TRAINING GUIDE

ArcGIS Server and Geodatabase Administration

Part 1

ArcGIS for Server and Geodatabase Administration - Part 1

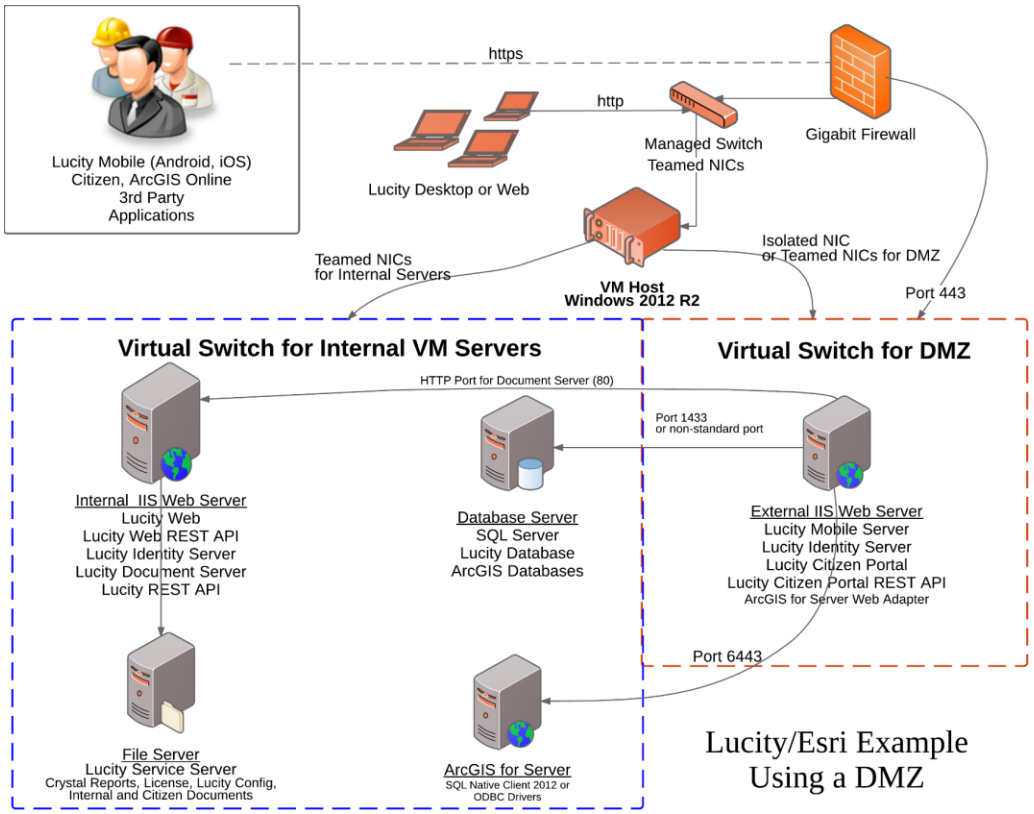
Here at Lucity, we understand that our software is requiring more skills in ESRI technology and these Esri systems can be difficult to manage without training. In this workshop, we will explore the nature of ArcGIS for Server v10.4.1, touch on key principles and techniques, as well as explore best practices for integration into Lucity. We will cover some key administration best practices for: design, setup, maintenance, and optional editing workflow. Even though we won't be covering the full gamut of ESRI technologies, we will be focused on the administration of ArcGIS for Server, how this relates to the IT and GIS administrators and what are some basic principles for enabling ArcGIS for Server to be compatible with Lucity.

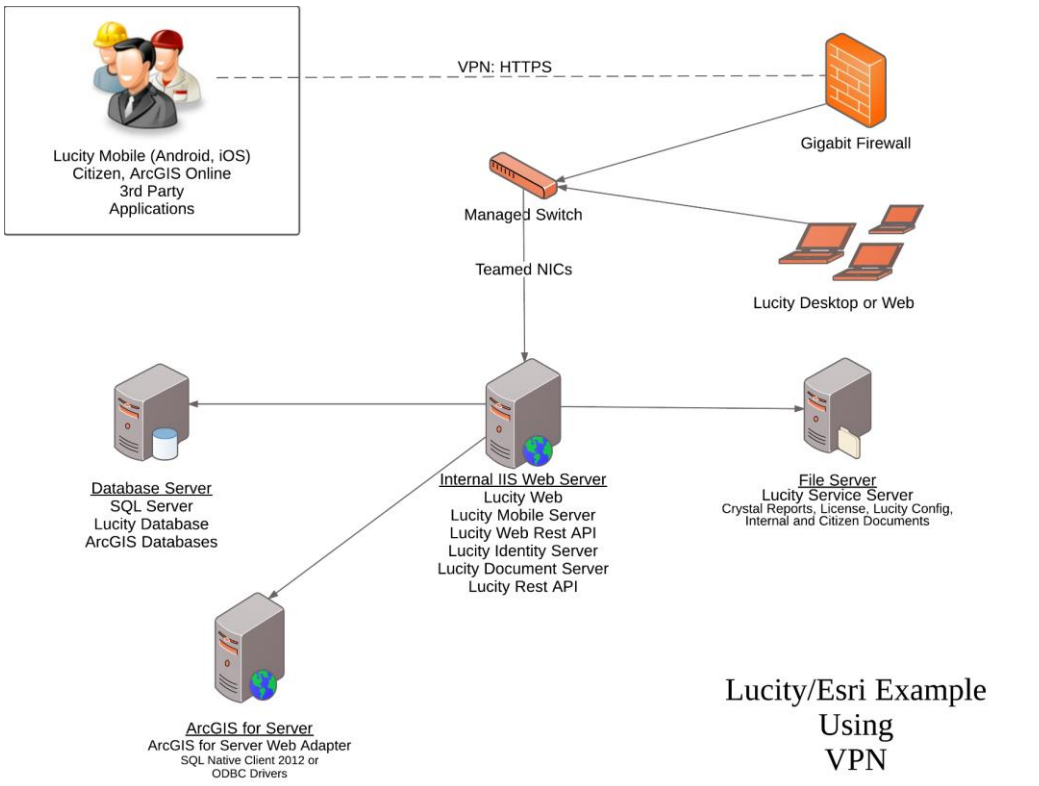
Table of Contents

Setup

ArcGIS for Server Design

- ArcGIS for Server 10.2.2 and higher are supported for Lucity
- Support Windows Server 2008 R2 or higher
  - For Virtualization, recommend Windows Server 2012 R2
- Server should have 2-4 cores minimum and 4GB of RAM per core. For a 4 core system, you should have at least 16GB of RAM.
- SQL Server 2012, 2014 and 2016 are supported
- If using ODBC drivers for SQL Server 2016 and ArcGIS 10.4.1, use ODBC Driver v13. Otherwise, use ODBC Driver v11 or SQL Server native client 2012.
- If you have virtual servers, make sure you dedicate resources and have the latest VMware or Hyper-V software available. Based on ESRI's testing, Virtual software is the key to many performance issues. Make sure in VMware environments that you subtract overhead of two cores for the Virtual Environment so ArcGIS for Server map services doesn't pool across the Virtual overhead cores. If you don't, you will see a significant performance decrease in ArcGIS for Server.
- Try to limit map services to utilize 4 pools per core maximum. Anything more than that, you could allow ArcGIS for Server crashes when many people are simultaneously hitting your server.
- If you have a dedicated system for ArcGIS for Server, try creating a RAID 1 SSD configuration for your hard drives. Also, use the latest version of SSD standards as this will increase performance and reliability. For all new SSD cards, it will take at least 40 years before they reach their read/write maximum. This benchmark test was performed on a 24/7 continuous read/write routine. If SAS drives, use RAID 10 with a good RAID controller.
- Space depends on caching. If you plan to cache imagery, please account for large image files. Remember, each scale in the cache will have separate tiles for each scale. If you have 9 scales within a cache, you will have nine separate tiles of cache. Smaller scale images will be smaller in size and the larger scale images will be larger in size.
- 10.4.1 installation automatically configures HTTP and HTTPS Secure Design for new installations. Upgrades stay the same as previous versions.
- For Lucity, we use ArcGIS Tokens for authentication mode. **Do not** use Web Tier Authentication
  Lucity Web, Lucity Services, Lucity Mobile Server servers and mobile devices need access to the map service rest endpoints in order to function.


Lucity Mobile (Android, iOS)
Citizen, ArcGIS Online
3rd Party
Applications
https
http
Lucity Desktop or Web
Managed Switch
Teamed NICs
Gigabit Firewall
Isolated NIC
or Teamed NICs for DMZ
Teamed NICs
for Internal Servers
VM Host
Windows 2012 R2
Port 443
Virtual Switch for Internal VM Servers
Virtual Switch for DMZ
HTTP Port for Document Server (80)
Port 1433
or non-standard port
Internal IIS Web Server
Lucity Web
Lucity Web REST API
Lucity Identity Server
Lucity Document Server
Lucity REST API
Database Server
SQL Server
Lucity Database
ArcGIS Databases
External IIS Web Server
Lucity Mobile Server
Lucity Identity Server
Lucity Citizen Portal
Lucity Citizen Portal REST API
ArcGIS for Server Web Adapter
Port 6443
File Server
Lucity Service Server
Crystal Reports, License, Lucity Config,
Internal and Citizen Documents
ArcGIS for Server
SQL Native Client 2012 or
ODBC Drivers
Lucity/Esri Example
Using a DMZ


Lucity Mobile (Android, iOS)
Citizen, ArcGIS Online
3rd Party
Applications
VPN: HTTPS
Gigabit Firewall
Managed Switch
Teamed NICs
Lucity Desktop or Web
Database Server
SQL Server
Lucity Database
ArcGIS Databases
Internal IIS Web Server
Lucity Web
Lucity Mobile Server
Lucity Web Rest API
Lucity Identity Server
Lucity Document Server
Lucity Rest API
File Server
Lucity Service Server
Crystal Reports, License, Lucity Config,
Internal and Citizen Documents
ArcGIS for Server
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ArcGIS for Server Setup

1. Download the ArcGIS for Server program. You may also want to download the ArcGIS for Server Web Adaptor for IIS as well. The web adaptor can be placed on internal and external web servers.

   Note: When installing ArcGIS for Server on a separate server than your SQL Server 2012 or higher instance, you need the SQL Server 2012 Native Client 64 bit. You can also use the ODBC drivers supplied at MyEsri. Latest SQL Server 2012 Native 64-bit Client download link: http://www.microsoft.com/en-us/download/details.aspx?id=29065

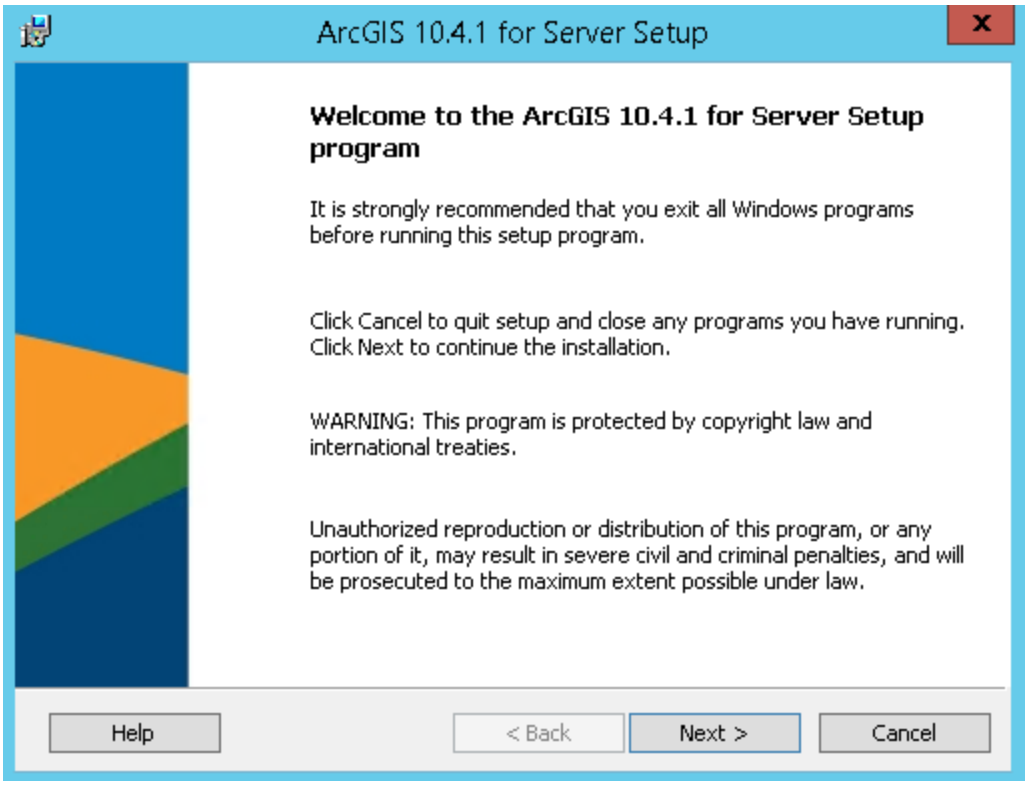
Select Downloads

Select the items below that you want to download: Filter: Filter files

Files	Guides	File Size	Select
ArcGIS for Server	Install guide	1.62 GB	Download
Portal for ArcGIS	Install guide	981.93 MB	Download
ArcGIS Web Adaptor (IIS)	Install guide	22.58 MB	Download
ArcGIS Web Adaptor (Java Platform)	Install guide	25.02 MB	Download
ArcGIS Data Store for Server	Install guide	211.66 MB	Download
ArcGIS GeoEvent Extension for Server	Install guide	221.48 MB	Download
ArcGIS Data Interoperability for Server		658.35 MB	Download
ArcGIS Data Reviewer for Server	Install guide	53.01 MB	Download
ArcGIS Workflow Manager for Server	Install guide	12.69 MB	Download
ArcGIS Server Cloud Builder on Amazon Web Services (Windows)		80.91 MB	Download
ArcGIS Server Cloud Builder for Microsoft Azure Web Services (Windows)	Install guide	16.00 KB	Download
ArcGIS License Manager (Windows)	Reference guide	19.13 MB	Download
ArcGIS License Manager (Linux)	Reference guide	126.56 MB	Download
ArcObjects SDK for the Microsoft .NET Framework		387.63 MB	Download
ArcObjects SDK for Java (Windows)		438.88 MB	Download

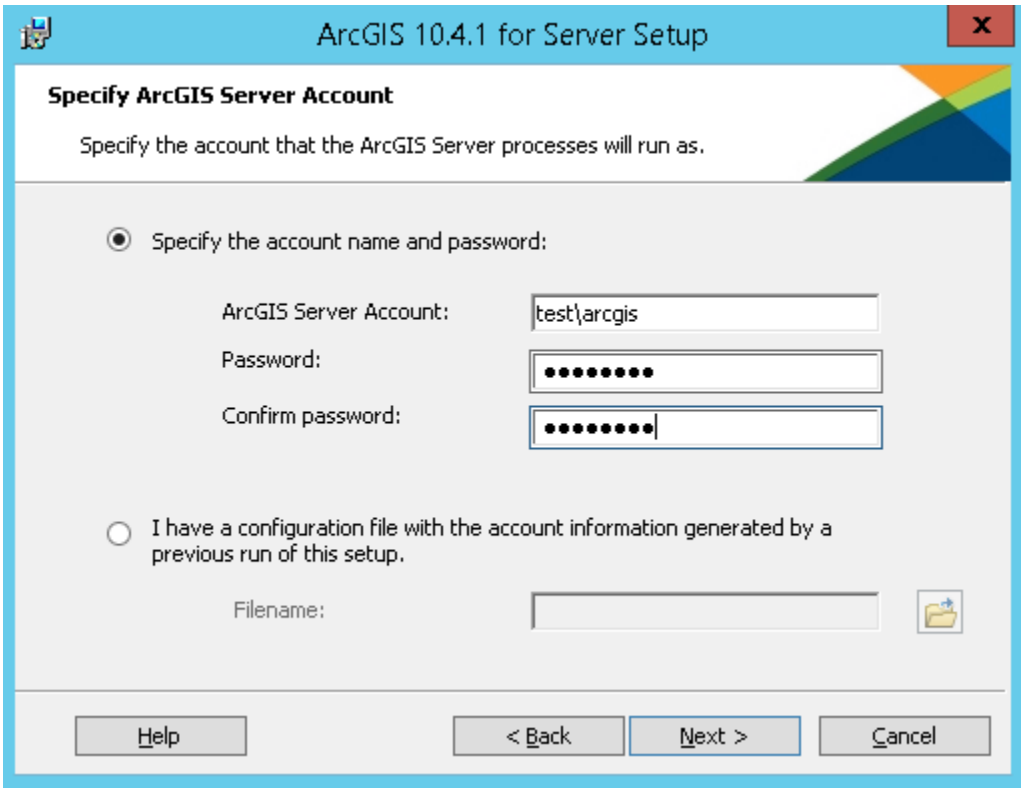
Information may not reflect recent changes.

2. Start the install for ArcGIS for Server Windows after program extracts
3. Once installation starts click next.

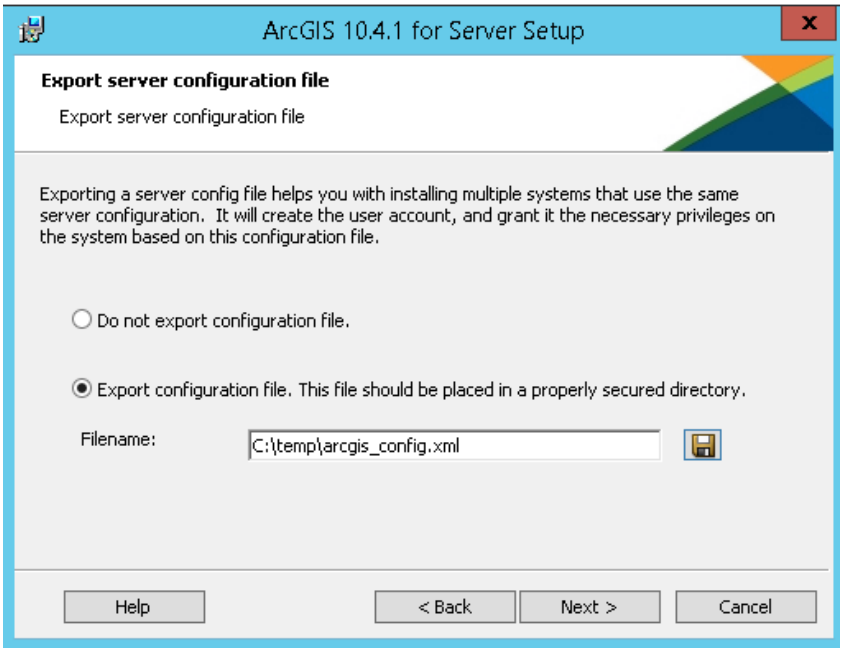


4. In the next dialog, click on 'I Accept' and click next.
5. For python, this is needed for geoprocessing and click next.

6. In the 'Specify ArcGIS for Server Account name and password', create a username and passwords for ArcGIS. Recommend to add ArcGIS as a user within Active Directory and add this to ArcGIS for Server Account information <domain>\<user>.

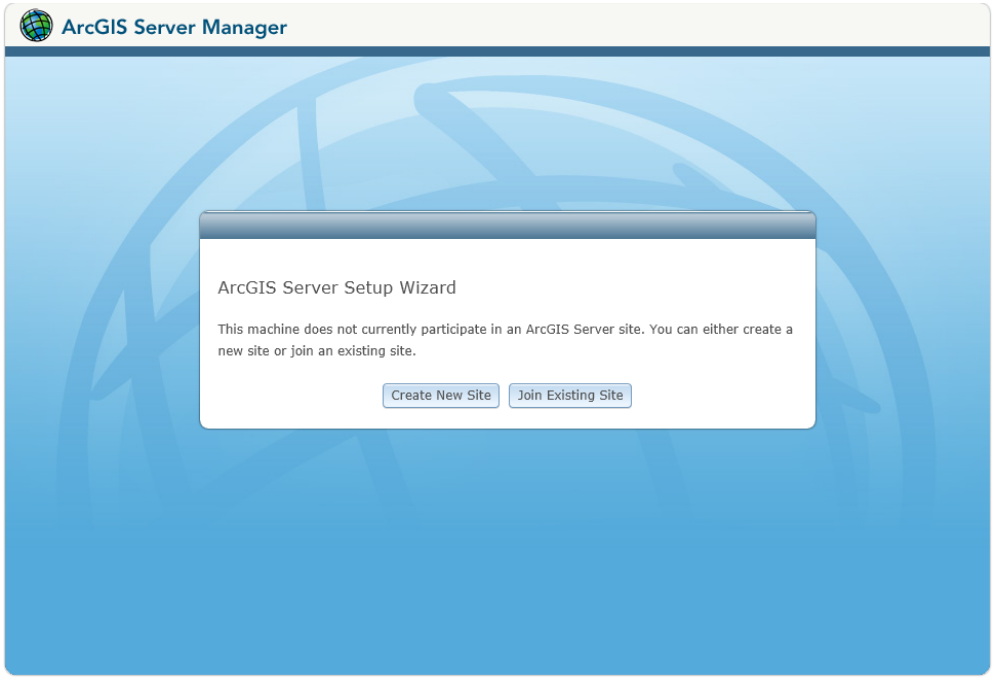


7. In the next screen, you will be given the option to export your configuration; this is recommended and will be helpful during upgrades. Click next and install.

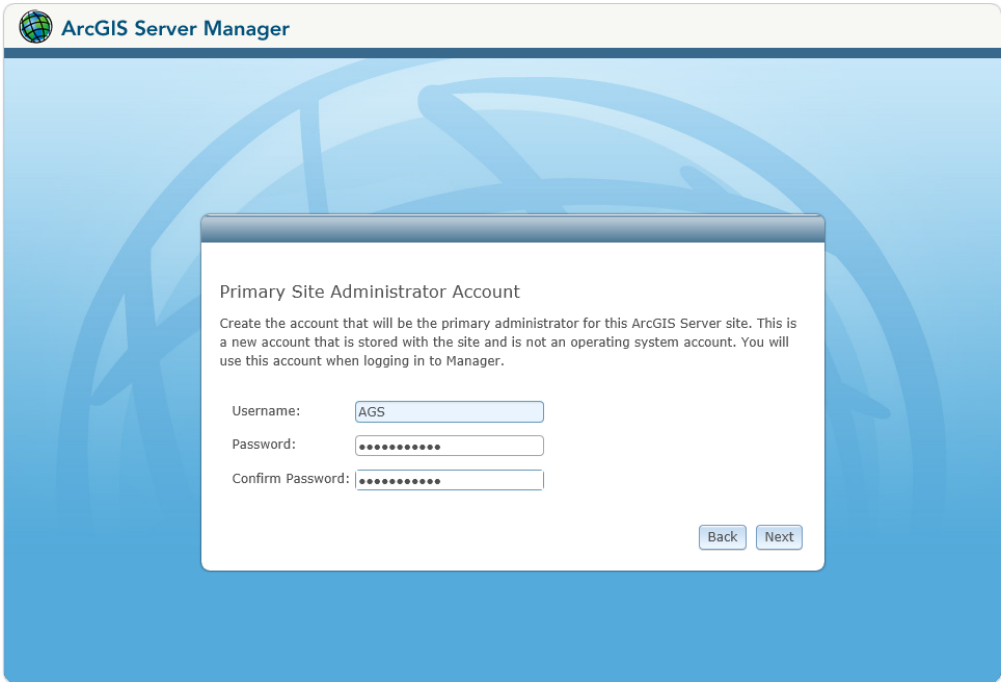


8. When finished, you will need to activate. Refer to Enabling ArcSDE for Workgroup Databases section for more detail about the activation process.

