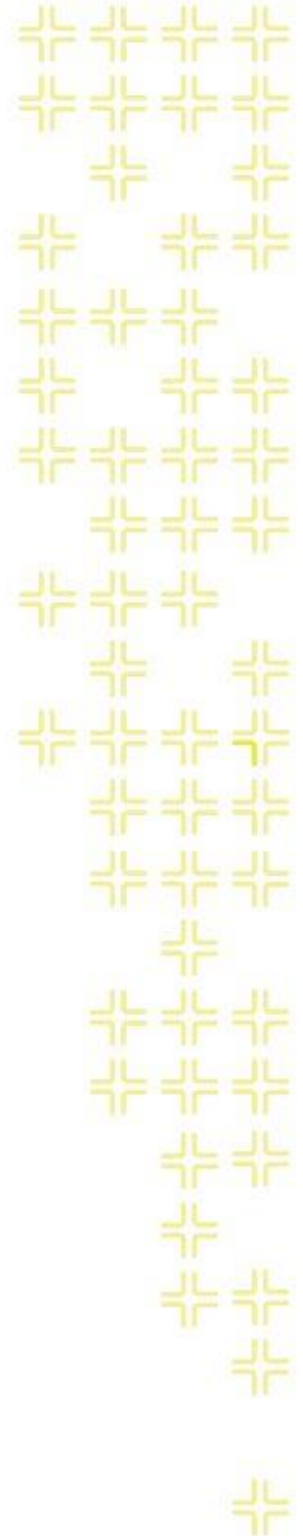




TRAINING GUIDE

# ArcGIS Server and Geodatabase Administration

Part 2



# ArcGIS for Server Geodatabase Administration

## - Part 2

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This session touches on key elements of maintaining enterprise geodatabases that help drive ArcGIS for Server services as well as backup techniques.

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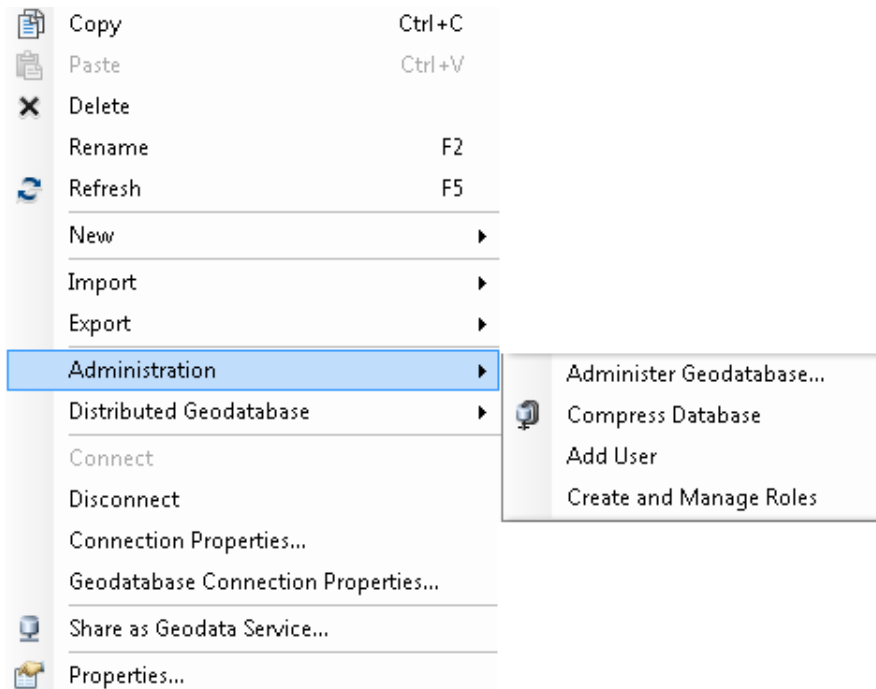
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# Maintenance

## Geodatabase Administration Tools

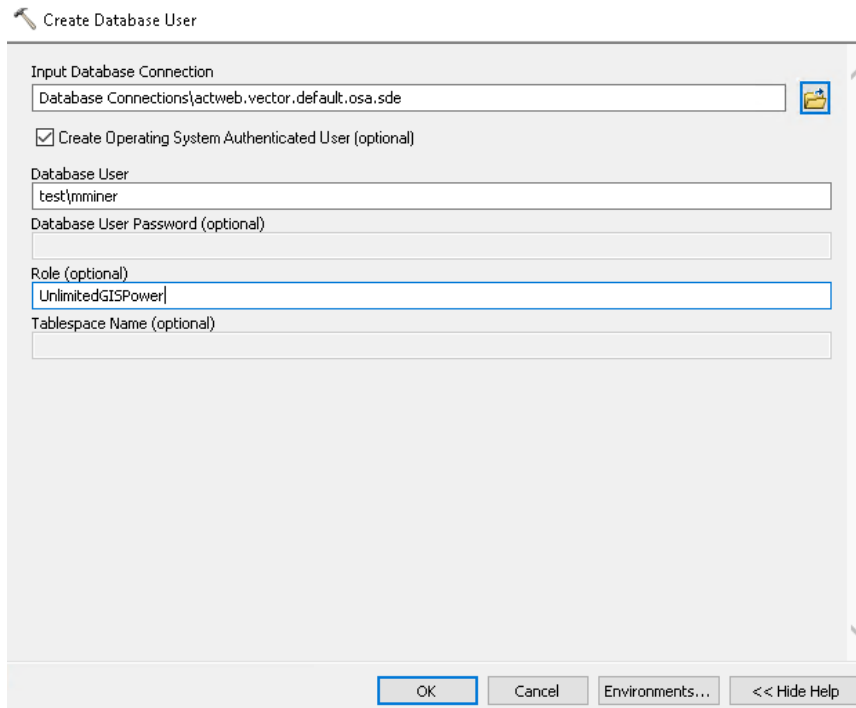
You can use the ArcCatalog interface for administrating users in the Enterprise Geodatabase.

1. Go to ArcCatalog and connect to a Geodatabase as an administrator with Dbo privileges. Once connected, right click on the connection and choose administration.

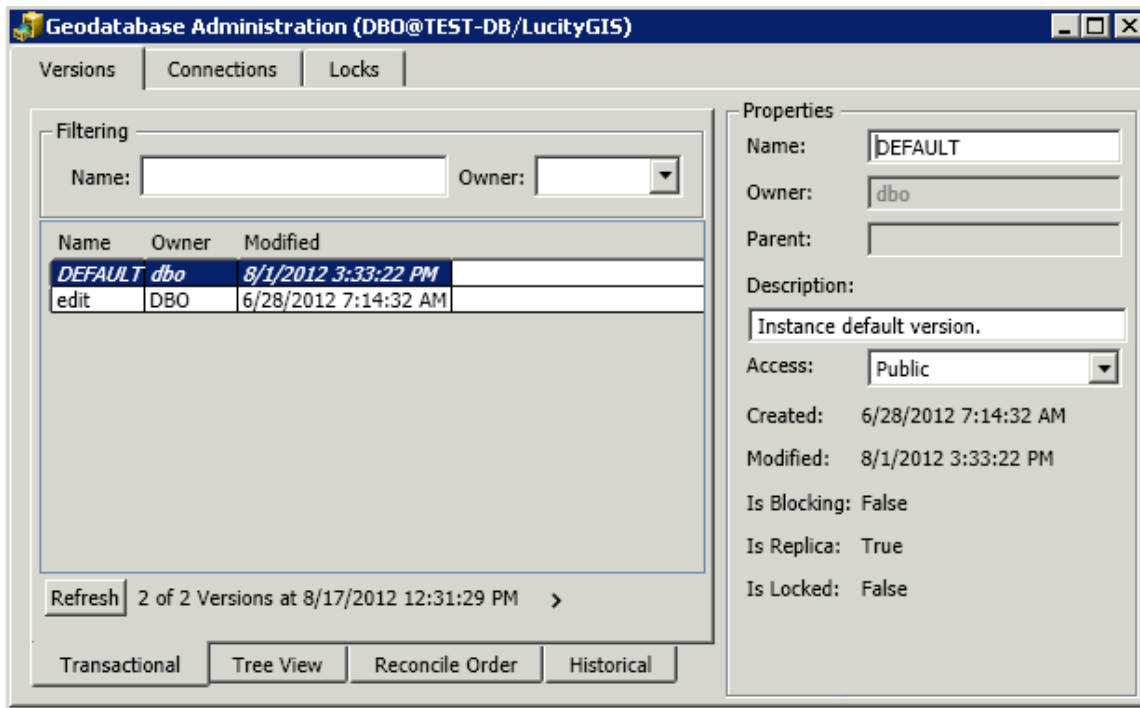


2. In the administration menu, you will see four choices. Compress is now integrated within the administration menu. Also, you can add users and create/manage roles in your enterprise Geodatabase without touching SQL Server. Roles will allow you to give permissions to the role without having to give permissions to each and every user. Think of a role as a group.

- Click on Add User. You have two choices, operating system authentication or sql server authentication which gives an arbitrary login and password not related to windows but related to sql server only. You have the choice of adding the user to a role.



- Go to Administer Geodatabase on the administration menu, the Geodatabase Administration dialog will appear. You can create versions, check connections and locks.

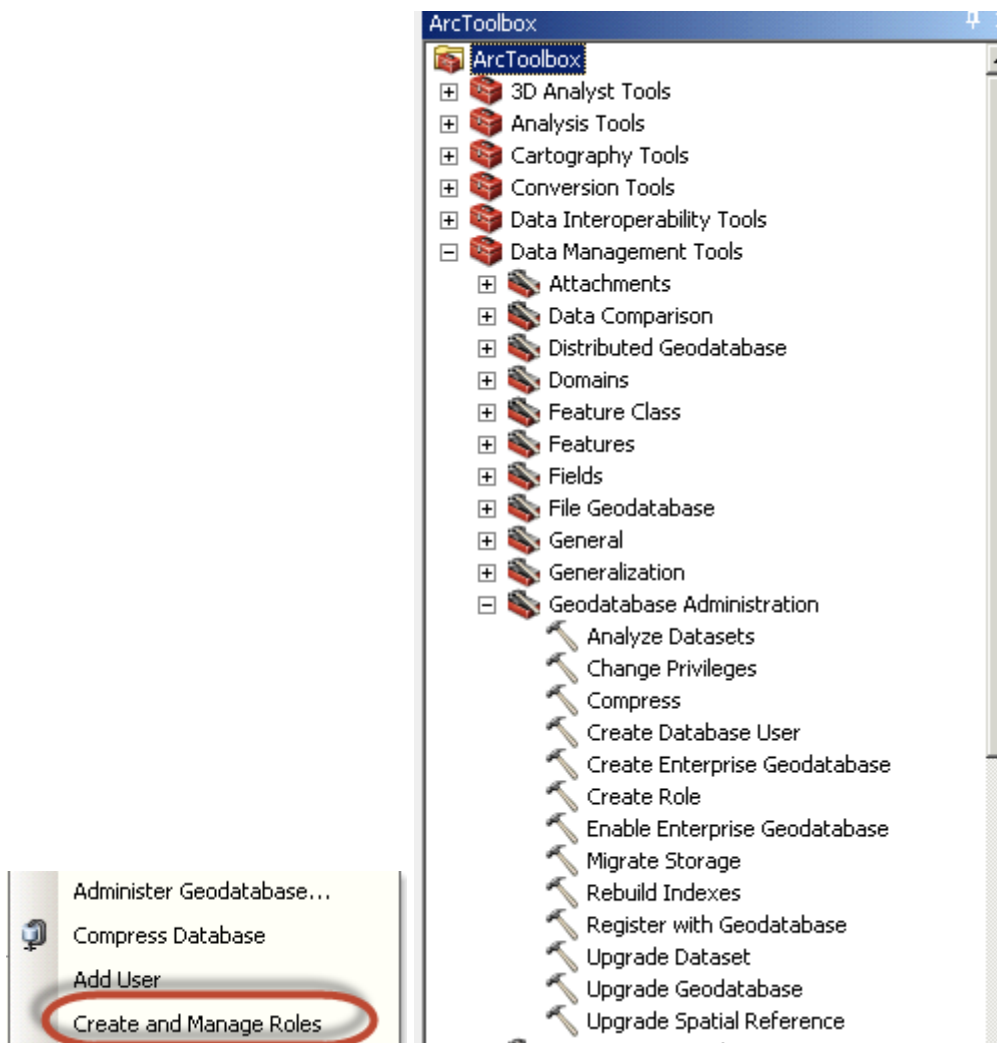


## Create Role

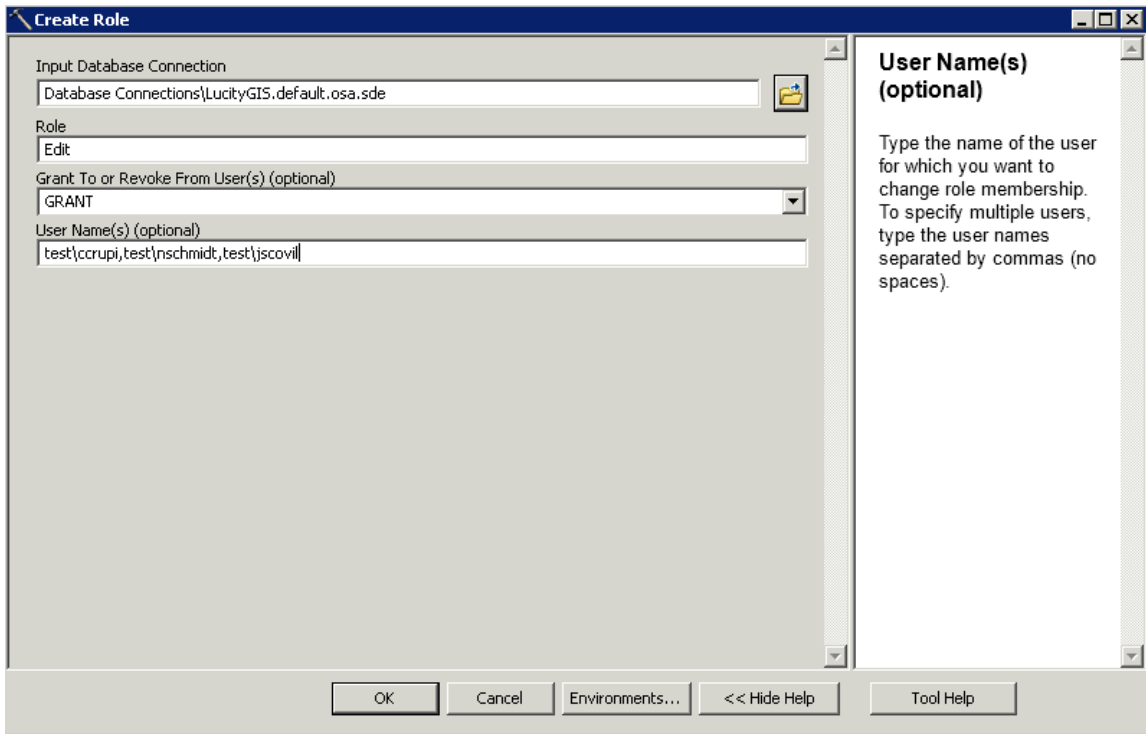
There are two different ways you can create roles. One way is to create an SDE role and assign users to the roles. The other way is to create Active Directory groups, add active directory groups to SQL Server allowing for Active Directory groups to act like roles. The great thing is that Active Directory is then managed by your IT user administration system without needing to manage all the users through SQL Server. We will show both ways below.

### Create Role within ArcCatalog

1. Right click on the database connection and go to Create and Manage Roles. You can access this from ArcToolbox Data Management Tools as well.

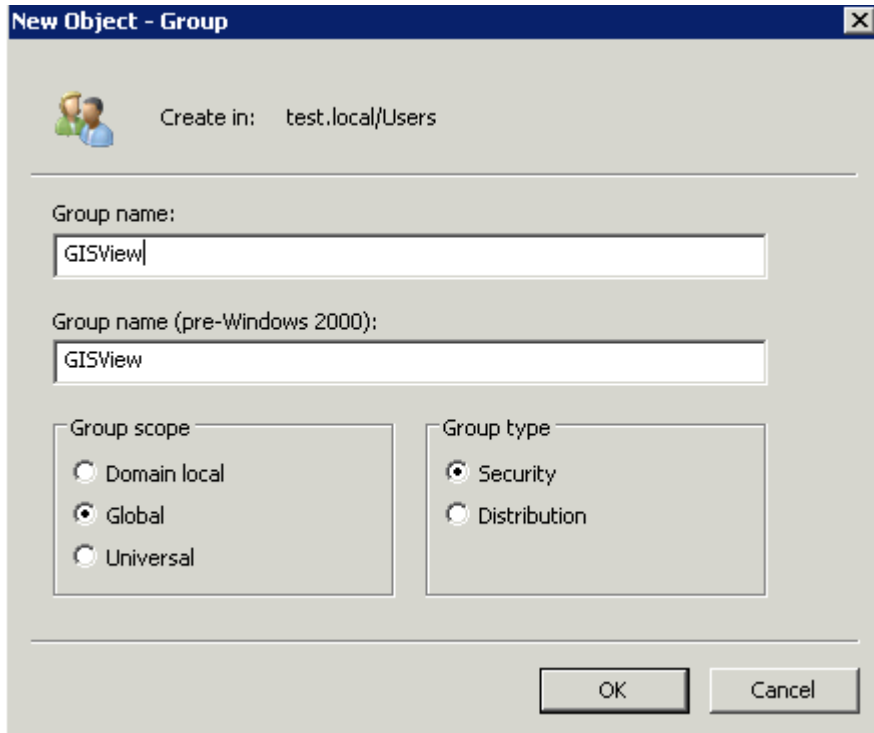


2. The create role dialog will appear. You can grant or revoke users from roles from this interface.

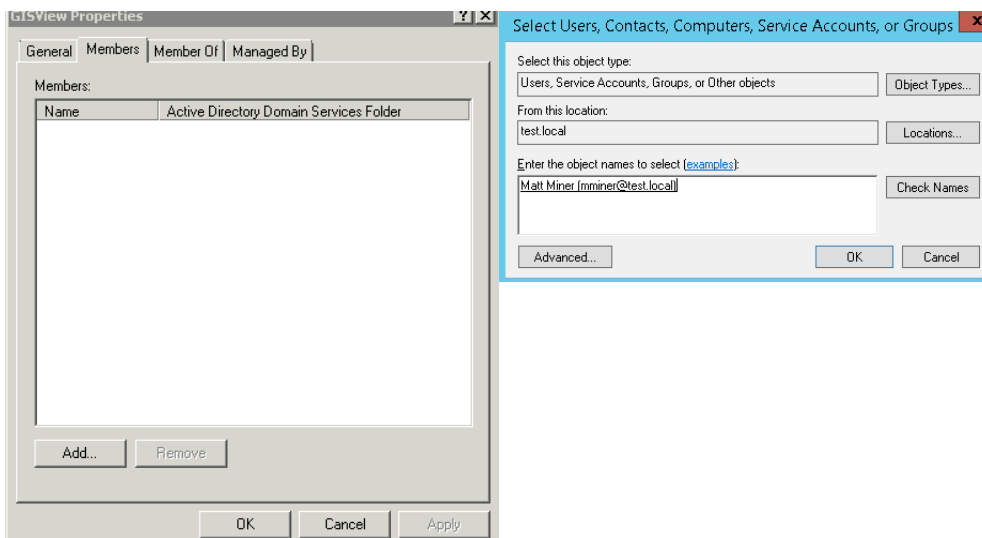


3. Create Active Directory Groups for the Enterprise Geodatabase

- Open the Active Directory Users and Computers dialog from your domain controller and add a group by right clicking on users and select new group. Add a name such as GISView. The default settings are fine. Click ok.

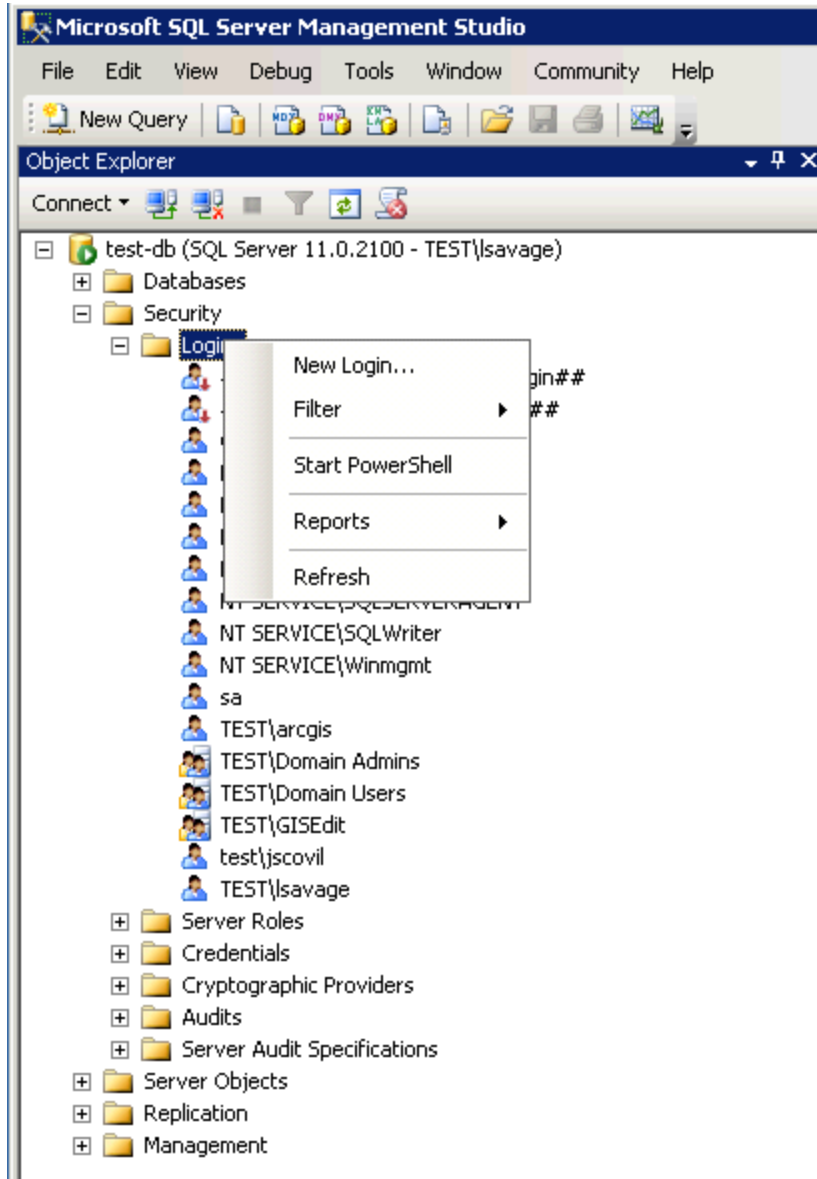


- Double click on the new group and add members within the members tab.



