analyze table sde_blk_1
      estimate statistics sample 1 percent;

Table analyzed.
```

Build the raster statistics (if necessary)

- Raster statistics are only necessary if the data needs to be stretched.
- Consult with your data provider to determine if you need to stretch the data.
- Build the statistics on the highest pyramid level and examine it.
- Building image statistics on the base pyramid level can take a very long time.

View the finished product

- Examine the image with your application
  - ArcMap, ArcGlobe, etc…
- View the performance of the display, it should be fluid.
  - If it takes a long time to display, make sure the DBMS stats are up to date on the raster blocks table.
- ArcSDE 9.0 partial pyramid construction allows you to view the raster as it is loaded
  - DBMS stats will be needed on raster blocks table once as the table grows

Transferring the data

- Things to consider when transferring raster data.
  - How large is the data?
  - Local copy verses remote copy?
  - What distribution media is available?

How large is the data?

- Raster datasets and raster catalogs can be huge
  - Earth Satellite Corporation are expecting that their 1 Terrabyte 15 meter resolution earth raster dataset will need to be loaded as 5 meter resolution in the future and will grow to 9 Terrabytes. As well certain areas of interest will need to be supplemented with 1 meter resolution.
- Special considerations need to be made to move data that, as a unit, exceeds commonly used transport media.

Local copy

- If data is duplicated onsite you can do a copy/paste.
  - Benefits of a copy/paste are that you do not need extra space to store the export file(s) and it is a simple to do.
  - For very large rasters objects however you may want to create the export files as a interim step

Remote copy

- Data sent to another site may need to be copied to a transport media.
- The size of the raster object may prohibit this from happening easily.
- May need to break up the data into volumes.
  - sdeexport –X option creates volumes
- Some DBMS vendors provide a detachable database file capability
  - Oracle transportable tablespaces
    - At Oracle 10G the data files are inter O/S capable.
  - SQL server detached files.
  - Much faster then loading an export.

Using SDE export files

- Use the sdeexport –X option if the export file size exceeds your transfer media's available storage space.
  - The –X option specifies the maximum size of the export file volume.
  - At ArcSDE 9.0 the maximum volume size is 4GB. At 9.1 the volume size will be increased to the O/S file limits.
- Use the sderaster list operation with the -storage option to determine the size of the export file that will be created.

Using SDE export files

- The SDEEXPORT command requires a lot of sort space to export raster data
  - You will need to create temporary space that is approximately 4 percent of the size of the final export file.
  - If sderaster –o list –storage returns a total of 100GB for the export file, you will need to have 4GB of temporary space available.

SDEEXPORT (example)

```
$ sdeexport –o create –t earth –f earth –X 4G
ArcSDE for <dbms> Mon Jul 19 16:06:36 PDT 2004
SDEX File Export        Administration Utility
------------------------------------------------------------
Exporting ArcSDE object to “earth" in SDEX 9.0 export format ...
Exporting table “earth".
  Spatial column "FOOTPRINT"
  Raster column "RASTER"
    1 features converted.
    1 features exported.

$ ls –l
total 5
-rw-rw-r--   1 sde    nuucp  4294967296 Aug  5 17:01 earth.000
-rw-rw-r--   1 sde    nuucp  4294967296 Aug  5 17:01 earth.001
-rw-rw-r--   1 sde    nuucp       9281019 Aug  5 17:01 earth.002
```

SDEIMPORT (example)