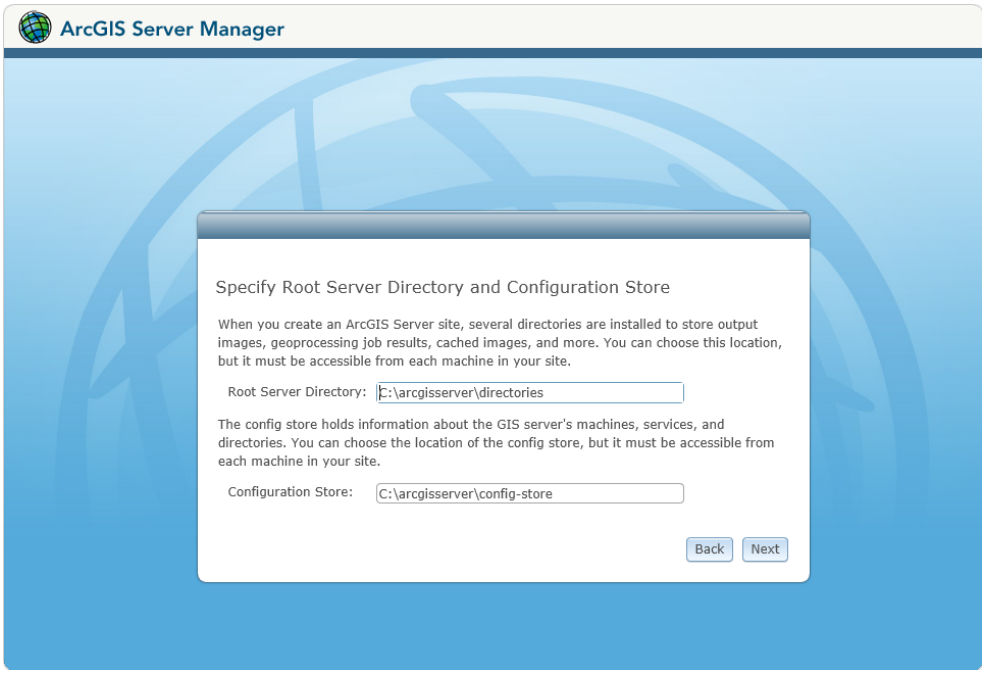
9. When finished activation, you will be prompted to create a new site.



10. Click on create a new site and supply the username and password for the site administrator account. Click next.



11. Specify the root server directory and configuration storage. Your server configuration is stored in the config-store directory and your working directories are stored in directories (arcgiscache, arcgisjobs, arcgisoutput, arcgissystem). In this example we will take the defaults.

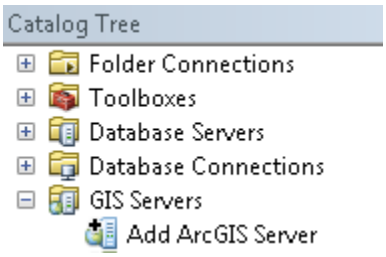


12. Click next and finish when done.

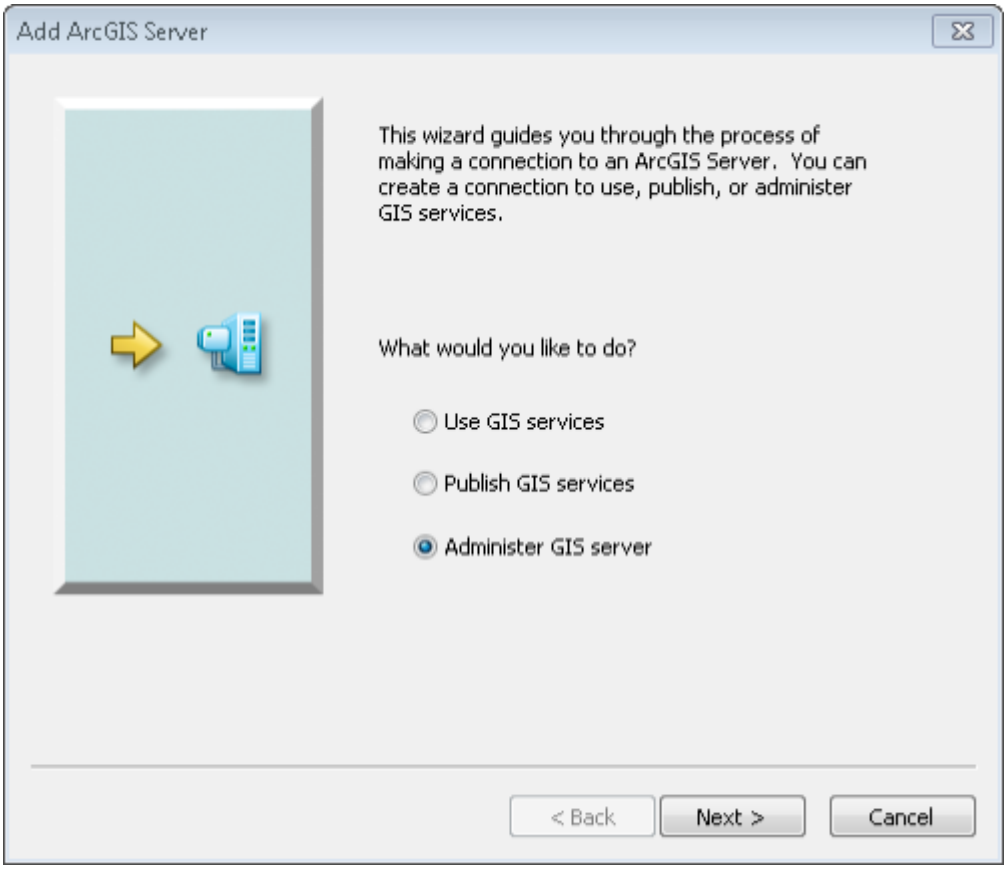
> ***ArcGIS for Server does not need a web client to run. ESRI chose to use Tomcat as the servlet engine for ArcGIS for Server and can be a stand-alone system if used internally. However, if you want to serve webpages out through IIS, consider installing a Web Adaptor. ArcGIS for Server web adaptor will act as a proxy server that will pass requests to and from ArcGIS for Server. Web Adaptor will also be able to create an alias URL location for your ArcGIS for Server. ArcGIS for Server by itself needs to have port 6080 as the rest service endpoint for the URL. For example:*** *http://<internalservername>:6080/arcgis/rest/services* ***is the URL without the Web Adaptor. When using the Web Adaptor, requests can be masked through an alias URL designation*** *http://<URLname>/<virtualdirectory>/rest/services.* ***The Web Adaptor takes care of the requests to and from ArcGIS for Server using port 6080 and translating this to the user. The Web Adaptor for ArcGIS for Server can be located on ArcGIS for Server machine running IIS or on a different server within the LAN or a DMZ. For internet and intranet based ArcGIS for Server services, it's recommended to use a DMZ with the firewall open from DMZ web server to the internal ArcGIS for Server on port 6443. The Web Adaptor will be installed on the DMZ web server. Also, it is highly recommended that the Web Adaptor uses HTTPS as the protocol within a secure design as well as running ArcGIS for Server as HTTPS and HTTP. By default, new ArcGIS for Server 10.4.1 installs http and https protocols automatically. In ArcGIS for Server design section, we have added a diagram of what this actually looks like.***

Connect to ArcGIS for Server from ArcCatalog

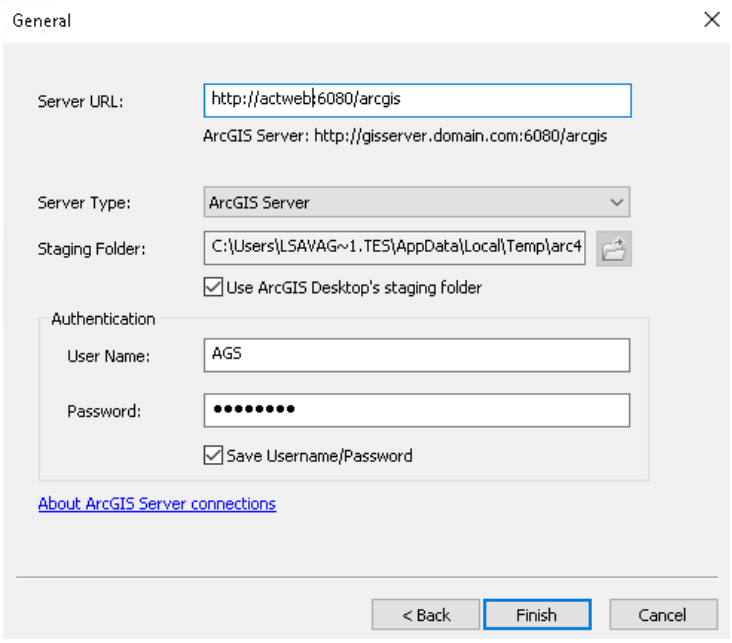
1. Open ArcCatalog and go to the TOC. Expand GIS Servers.



13. Click on Add ArcGIS for Server and choose Administer GIS Server. As a note, you can add users to be able to publish gis services without having administrative rights.



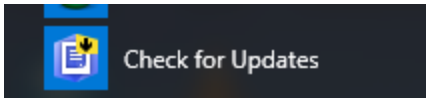
14. In the general dialog, you need to add the URL and the username and password for administrating the server. Make sure you use the exact case for your username and password as ArcGIS for Server is now case sensitive. If Web Adaptor is installed, you can use the Web Adaptor URL to connect to ArcGIS for Server if it is setup to accept management. Because 10.4.1 installs http and https, you may need to accept certificates when connecting.

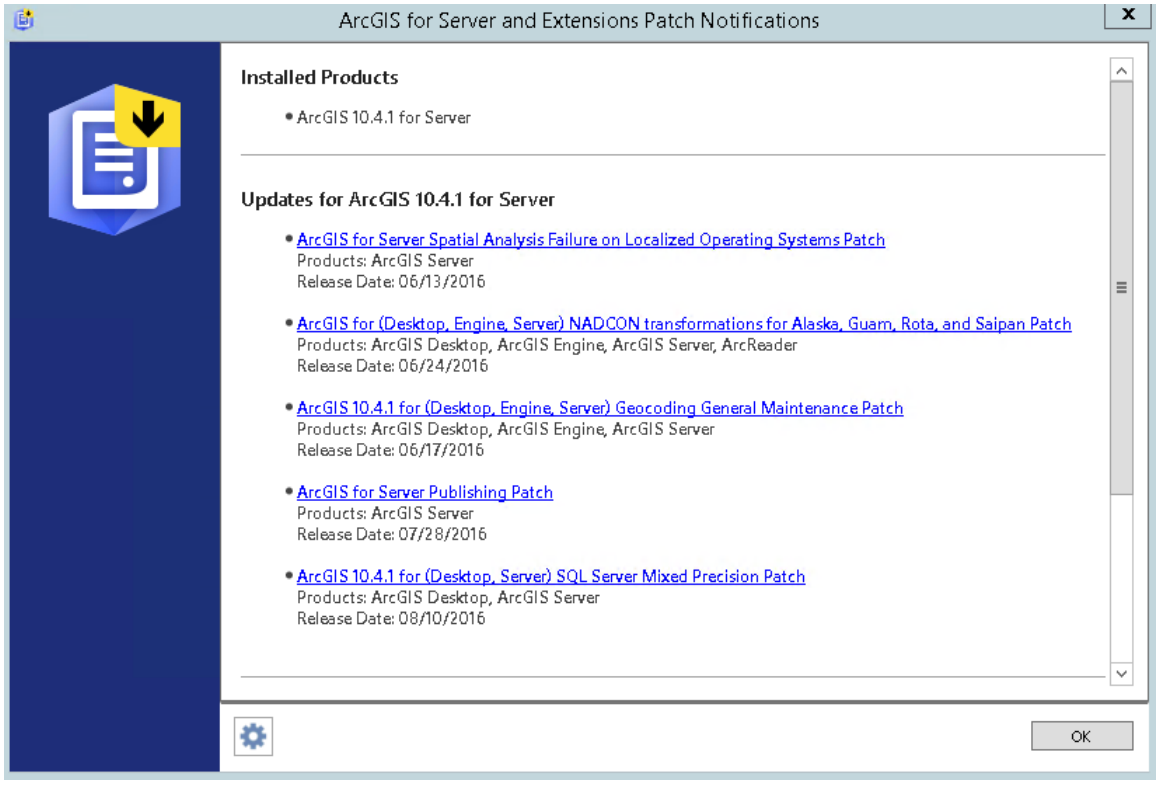


15. Click finish.

ArcGIS for Server and Extensions Patch Notification

1. Go to the Start Menu/All Programs/ArcGIS app folder and choose Check for Updates to check for ArcGIS for Server patches. For 10.4.1, publishing patch is highly recommended.





Installing and Configuring ArcGIS for Server Web Adaptor

1. Download the ArcGIS Web Adaptor (IIS) and install. If IIS is not setup with features, ArcGIS for Server Web Adaptor will configure IIS for you with the features necessary to run the Web Adaptor.

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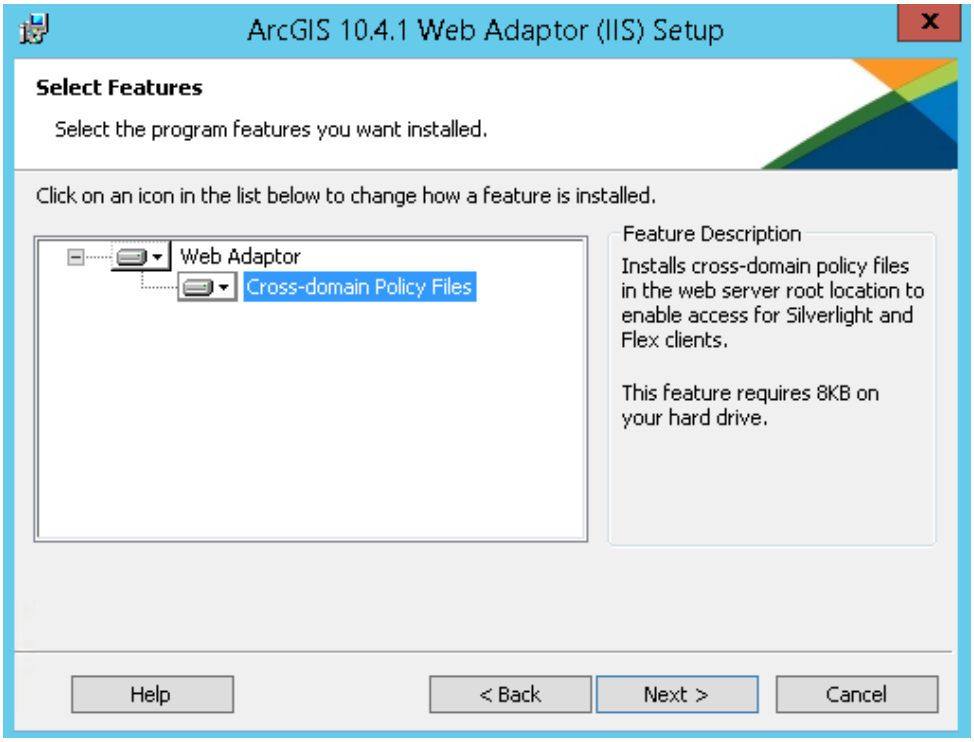
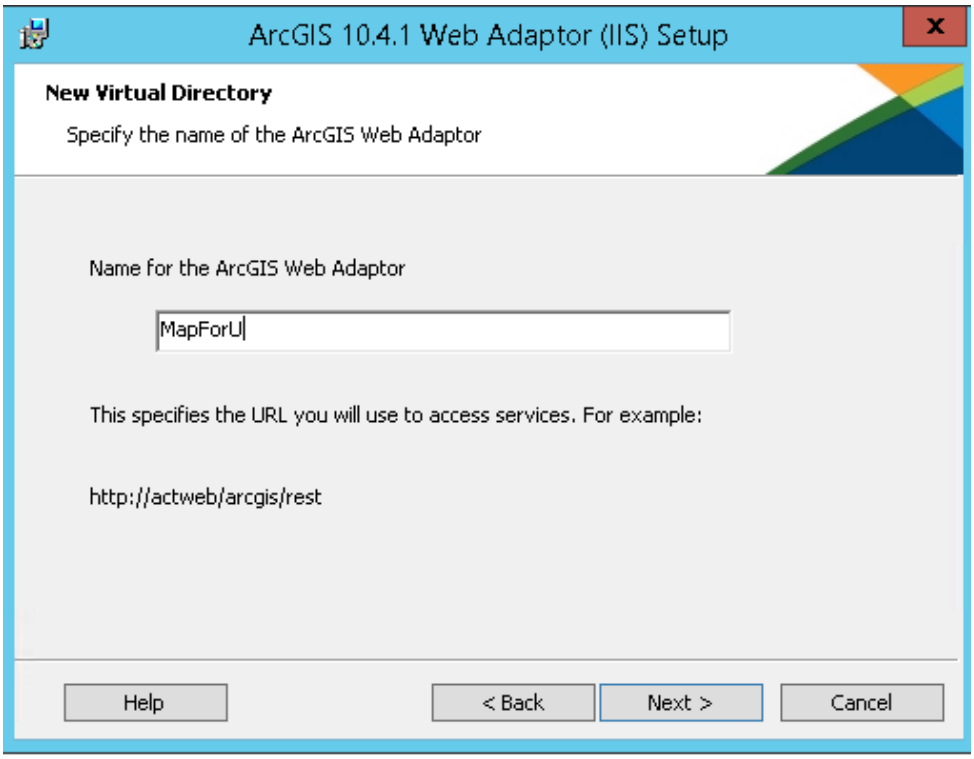
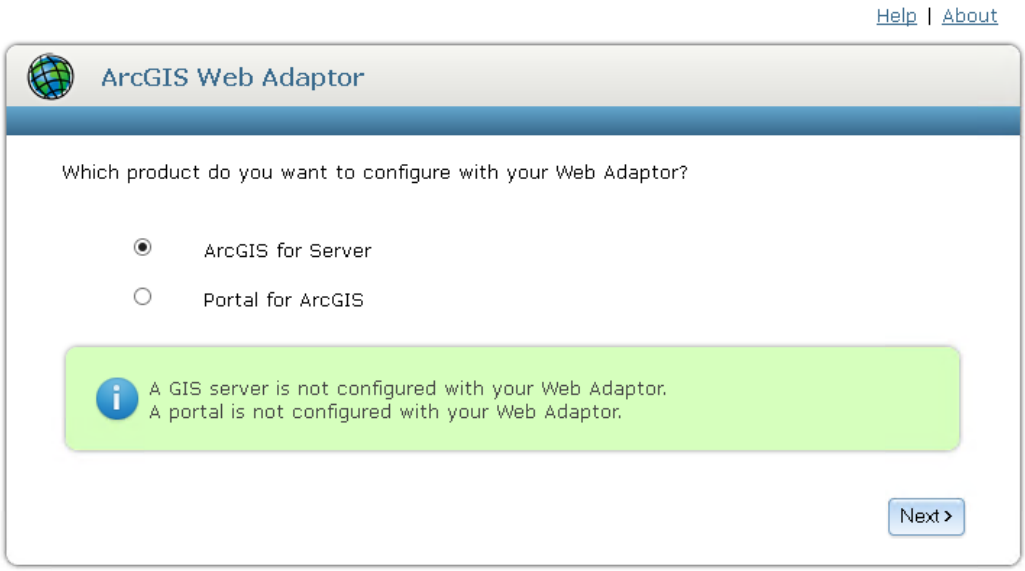


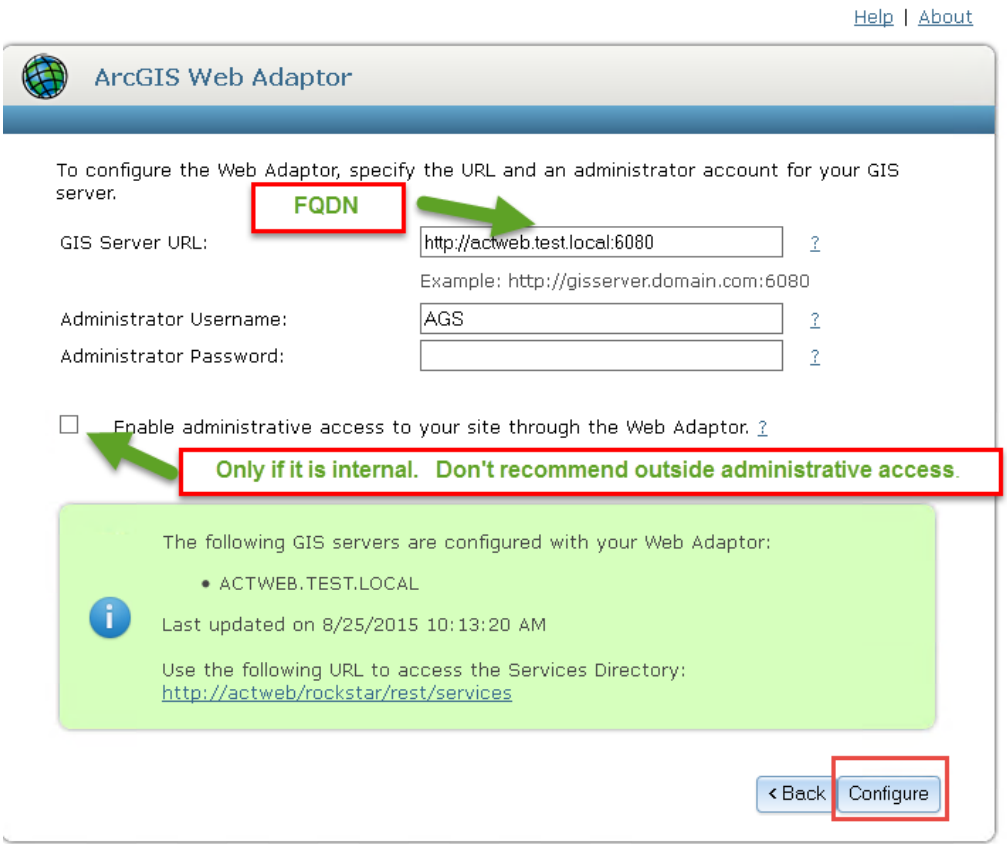
16. In the new Virtual Directory section, create your own virtual directory that will be used to alias ArcGIS for Server URL location. In this example, the URL change will be http://<URLname>/MapForU/rest/services. Click next.