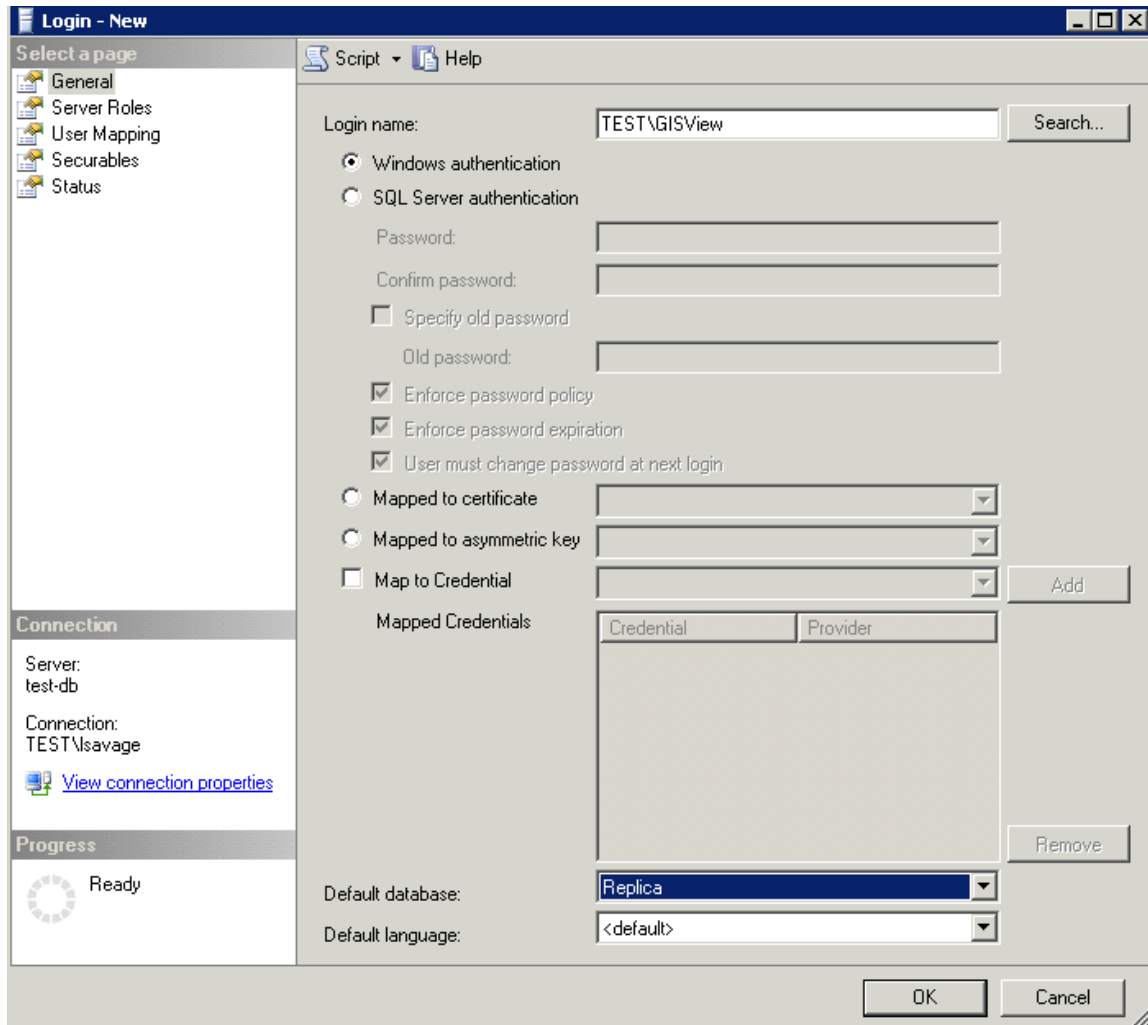
- Add the member and click ok.

7. Open SQL Server Management Studio and add new group to SQL Server by going to the TOC of the instance connection and expand security. Right click on the Login folder and select new login.

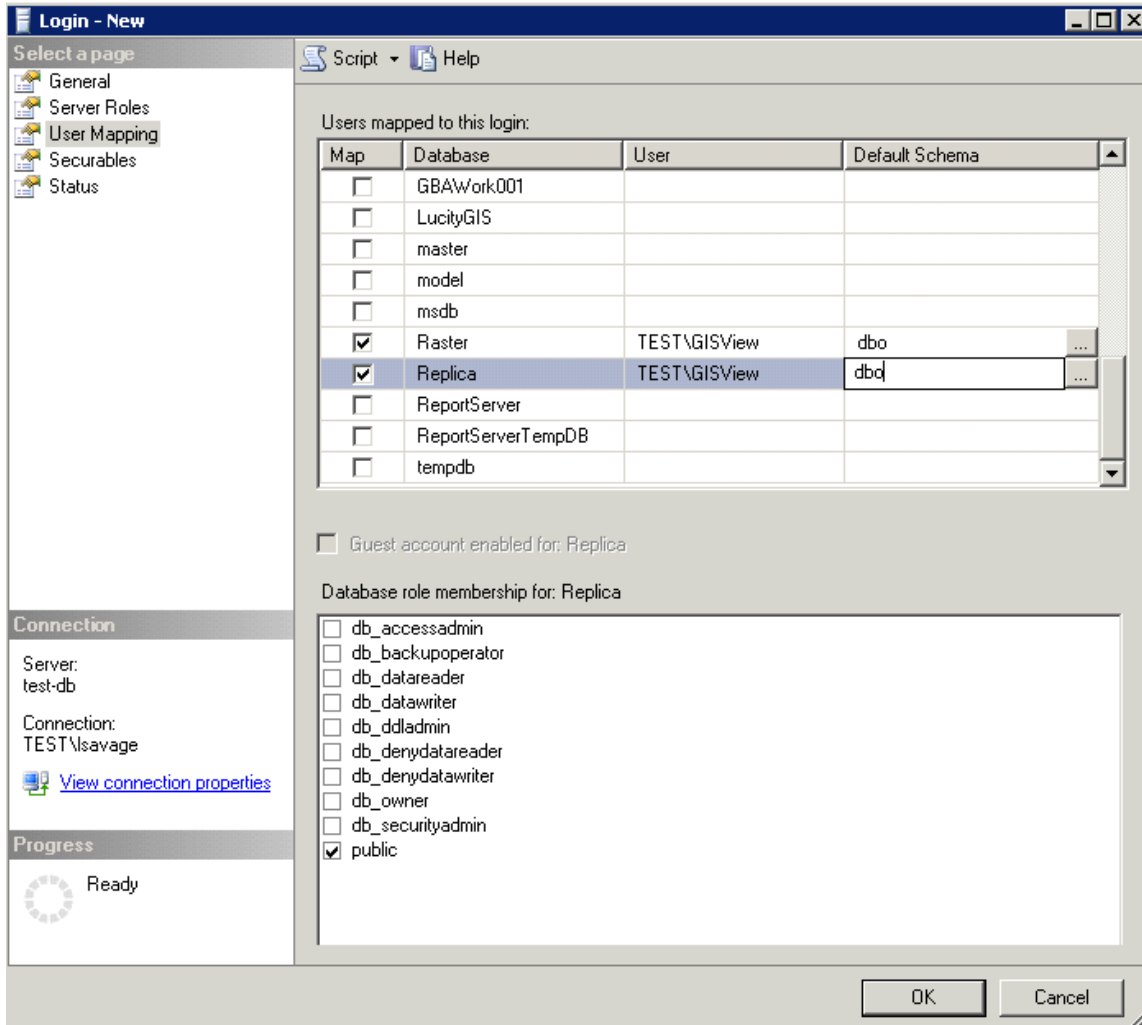




- Click on Search and make sure you are connecting to your domain as the location and add groups as a selectable item from Object Types. Click ok when you've found the group. In this example, we're using test\GISView. Make sure the default database is selected to something other than master. Since these users are going to a view only group, we're assigning the group to the replica as the default database.



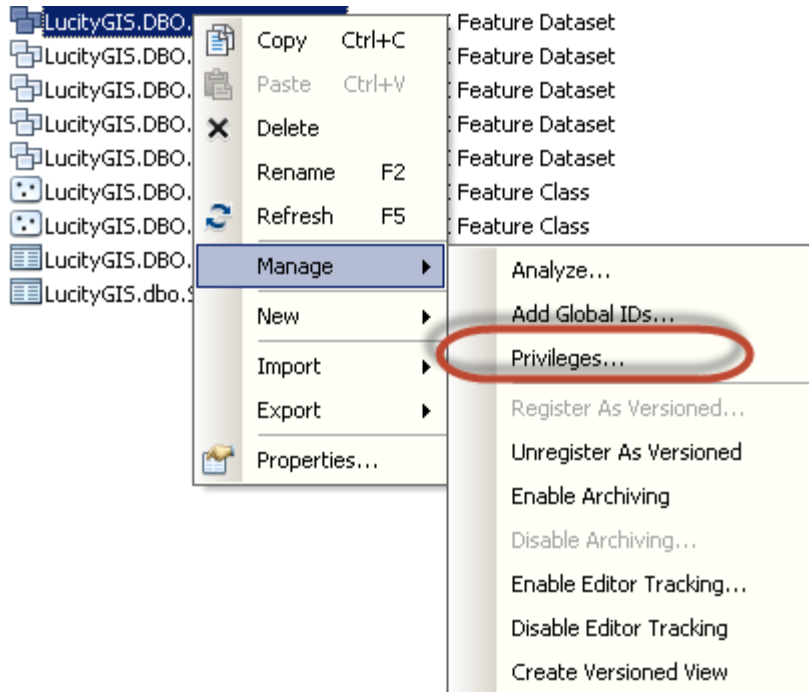
- In the TOC of the Login - New dialog, click on user mapping. Check the boxes next to the databases you want the group to be assigned to. Just keep database role membership for <database> set to public. We'll let the Enterprise Geodatabase control privileges. Click ok.



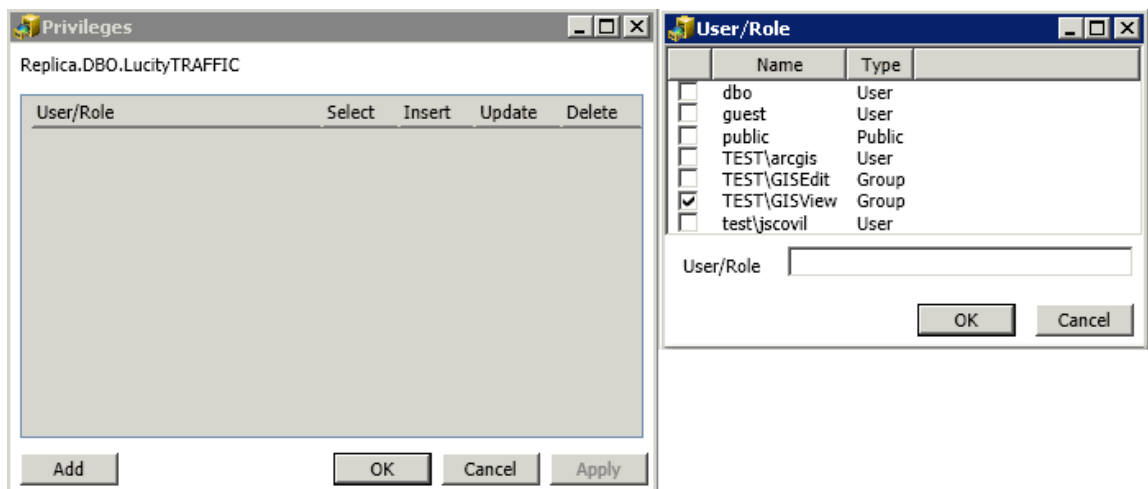
## Change/Add Privileges

In the previous exercise, we created two types of role scenarios. One is using the enterprise Geodatabase tools to create a role with multiple users which can be revoked per user. The other is allowing Active Directory Groups to be assigned like roles. Now, we are going to assign privileges to those roles.

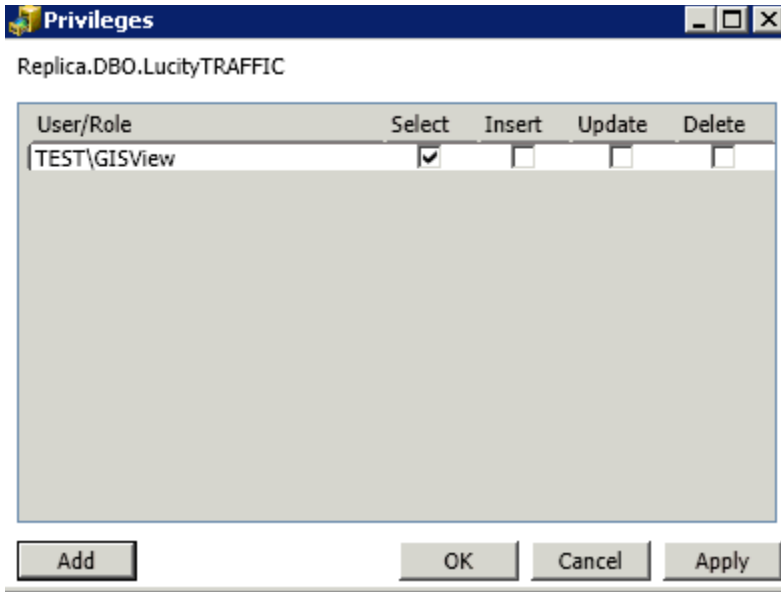
1. Go to ArcCatalog database connection as administrator and right click on the data you want to add privileges to. Remember, you can multiply select one object at a time (Feature Datasets, Feature Classes, and Tables). In this example, we'll be adding the active directory group we created. Select Privileges.



2. Click on the user/role you would like to add. Click ok.



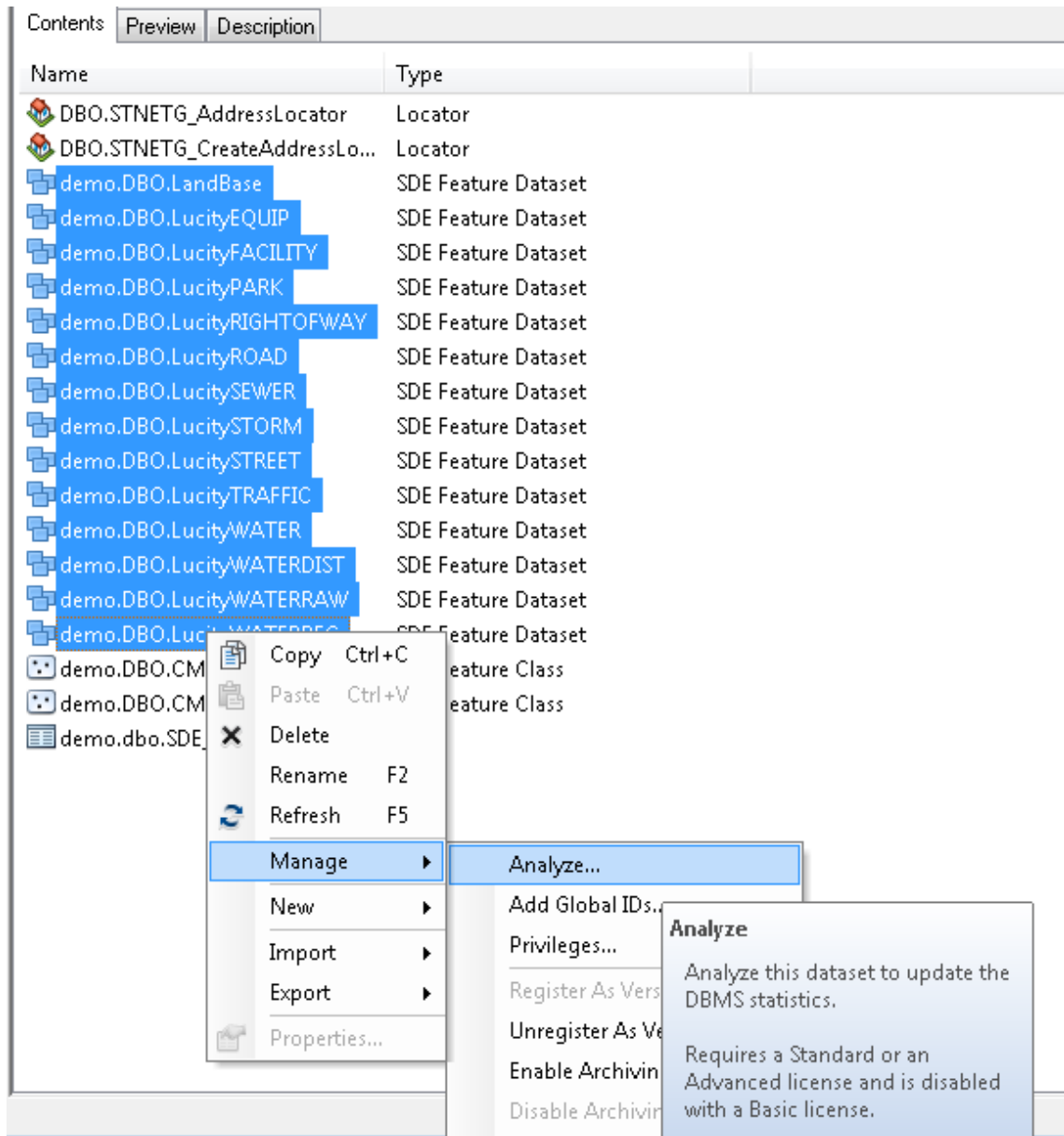
3. Since the GIS View group is read-only, only keep the select box checked. Click ok.



## Analyze and Index

Analyze and index is something that you want to do on a regular basis if you creating and adding features to your database. This will allow for better faster access to your database. Make sure ArcGIS for Server services are stopped before rebuilding indexes.

- Go to your database connection and select on the objects you want to analyze and rebuilt index. Right click on the select items and go to manage/analyze. There is no feel good complete dialog given so let the wheel turn until complete.



# Compression

## What is Compression?

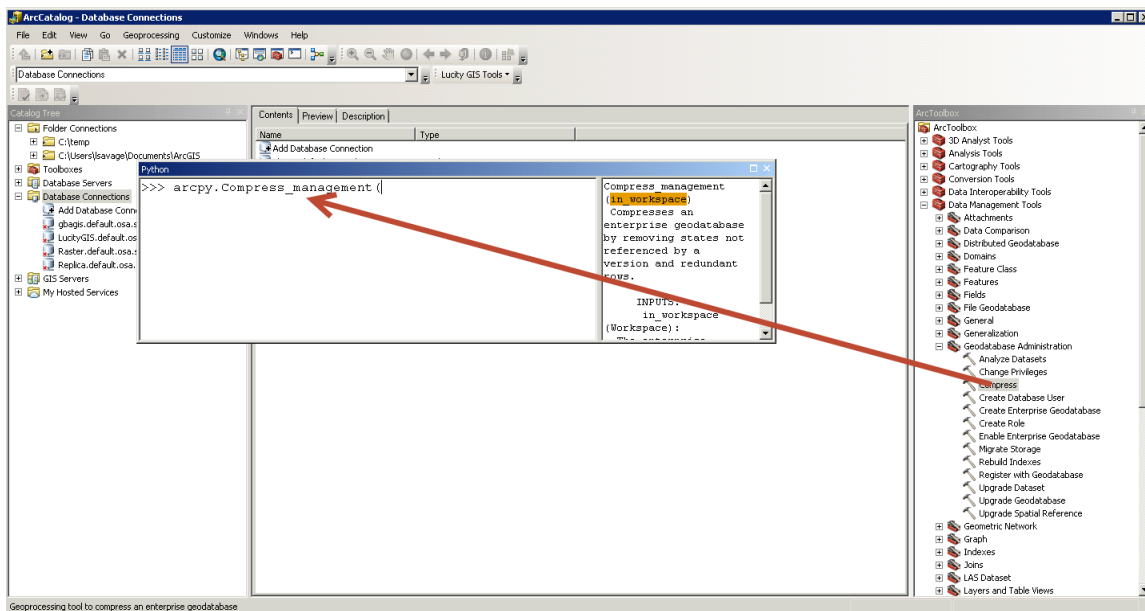
Is a process of moving rows of data from the delta (add and delete) tables to the base tables of the feature classes. This is a versioning performance process.