```
$ sdeimport –o create –t earth_at_15m –f earth –k earth_at_15m

ArcSDE 9.0 for <dbms>  Mon Jul 19 16:06:36 PDT 2004
SDEX File Import         Administration Utility
------------------------------------------------------------
Importing SDEX from earth.000 ...
  Importing spatial column "FOOTPRINT"
  Importing raster column "RASTER"
    1 record read.
    1 record stored.
```

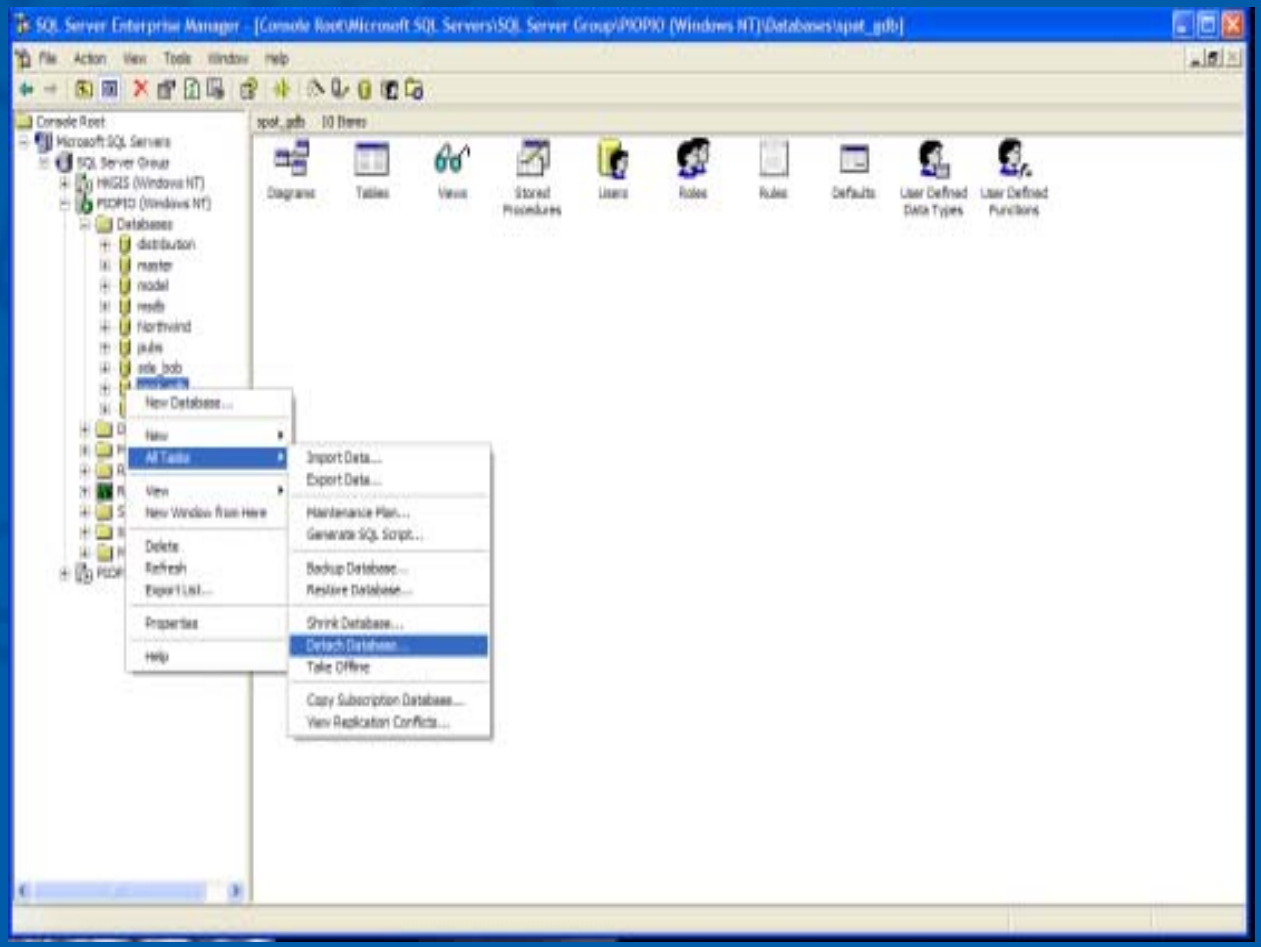
Using the DBMS export format

- Using the DBMS export format as an alternative to moving larger raster objects from one location to another.
- Unless you move the entire SDE instance, you will need to manually update the SDE metadata tables when you import the data.
  - The easiest way is to create an empty raster object, drop the tables of that object and replace them with the imported ones. Tricky, but doable.

SQLServer detached devices

- SQLServer allows you to detach the database so that the files of it's file group may be copied to another location.

SQLServer detached devices



Oracle transportable tablespaces

- Using transportable tablespaces you can export the metadata of a list of tablespaces to an export file.
- The datafile associated with the tablespaces and the export files are copied to the new location.
- Export file is imported
- Tables must be in read only mode when they are exported and copied.
- Requires the use of parameter files
- At Oracle9i the operating systems must be the same, but at Oracle10g the operating systems may be different (i.e) you can copy from Solaris to Intel and vice versa.

Distribution media

- Database files and export files storing raster data may exceed the storage capacity of tradition tape transfer media.
- Other solutions are available, “data bricks” storing upwards of 1.5 TerraBytes are available.
- However even larger transfer media systems may be needed
  - Suitcases or disk arrays with network cards attached are one possibility
  - Where necessary it may be feasible to ship the entire system, load the data, and ship it back.

Evaluation Form

Please fill out the evaluation form.

Questions