17. Click Install.

After install is finished, you will be rerouted to a site that will allow you to configure your ArcGIS Web Adaptor. There are many options but the great thing about the Web Adaptor is you can be security conscience. Make sure you figure out if you want management internal only or allow management from both the Web Adaptor and ArcGIS for Server. Enabling administrative access to your site through the web adaptor is fine but discuss this option with your network engineer before enabling it to make sure the vulnerability is acceptable.





18. Once configured, you should see a change in the green section of the web adaptor page.

SQL Server Specifications

- Server should have 2-4 cores minimum and 4GB of RAM so that SQL Server can use at least 2GB dedicated for the instance (sql server express can only use up to 1GB RAM per instance). For a Lucity and an Enterprise Geodatabase SQL Instance configuration, I would suggest 4 cores minimum with at least 8GB dedicated to SQL Server of RAM. Training, Development or Test servers can have less; 2 cores with at least 4GB of RAM which 1GB is dedicated to the SQL Server instance.
- RAID 10 configurations has become a standard RAID best practice. Please don't use onboard RAID controllers as they are not performance based.
- Don't load ArcGIS for Server on a database server. ArcGIS for Server is a memory hog and will fight for computer resources.
- Plan for data scalability 5 years out. If you have imagery that consumes 20GB and you know you will acquire a new image at least once within the 5 years, scale out four times the consumption rate. Space is cheap and there is no need to be caught in a low memory situation. Remember, digital imagery space is higher as they have a smaller focal length per image. If you acquired analog images in the past, digital images can be 2-3 times the memory size.
    - **Case study**: *Pocatello used 70GB 2012 Aerial for storage space. In their 2015 Aerial delivery, the database grew by 400GB. Higher resolution is becoming cheaper to purchase.*
- If in a virtual environment, make sure you have enough RAM and storage space for your servers. You could have as much as three to four servers minimum depending on your system design.

SQL Server 2016 features by edition

			Developer[1]	Express	Standard	Enterprise
Mission critical performance	Maximum number of cores	New	Unlimited	4 cores	24 cores	Unlimited
	Maximum memory utilized per instance		OS Max	1 GB	128 GB	OS Max
	Maximum size		524 PB	10 GB	524 PB	524 PB
	Production use rights			●	●	●
	Basic OLTP		●	●	●	●
	Manageability (Management Studio, Policy-Based Management)		●	●	●	●
	Basic high availability (2-node single database failover, non-readable secondary)	New	●		●	●
	Enterprise data management (Master Data Services, Data Quality Services)		●			●
	Advanced OLTP (In-memory OLTP, Operational analytics)	New	●			●
	Advanced HA (Always On - multi-node, multi-db failover, readable secondaries)		●			●
Security	Basic security (Row-level security, data masking, basic auditing, separation of duties)	New	●		●	●
	Advanced security (Transparent Data Encryption, Always Encrypted)	New	●			●
Data warehousing	Advanced data integration (Fuzzy grouping and look ups, change data capture)		●			●
	Data warehousing (In-Memory ColumnStore, Partitioning)	New	●			●
	PolyBase[2]		●		●	●
Business intelligence	Programmability & developer t ools (T-SQL, CLR, Data Types, FileTable, JSON)	New	●	●	●	●
	Basic reporting & analytics		●	●	●	●
	Basic data integration (SSIS, built-in connectors)		●		●	●
	Basic Corporate Business Intelligence (Multi-dimensional models, Basic tabular model)	New	●		●	●
	Mobile BI (Datazen)	New	●			●
	Advanced Corporate Business Intelligence (Advanced tabular model, DirectQuery, in-memory analytics, advanced data mining)	New	●			●
Advanced analytics	Basic "R" integration (Connectivity to R Open, Limited parallelism for RRE)	New	●	●	●	●
	Advanced "R" integration (Full parallelism for RRE)	New	●			●
Hybrid cloud	Stretch Database	New	●	●	●	●

[1] SQL Server 2016 Developer Edition offers the full feature set of SQL Server 2016 Enterprise Edition, but Developer Edition is for development and test only, and not for production environments or use with production data.
[2] Scale out relational and non-relational data queries with the simplicity of T-SQL using PolyBase, which requires single Microsoft SQL Server 2016 Enterprise Edition as head node.

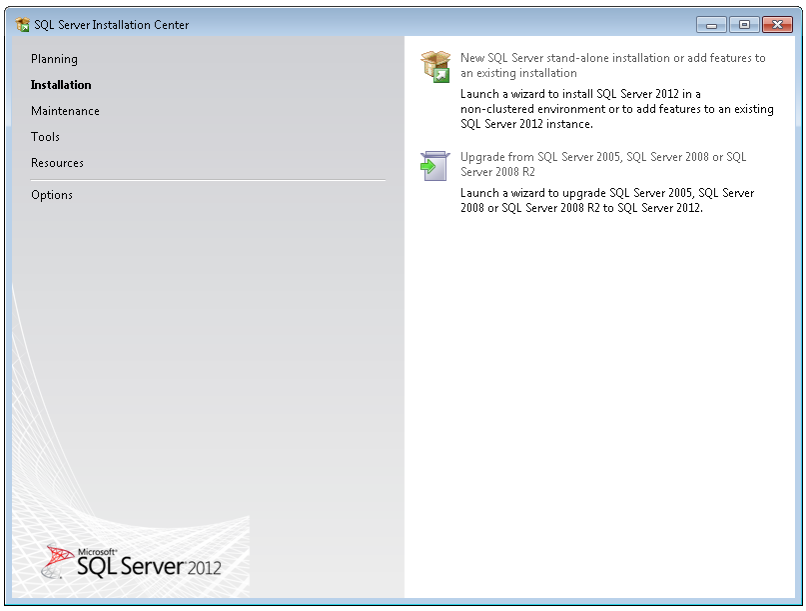
Microsoft

*NOTE: COMPARE SQL SERVER VERSIONS HTTPS://WWW.MICROSOFT.COM/EN-US/CLOUD-PLATFORM/SQL-SERVER-COMPARISON

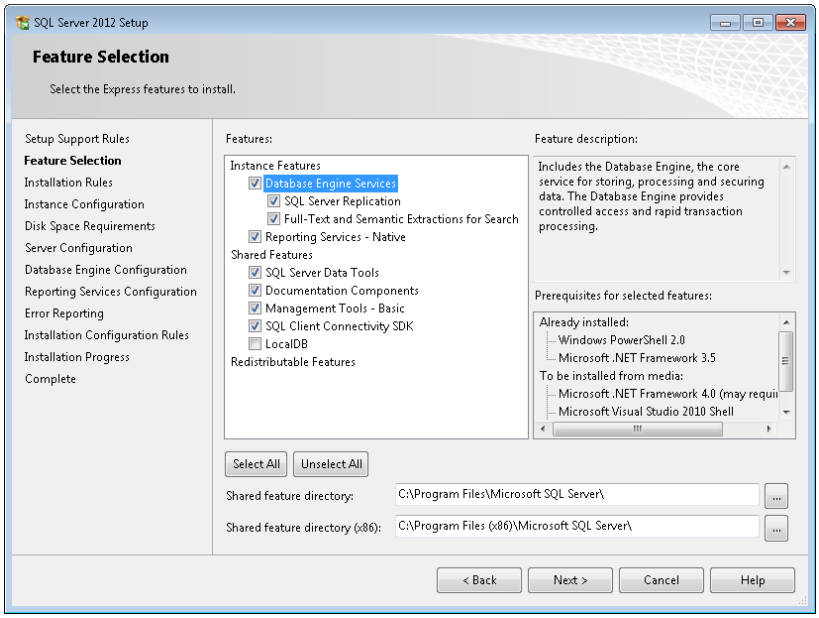
SQL Instance Setup

Install SQL Server for ArcSDE for Workgroup

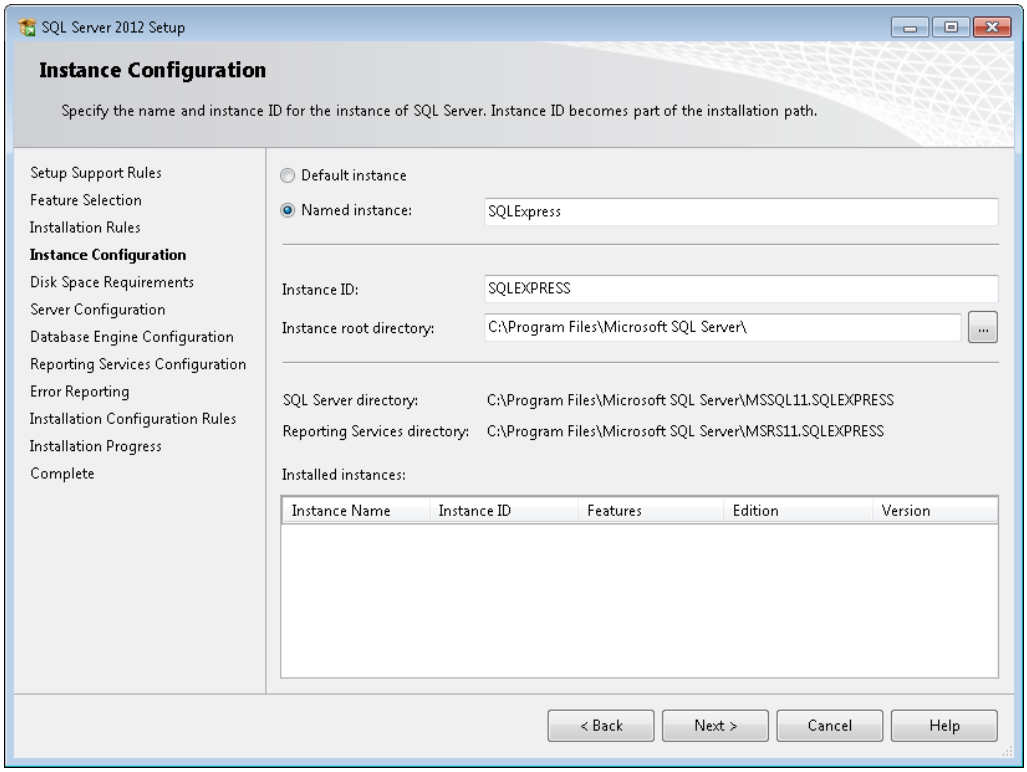
1. You can install from ArcGIS for Server disk or you can download installation from Microsoft for SQL Server 2012-2014 Express 64bit with Advanced Services. For Windows Server 2012 and 2012R2, you may need to install .net 3.5 sp1. Below is the command line link. Also, for 10.4.1, it requires Visual C++ 2008 sp1 64 bit (v9.0.30729.17) to install the Database Server for Workgroup. If using Enterprise, this is not needed.
    a. Visual C++ 2008 sp1 64 bit: https://www.microsoft.com/en-us/download/details.aspx?id=2092
    b. For SQL Server 2012-2014 install on Windows 2012 or 2012 R2, .net 3.5 sp1 needs to be enabled. Make sure the install .iso is available or you've extracted from the install disk to d:\ or somewhere appropriate on your server. Run as Administration command line below.
        i. Dism /online /enable-feature /featurename:NetFX3 /All /Source:D:\sources\sxs /LimitAccess
2. Click on the SQL Server executable.



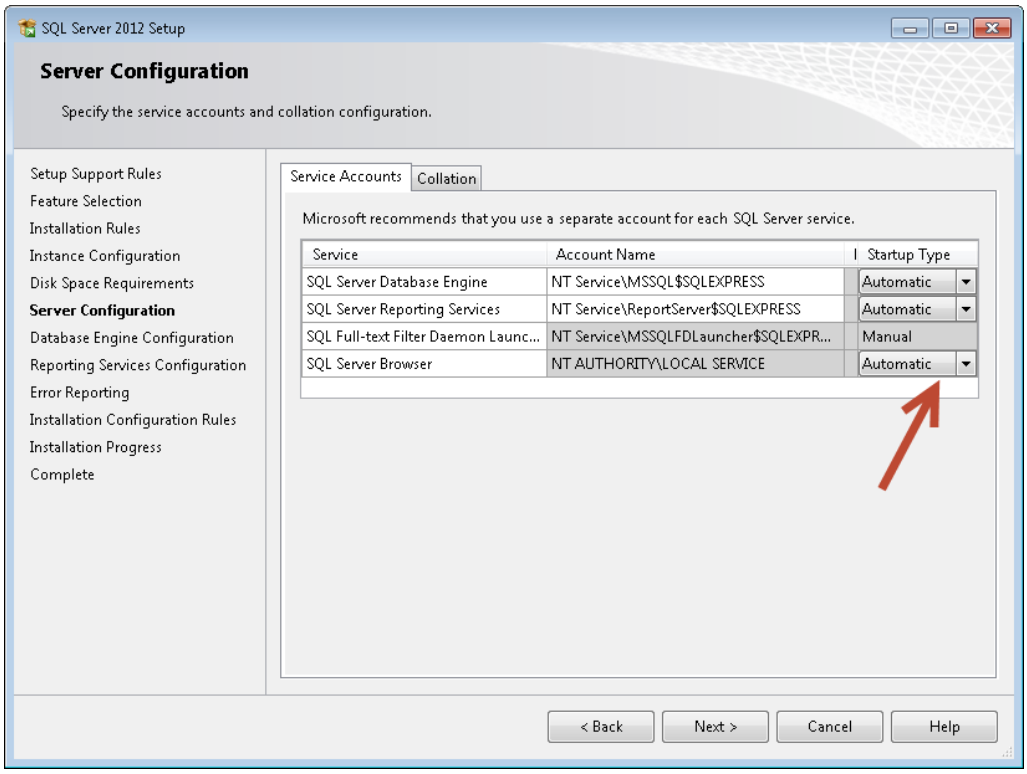
3. Click on new sql server stand-alone installation or add features to an existing installation. In this example, we will be using a fresh installation.
4. You can assign different locations for your shared feature directory, most of the time you'll take the defaults and click next. If you don't want reporting services, uncheck the 'Reporting Services –Native' checkbox. If you don't know and may in the future, you can continue with it checked.



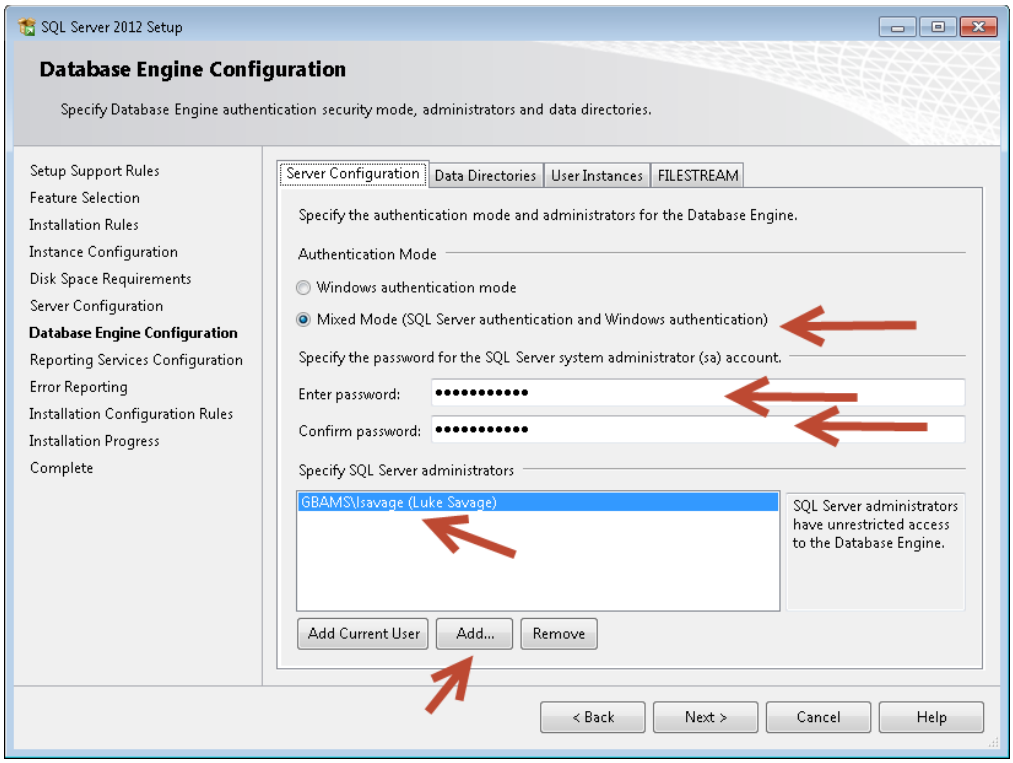
5. You can assign different instance names, install as a default instance, and create reporting services directory but in this particular example, we will use the defaults.



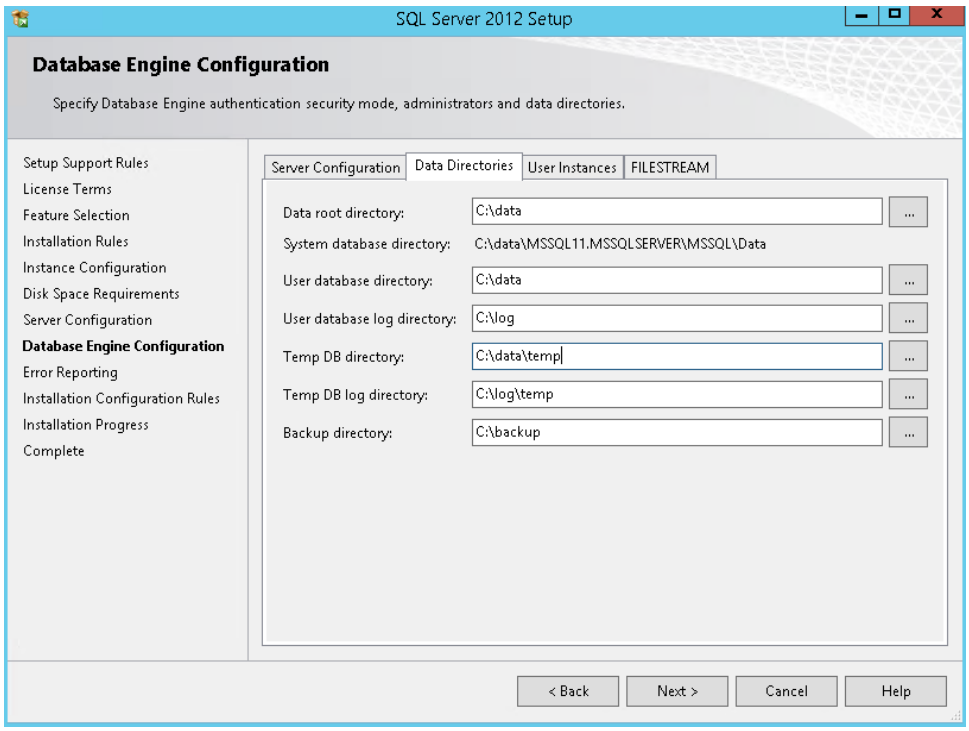
6. In this next dialog, turn on the sql browser to automatic startup



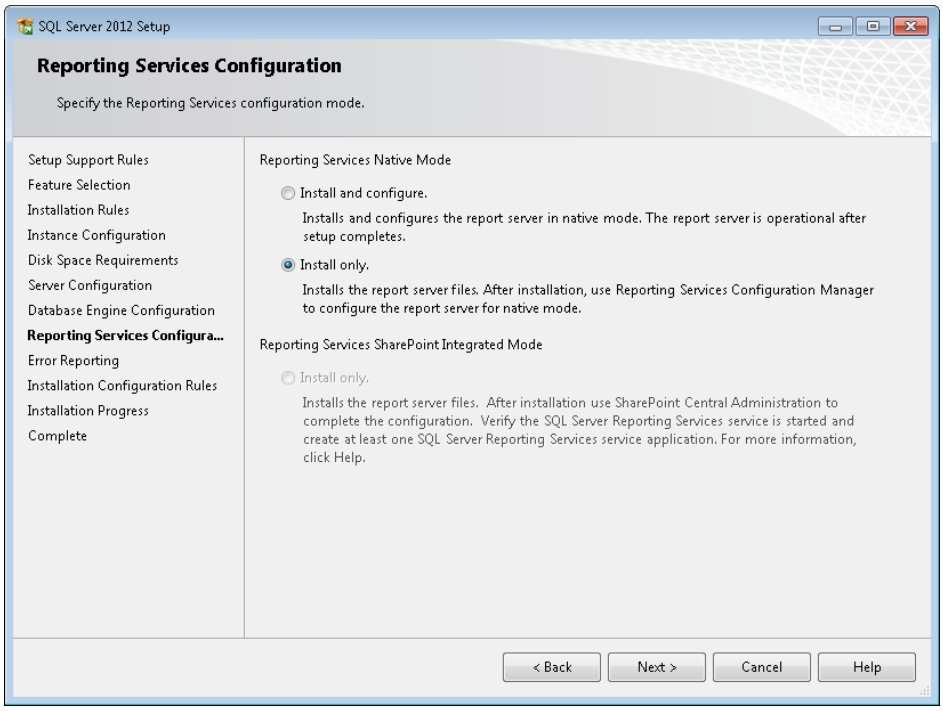
7. For Server Configuration, it is good to enabled mixed mode. This is the case where you have an administrator and you would like to have SA as an admin user that is constant. Windows authentication only is bad if the person that administrates ever leaves and you disable their active directory account by accident. It's not the end of the world, but this is an IT assurance issue. For me, it's better to be safe than sorry. Store your SA password in a safe location that can be accessed in case of administrative role changes. Again, vulnerability and stability assurance measures are the key to a healthy working server environment. Reduce the number of server admins so you have a single point of entry into the database as an administrator. For those using AD domain or LDAP, please change the account name to include a domain user so you can browse the local server when added in a domain. SQL Server Browser, SQL Server Agent and the database engine is necessary to be network aware if using backup maintenance plans (database maintenance plans are enabled for SQL Server Standard, Developer or Enterprise only).