- If your data is in default and you have the data versioned, you should compress.
- Performance and Data Integrity Tip: Analyze statistics and rebuilt indexes before and after compression
- Data Integrity Tip: Compress at least once a week
- Data Integrity Tip: Compress after large loads of data or major changes in data

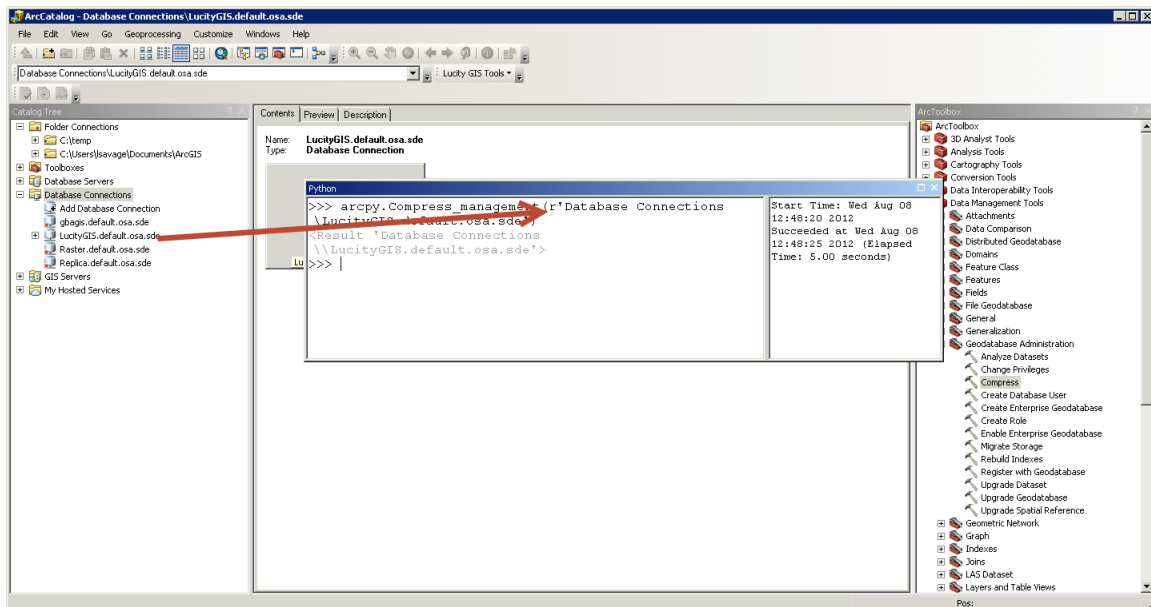
There are several ways to compress your database. Below are the different ways to compress your database.

### 1. Using Python

- Open ArcToolbox and go to data management tools/Geodatabase Administration/Compress
- Open the Python dialog by going to the Geoprocessing Menu and left click on Python
- A dialog window will open for Python. Left click on the Compress tool in ArcToolbox and drag the tool within the Python window
- Notice that the Python dialog has been updated with the new function

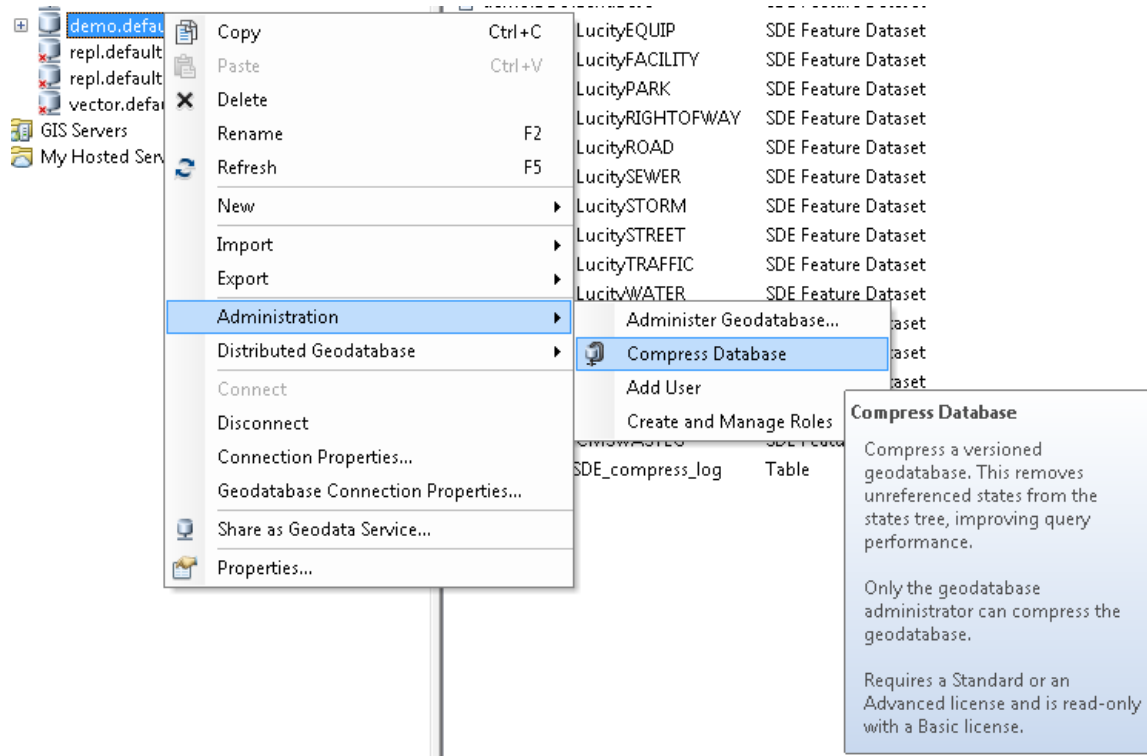


- e. Now open the database connection you would like to compress. Make sure the connection has rights to perform a compress. Drag and drop the connection into the Python dialog
- f. Hit the Enter button on the keyboard as this will execute the command. On the right, the dialog will show the start time and how long it took to complete the operation.



## 2. Using the ArcCatalog Tool

- a. Right Click on a database connection in the ArcCatalog TOC
- b. Choose Administration/Compress Database



**Note:** Compress process will only compress data that is in read-only mode. If a feature class is being edited, the compress process will bypass the feature class table and only compress non-edited data. If you are having problems with compression, please reconcile, post all versions. Afterwards, delete the versions and make sure all state locks are terminated as well as all users are disconnected. After all users are disconnected, perform the compression routine. This is better known as “Zero State Compression”. Afterwards, recreate your versions and you’ll have clean delta tables. Recommend Zero State Compression at least once a year.

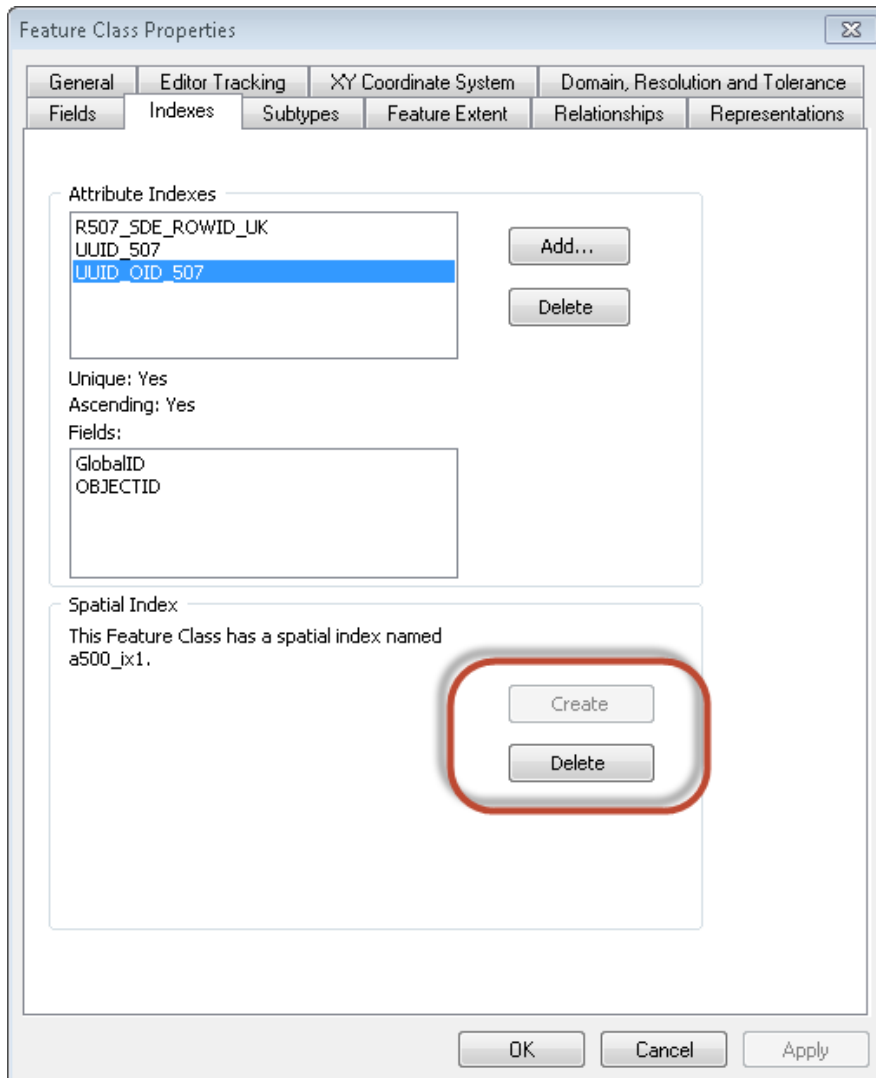


## Spatial and Attribute Indexes

Spatial indexes are managed for you in a sql table. You can delete and recreate the spatial index from the feature class properties. Spatial indexes allow your spatial data to be queried faster within a grid concept. Each grid has a size based on the density of your spatial data. In the past, this was a calculation that needed to be performed by the GIS DBA or GIS Analyst but is now automated for you. Kudos ESRI!

### Spatial Indexes

1. If you are recalculating your feature extent and feel that you want to recreate your spatial index, right click on a feature class and choose properties.
2. When the feature class properties dialog appears, go to the indexes tab.
3. Click Delete and Create under Spatial Index at the bottom of the dialog. Click Apply.

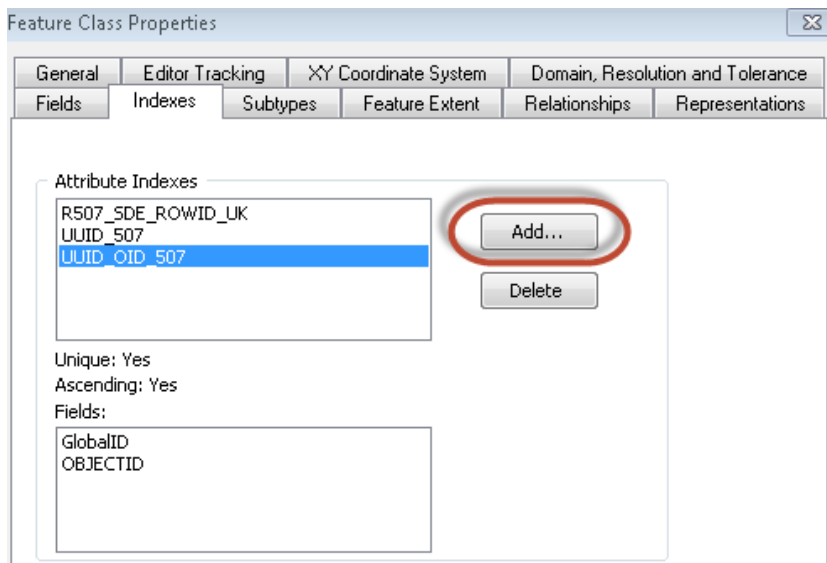


4. This process will recreate the feature class spatial index table for the feature class.

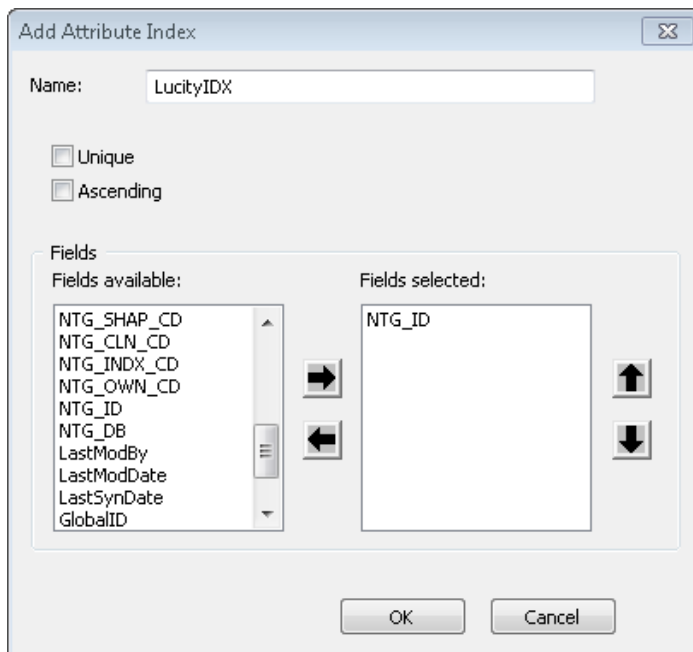
## Attribute Indexes

Attribute indexes are used to speed the performance of data queries used on a consistent basis. As an example, we will manually setup an attribute index for LucyGIS data. Both the common ID and the Lucy AutoID will speed up your query performance capability for each feature class that is linked to Lucy when assigning an attribute index. Lucy now has a tool to add Attribute Indexes for Lucy linked feature classes in the Geodatabase Configuration Tool. This will be featured in the ACT Class “Geodatabase Configuration Tool Overview”

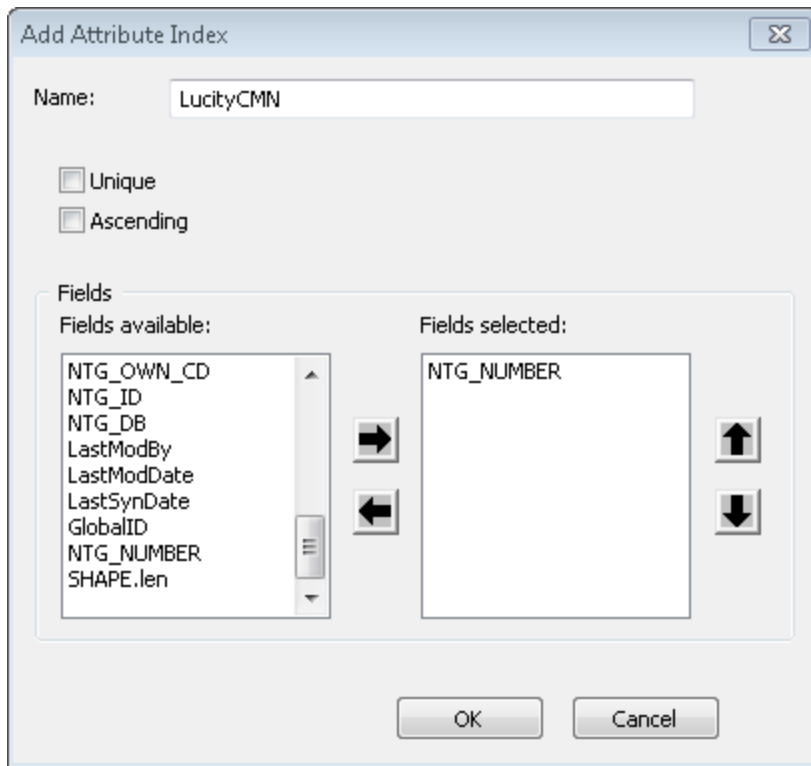
1. In the same dialog as the previous exercise (Feature Class Properties), please go to the indexes tab.
2. Click on the Add button next to Attribute Indexes.



3. Create LucyIDX for the Name and add the NTG\_ID which is linked to the Lucy AutoID.



4. Click ok and Apply.
5. Complete the same operation again by adding LucyCMN index and associate it with the field NTG\_NUMBER which is linked to the Lucy AltID.

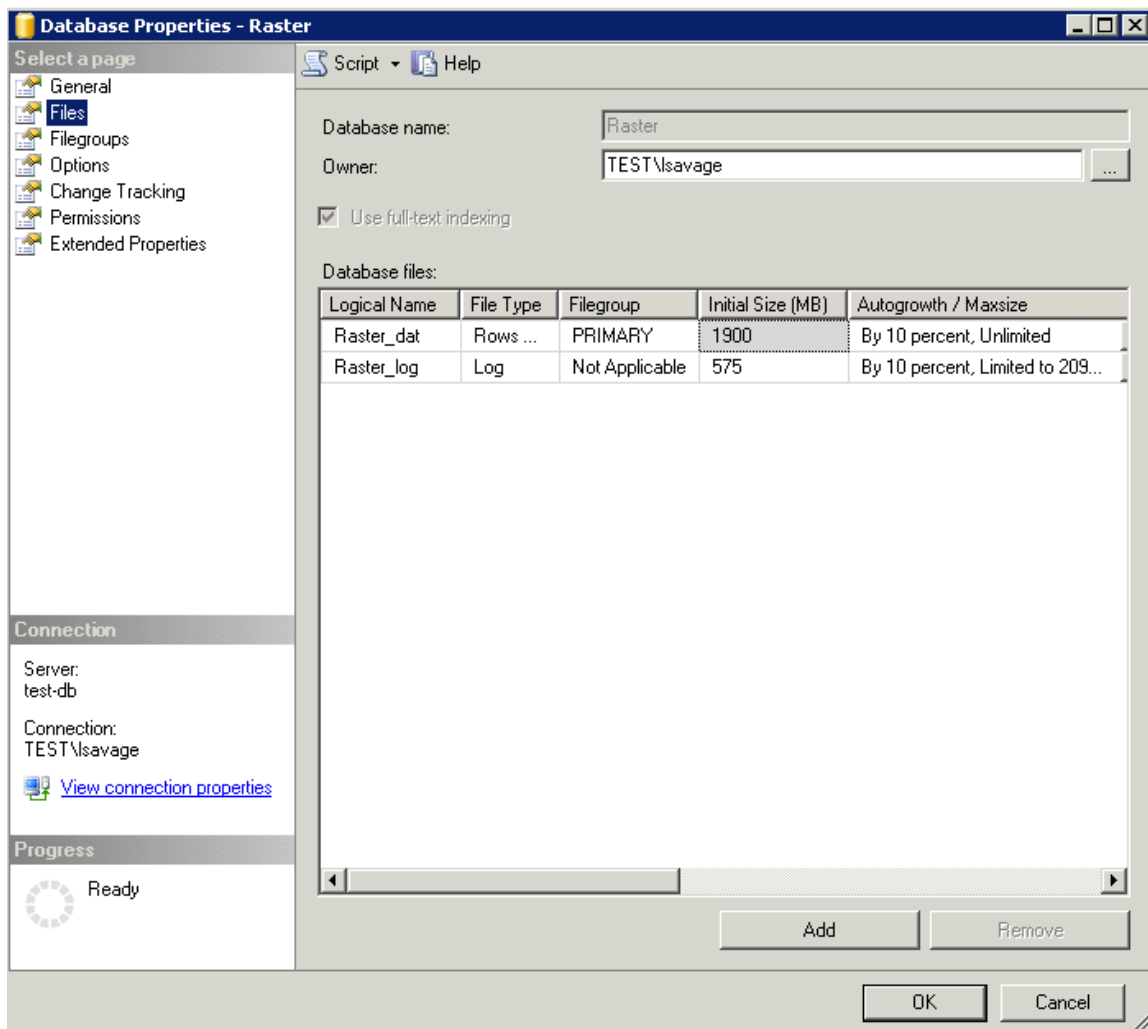


6. Click Ok and Apply.

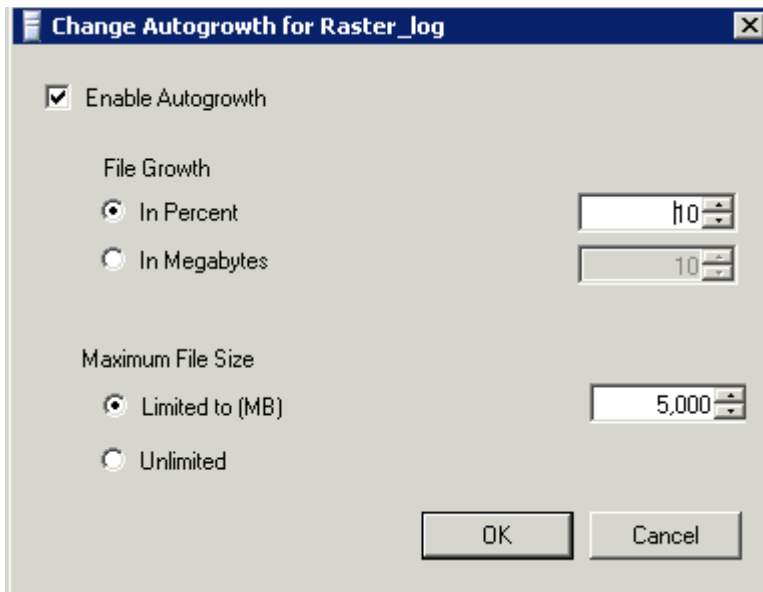
## Tune SQL Server space for Geodatabases

In terms of SQL Server space for Geodatabases, the functionality of the Geodatabase is key to how much space you will need. Recommend splitting up the vector and the raster data into two separate Geodatabases. Raster should be in its own database. This will allow for easy to manage backups and system configuration. If you don't want Raster data in a Geodatabase, I would suggest using the mosaic tool in ArcGIS which requires an [image extension](#) for ArcGIS for Server when publishing.