SQL Server 2012 Setup
Database Engine Configuration
Specify Database Engine authentication security mode, administrators and data directories.
Setup Support Rules
Feature Selection
Installation Rules
Instance Configuration
Disk Space Requirements
Server Configuration
Database Engine Configuration
Reporting Services Configuration
Error Reporting
Installation Configuration Rules
Installation Progress
Complete
Server Configuration
Data Directories
User Instances
FILESTREAM
Specify the authentication mode and administrators for the Database Engine.
Authentication Mode
Windows authentication mode
Mixed Mode (SQL Server authentication and Windows authentication)
Specify the password for the SQL Server system administrator (sa) account.
Enter password:
Confirm password:
Specify SQL Server administrators
GBAMS\lsavage (Luke Savage)
SQL Server administrators have unrestricted access to the Database Engine.
Add Current User
Add...
Remove
< Back
Next >
Cancel
Help

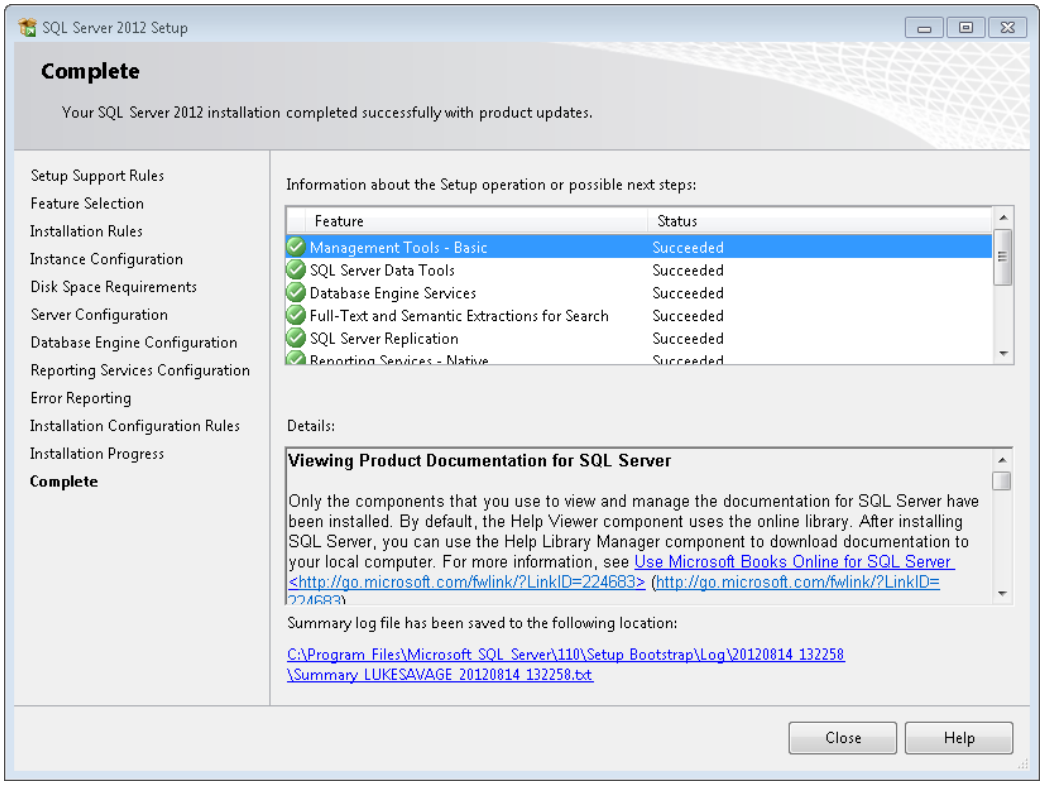
8. On the data directories tab, it is good to change the location for easy backup queries and administration. However, system tables will use the Microsoft default location within the root directory of the databases. I would not recommend enabling user instances on the user instance tab as well as filestreaming unless you plan on loading large documents outside of the Geodatabase as BLOBs. Click next when complete.



9. Optional: In the reporting services configuration, if you are using the reporting services, install and configure. If not, I would install and not configure. I chose to install but not configure right away. If you chose not to install at all during the setup process, you will not see this dialog. Click next.



10. Your choice of sending Microsoft the error reports and usage automatically. I generally do this for a development or test environment. For a production environment, leave unchecked. Click Next.

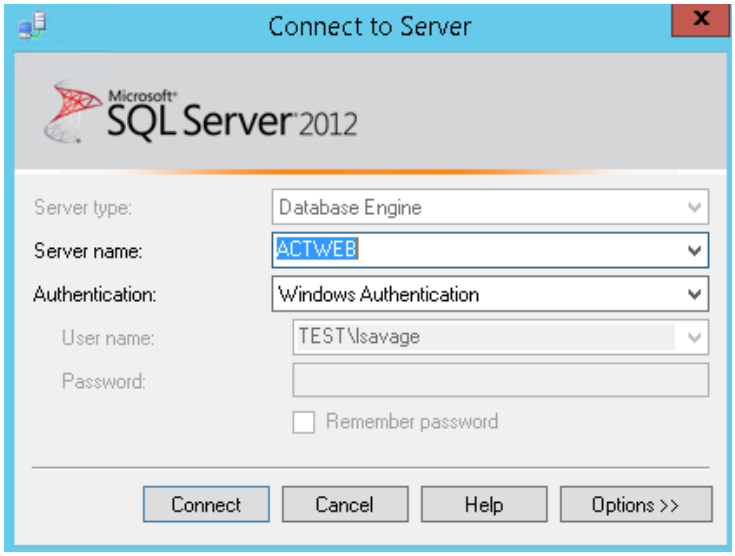


11. If complete, you have successfully created a sql instance. If not, go through the troubleshooting information listed in the error log. Highly recommend latest service packs.

12. Go to start/all programs/Microsoft sql server 2012/sql server management studio. If you had sql server 2008 before, you can import profile settings.

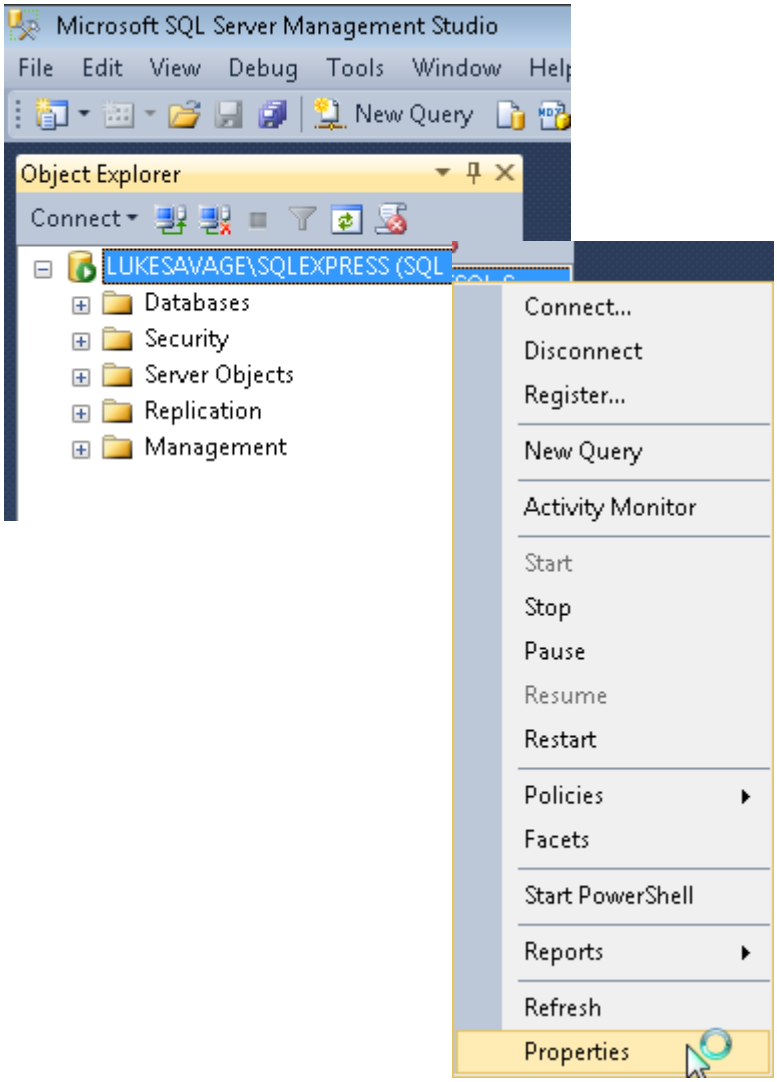
    a. If you don't have sql server management studio, you'll need to download and install from the Microsoft website. Below is the link.

    https://www.microsoft.com/en-us/download/details.aspx?id=29062

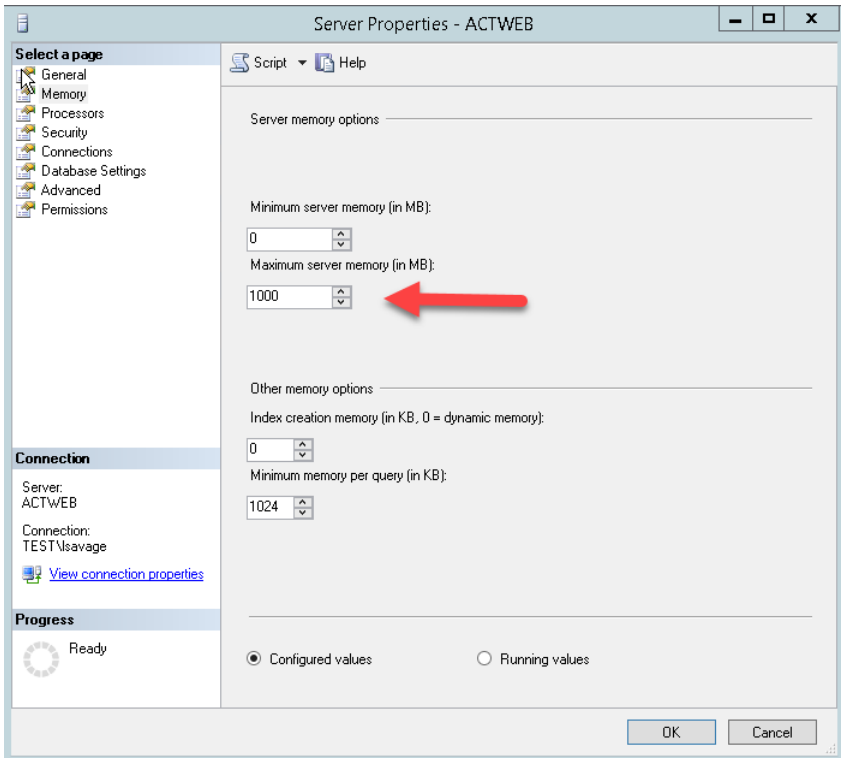


13. Click connect

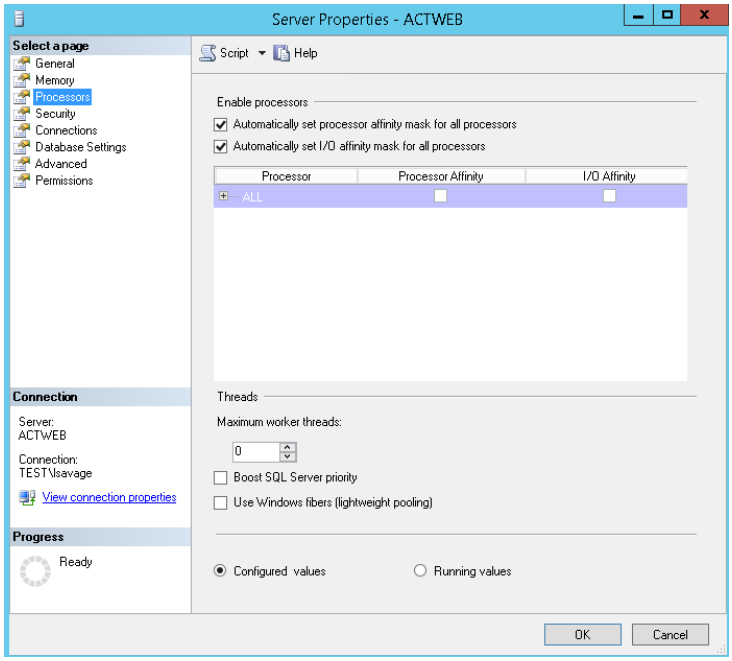
14. Right click the instance you connected to and choose properties



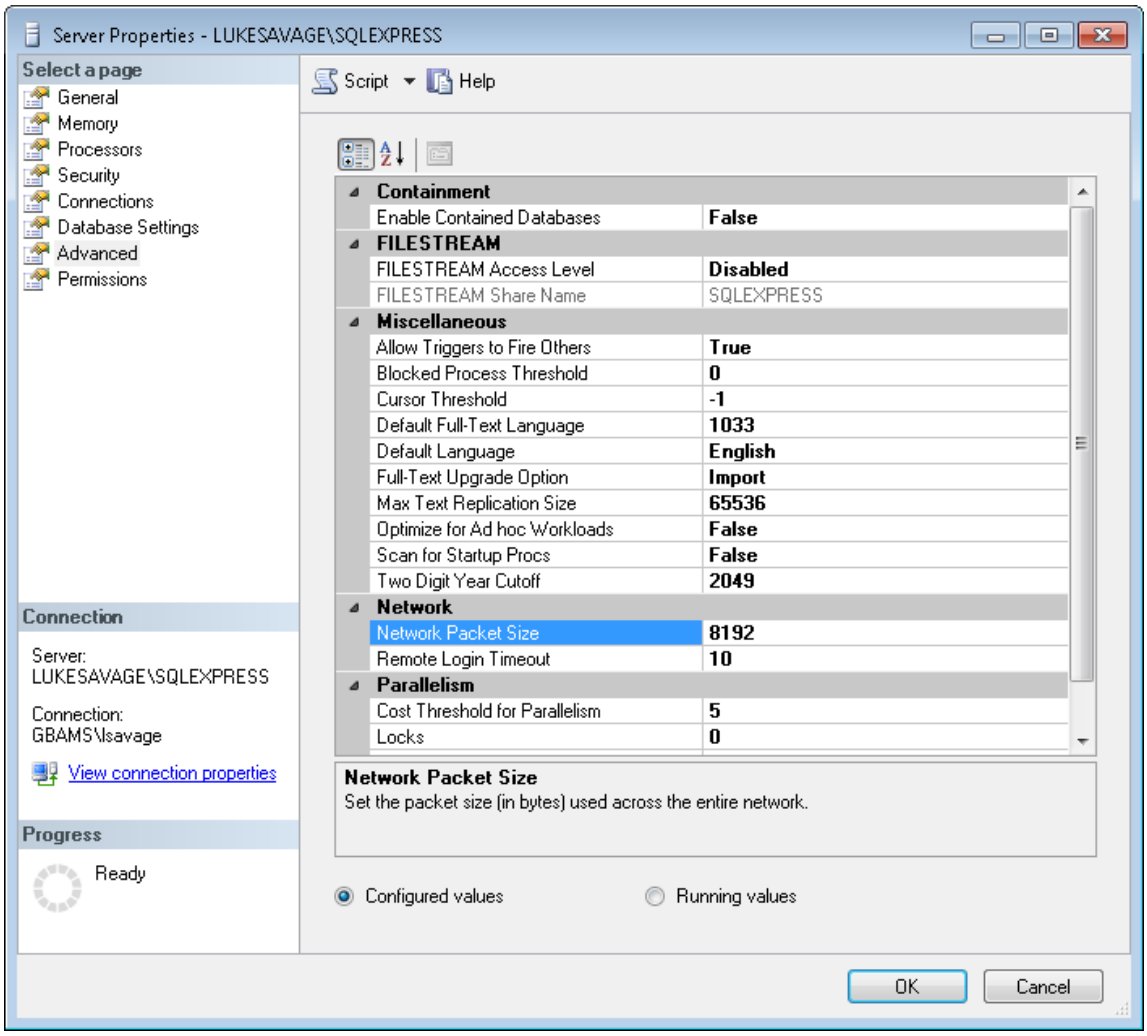
15. Go to the memory tab and click on maximum server memory. You will want this to be a realistic number as the default puts an ungodly amount of maximum ram that will far exceed your server limit. Because we are treating this as a production server, you will want to dedicate resources to SQL Server. For the operating system, at least give the operating system 512 GB of RAM and for SQL Server adjust appropriately. In this case, I'm giving SQL Server 1 GB of RAM but in can be more depending on your instance load and available memory. All other defaults are fine.



16. Tab down to Processors in the TOC, do not check Boost SQL Server Priority for a VM Host using VMWare or Hyper-V. **DO NOT ENABLE WINDOWS FIBERS (lightweight pooling)!** This is for older technologies and ArcSDE from v10 and higher uses XML calls to the SQL Server database so keep windows fibers disabled.



17. Double the network packet size for the Geodatabase connections in the advanced menu item (from 4096 to 8192). For network traffic and performance, the Geodatabase network packets need the additional size increase.



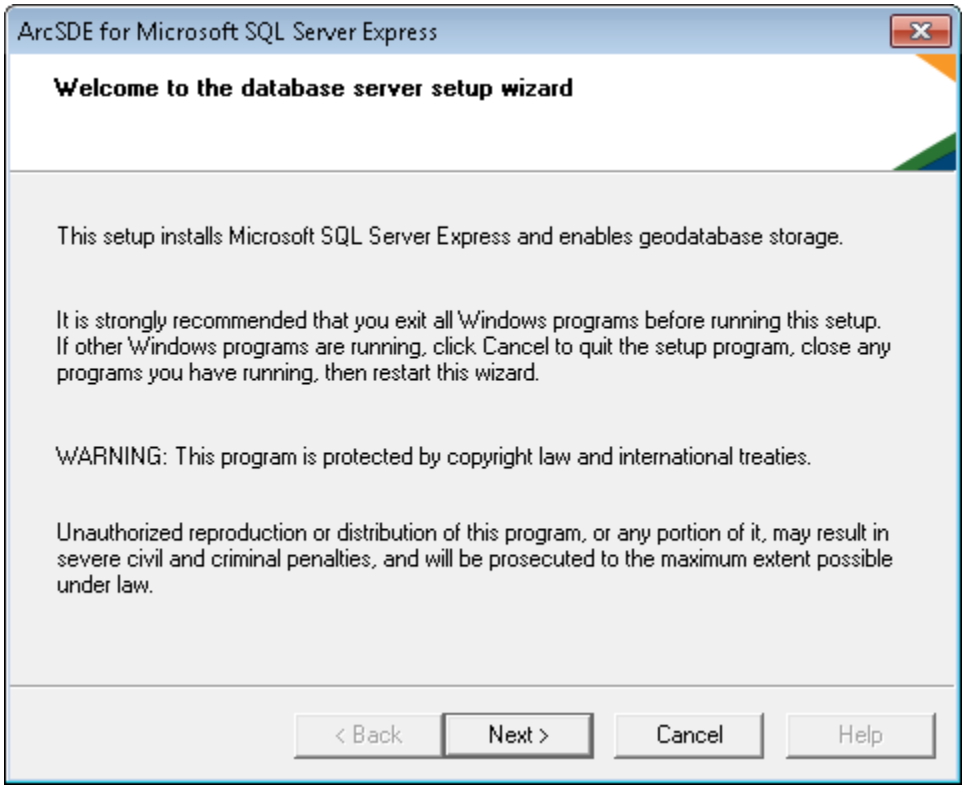
SQL Server Enterprise Setup

Very similar to the workgroup setup above only that I recommend using default instance and locating all databases for Lucity and ArcGIS in one instance for ease of administration and resource dedication.

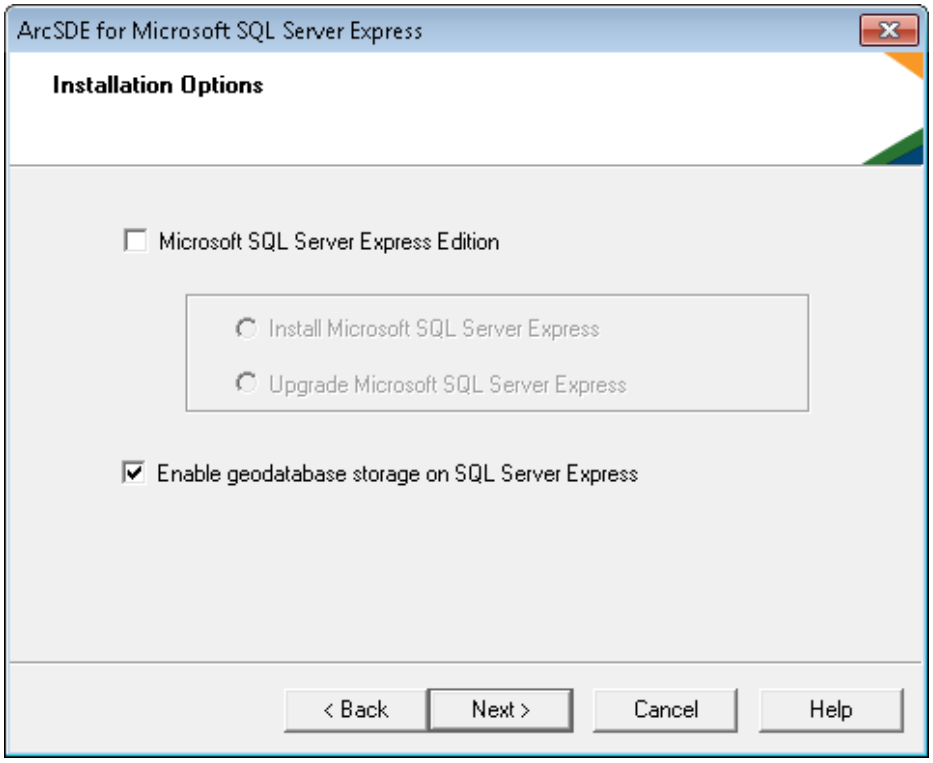
2. Download Database Server and install.

Files	Guides	File Size	Select
ArcGIS for Server	Install guide	1.62 GB	Download
Portal for ArcGIS	Install guide	981.93 MB	Download
ArcGIS Web Adaptor (IIS)	Install guide	22.58 MB	Download
ArcGIS Web Adaptor (Java Platform)	Install guide	25.02 MB	Download
ArcGIS Data Store for Server	Install guide	211.66 MB	Download
Database Server (Workgroup)	Install guide	146.91 MB	Download
ArcGIS GeoEvent Extension for Server	Install guide	221.48 MB	Download
ArcGIS Data Interoperability for Server		658.35 MB	Download
ArcGIS Data Reviewer for Server	Install guide	53.01 MB	Download
ArcGIS Workflow Manager for Server	Install guide	12.69 MB	Download

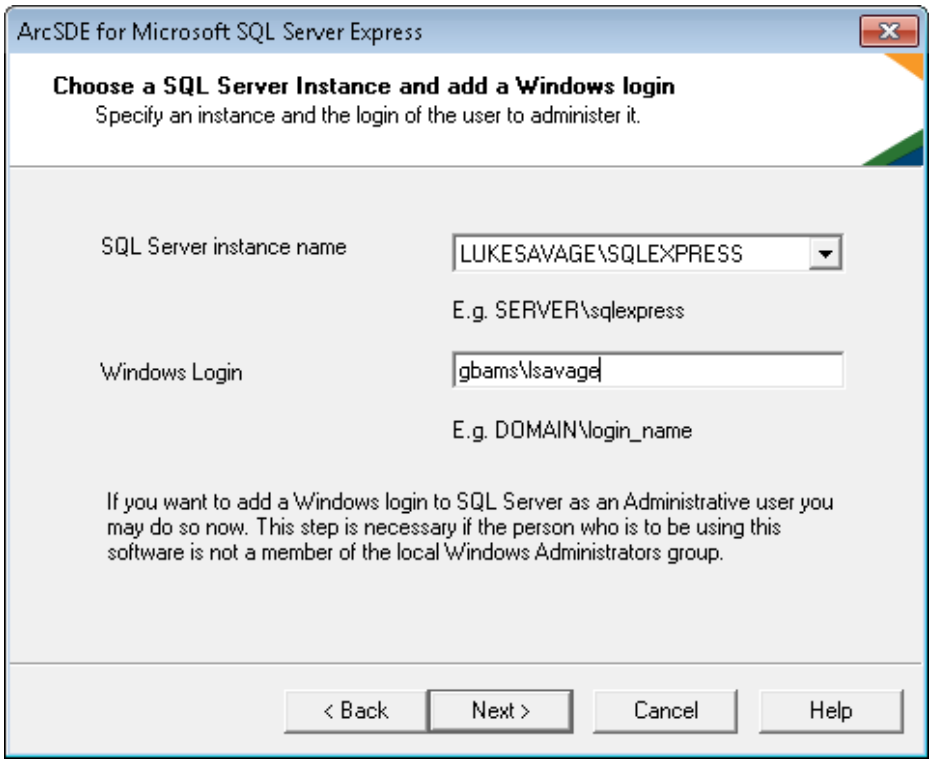
3. Click Next



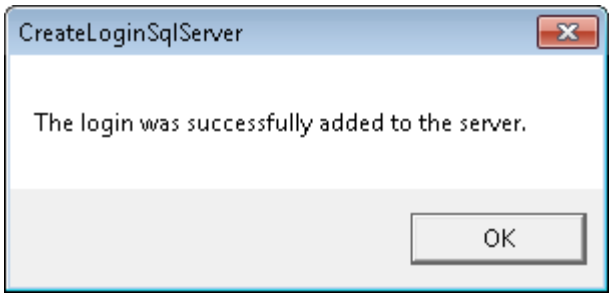
4. Uncheck the checkbox next to Microsoft SQL Server Express Edition



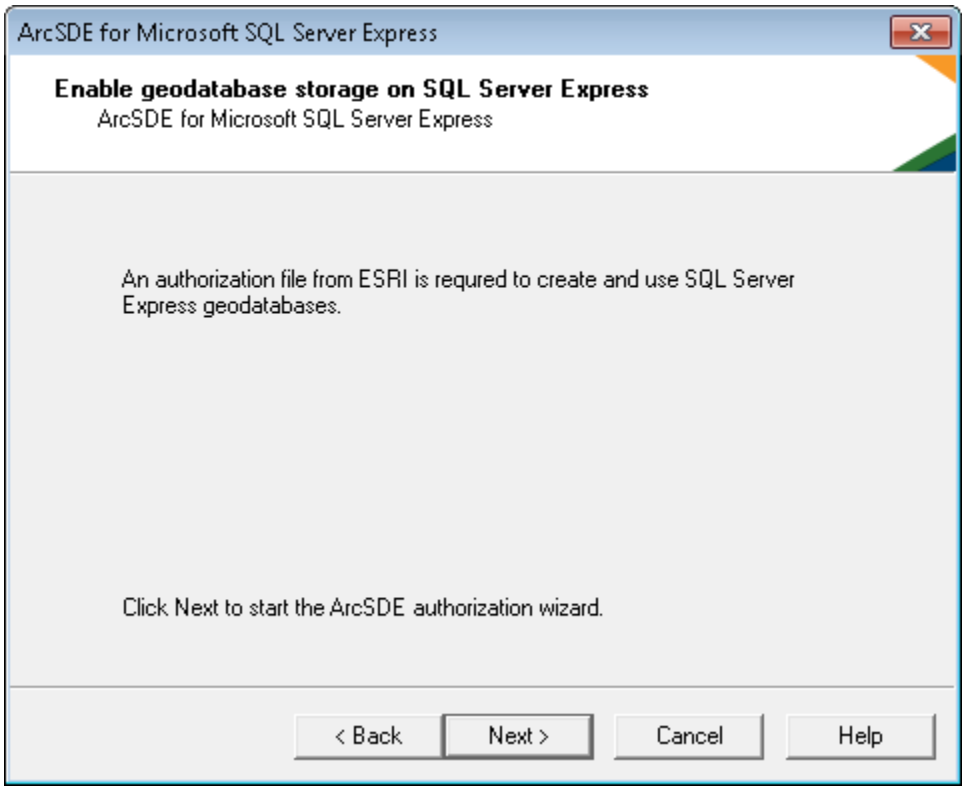
5. Click next
6. Supply your instance name and windows login



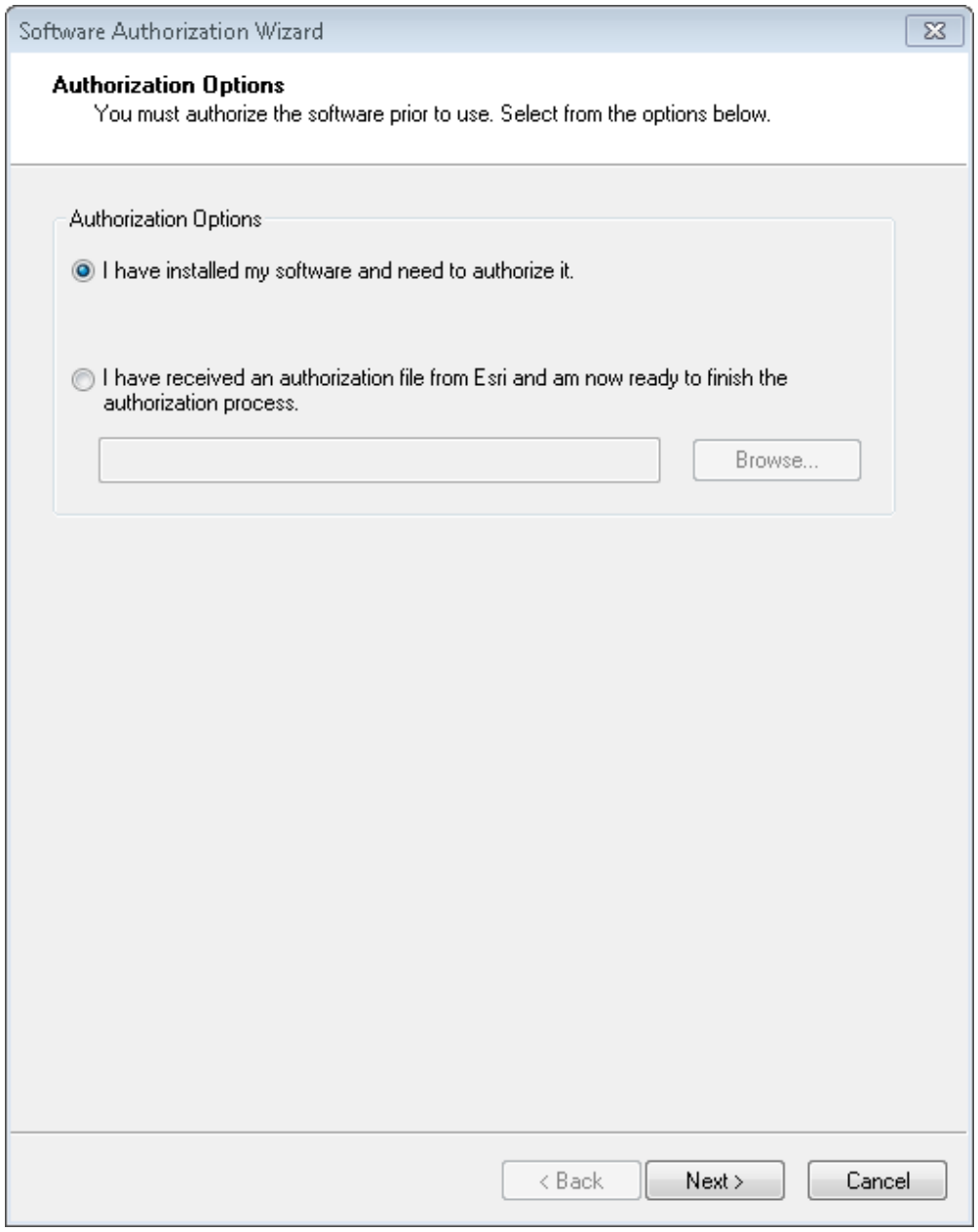
7. If successful, click ok and move to step 24. If not, fix the connection issues.



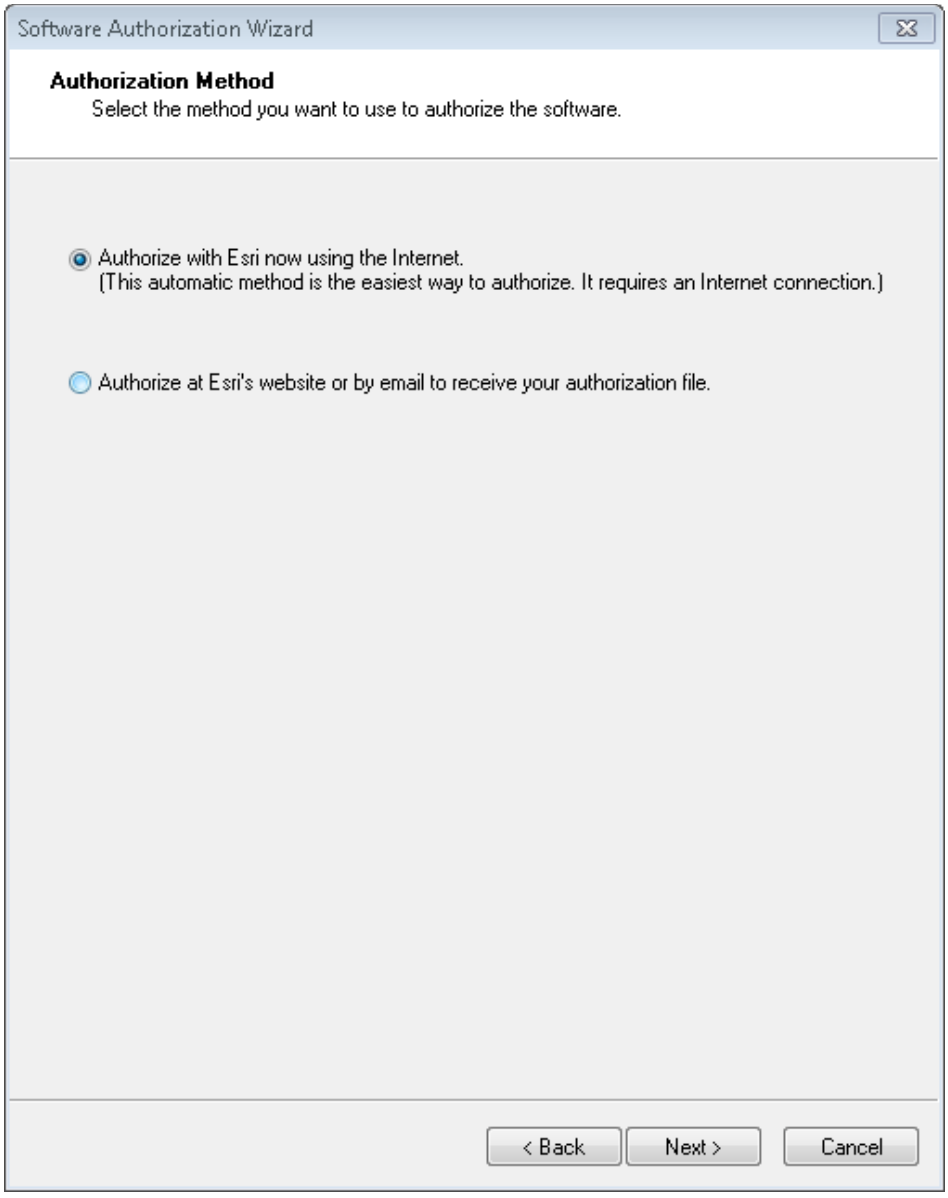
8. The next section will authorize the SQL Server Express instance. For SQL Server enterprise, this is different as the subsequent topics will show you how to authorize Enterprise Geodatabases for SQL Server. Click next



9. The authorize option allows you to point to an authorize file supplied from ESRI or to authorize the software installation. In this example, we will be choosing the later. Click next

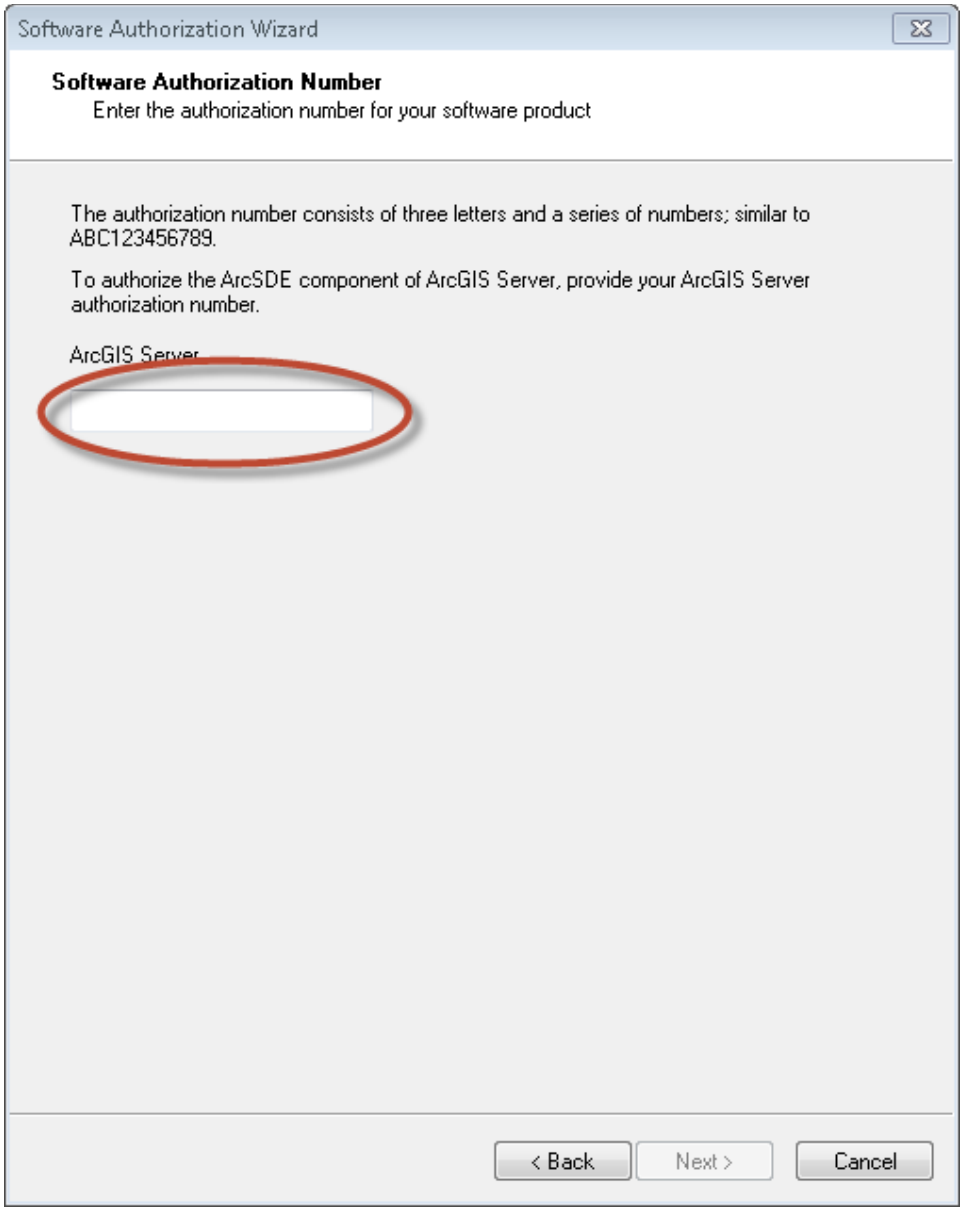


10. Again, you have the choice of email, website or through the internet. We will be performing the later. Click next.

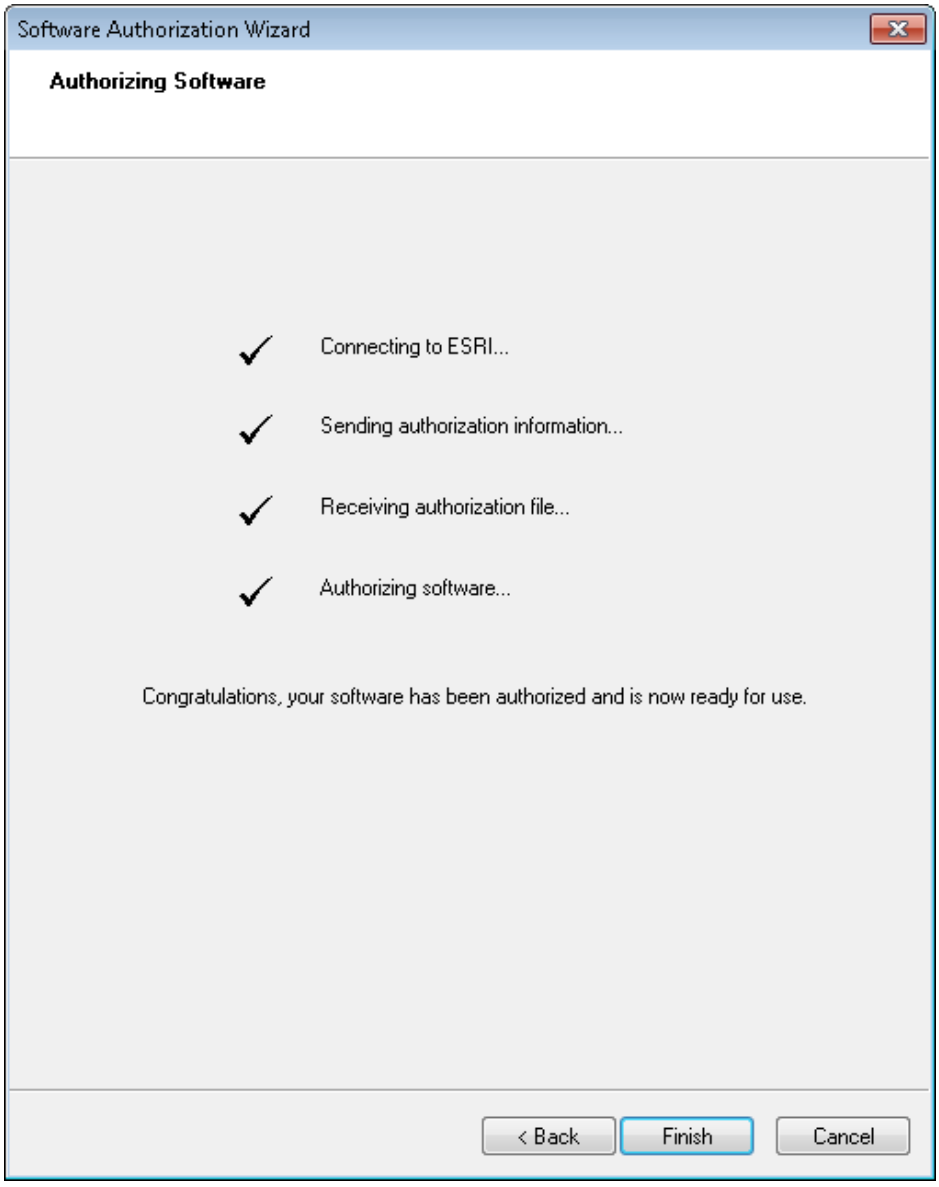


11. The authorization information will need filled out. Click next. Click next.

12. In software authorization number dialog, you will need to supply the authorization number that ESRI has supplied to you for ArcGIS for Server Workgroup. Click next.



13. If you do not receive a congratulations message as it may be an internet interruption. If you are not successful, contact your ESRI representative for an authorization file. Click Finish.

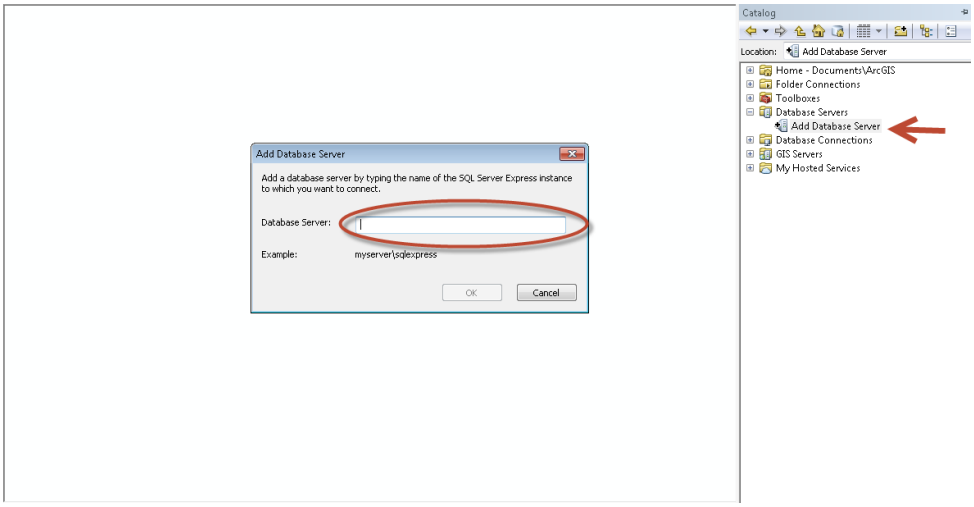


Install SQL Server Native Client

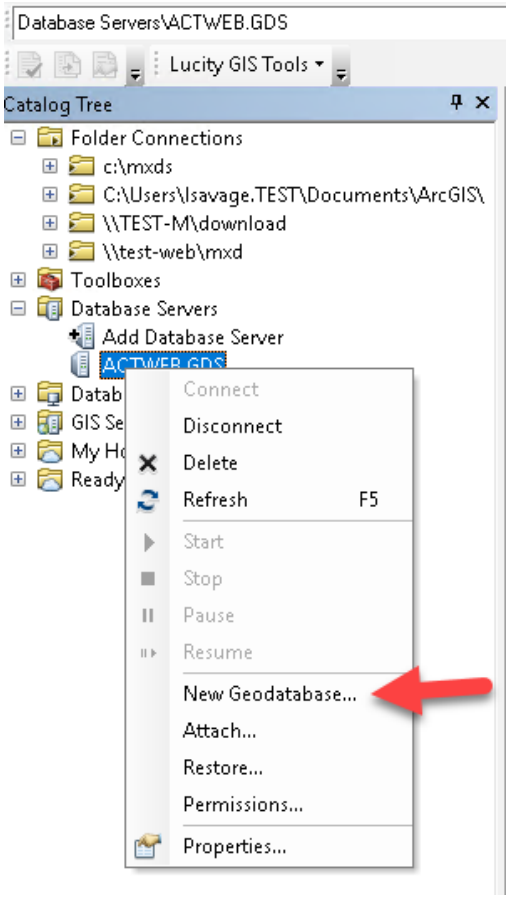
You will need to install the SQL Server Native Client or the ODBC drivers listed in the previous sections on each workstation that will connect using ArcMap or ArcCatalog for the Geodatabase.