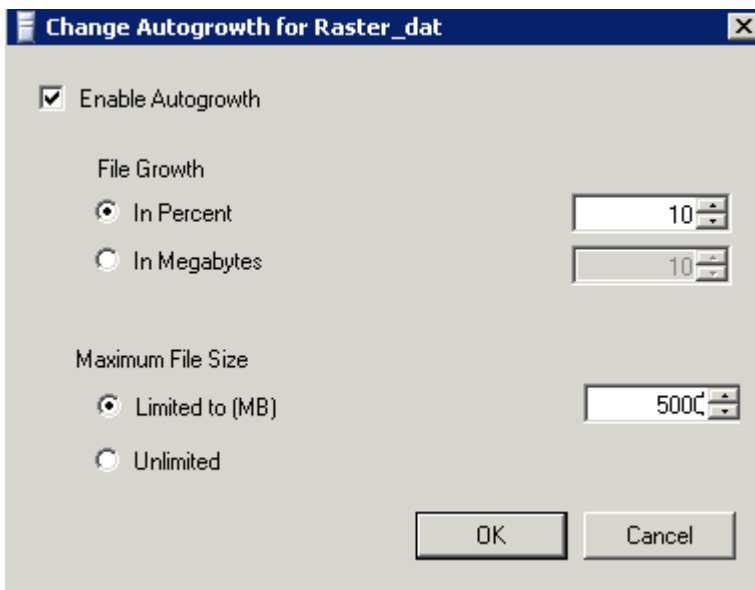
1. When loading Raster data calculate the decompressed size of the image and set this as the file size for the initial load. The logfile can be somewhat small as ESRI has changed the transaction of the loads from one long transaction to iterative raster load transactions. A good rule of thumb, create logfiles for Raster 1/3 of the size of the Raster database. For the data file size, find out the decompression size of the complete mosaic raster data or single image size as a collection. You can choose to use the new mosaic option for raster as this will create a virtual mosaic dataset like the terrain datasets but that's totally up to you as the administrator.



- For log files, don't let the log files use unlimited file growth as a looped transaction could bring your server down.



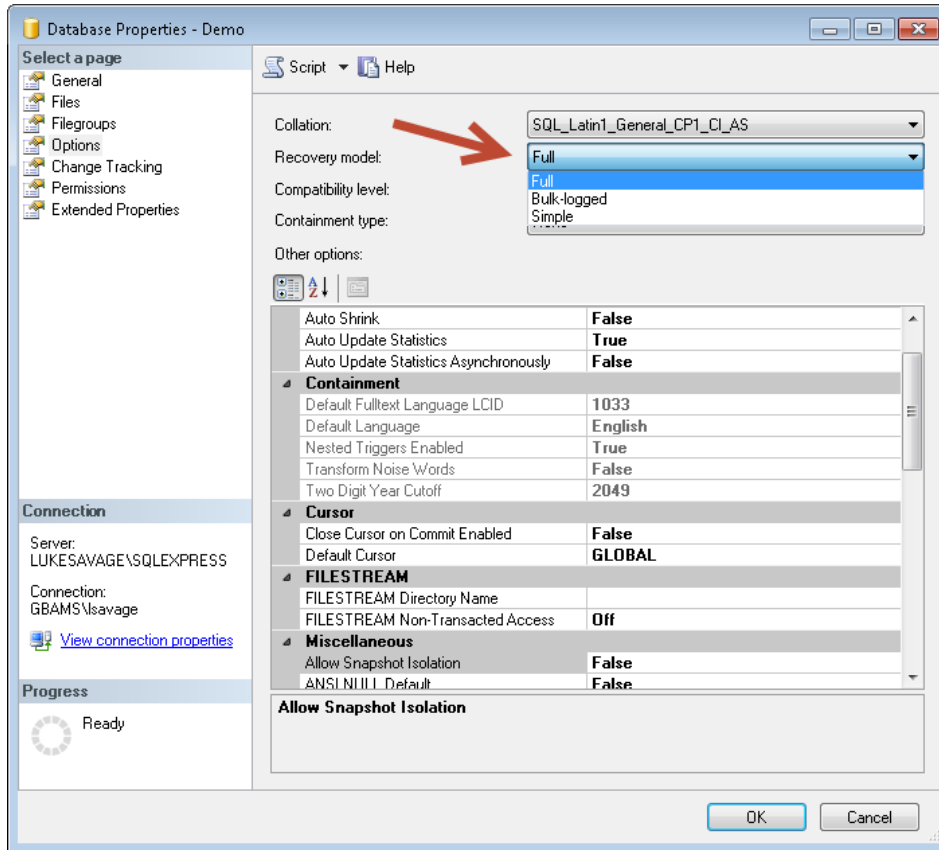
- Do the same for the data filegroup.



- Most Raster datasets are 30 GB to 70 GB once loaded in the Enterprise Geodatabase. You may want to compensate for the increase. It's faster to pre-allocate space for Raster before you load. Don't allow Raster databases to get too large. As a recommendation, you could split up Raster databases into separate databases maxing out each one into 300GB databases.
- After loading, analyze through ArcCatalog and assign permissions. Make sure you backup, truncate and shrink the log files before making it available to the public.
- If large loads for vector data or a Geodatabase that is used as an editing Geodatabase, perform similar operations.
- Set your growth to a manageable amount within your data storage. For Vector, you can use percentage. For Raster, you will be adding large amounts of data in one transaction. You should consider size growth rather than percentage. Backups

If you want to create backups using the SQL Server maintenance wizard, this is an easy step by step process. However, in our example below, we will be creating backups from SQL Backup Master. This an optional program to use for backing up SQL Express as well as SQL Server Standard and Enterprise. *Note: when you want 99% assurance of your enterprise geodatabase backups, simply backup to a known location both offsite and onsite as a file geodatabase.*

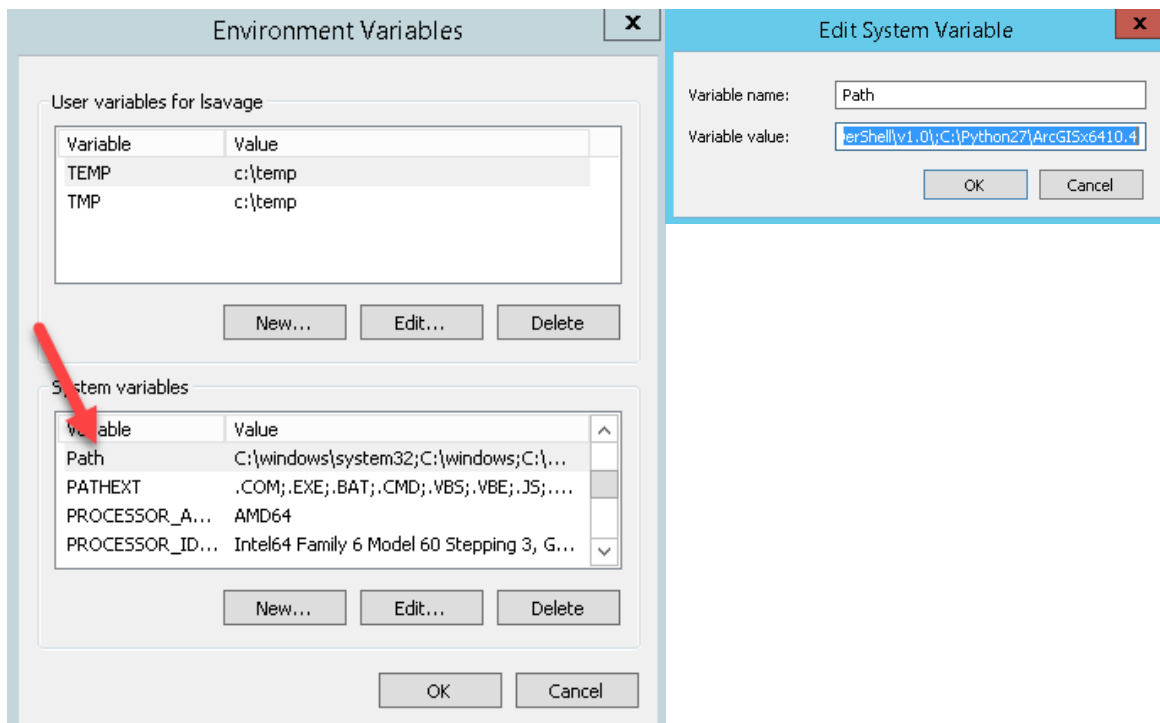
## Enterprise Geodatabase Backups



## Security Scan Report

New to 10.4, Esri has added a security scan python script that will print out possible security issues with your ArcGIS for Server configuration. Below, we will show you how to setup the python script to run on ArcGIS for Server and execute. List of severity is listed on [Esri's Security best practices](#) page.

1. Add python within the environment variables for Windows. Add at the end of the path→  
`;C:\python27\ArcGISx6410.4`



2. Copy python script from the ArcGIS for Server path to a known path (C:\Program Files\ArcGIS\Server\tools\admin.serverScan.py). In this example, I'll run the python script from the root of C:\
3. Execute serverScan.py in command line. I highly recommend to run as administrator.

```
Administrator: Command Prompt
C:\>serverScan.py
Enter ArcGIS for Server fully qualified domain name: test-web.test.local
Enter administrator username: arcgis
Enter administrator password:
Server scan completed - 6 security items noted
Scan results written to serverScanReport_test-web_2016-08-25.html
```

- Click on the html server scan report to view in any browser.

**ArcGIS for Server Security Scan Report - 2016-08-25**

test-web.test.local

**Potential security items to review**

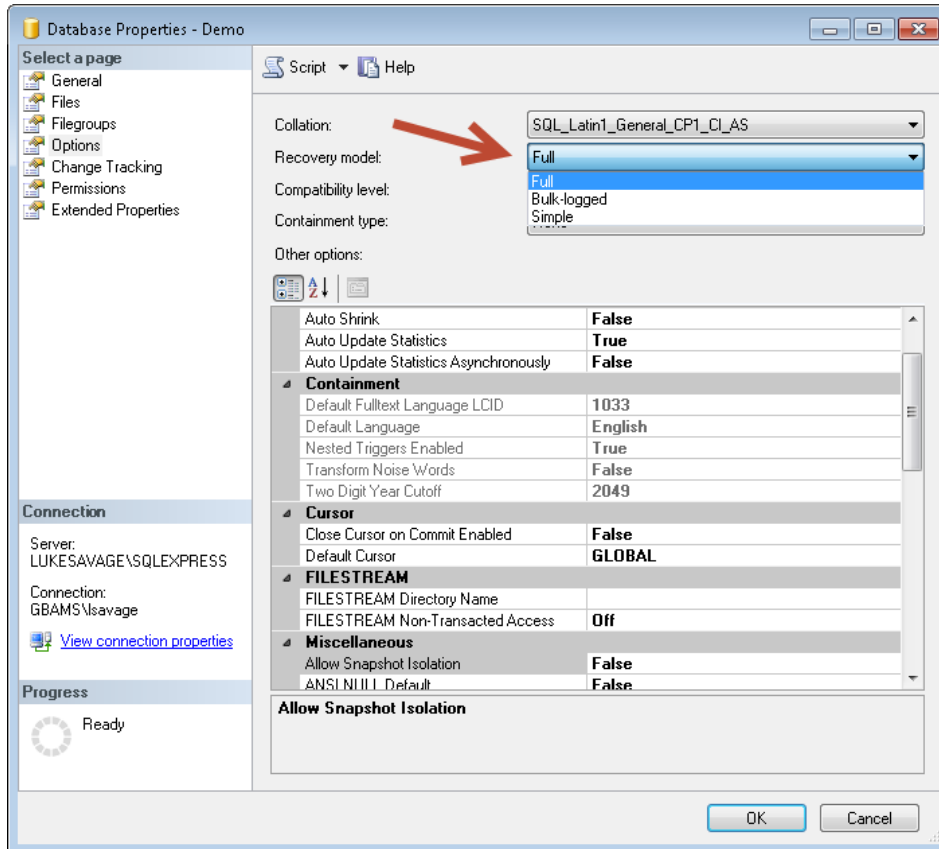
| <u><b>Id</b></u> | <u><b>Severity</b></u> | <u><b>Property Tested</b></u> | <u><b>Scan Results</b></u>  |
|------------------|------------------------|-------------------------------|---|
| SS08             | Important              | Cross-domain requests         | Cross-domain requests are unrestricted. To reduce the possibility of a recommended to restrict the use of your services to applications hosted                                  |
| SS07             | Important              | Rest services directory       | The Rest services directory is accessible through a web browser. Unless reduce the chance that your services can be browsed, found in a web cross-site scripting (XSS) attacks. |
| SS12             | Recommended            | Feature service operations    | Feature service: ValveExercisingIMP<br>This feature service has the update and/or delete operations enabled a deleted without authentication.                                   |
| SS12             | Recommended            | Feature service operations    | Feature service: LucityGIS_Redlining<br>This feature service has the update and/or delete operations enabled a deleted without authentication.                                  |
| SS11             | Recommended            | PSA account status            | The primary site administrator account is enabled. It is recommended Server other than the group or role that has been specified in your ide                                    |
| SS10             | Recommended            | Web adaptor registration      | One or more web adaptors are registered over HTTP. To allow Serve HTTPS.  |



## Backups

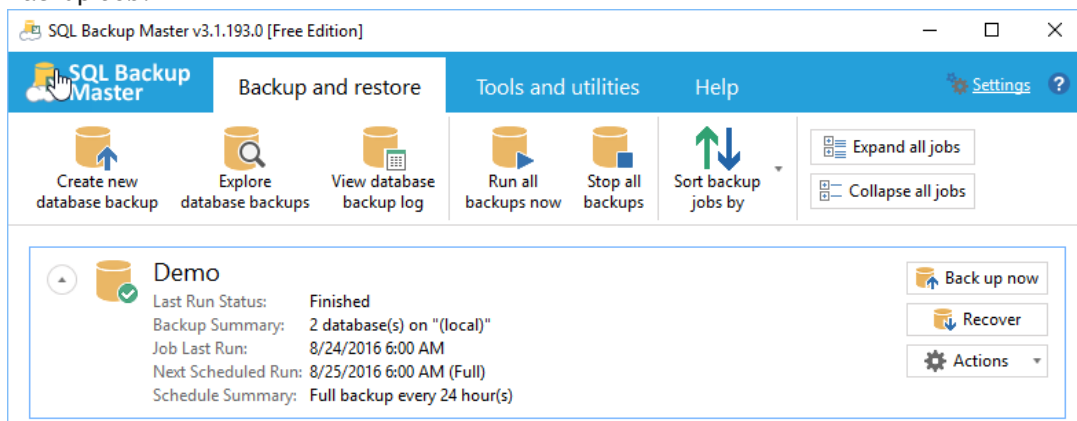
If you want to create backups using the SQL Server maintenance wizard, this is an easy step by step process. However, in our example below, we will be creating backups from SQL Backup Master. This an optional program to use for backing up SQL Express as well as SQL Server Standard and Enterprise. *Note: when you want 99% assurance of your enterprise geodatabase backups, simply backup to a known location both offsite and onsite as a file geodatabase.*

## Enterprise Geodatabase Backups

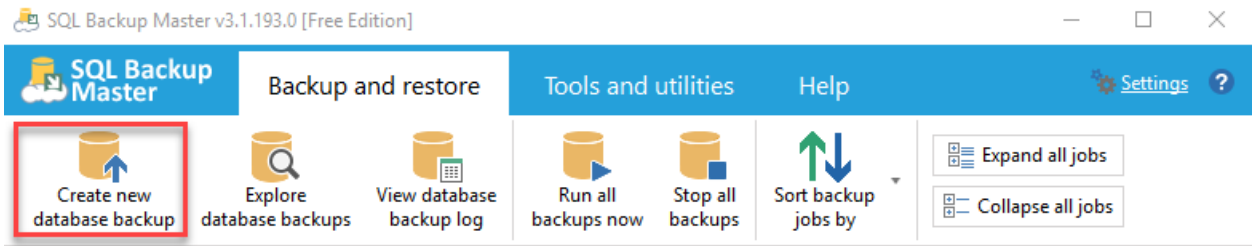


- Full Backup: This will backup the entire database.
- Intermediate Backups: Captures changes to the database since the last full backup (also known as differential backups).
- Truncate Logs: Truncates logs to free up space
- Shrink: Shrinks log files.
- Analyze and Index: Analyze/update statistics, and updates indexes
- We will be calculating an index of 90% capacity for fillfactor (which gives 10% growth for data indexes). Also, we will retain the backups for 13 days and starting over on the 14<sup>th</sup> day.
- Full Backup: Everyday at night
- Differential or Intermediate backup: Running every 12 hours
- Backup Logs: Run every 4 hours.
- Shrink Logs: Run after full backup
- Analyze, update statistics and indexes: Run after full backup.
- Create backup copy
- Test Recovery every once in a while (maybe every quarter)
- For Raster or Large Static Databases (20GB or more), consider separate plan for backup and recovery. Still backup transaction logs and shrink transaction logs on a periodic basis.

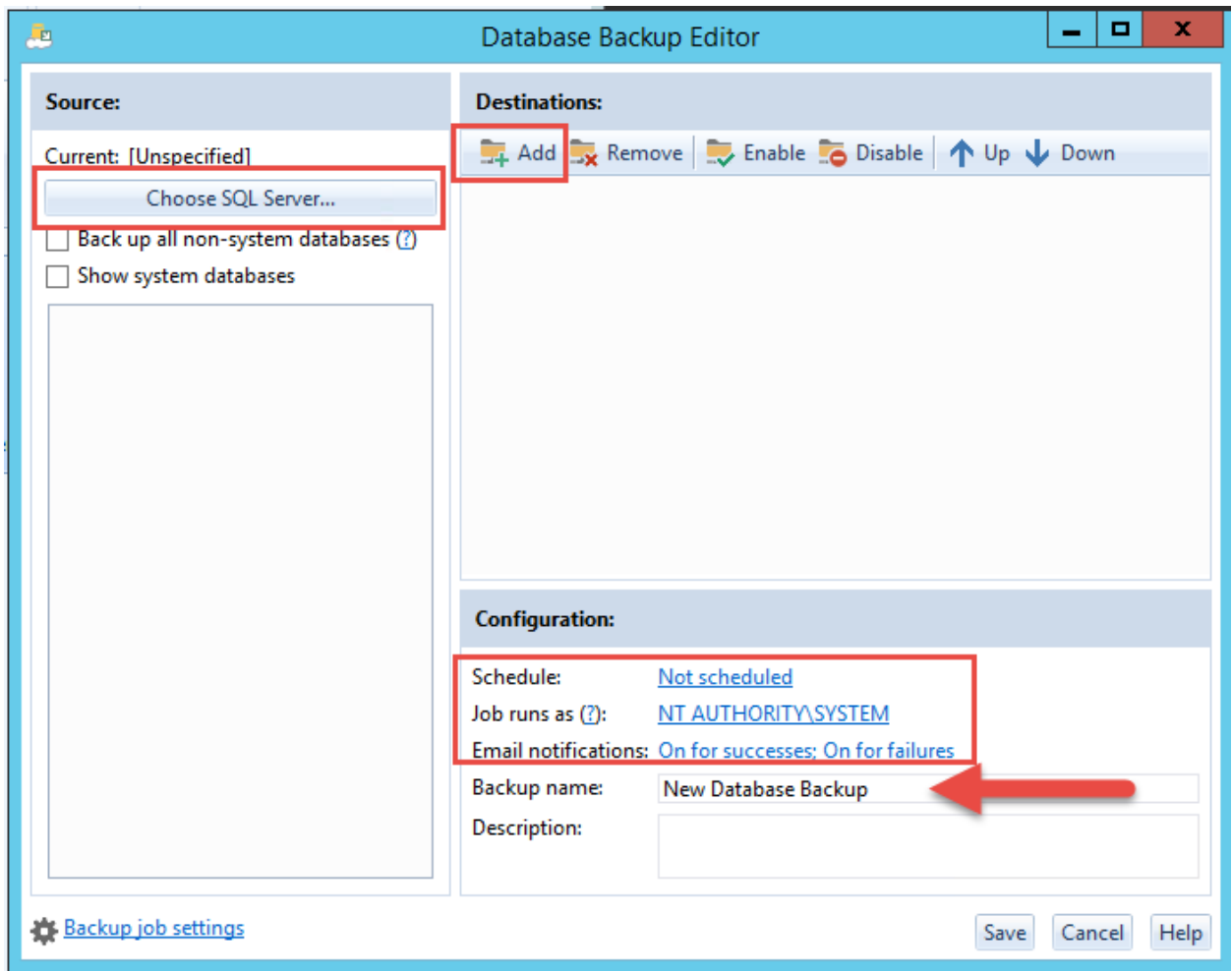
1. A free or paid tool to use is <http://www.sqlbackupmaster.com/>. SQL Server Maintenance Backup Job.



- Create new database backup



- Connect to SQL Server instance, backup databases and add destinations for backup





The image shows a Windows-style dialog box titled "Connect to SQL Server". It has a blue header bar with a small icon on the left and a red close button on the right. The main content area is white and contains the following elements:

- Server name:** A text box containing "(local)" with a dropdown arrow on the right.
- Server logon:** A section with two radio button options:
  - Connect using Windows Authentication**  
Choose this option if your current Windows account is a member of the System Administrator role in SQL Server
  - Connect using the following SQL Server account:**
    - Username:** An empty text box.
    - Password:** An empty text box.
- Buttons:** At the bottom, there are three buttons: "Test SQL Connection" on the left, and "OK" and "Cancel" on the right.