Connect and Create Geodatabase in Workgroup

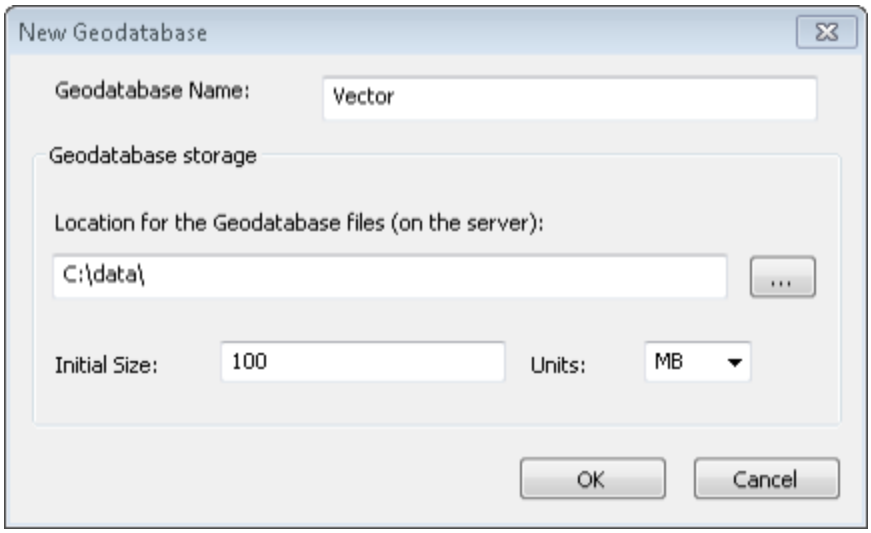
1. Open ArcCatalog or ArcMap -> Embedded ArcCatalog and expand the database server's item in the TOC. Click on Add Database Server.



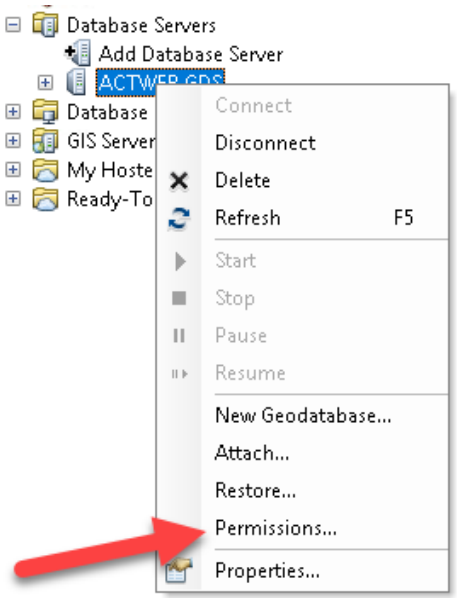
2. After the connection has been established, you have the choice of creating a Geodatabase by right clicking on the instance and choosing new Geodatabase.



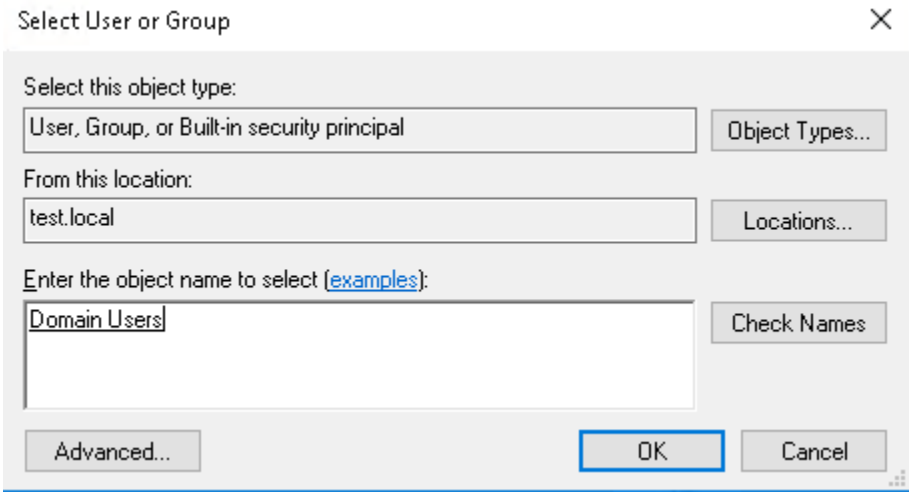
3. Create new Geodatabase and change the location if needed of the database file. Also, you have the option of changing the initial size but the autogrow method will be established. Click OK.



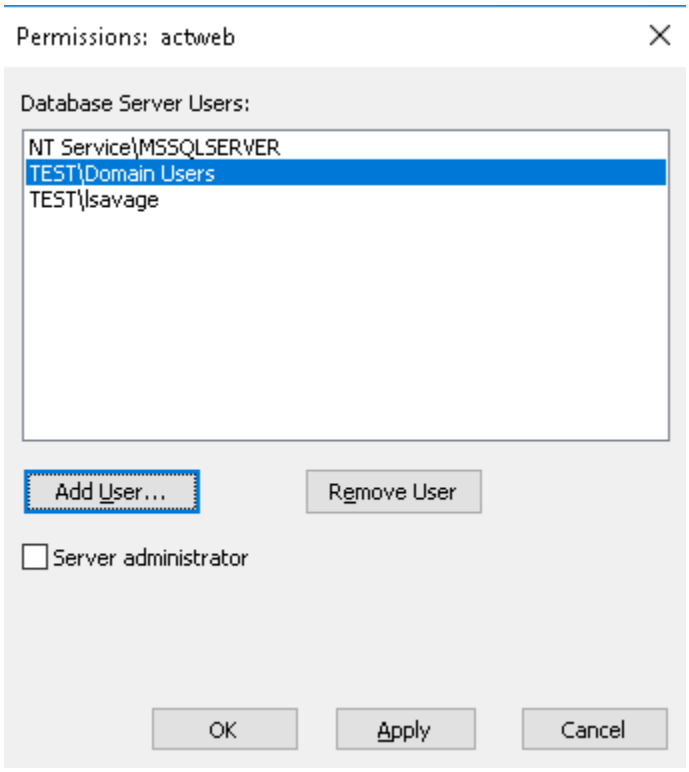
4. Once complete you will see a new database in your instance. Afterwards, you can add users to the instance by right clicking on the instance in the TOC and choosing permissions.



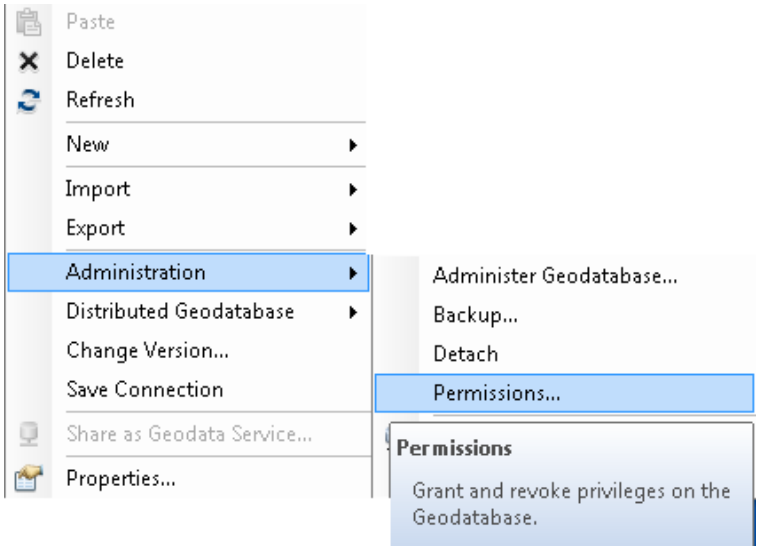
5. This is where you can add users and groups within your organization from Active Directory.



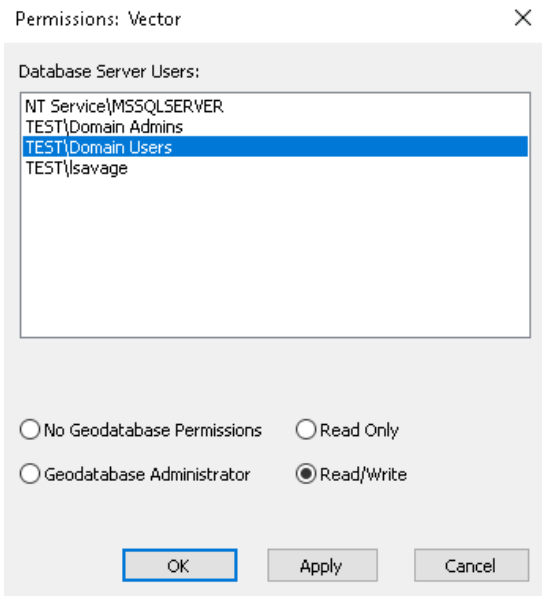
6. Once you click ok, you then need to make a decision if they are going to be server administrators or not. In this example, they are not server administrators. Click ok or apply.



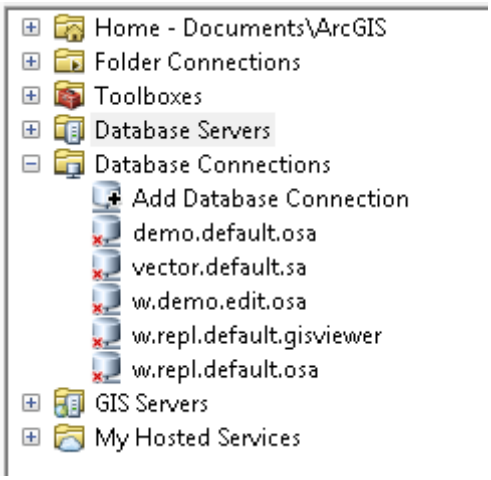
7. Next, you need to assign the group or user per Geodatabase if you have more than one. Because I separate Raster and Vector Geodatabases, the permissions change for users and groups depending on the intent for use. Right click on the new Geodatabase and select administration permissions in the drop down menu.



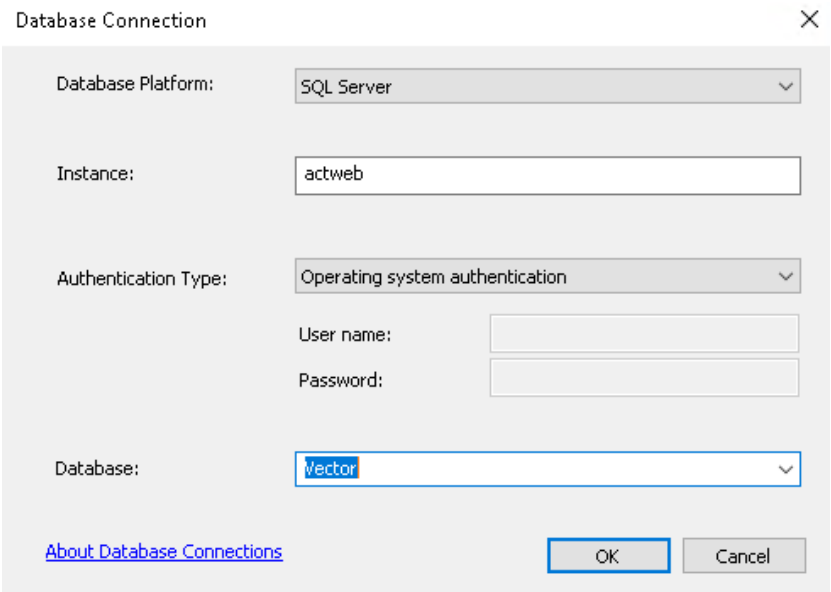
8. In the permissions: <database> dialog, select the group or user you would like to add permissions to and select the appropriate permission. In this example, I will be giving the Domain users group read/write permissions. Click ok or apply. Notice the other options available for Workgroup for example, backup, Administer Geodatabase, detach, save connection, compress, Geodatabase maintenance, and change versions. We will explore these tasks in subsequent sections.



9. For your users who edit and publish maps, you will want them to create a connection to the database. You can add database connections using the database connection utility as well. This is a primary connection for anyone running full versions of SQL Server. Go to the TOC of ArcCatalog again and expand Database Connections.

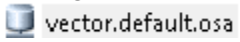


10. Click on 'Add Database Connection'. Add instance and the database to the connection strings. You have the choice of authenticating using the operating system or SQL Server user accounts. In this example, we are going to use the OSA method. Click ok.



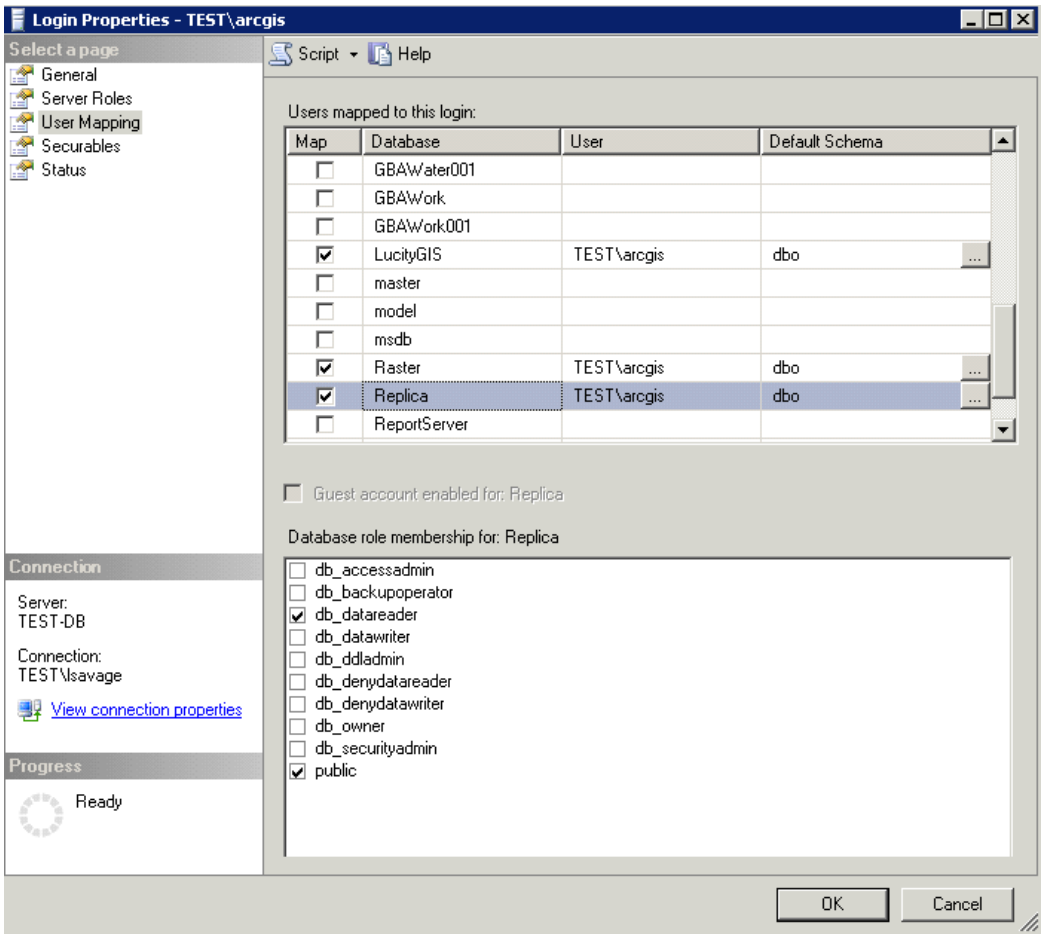
11. The connection string for the name of the connection is always arbitrary. Recommend using the following naming convention.

- **<instance if more than one instance; if not skip>.<database>.<version>.<OSA or SQL user>**
- For this example, we will be renaming the connection to vector.default.osa.
- Right click on the new connection and select rename. Type in the new name.

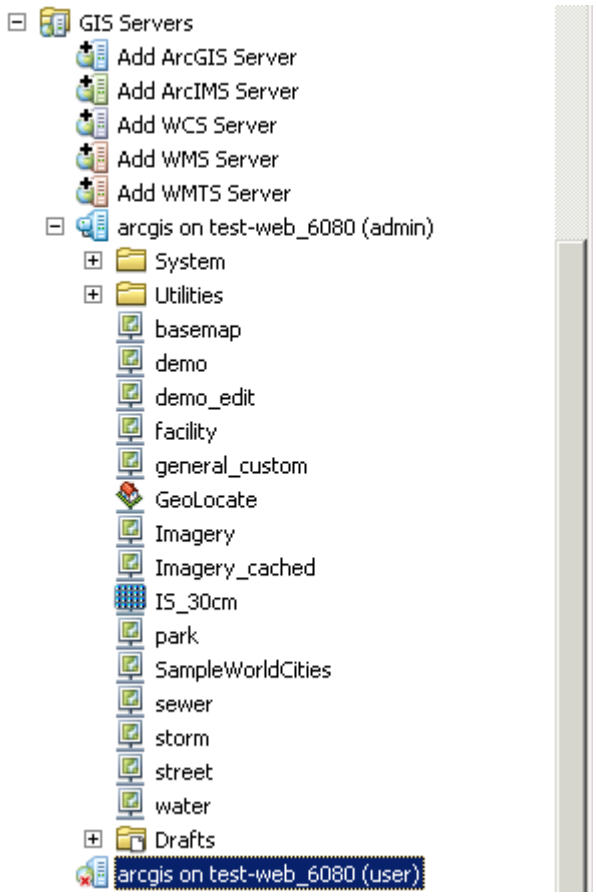


Registering the Geodatabase in ArcGIS for Server

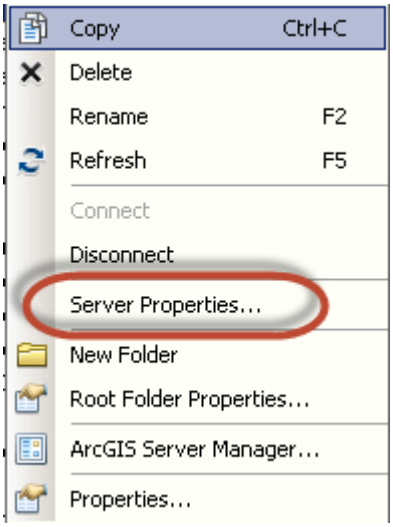
1. If you are using Operating System Authentication to publish map services and in order for ArcGIS for Server to connect to your database, you need to add ArcGIS for Server service user as read or read/write depending on your uses. Otherwise, use a SQL Server user so you don't need to add ArcGIS for Server service user in the database.
2. You can either grant permissions to ArcGIS for Server service user through the Geodatabase Administration toolset in ArcCatalog or you can add the user in SQL Server and then grant permissions of the data to the user. In this exercise, we'll go through and add ArcGIS for Server user to SQL Server. This exercise is beneficial for GIS workflow scenarios. We will be assigning ArcGIS for Server service user that has read/write access to the database with no DBO or other special privileges.
3. Go to SQL Server Management Studio and add the new user to your Geodatabase or Geodatabases. Open Security within the SSMS TOC and right click on logins. Select new login. Add ArcGIS for Server Service user to the Geodatabase. Recommend assign a default database to general groups or users other than master.
4. Go to User Mapping and select on the appropriate databases you want ArcGIS for Server service user to connect to. Make sure it has db_datareader or db_datawriter enabled depending on the functionality you want. You may still need to assign privileges within ArcCatalog in an enterprise setup.



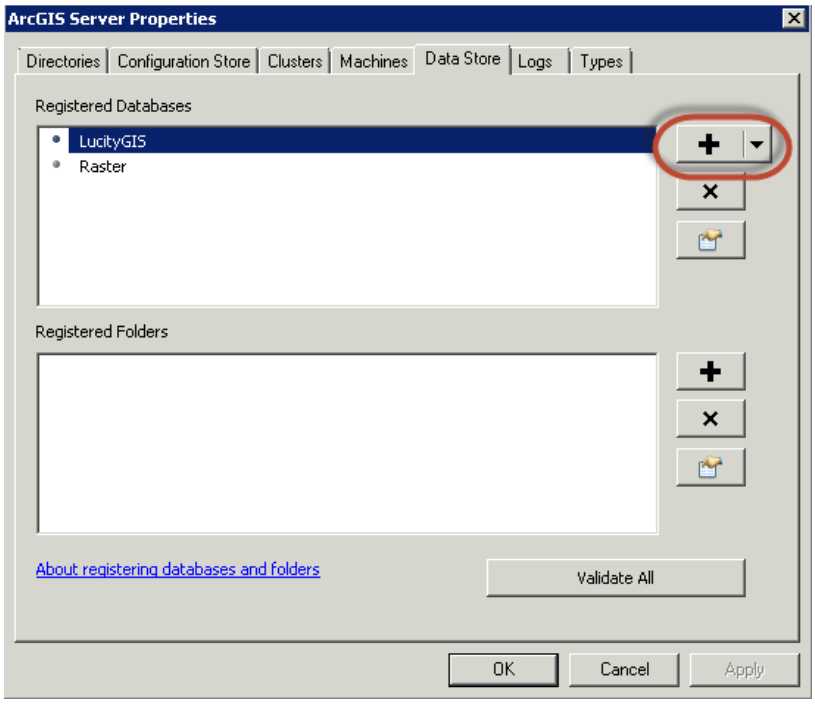
Click ok and go to your workstation and open ArcCatalog. Go to the GIS Servers section within the TOC of ArcCatalog. Connect to the administration connection by double clicking the connection or right click and choose connect.



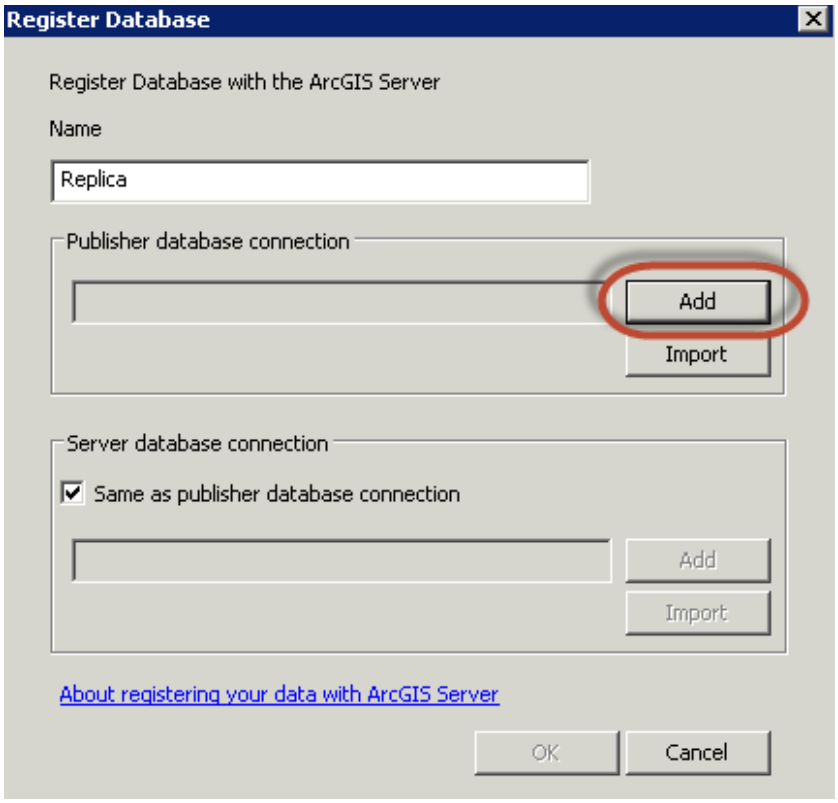
5. Once connected, right click on the connection and choose server properties.