- If using Windows Auth, you'll be prompted for running the backup as windows auth.

The screenshot shows the 'Backup Job Settings' dialog box with the 'Windows Account' tab selected. The 'Run backup as different Windows user' checkbox is checked. The 'Account name' field contains 'TEST\lsavage' and the 'Password' field contains ten dots. A 'Test' button is located below the password field. An important note explains that the specified account will be used for SQL Server connections and file moves. At the bottom, there is a 'Save these settings as default' checkbox and 'Save', 'Cancel', and 'Help' buttons.

**Backup Job Settings**

General Database **Windows Account** Compression / Encryption SQL Scripts Notifications

Run backup as different Windows user

Account name: TEST\lsavage

Password: ●●●●●●●●●●

Test

**Important:** When running a backup job as a different Windows user, the specified account will be used to connect to SQL Server (when Windows Authentication is specified in the database connection settings) and move backup files to their destinations (e.g. a network folder, etc.).

Please see [this help file topic](#) for more information regarding this option.

Save these settings as default

Save Cancel Help

- Click on the schedule hyperlink. You may want to start this overnight when there is little chance people are on Lucy/GIS or other sql databases within the sql server instance.

**Backup Job Schedule**

**Schedule**

Full Backup Every  hrs

Differential Every  hrs  mins (after the full backup)

Transaction Log Every  hrs  mins (after the full backup)

Start date/time:  (applies to full backup)

End date/time:

Days of week:  Sun  Mon  Tues  Wed  Thu  Fri  Sat

[Load a preset backup plan...](#)

[Reset to defaults](#)

**Estimated Execution Plan**

| Date / Time                        | Backup Type     |
|------------------------------------|-----------------|
| Thursday, August 06, 2015 3:00 PM  | Full            |
| Thursday, August 06, 2015 7:00 PM  | Transaction Log |
| Thursday, August 06, 2015 11:00 PM | Transaction Log |

Help Save Cancel

- Click on e-mail notifications hyperlink

The screenshot shows the 'Backup Job Settings' dialog box with the 'Notifications' tab selected. The dialog has a blue title bar with a close button (X) in the top right corner. Below the title bar are several tabs: 'General', 'Database', 'Windows Account', 'Compression / Encryption', 'SQL Scripts', and 'Notifications'. The 'Notifications' tab is active and contains the following settings:

- Send email notifications
- Notify on:
  - Successful backup
  - Failed backup (or completed with errors)
- Notify about:
  - Full backups
  - Differential backups
  - Transaction log backups
- Notification email addresses:
  - From address: wonderifthisworks@lucity.com
  - Recipient address(es): itmustwork@lucity.com
- Server settings:
  - Custom  GMail
  - SMTP server: smtp.office365.com
  - SMTP port: 587
  - Username: wonderifthisworks@lucity.com
  - Password: [masked with 8 dots]
  - Encryption:  Use SSL

At the bottom right of the 'Server settings' section is a 'Send test message' button. At the bottom of the dialog, there is a checkbox for 'Save these settings as default' and three buttons: 'Save', 'Cancel', and 'Help'.

- Save and you can see your Backup plan listed. You can create multiple plans for different SQL Server instances as well. As you can see, recovery is simple and time stamped for each different type of backup within the plan.

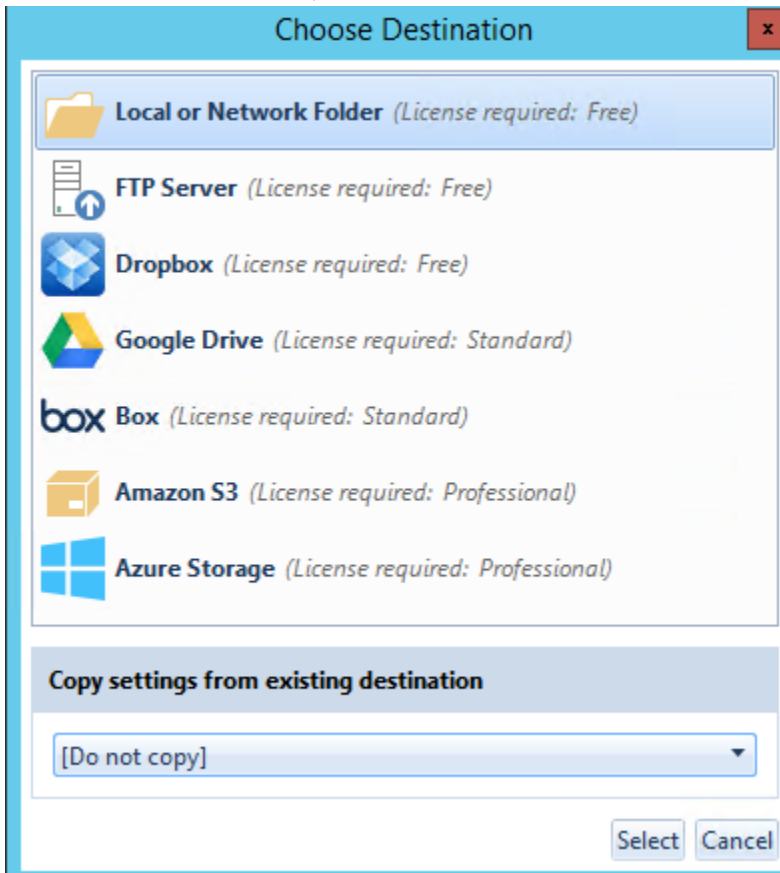
The screenshot shows the 'Database Backup Recovery Explorer' window. At the top, there are controls for 'Backup Job' (set to 'Demo') and 'Destination' (set to 'C:\Backup'). There are also fields for 'Start date' and 'End date', both with 'Enter start date' and 'Enter end date' prompts. To the right of these fields are 'Refresh' and 'Help' buttons. Below the controls is a table listing backup jobs.

| Database Name | File Name  | Type | Created           | Size   | Action   |
|---------------|------------|------|-------------------|--------|--|
| Lucy          | Lucy-20... | Full | 8/24/2016 6:00 AM | 120 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Demo          | Demo-20... | Full | 8/24/2016 6:00 AM | 110 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Lucy          | Lucy-20... | Full | 8/23/2016 7:27 AM | 120 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Demo          | Demo-20... | Full | 8/23/2016 7:27 AM | 110 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Lucy          | Lucy-20... | Full | 8/23/2016 6:00 AM | 120 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Demo          | Demo-20... | Full | 8/23/2016 6:00 AM | 110 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Lucy          | Lucy-20... | Full | 8/20/2016 6:00 AM | 120 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Demo          | Demo-20... | Full | 8/20/2016 6:00 AM | 110 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Lucy          | Lucy-20... | Full | 8/19/2016 6:00 AM | 120 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |
| Demo          | Demo-20... | Full | 8/19/2016 6:00 AM | 110 MB | <a href="#">Recover</a>   <a href="#">Delete</a> |

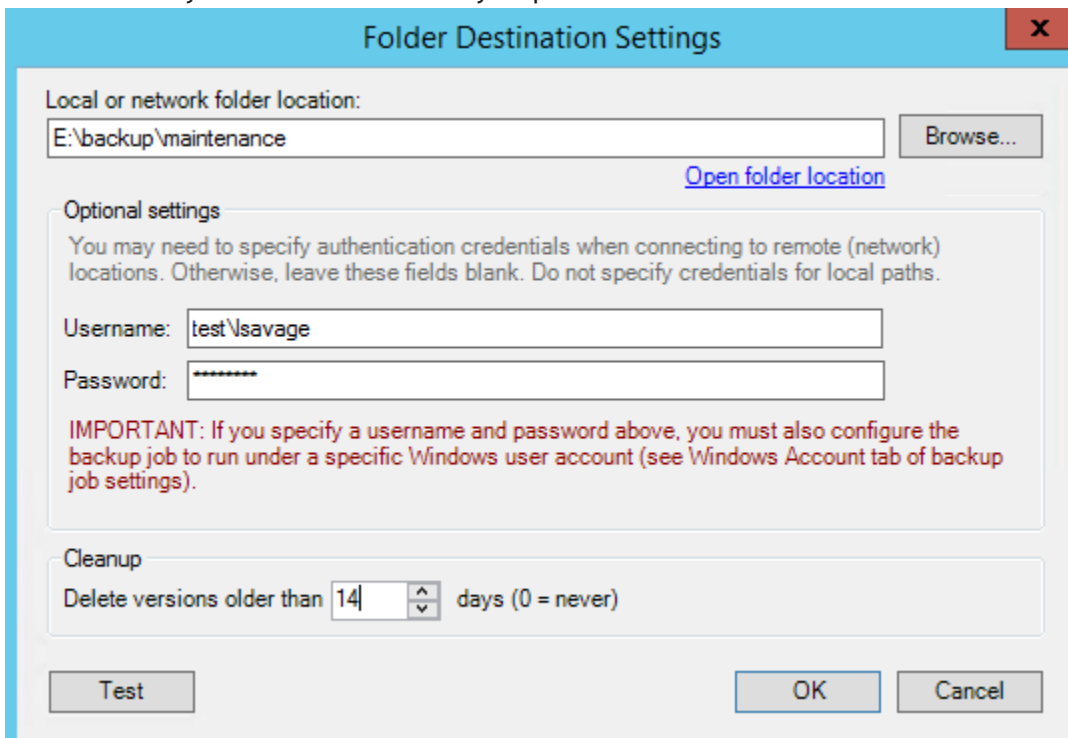
At the bottom of the window, there is a link 'Delete all shown database backup files' and a checkbox labeled 'Show files not created by the selected destination' which is currently checked.



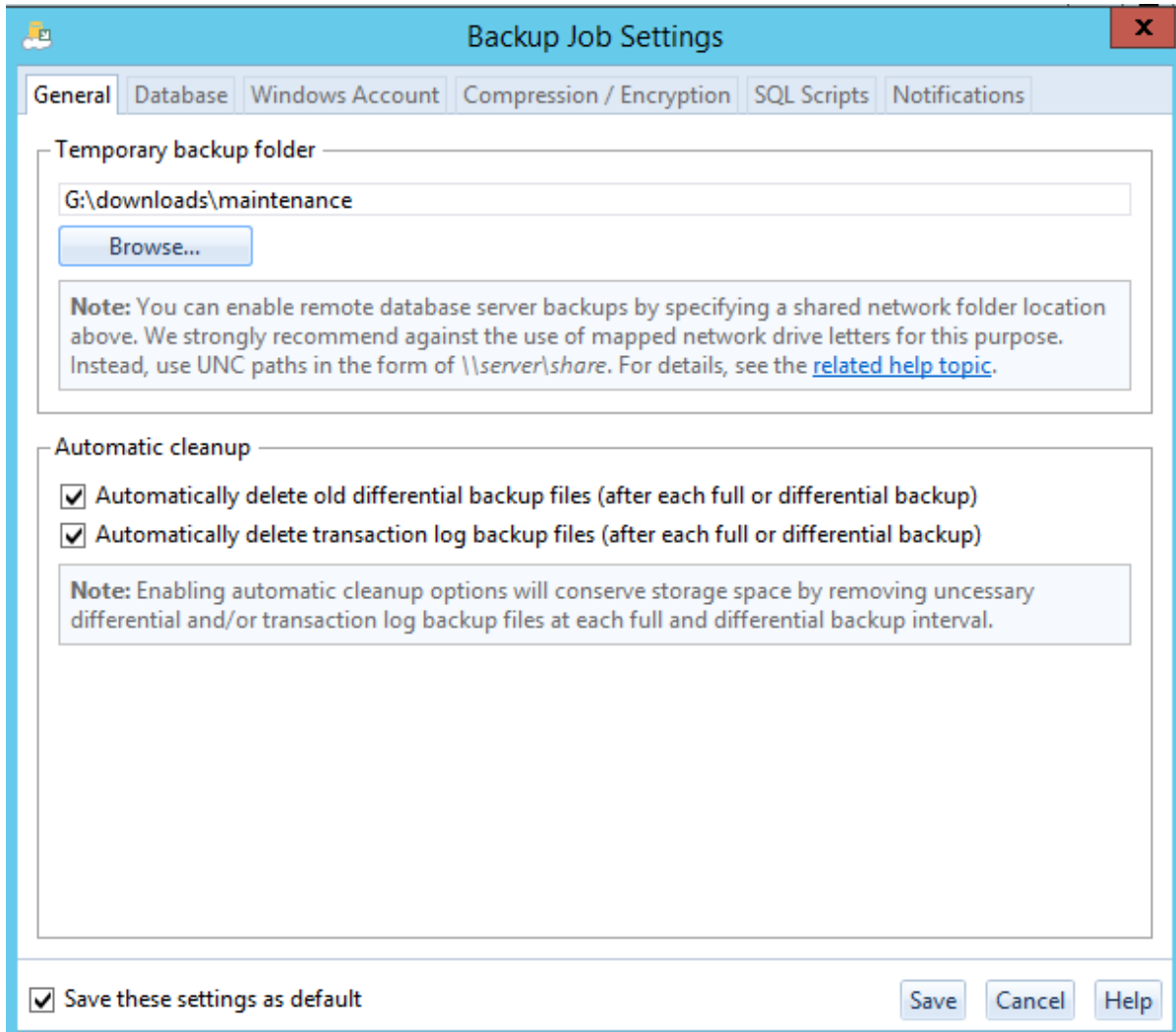
- Add a destination, there are several choices. Pick one.



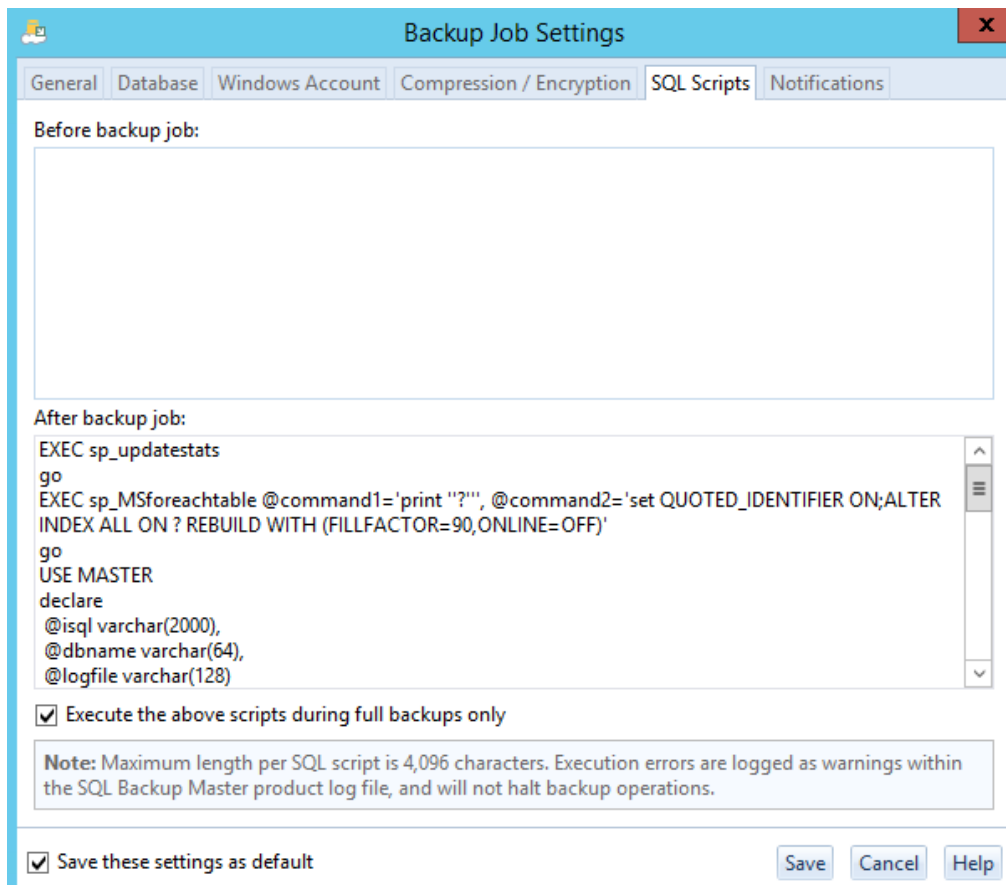
- Add in your credentials and recycle period.



- Click on backup job settings and change temporary backup folder. Recommend somewhere local on the server if you can. This will backup and compress the files before it's copied to the final destination



- Go to SQL Scripts tab and you can add your maintenance scripts. For this example, the maintenance script will only run after the full backup is complete and bypasses script on differential and transaction log backups. The script will update statistics, rebuild indexes, and shrink the transaction logs. In our setup in this example, this script only fires off every 24 hours at night.



## Example Script for After Full Backup

### *--Rebuild Index and Update Statistics*

```
--Rebuild Indexes
Use Master
go
DECLARE @cmd VARCHAR(8000);
SET @cmd = 'exec sp_MSforeachtable @command1="print ""?"" , @command2="set QUOTED_IDENTIFIER ON;ALTER INDEX ALL ON ? REBUILD WITH
(FILLFACTOR=90,ONLINE=OFF)'"
EXEC sp_msforeachdb @command1 =@cmd
go
DECLARE @cmd VARCHAR(8000);
SET @cmd = 'EXEC sp_updatestats'
EXEC sp_msforeachdb @command1 =@cmd
go
```

### *--Shrink Logfiles for non-system databases*

```
USE MASTER
declare
@isql varchar(2000),
@dbname varchar(64),
@logfile varchar(128)
declare c1 cursor for
SELECT d.name, mf.name as logfile--, physical_name AS current_file_location, size
FROM sys.master_files mf
inner join sys.databases d
on mf.database_id = d.database_id
where d.name not in ('master','model','msdb','tempdb')
and mf.type_desc = 'LOG'
open c1
fetch next from c1 into @dbname, @logfile
While @@fetch_status <> -1
begin
select @isql='USE ' + @dbname + ' checkpoint'
print @isql
exec(@isql)
select @isql='USE ' + @dbname + ' DBCC SHRINKFILE (N" + @logfile + "', 100)'
print @isql
exec(@isql)
fetch next from c1 into @dbname, @logfile
end
close c1
deallocate c1
go
```

## Backup ArcGIS for Server Site

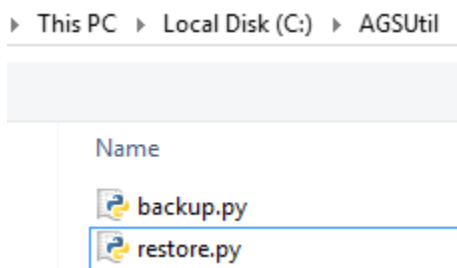
Provided with ArcGIS for Server, you can now backup your site. This backup only accounts for the site configuration not the data. If you have caches, handle the backup of the caches using another copy or backup utility.

1. On your ArcGIS for Server, go to C:\Program Files\ArcGIS\Server\tools\admin and copy the two python script utilities.

This PC > Local Disk (C:) > Program Files > ArcGIS > Server > tools > admin

| Name                         | Date modified     | Type        | Size  |
|------------------------------|-------------------|-------------|-------|
| backup.py                    | 2/13/2014 3:42 PM | Python File | 7 KB  |
| convertcachestorageformat.py | 2/13/2014 3:42 PM | Python File | 1 KB  |
| createcacheschema.py         | 2/13/2014 3:42 PM | Python File | 1 KB  |
| createservice.py             | 2/13/2014 3:42 PM | Python File | 1 KB  |
| deletecache.py               | 2/13/2014 3:42 PM | Python File | 1 KB  |
| managecachetiles.py          | 2/13/2014 3:42 PM | Python File | 1 KB  |
| manageservice.py             | 2/13/2014 3:42 PM | Python File | 1 KB  |
| managesite.py                | 2/13/2014 3:42 PM | Python File | 1 KB  |
| restore.py                   | 2/13/2014 3:42 PM | Python File | 11 KB |

2. Create a new folder in a known location that is easy to get to in command line. As an example, I created an agsutil folder under the root of c:\.
3. Paste them in the new location.



4. Go to the command prompt as an administrator, run the backup.py script. Make sure you are connecting to python's home directory or set python.exe as a path. Below is an example after setting python.exe path in environment variables.
  - a. Python.exe c:\agsutil\backup.py -u <ags admin> -p <password> -s http://<localhost or servername:6080> -f c:\backup\ags
  - b. After running, below is an example of the output.

Aug-28-2014\_09-58-13.agssite

## Restore ArcGIS for Server Site

Provided with ArcGIS for Server, you can restore a backup of your site.