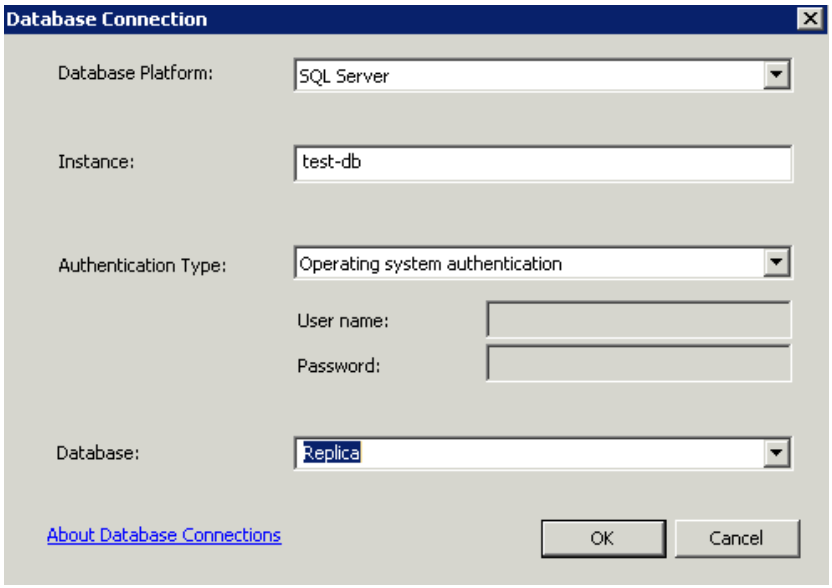
6. Go to the data store tab and click the plus button.



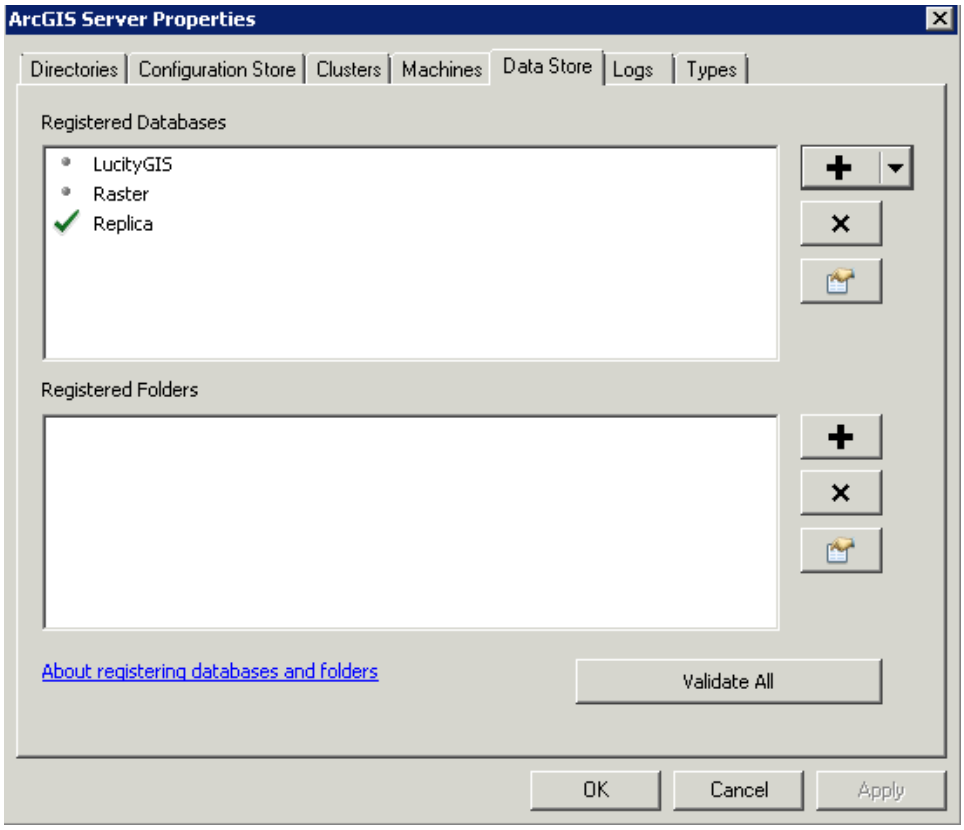
7. Notice I already have LucityGIS and Raster inside of my data store and now I want to connect to the Replica. Add the replica name and click add for publisher database connection.



8. Add the appropriate information in instance and database. Click ok and ok.



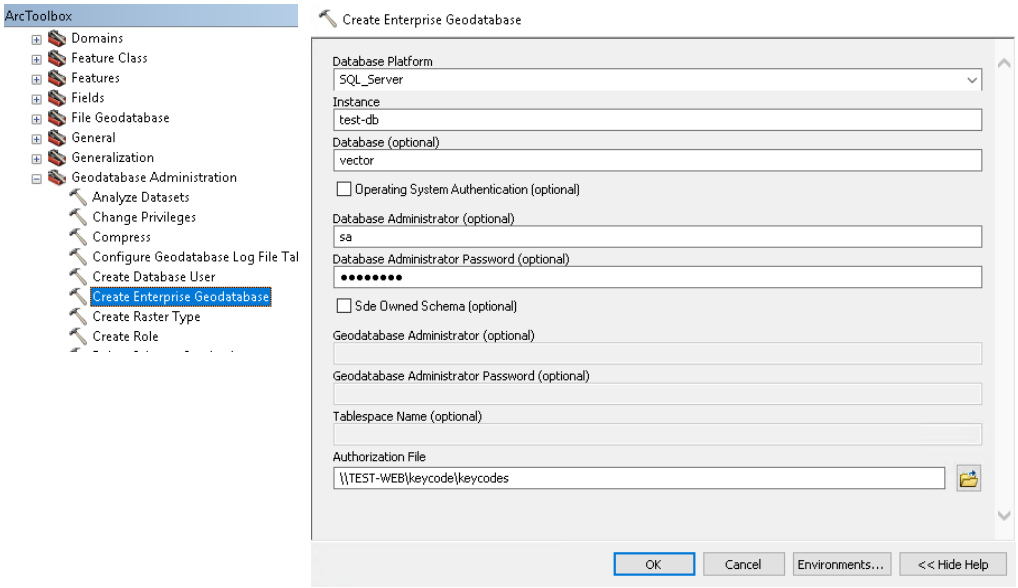
9. Your database should have a green check next to it to signify completed successfully.



10. Now you are ready to publish map services from connections to the SQL Server Enterprise Geodatabase.

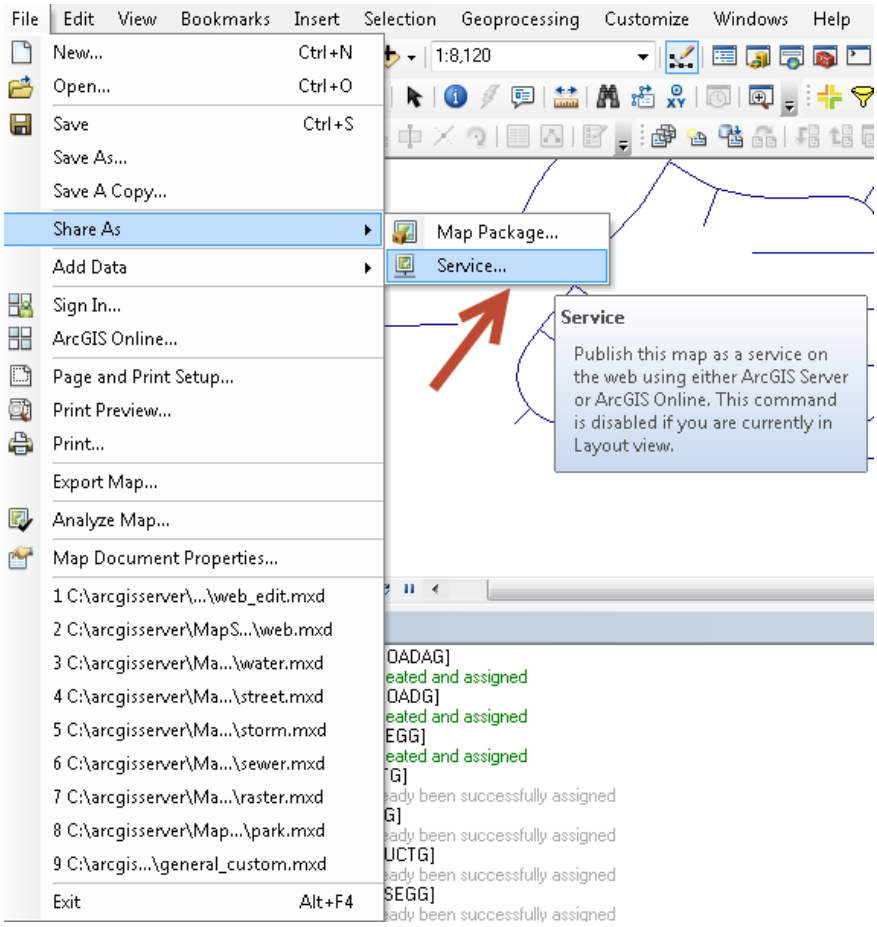
Create Enterprise Geodatabase (formerly ArcSDE)

1. Choose the database platform you will be connecting to. Since Lucity is SQL Server friendly, this will demonstrate the sql server platform type.
2. Within SQL Server, an instance is the container or the repository of the databases.
3. Database would be a name given to the database. In SQL Server's case, you will be specifying a name of the database. In this example, we will be creating a database called "vector".
4. Since I have mixed mode turned on for sql authentication, I chose to use the sa account. As the sysadmin, I could have created a database using my OSA account; however, for organizations that have changes, I would recommend creating the database using the SA as this will tag the database to be owned by sa. For most cases, a mixed mode sql instance is the best practice. This gives your organization the flexibility of using both the sa account and OSA when managing databases. **If a DBA is let go and they have created databases using their credentials and the SQL Server instance is set to only use OSA credentials, you will not like the outcome.**
5. Uncheck sde owned schema as this was the old way ESRI used for the ArcSDE setup and configuration. DBO schemas are much preferred as they have the most flexibility within a windows environment.
6. Authorization file is the file created after authenticating ArcGIS for Server (i.e. c:\program files\ESRI\ License10.4\sysgen\keycodes)

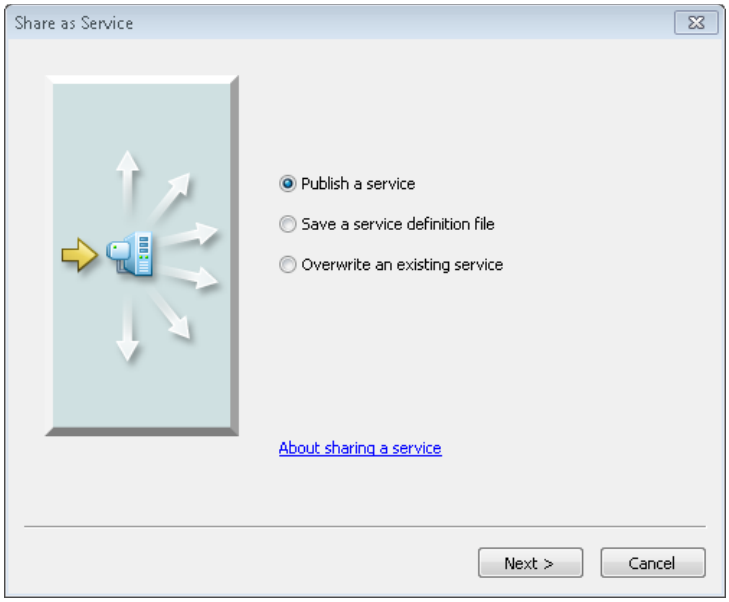


Publishing and Configuring Map Services

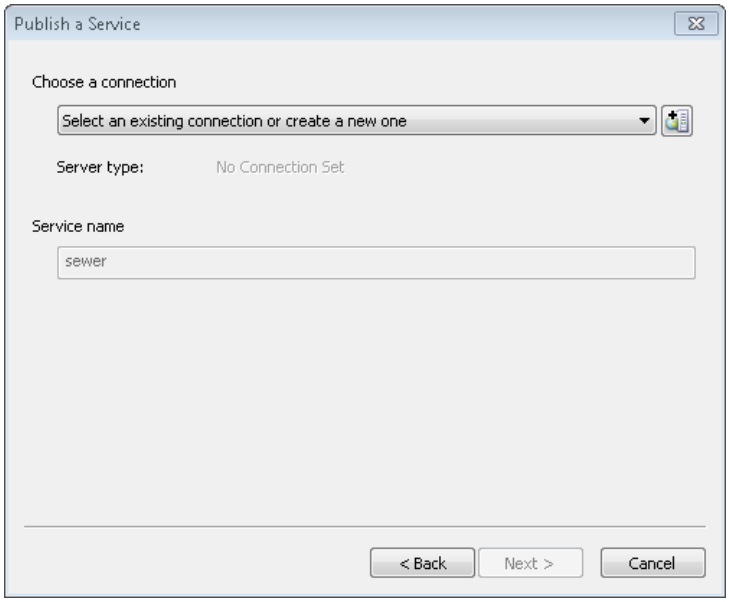
1. Open ArcMap and locate your .mxd to publish to ArcGIS Server
    - Recommend: If you have an image, recommend separating the image from the vector map services for performance reasons.
    - Recommend: Cached Image Service
    - Recommend: Converting dynamic labels to Annotation and scale.
    - Recommend: Make your map services scale dependent so not everything shows up in a small scale extent.
    - Recommend: Use ArcGIS Server Web Adaptor if using a DMZ. Please consult your IT Administrator for setting up a DMZ.
    - Recommend: Make sure your Symbols are bigger if using map services for Mobile tablet applications.
2. When cartographic and scaling operations are complete, go to the file menu and click on 'Share As/Service'.



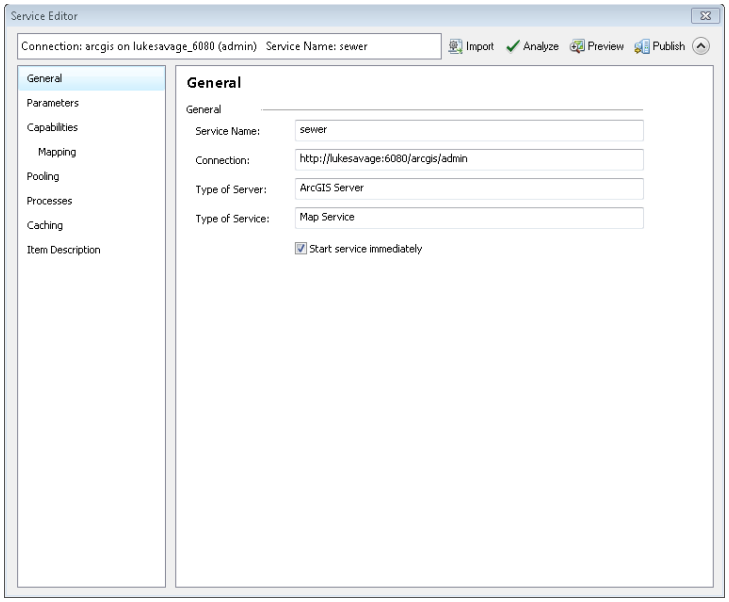
3. Share as Service dialog prompts. There are three choices. Choose Publish a service and click next.



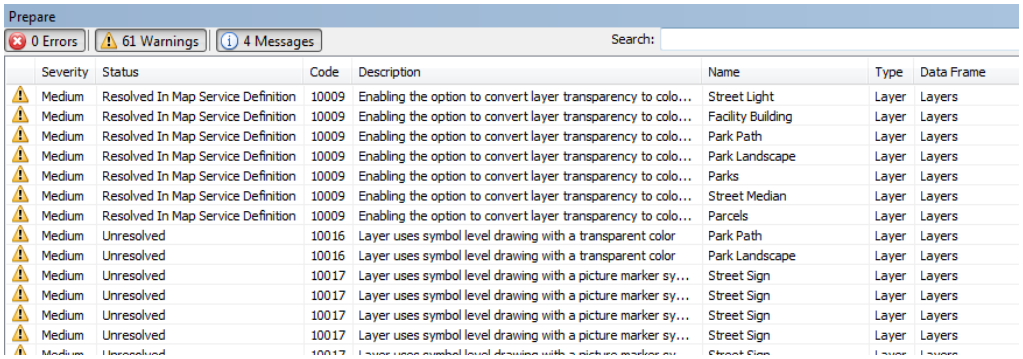
4. Publish a Service dialog appears and give it a name. Click Next.



5. Service Editor dialog will appear and this is where you add your settings for your map service.



6. Click on Analyze at the top of the dialog. After the analyze tool has completed, it will list errors, warnings and messages letting you know if there are any issues with the performance of the data being rendered to ArcGIS Server.



	Severity	Status	Code	Description	Name	Type	Data Frame
⚠	Medium	Resolved In Map Service Definition	10009	Enabling the option to convert layer transparency to colo...	Street Light	Layer	Layers
⚠	Medium	Resolved In Map Service Definition	10009	Enabling the option to convert layer transparency to colo...	Facility Building	Layer	Layers
⚠	Medium	Resolved In Map Service Definition	10009	Enabling the option to convert layer transparency to colo...	Park Path	Layer	Layers
⚠	Medium	Resolved In Map Service Definition	10009	Enabling the option to convert layer transparency to colo...	Park Landscape	Layer	Layers
⚠	Medium	Resolved In Map Service Definition	10009	Enabling the option to convert layer transparency to colo...	Parks	Layer	Layers
⚠	Medium	Resolved In Map Service Definition	10009	Enabling the option to convert layer transparency to colo...	Street Median	Layer	Layers
⚠	Medium	Resolved In Map Service Definition	10009	Enabling the option to convert layer transparency to colo...	Parcels	Layer	Layers
⚠	Medium	Unresolved	10016	Layer uses symbol level drawing with a transparent color	Park Path	Layer	Layers
⚠	Medium	Unresolved	10016	Layer uses symbol level drawing with a transparent color	Park Landscape	Layer	Layers
⚠	Medium	Unresolved	10017	Layer uses symbol level drawing with a picture marker sy...	Street Sign	Layer	Layers
⚠	Medium	Unresolved	10017	Layer uses symbol level drawing with a picture marker sy...	Street Sign	Layer	Layers
⚠	Medium	Unresolved	10017	Layer uses symbol level drawing with a picture marker sy...	Street Sign	Layer	Layers
⚠	Medium	Unresolved	10017	Layer uses symbol level drawing with a picture marker sy...	Street Sign	Layer	Layers

- If errors, you need to resolve before proceeding.
- If warnings, you may or may not address these issues but ESRI highly recommends fixing these issues.
- Messages are helpful hints on low priority performance issues. Most of the time, these do not need to be addressed as issues as they are intended.

7. Go to parameters in the TOC for the Service Editor dialog and change the anti-aliasing to Normal. Not all map services will show artifacts but if so normal is a good place to start.

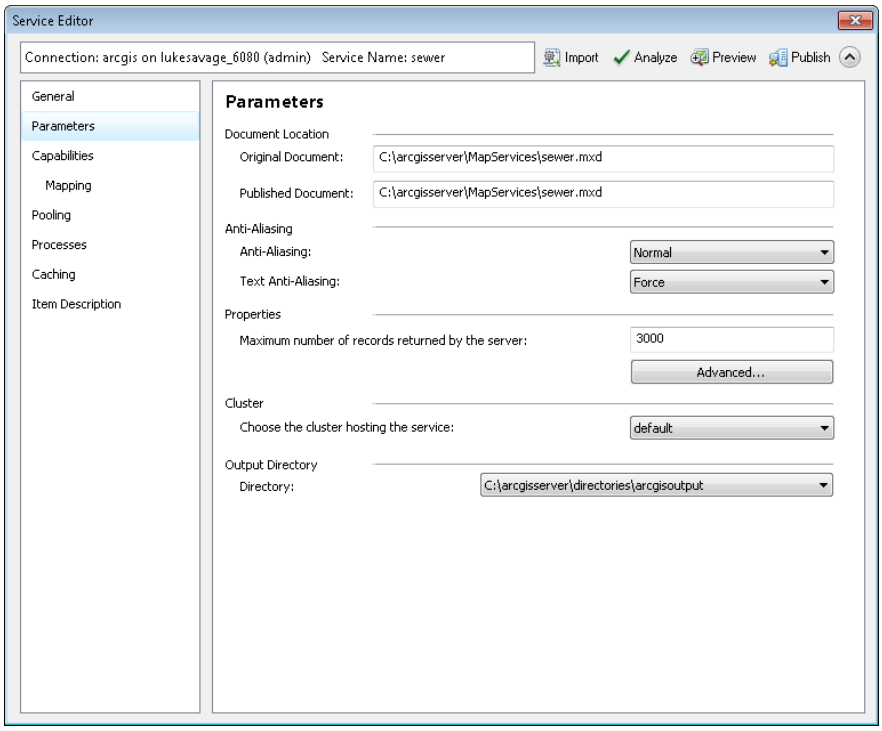
   Note: Anti-Aliasing: A graphics technique that blends foreground and background pixels near edges of objects to trick your eye into seeing smoother borders. You can use this option if unwanted artifacts appear in your map displays, for example, jagged lines, wavy lines or bands, and moiré patterns.

Use the following options to get the graphics effect and performance that will meet your map service needs:

- *None: No antialiasing is performed.*
- *Fastest: Minimal antialiasing is performed, optimized for speed.*
- *Fast: Some antialiasing is performed, optimized for speed with better quality than can be achieved with Fastest.*
- *Normal: A good balance of speed and quality.*
- *Best: The best quality antialiasing. This option takes the longest to render.*

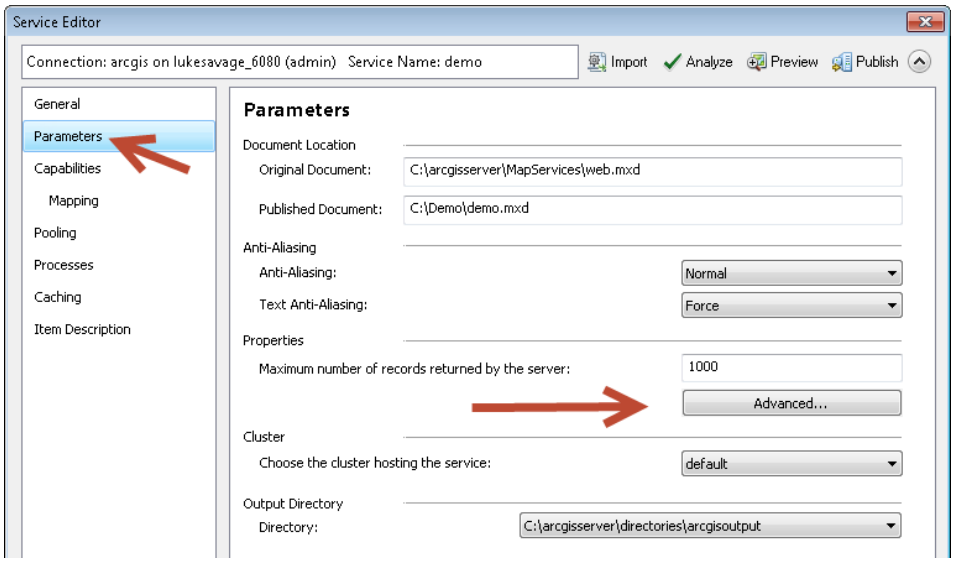
- Force text anti-aliasing should be enabled by default.