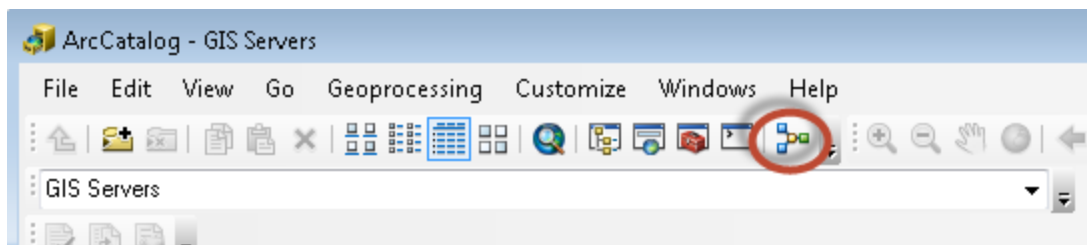
5. Go to command prompt and restore your site using the backup and restore.py script. Below is an example.
  - a. Python.exe c:\agsutil\restore.py -u <username> -p <password> -s <localhost or servername>:6080 -f c:\backup\ags\Aug-29-2014\_09-58-13.agssite -r c:\backup\ags
  - b. This procedure will take some time and your site will be down until complete.

```
C:\>python.exe c:\agsutil\restore.py -u AGS -p QWE@zxc1234 -s http://lukesavage:6080 -f c:\backup\ags\Aug-28-2014_09-58-13.agssite -r c:\backup\ags  
Beginning to restore the site running on "lukesavage" using the site backup available at: c:\backup\ags\Aug-28-2014_09-58-13.agssite  
This operation can take some time. You will not receive any status messages and will not be able to access the site until the operation is complete...
```

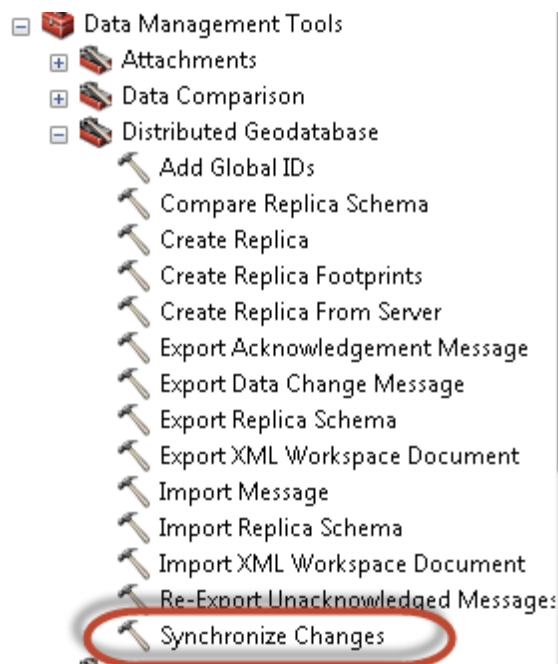
6. It is important that you reregister your web adaptor to ArcGIS for Server after the restore is complete.

## Automate Replica Synchronization using Python

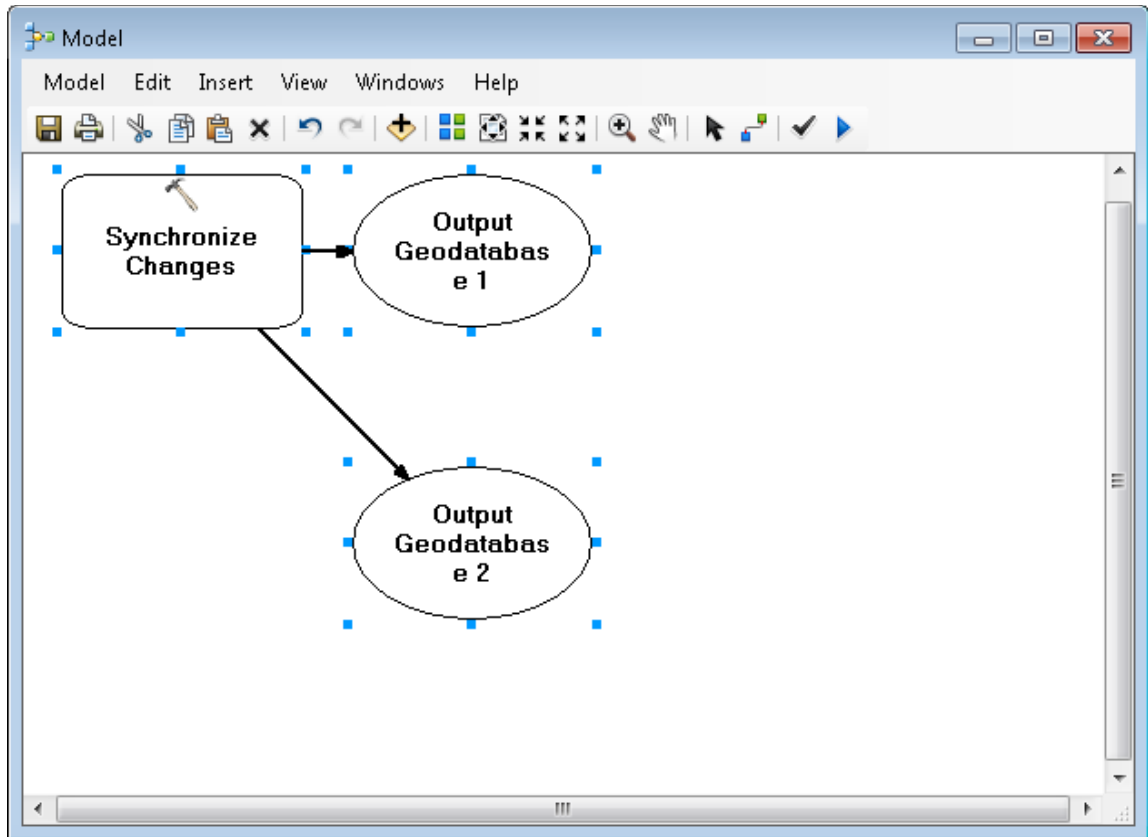
1. Go to ArcCatalog and open model builder. This is the Garfield way of creating python scripts for the non-savvy coder.



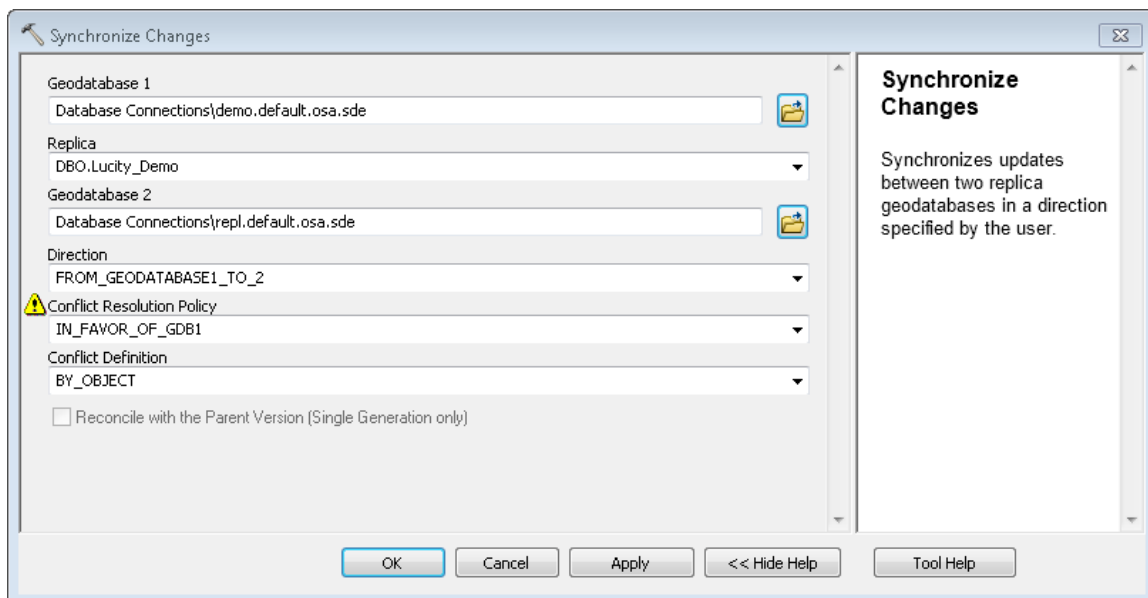
2. In Model Builder, open arctoolbox if not already open and go to Distributed Geodatabases/Synchronize Changes



3. Drag and drop the tool into Model Builder.

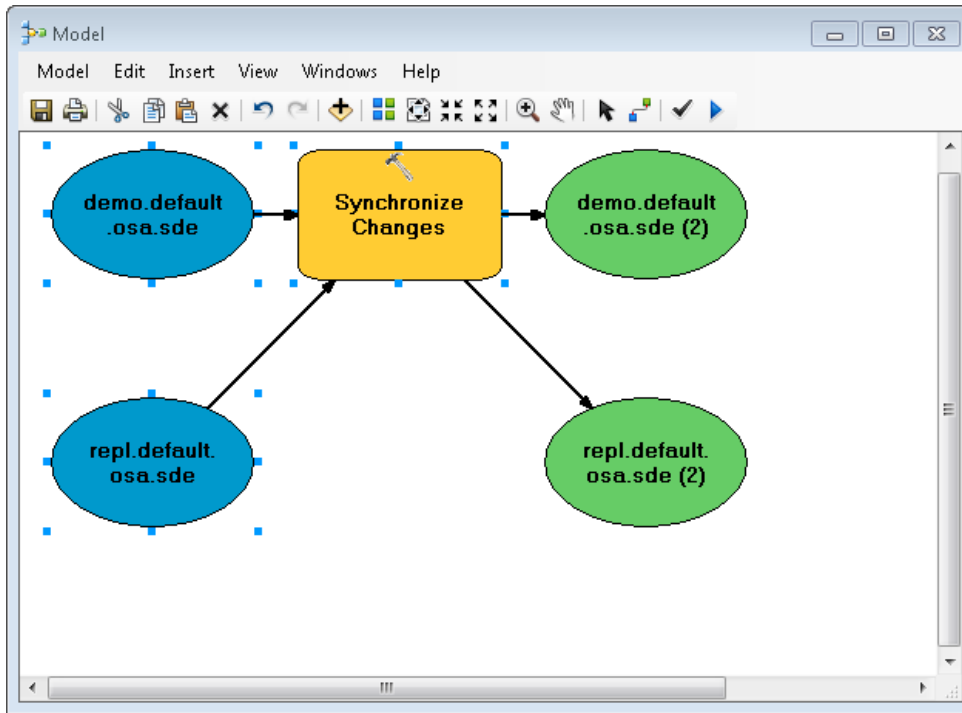


4. Once tool is in Model Builder, double click on Synchronize Changes box to open the dialog.
5. Fill in the information appropriately. For reference, please visit the Replica section.

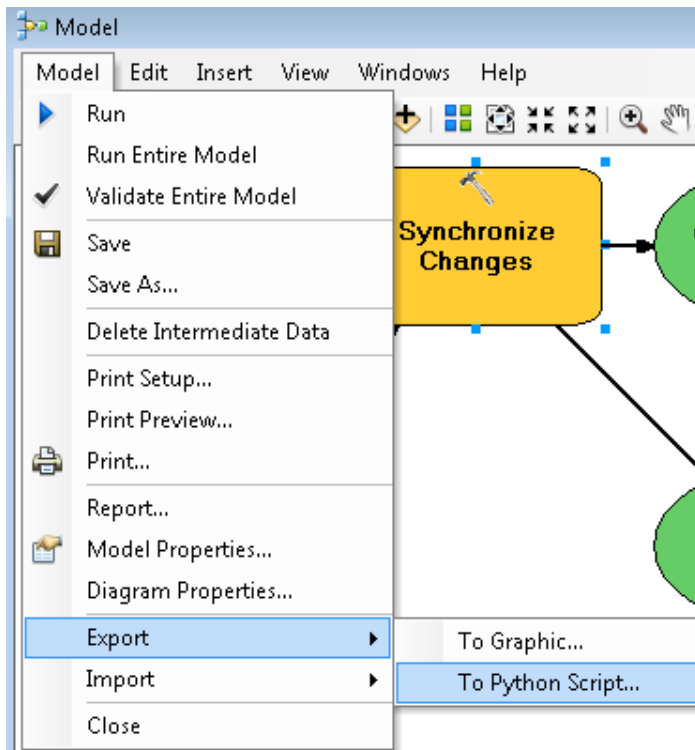




- Click ok. Notice colors change in the dialog. Run the model to test by clicking on the run button. ▶



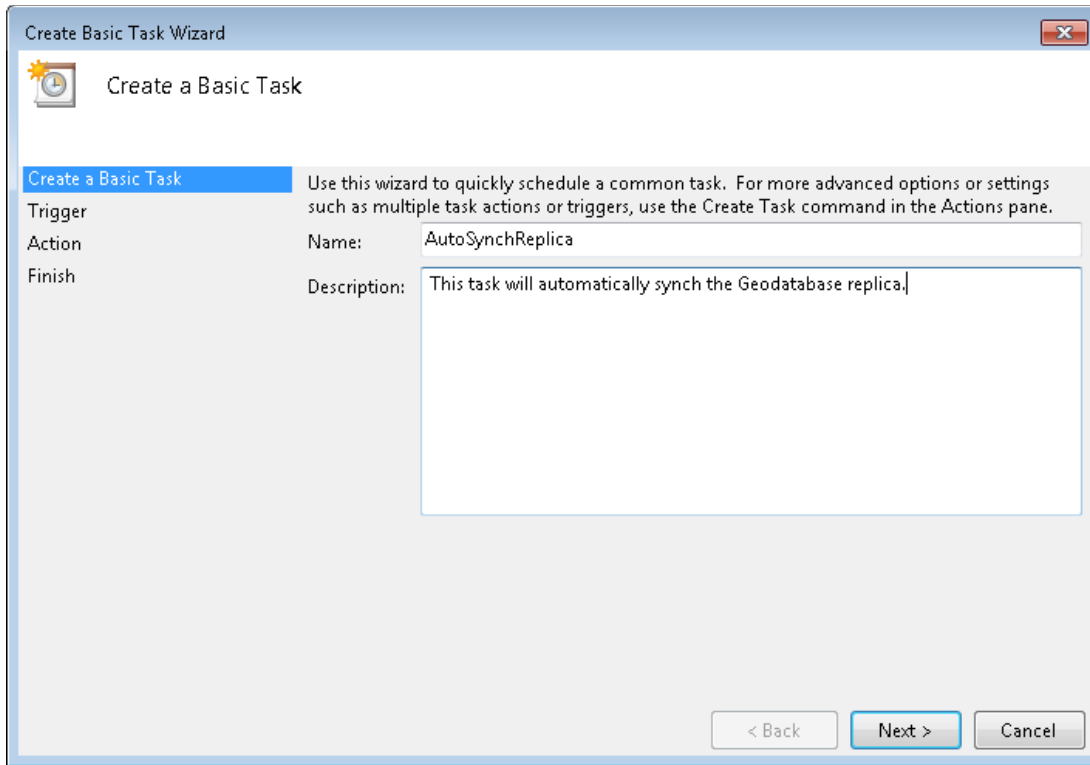
- After successfully testing the model, go to the model menu and click on export/To Python Script.



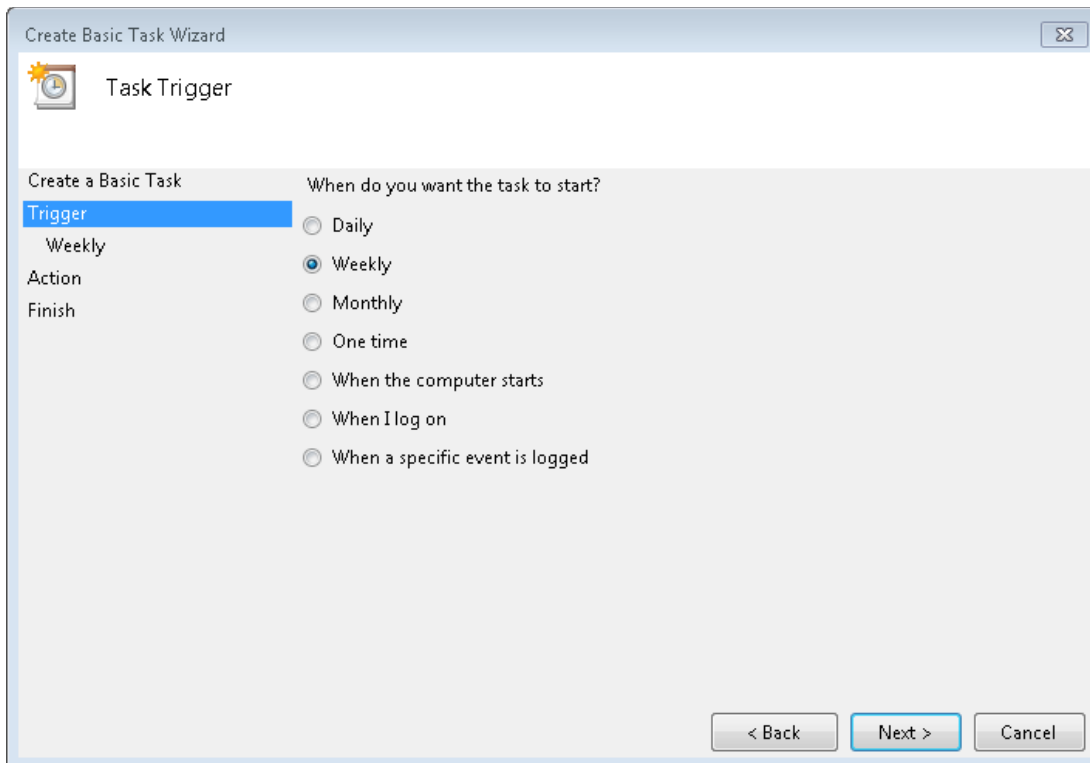
8. Save in location that has Python and ArcCatalog installed. For example, auto\_synch.py under the root of c:\.
9. Edit the Python script so that it references arcinfo rather than arceditor. This can produce errors in your script. Also, add the RED content below to enable logging when running this script.

```
# Set the necessary product code
import arcinfo
# Import arcpy module
import arcpy
# Record Logs
arcpy.SetLogHistory(True)
# Local variables:
demo_default_osa_sde = "Database Connections\\demo.default.osa.sde"
repl_default_osa_sde = "Database Connections\\repl.default.osa.sde"
# Process: Synchronize Changes
arcpy.SynchronizeChanges_management(demo_default_osa_sde, "DBO.Lucity_Demo",
repl_default_osa_sde, "FROM_GEODATABASE1_TO_2", "IN_FAVOR_OF_GDB1", "BY_OBJECT",
"DO_NOT_RECONCILE")
```

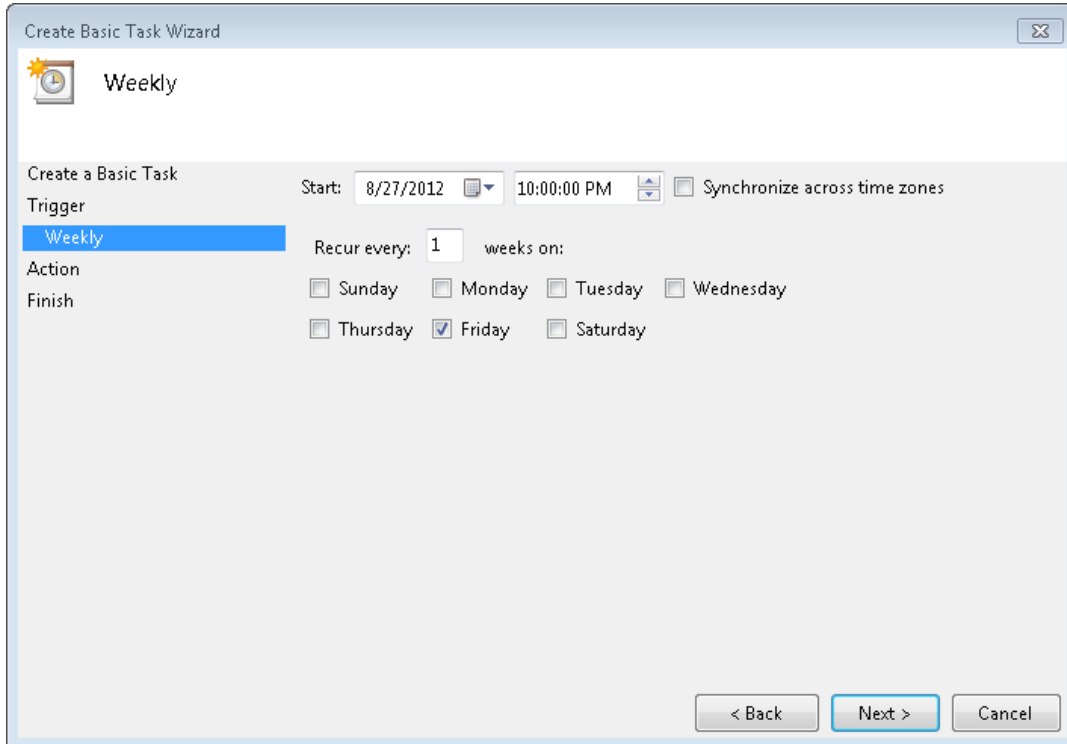
10. Go to Windows Task Scheduler and create a basic task.



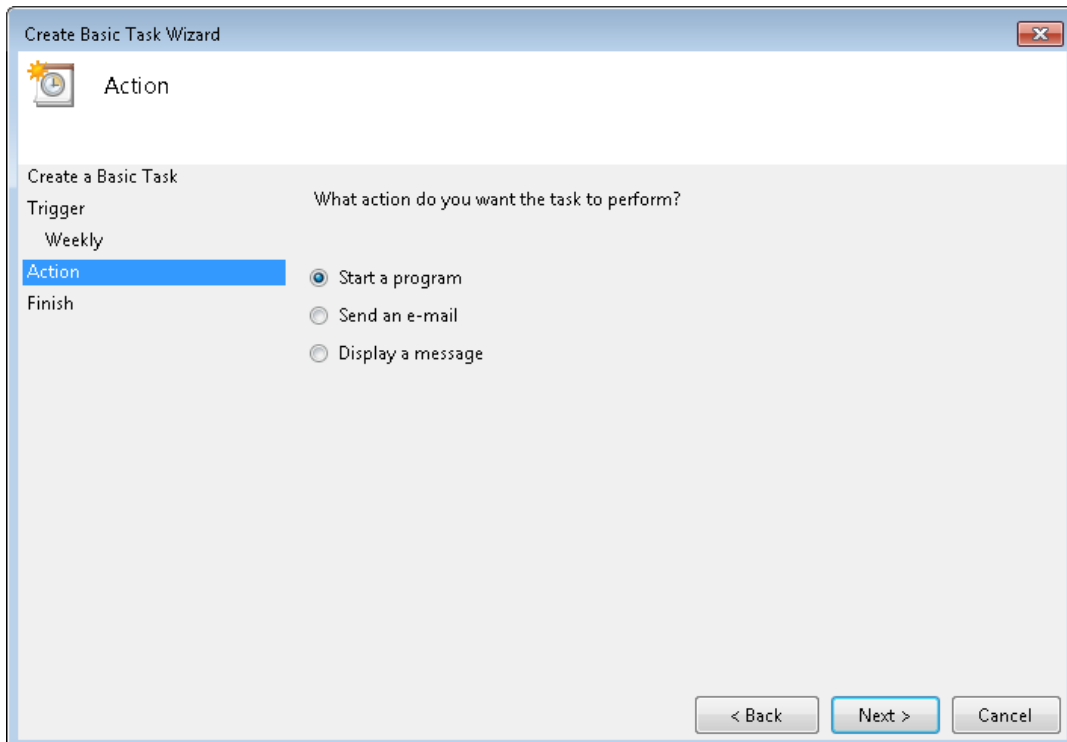
11. Click next and schedule the synchronization of the replica to whenever you want the synchronization to take place. Usually each day or once a week will fit most organizations. In this example we are going to setup a weekly schedule. Click next.



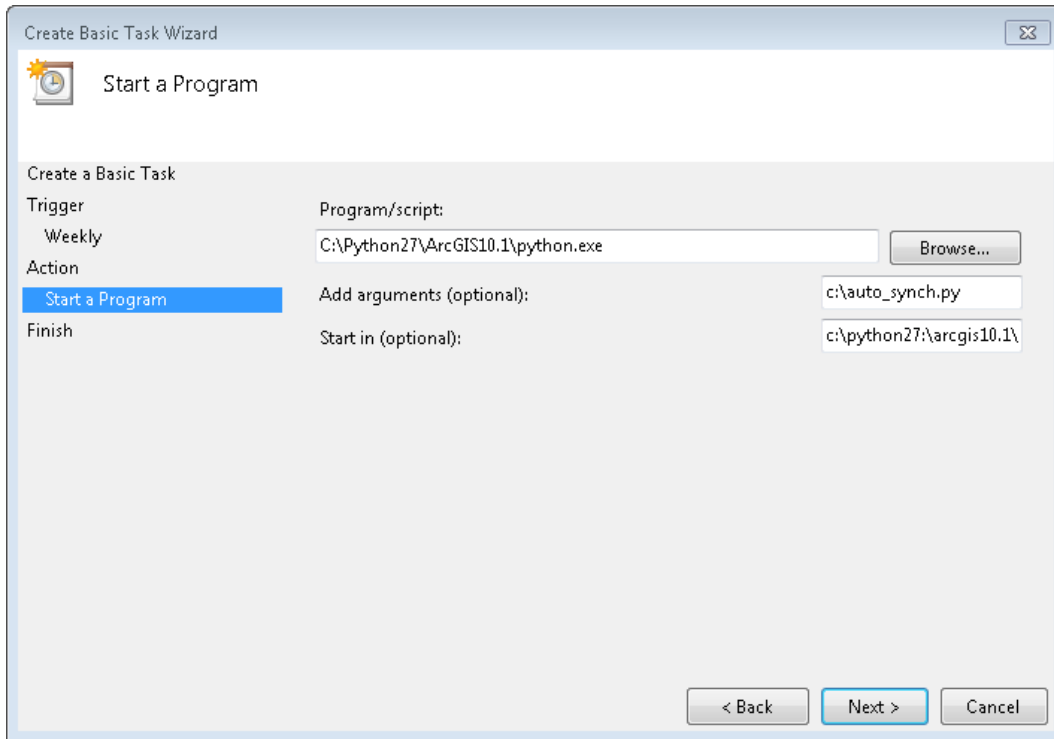
12. In the timeliness of this schedule, I want this to fire off before the backups have occurred so that my databases stay in tune. In my backup routines, I may have a performance maintenance script that analyzes, updates statistics and indexes as well as backups the transaction logs and shrinks the database. Therefore, in this example we'll set the synchronization to occur after I leave for the day on Friday. Click next.



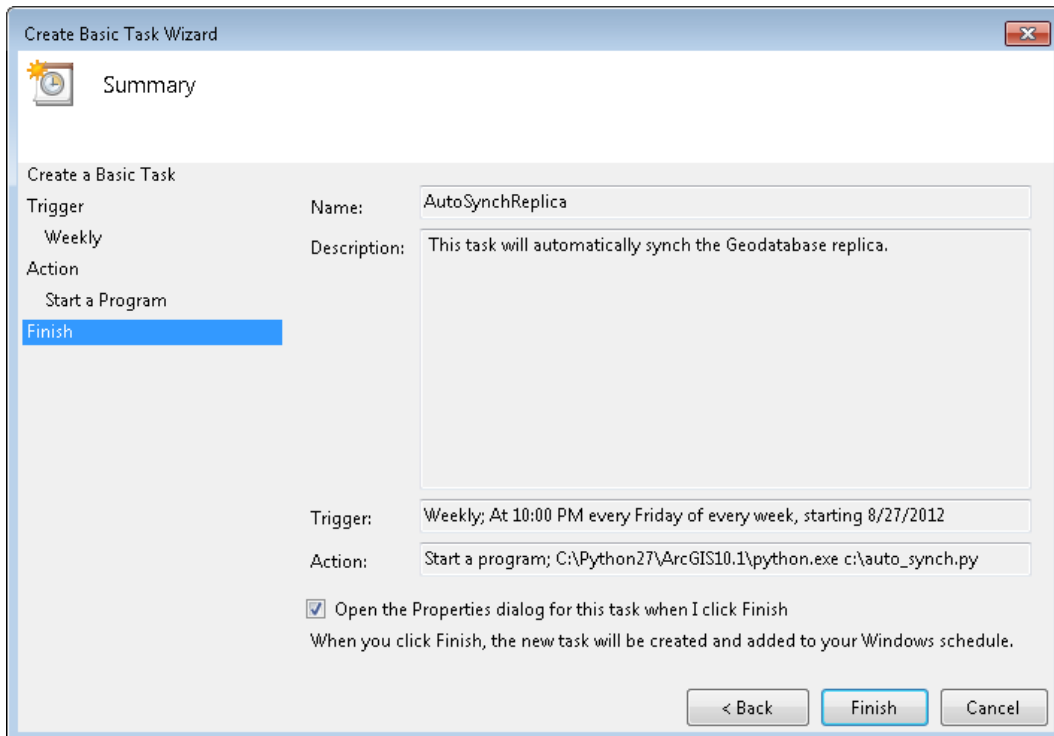
13. Choose start a program and click next.



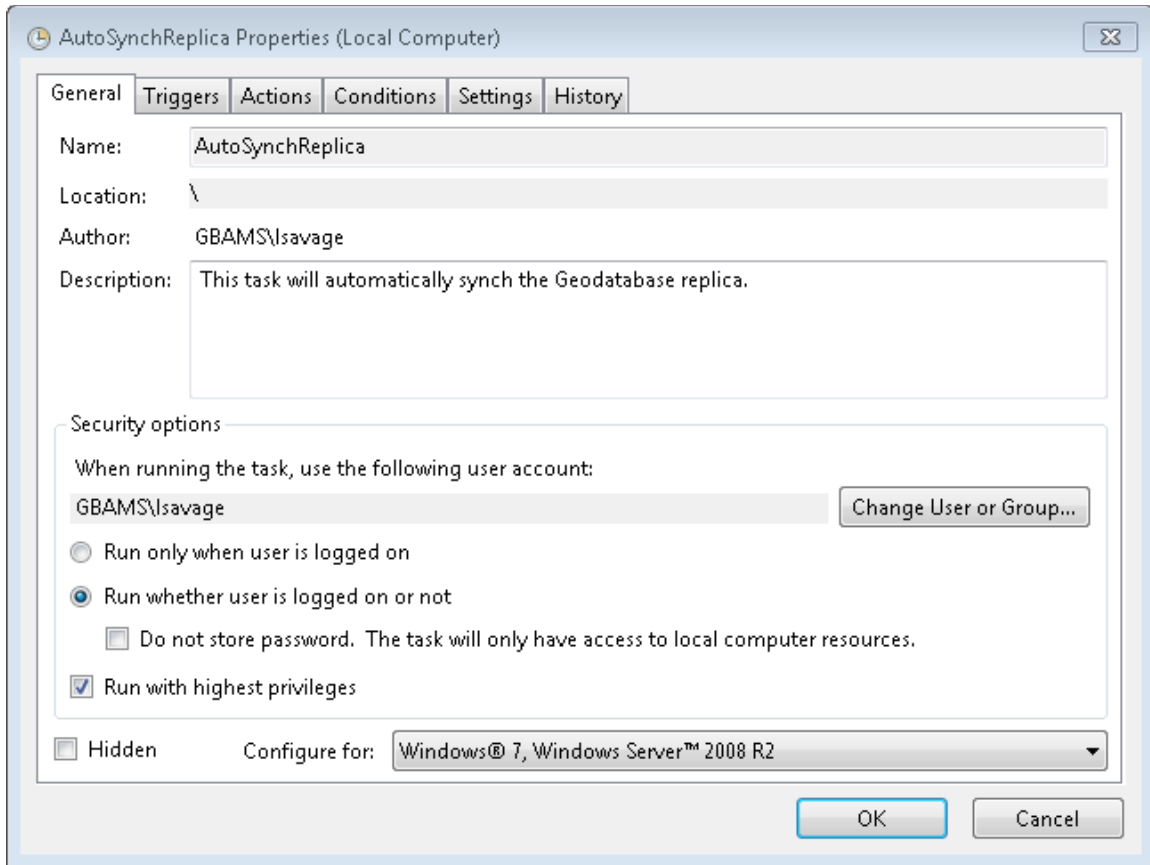
14. In Windows Vista and above, we need to add the python program as the script so that it knows what executable to use. In Add arguments (optional):, you need to add the location of your saved python script. Also, in 'Start in (optional), you need to add the location folder of the python executable. Once complete, click next.



15. Click the 'Open the Properties dialog for this task when I click Finish' checkbox to verify administrative user to run this task and its credentials. Click Finish.



16. Check the 'Run whether user is logged on or not' radio button and check the checkbox next to 'Run with highest privileges'.



17. Test the task by right clicking on the new task and select run.
18. Check the ArcToolBox results history location by going to the following location.  
*C:\Users\<username>\AppData\Roaming\ESRI\Desktop10.4\ArcToolbox\History*

# Options

## Versioning

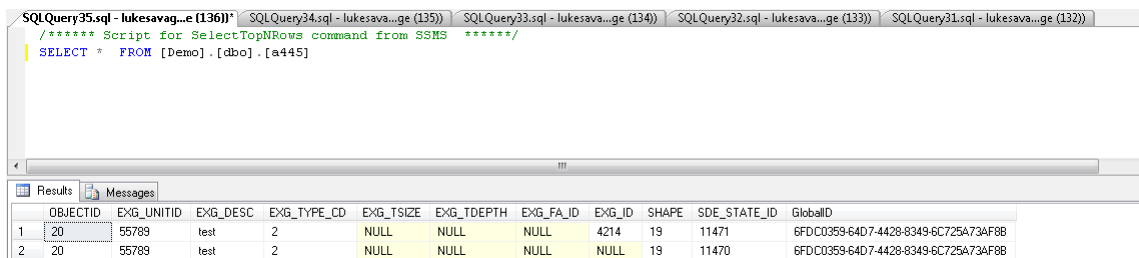
Is an alternative state of the database where you can make edits and changes that will not affect the base tables. When complete and edits are ready, the parent table will be reconciled and posted with the child version. Within the Geodatabase, there are two tables that store changes to the base data. These are called delta tables which are known as Add and Delete tables.

### What are A and D tables?

- A tables are add tables. Anytime you add a record or change a record, the changes are added to the A table.
- D tables are delete tables. Anytime you delete a record, the delete rows are added to the D table.
- A and D tables are numbered based on the registration\_id in the SDE\_Table\_Registry table.

### Example of finding an Add Table.

If you have made an edit to a feature class, you need to get the registration\_id for that feature class and go to the appropriate A table. This is stored in the sde\_table\_registry in SQL Server. For child versions, they are subsequent IDs such as default version would be the actual registration\_id (A144) and the child version would be (A145). Same applies to the D tables.



The screenshot shows a SQL Server query window with the following SQL statement:

```
SELECT * FROM [Demo].[dbo].[a145]
```

Below the query window is a results grid with the following columns and data:

| OBJECTID | EXG_UNITID | EXG_DESC | EXG_TYPE_CD | EXG_TSIZE | EXG_TDEPTH | EXG_FA_ID | EXG_ID | SHAPE | SDE_STATE_ID | GlobalID                             |
|----------|------------|----------|-------------|-----------|------------|-----------|--------|-------|--------------|--------------------------------------|
| 1        | 20         | test     | 2           | NULL      | NULL       | NULL      | 4214   | 19    | 11471        | 6FDC0359-64D7-4428-8349-6C725A73AF88 |
| 2        | 20         | test     | 2           | NULL      | NULL       | NULL      | NULL   | 19    | 11470        | 6FDC0359-64D7-4428-8349-6C725A73AF88 |

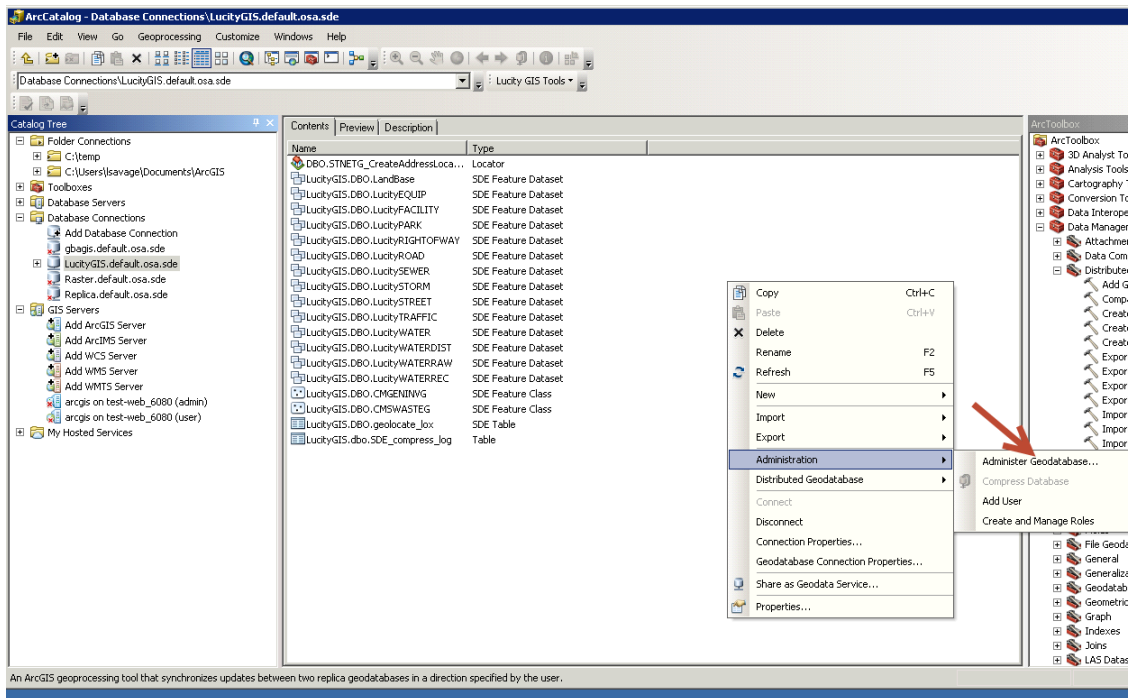
### When Does Versioning Make Sense?

The option to moving edits to base tables is a scary thing for GIS people. Why?

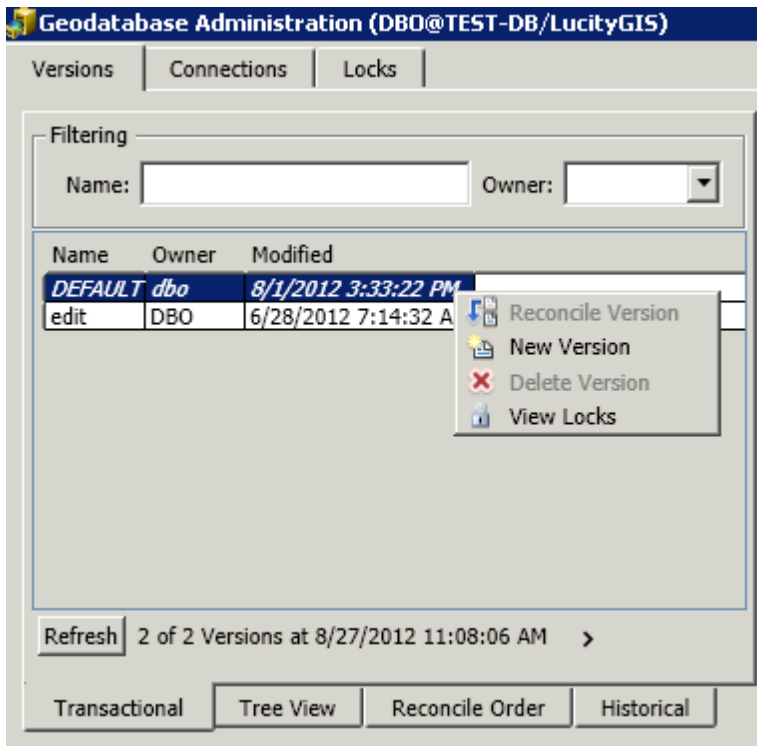
- You can edit simple data only—points, lines, polygons, annotation, and relationships. You cannot edit a feature class in a topology, geometric network, or terrain.
- You cannot archive changes for the dataset.
- You cannot replicate the dataset.
- When you edit the DEFAULT version or post a version to the DEFAULT, you do not have the ability to resolve conflicts, so it is possible to overwrite another user's edits.

## How to Create a Version

1. Right click on a Database Connection link in ArcCatalog TOC or right click in the white space in the contents tab in ArcCatalog

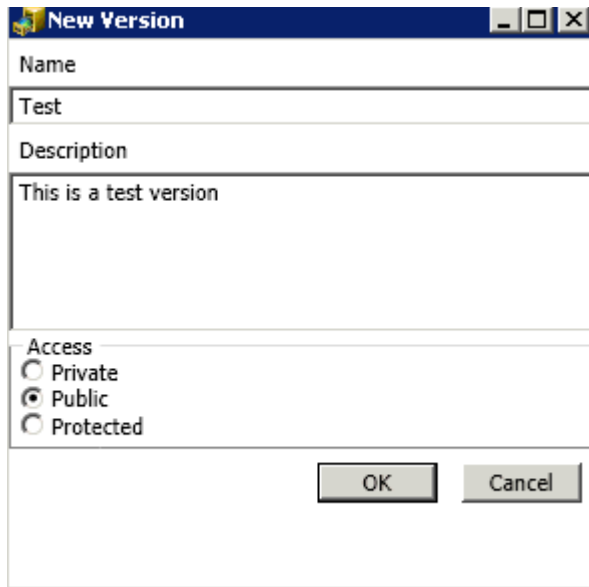


2. Click on Administration/Administrator Geodatabase.
3. Right click on the Default version and select new version





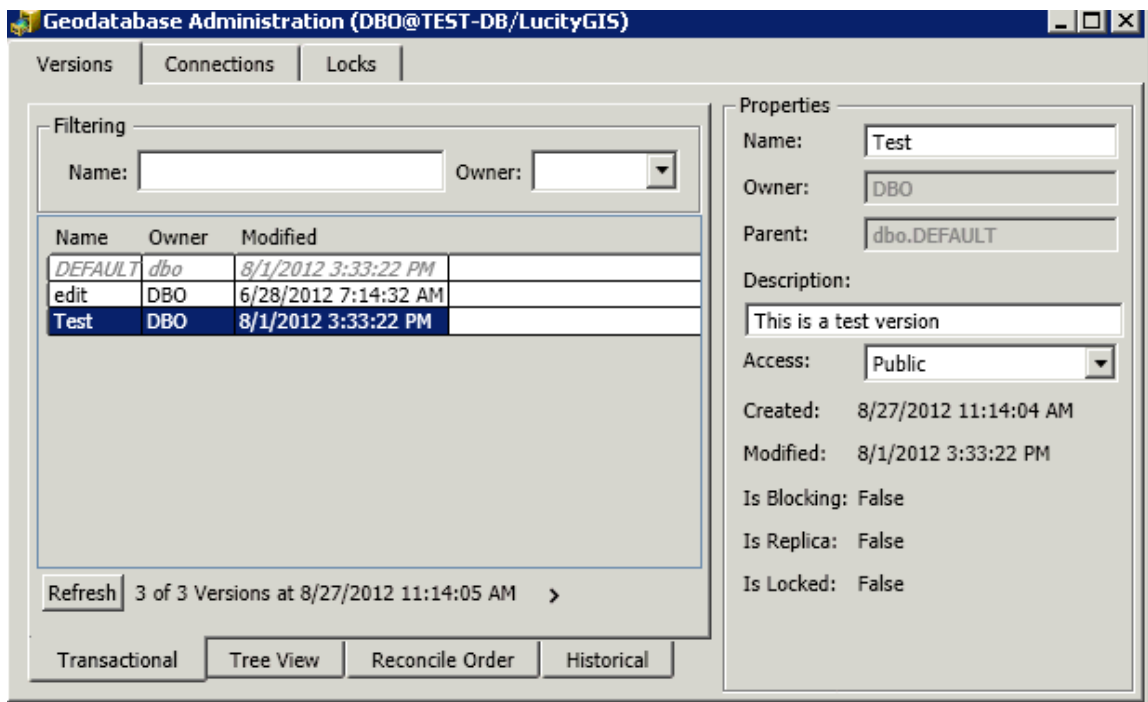
4. Create a Name for the new version and select public. Click Ok.



The 'New Version' dialog box has a title bar with a yellow icon and the text 'New Version'. It contains the following fields and controls:

- Name:** A text box containing the word 'Test'.
- Description:** A text area containing the text 'This is a test version'.
- Access:** A group box containing three radio buttons: 'Private' (unselected), 'Public' (selected), and 'Protected' (unselected).
- Buttons:** 'OK' and 'Cancel' buttons at the bottom right.

5. What's the difference between Access types
- Private: Created user eyes only; no one has access unless owner of the version
  - Public: Everyone can see the version and create versions from. If you have edit privileges, you can edit the version.
  - Protected: Everyone can see the version but cannot edit the version unless owner. Everyone can create versions from.
6. This is now the child of Default and is listed in the Geodatabase Administration dialog.



The 'Geodatabase Administration (DBO@TEST-DB/LucityGIS)' dialog box has a title bar with a yellow icon and the text 'Geodatabase Administration (DBO@TEST-DB/LucityGIS)'. It contains the following sections and controls:

- Filtering:** A section with 'Name:' and 'Owner:' text boxes and a dropdown arrow.
- Table:** A table with columns 'Name', 'Owner', and 'Modified'. The 'Test' row is highlighted in blue.
- Properties:** A section with 'Name:', 'Owner:', 'Parent:', 'Description:', 'Access:', 'Created:', 'Modified:', 'Is Blocking:', 'Is Replica:', and 'Is Locked:' labels and corresponding text boxes or dropdowns.
- Buttons:** 'Refresh', 'Transactional', 'Tree View', 'Reconcile Order', and 'Historical' buttons at the bottom.

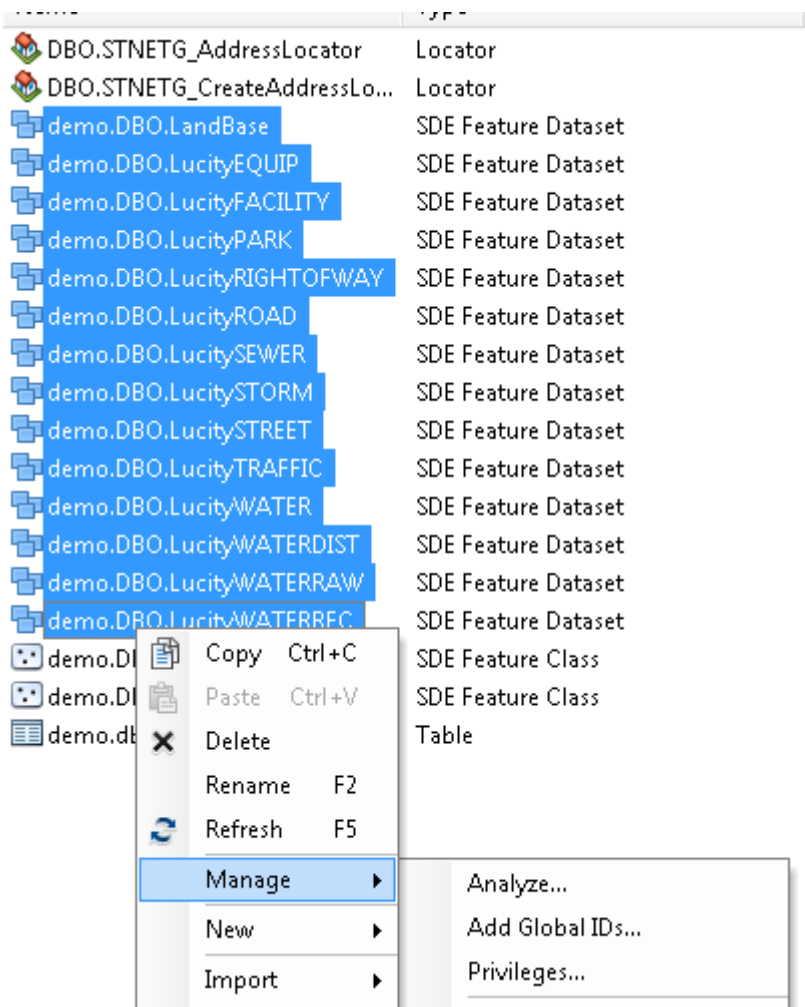
| Name    | Owner | Modified             |
|---------|-------|----------------------|
| DEFAULT | dbo   | 8/1/2012 3:33:22 PM  |
| edit    | DBO   | 6/28/2012 7:14:32 AM |
| Test    | DBO   | 8/1/2012 3:33:22 PM  |

## Replica

A replica is a copy of a database using GUID attributes that synchronize from the parent to the child databases or vice versa. There are several ways to create a replica but we will be creating the most likely replica used which is a one-way replica. One way replicas are easy to setup and are handy for the administrators to offload view only users off of the production database while performing synchronizations from time to time. Keeping the database in synch when production changes have been approved is a nice way to distribute your data to users while retaining data integrity, security and flexibility.

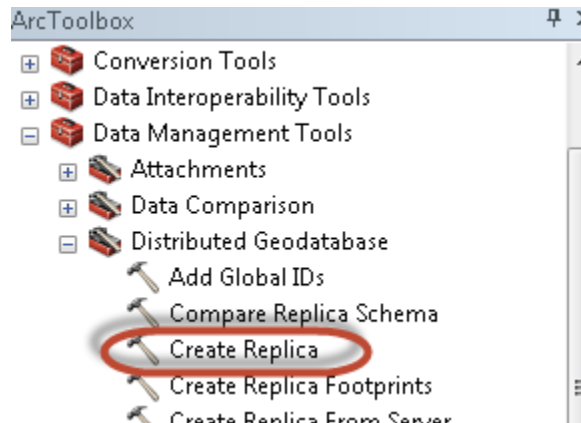
1. Prepare your data for a replica. Go to your database and right click on Feature Datasets, and go to manage/add global ids. Global Ids are necessary for the Geodatabase to keep track of changes in each database that is a part of a replica.

### Note: Data must be registered as versioned

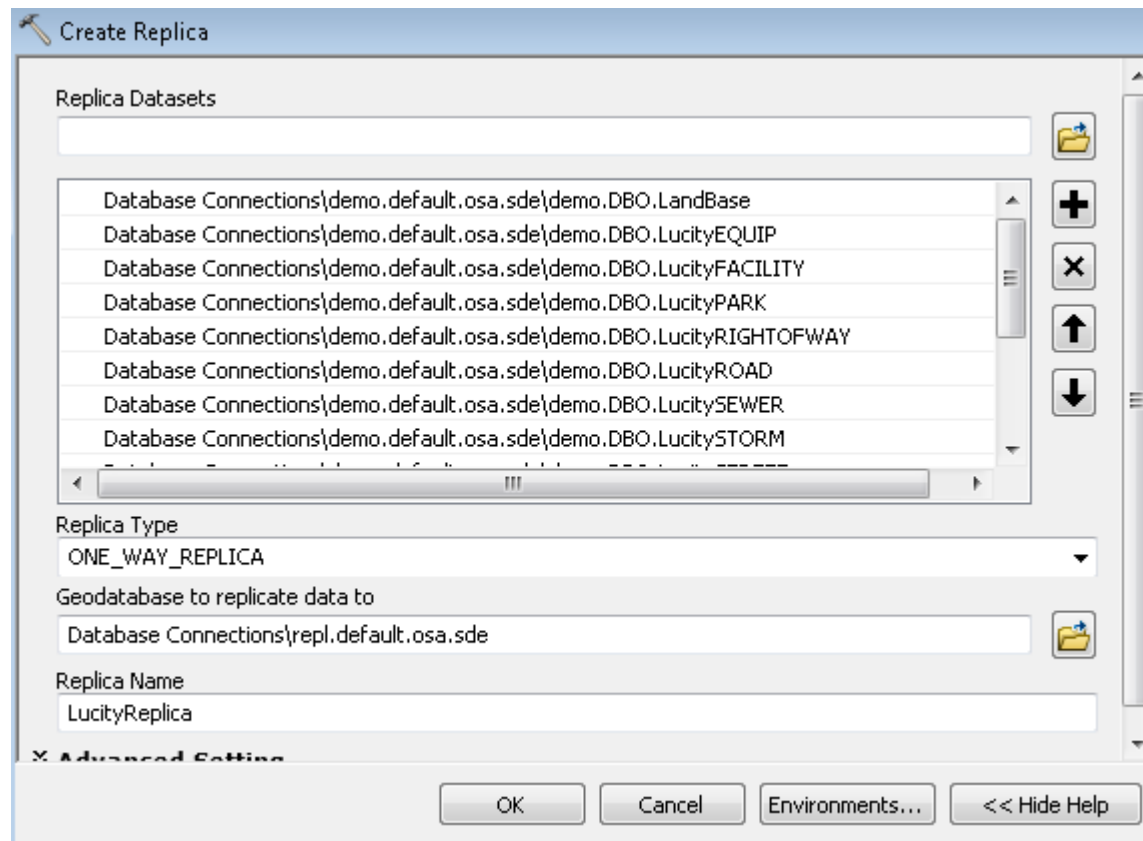


2. Do this for stand-alone Feature Classes as well.
3. To create a replica, go to ArcToolbox/Data Management Tools/Distributed Geodatabase and expand.

4. Click on Create Replica



5. Browse or drag and drop data you want to replicate from into the Create Replica dialog window. Change the Replica Type to one-way replica. Add the replicated database connection to replicate the data to. Give the Replica a name.



6. The advanced settings allow you to change the behavior of your replica. Usually, you would except the defaults and click ok.
7. Once replica is in place, you can assign privileges.

## Apply Schema Changes to Replica

In order to update the schema in a replica, there are three tools that you can use to update the schema. However, there are certain instances where you will need to unregister the replica, delete the replica feature class/tables/datasets and recreate the replica in order for the changes to push down from the parent to the child. Below is a matrix from [Esri's ArcGIS Resources](#) page for schema changes. It describes what is supported with the update process and what is not supported.

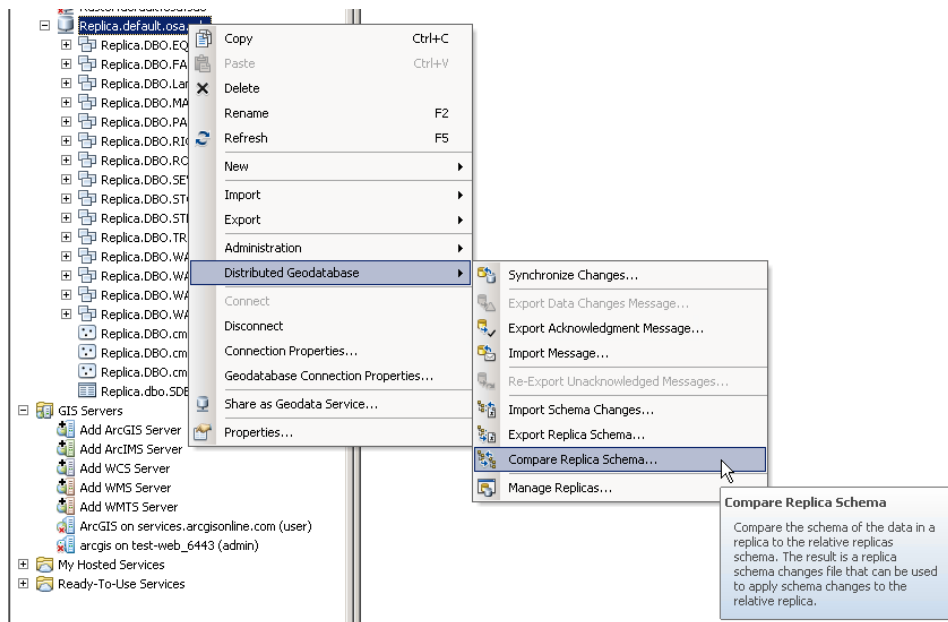
The following is a list of schema changes and whether or not they can be applied:

|                     | Add | Change                       | Drop |
|---------------------|-----|------------------------------|------|
| Field               | Y   | Y (domains)                  | Y    |
| Domain              | Y   | Y                            | Y    |
| Table/Feature Class | Y   | Y (domains, add/drop fields) | Y    |
| Geometric network   | N   | N                            | Y    |
| Topology            | N   | N                            | Y    |
| Feature dataset     | N   | N                            | Y    |
| Relationship class  | N   | Y (add/drop fields, domains) | Y    |

This table describes the schema changes that may be done on replicated datasets.

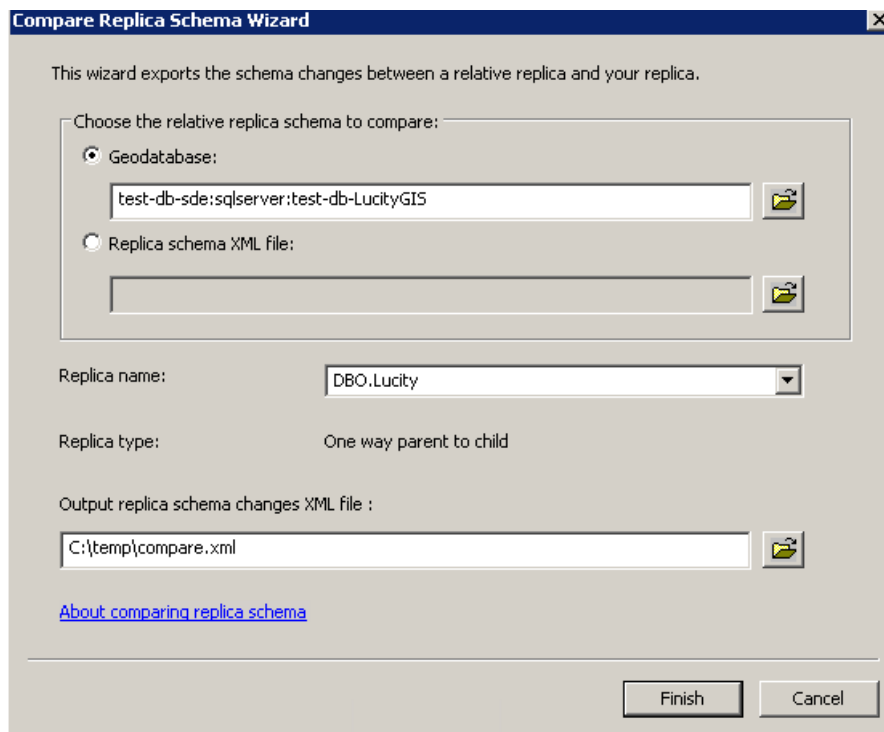
### Steps to complete

- Compare Schema in Parent
  - Import Schema into Child
1. Open ArcCatalog.
  2. Right Click on the Replica database and choose distributed geodatabase/compare replica schema

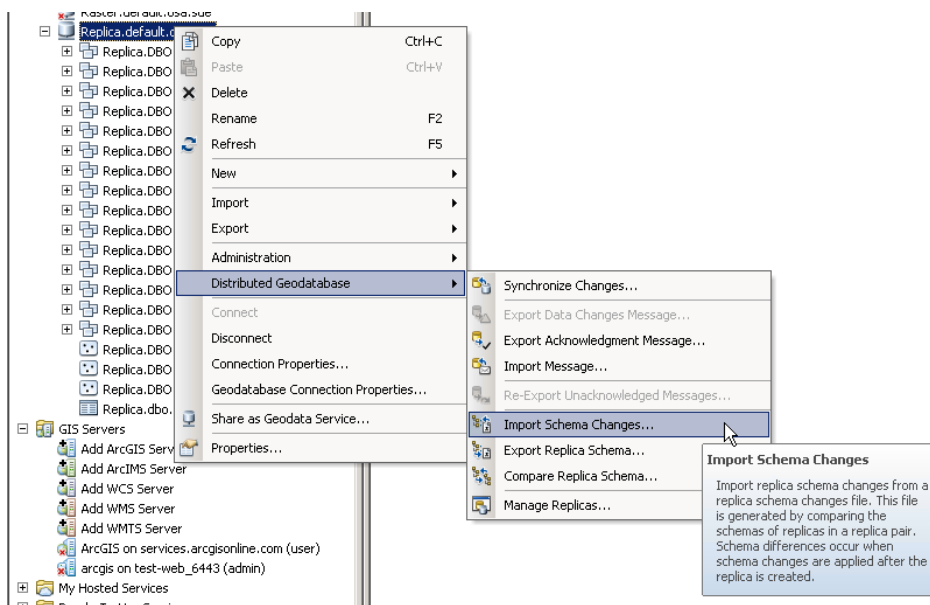


3. Browse to the parent geodatabase
4. Choose Replica Name if you have multiple replicas

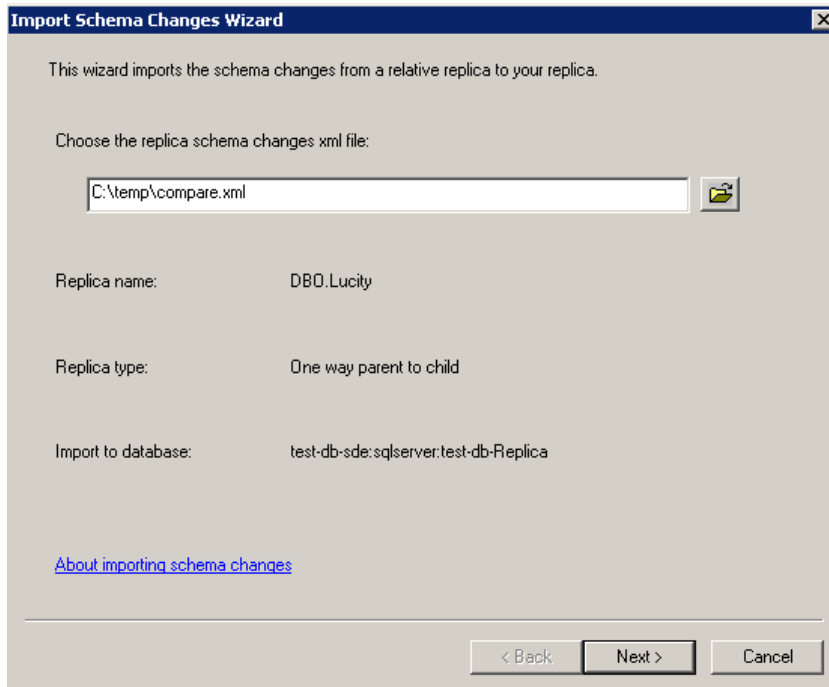
5. Choose a location to save the replica schema changes xml file



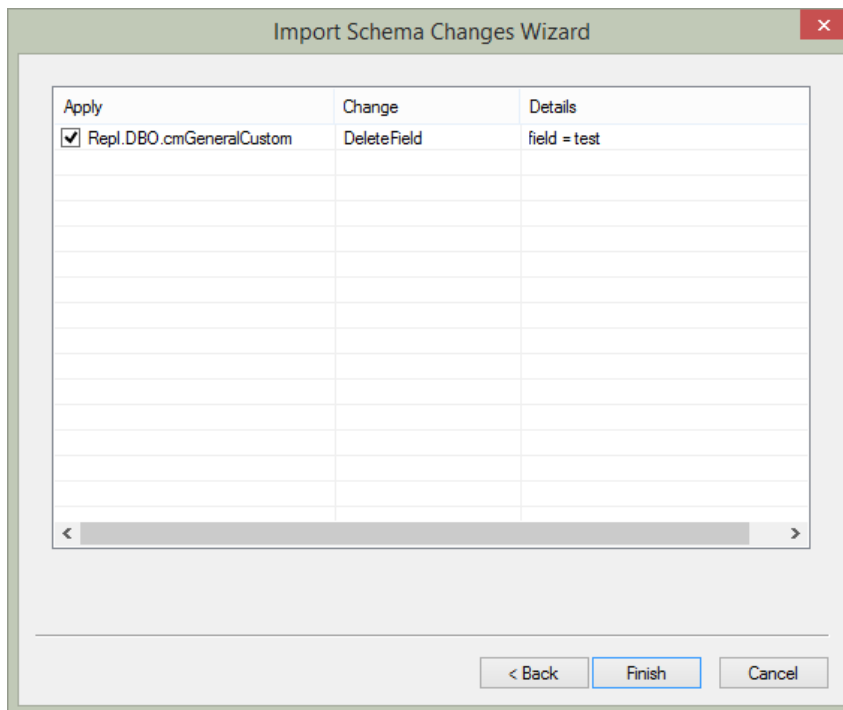
6. After complete, right click on the Replica database and choose distributed geodatabase/import replica schema



7. Locate the schema change xml file generated and add to the import schema changes wizard



8. Review the information and click next
9. In the next screen, you should see the changes to the schema to apply. In this scenario, we deleted a field called 'test; short int'.



10. Click Finish and Synchronize Changes.