8. Change the maximum number of records returned by the server. This will increase the records returned by one query. 3000 is a good number to return unless your users need more.

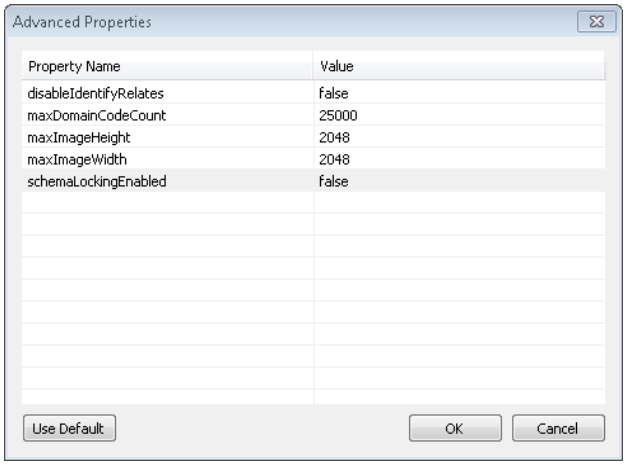


Unlock Schema

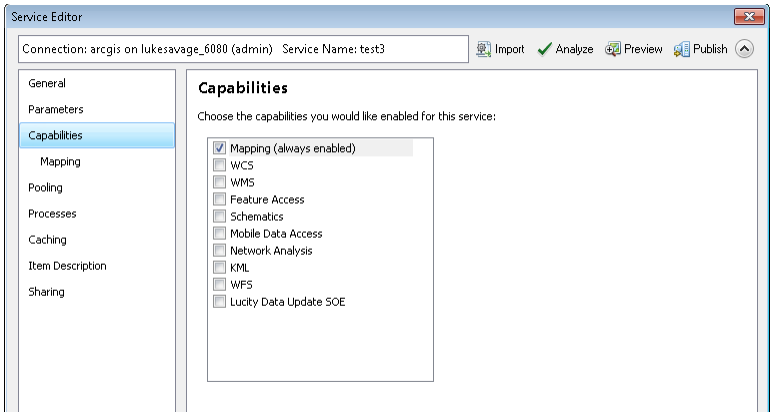
1. Set SchemaLockingEnabled to False in Service Properties of ArcGIS for Server disables schema locking. For those who wish to serve their production data as a map service, this is extremely helpful if you need to make any kind of schema changes in your database. However, **feature services will persist a schema lock** and override this setting.
2. Within the service editor dialog when publishing a map service, go to Parameters within the menu tabs on the left and click on advanced.



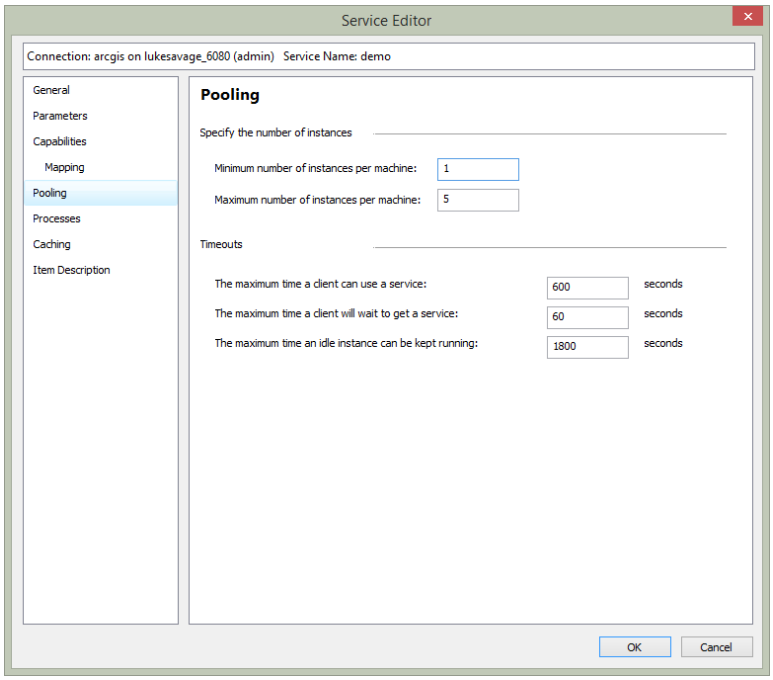
3. Click on the 'Advanced' button and change the values for schemaLockingEnabled to false if you don't want the map service to lock your database. Click ok when finished.



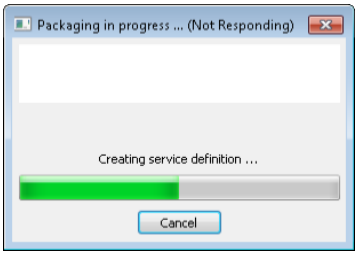
4. Go to the Capabilities tab and make sure the Mapping service is the only box checked.



5. In pooling, usually 1 minimum and 5 maximum will suffice for most organizations. For large organizations, increase based on user load.
6. In Processes, go to recycle this configuration every: <number> and change to a desirable value. Usually, 12 hours is a good recycled time frame.
7. Change the starting at value to 6:00 am or whenever you would like it to start



8. If you want to cache, click on caching and change the values to a suitable number. For basemaps and imagery, recommend caching. For interactive map services, leave caching turned off which is by default.
9. If you want to see the speed of your map service, click on the preview icon in the menu toolbar. Otherwise, click on publish.



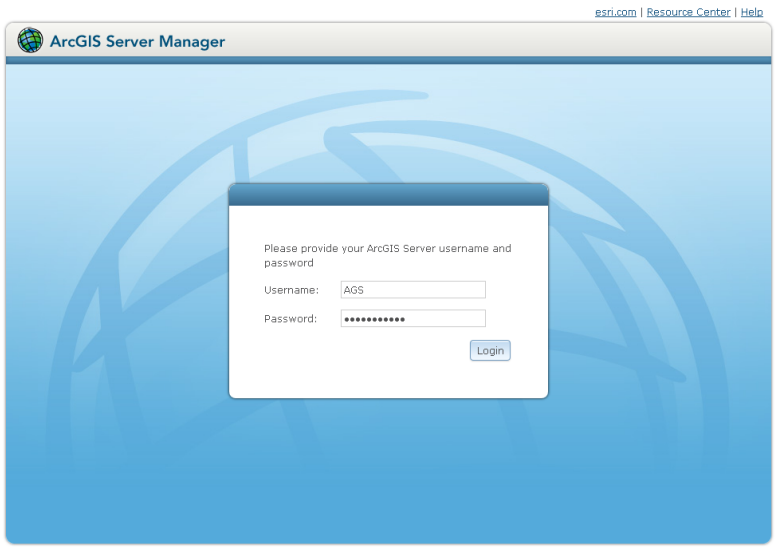
10. Below are Lucity map service deployment scenarios.

    - You may have multiple map services for each group if needed. It really depends on your setup with replication, versioning and how complex this may be. Each organization may be different on how they want to handle distributing maps to the users.
    - Create Basemaps and Imagery services (tiled) for distribution to your users. Consider your users and what content they would like to see in Basemaps.
    - Make sure your basemap services are using the same coordinate systems (prefer wkid) in the publishing map document.
    - Make sure operational layers are using wkid for the coordinate system in your map document.

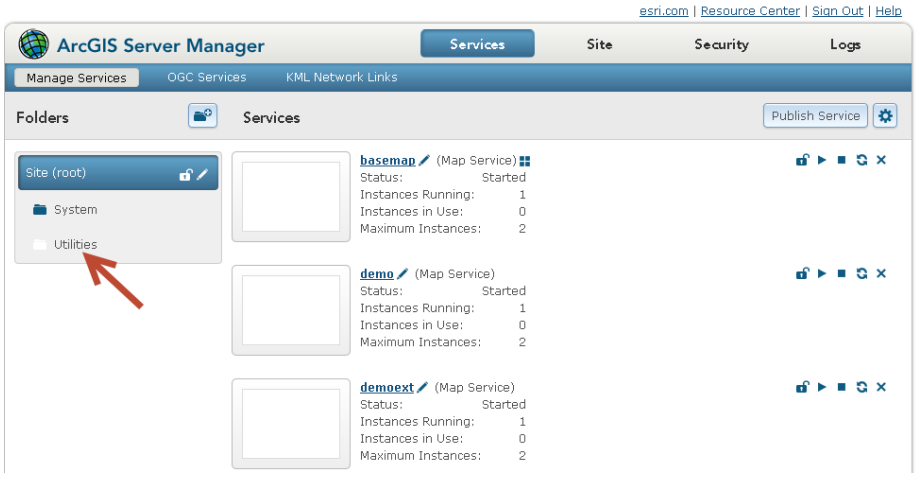
Enabling the Geometry Service

We need to enable the geometry service for Lucity GIS Web Map application to allow for buffering, projecting, calculating lengths and areas.

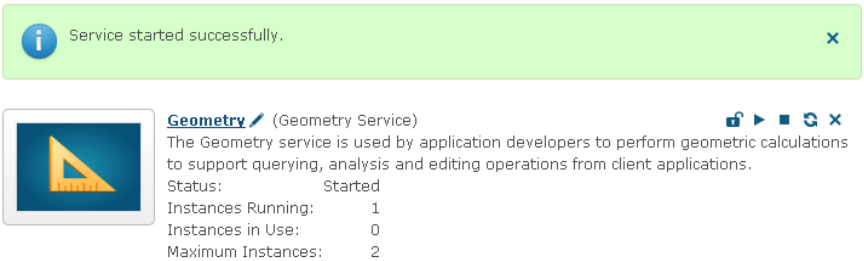
1. Log into ArcGIS Server Manager.



2. Once logged in, go to the site root tab on the left side of the browser and click on the folder called 'Utilities'



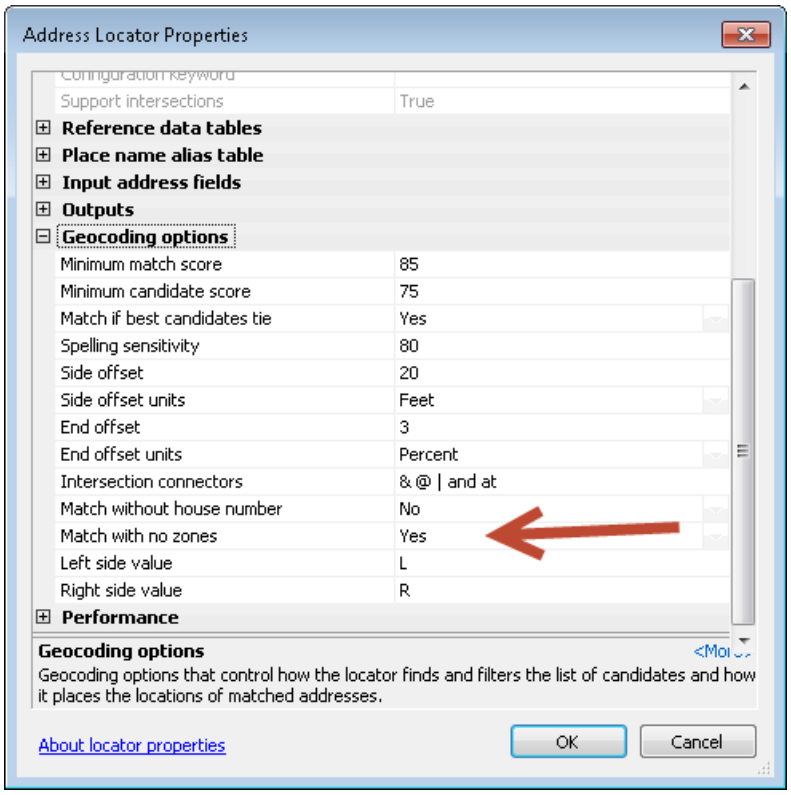
3. Go to the Geometry Service and click on the play icon ▶ to start a stopped service.
4. Once complete, the service is now available.



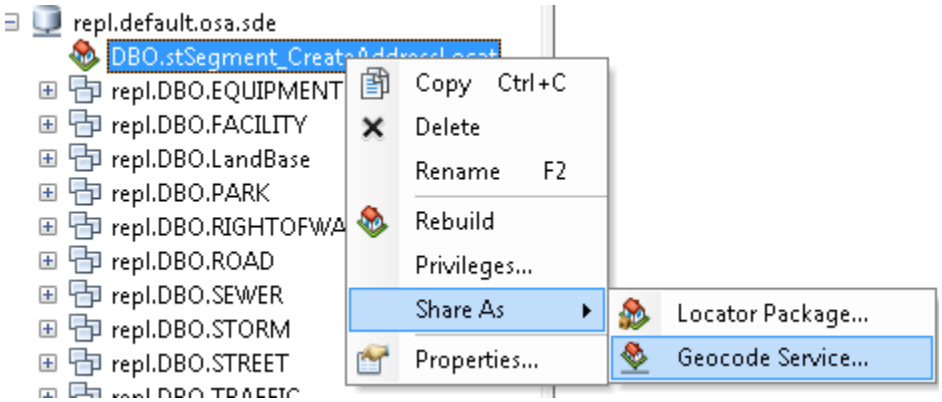
Creating a Geocoding Service

Geocoding services allow Lucity GIS Web Map to find and display addresses on a map and see how they relate to surrounding features. We do support composite geocoding services.

1. Open ArcCatalog
2. Create a geolocator in your publishing database
3. For dual ranges, make sure to set the 'Match with no zones' value to Yes

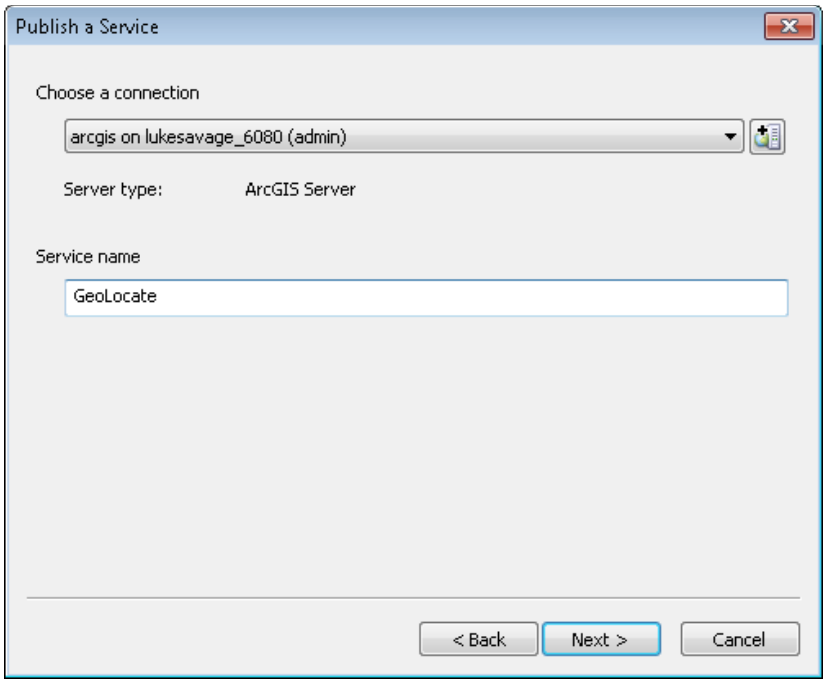


4. Right click on the geolocator in the Catalog Tree and click on Share As/Geocode service

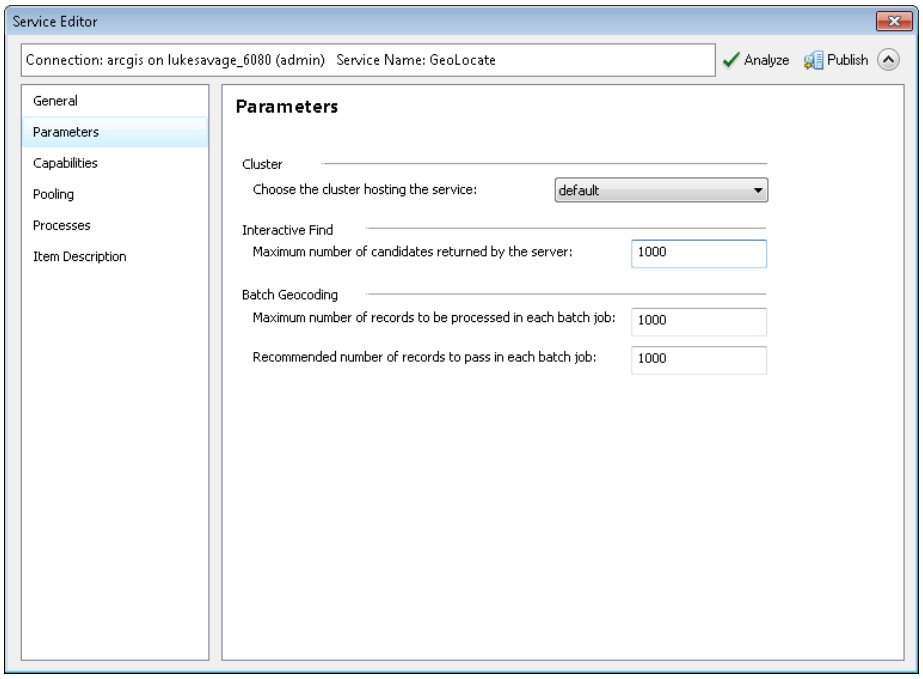


5. Publish a service
6. Click Next

7. Make the service name simple so it's easier to remember.



8. Click Next
9. Choose a folder or keep default location as root
10. Click Continue
11. Select Parameters and change the interactive Find if you want more than 500 records returned by the server.

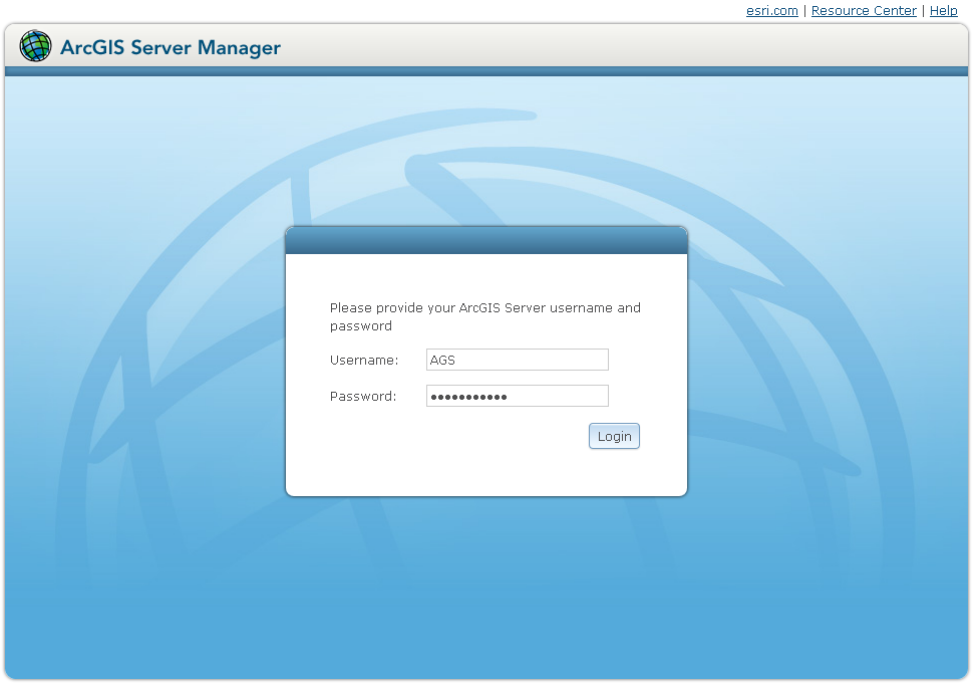


12. Analyze and fix any errors. If no errors, publish

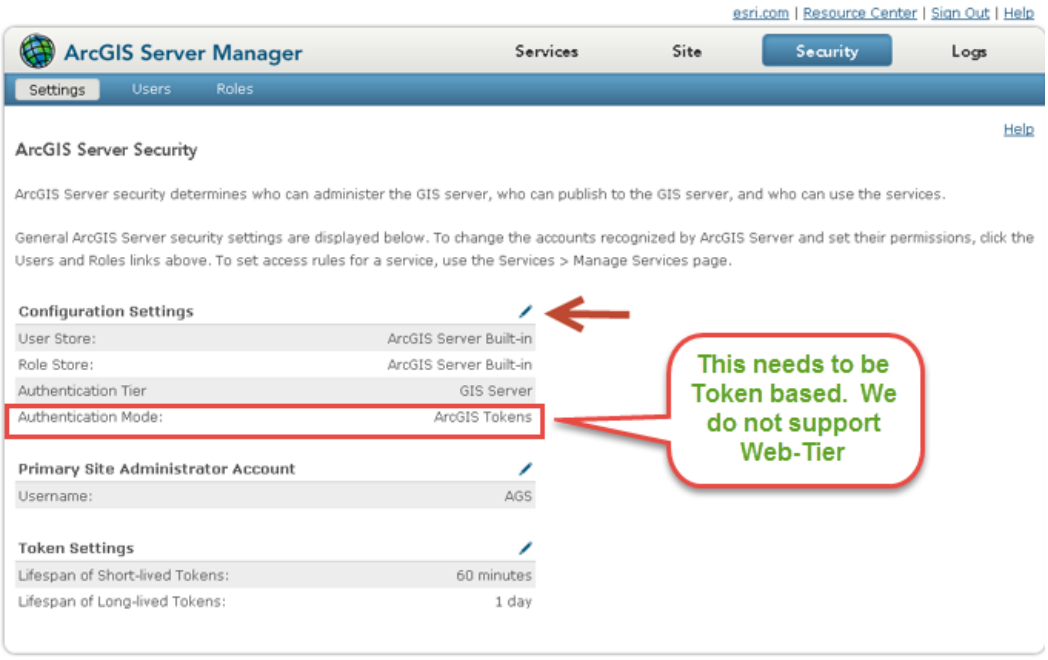
Securing a GIS Service

We now support ArcGIS for Server secure GIS services (map, geocoding, geometry, feature, image, and routing). In this section, we will describe the deployment of secure map services as a built-in user store.

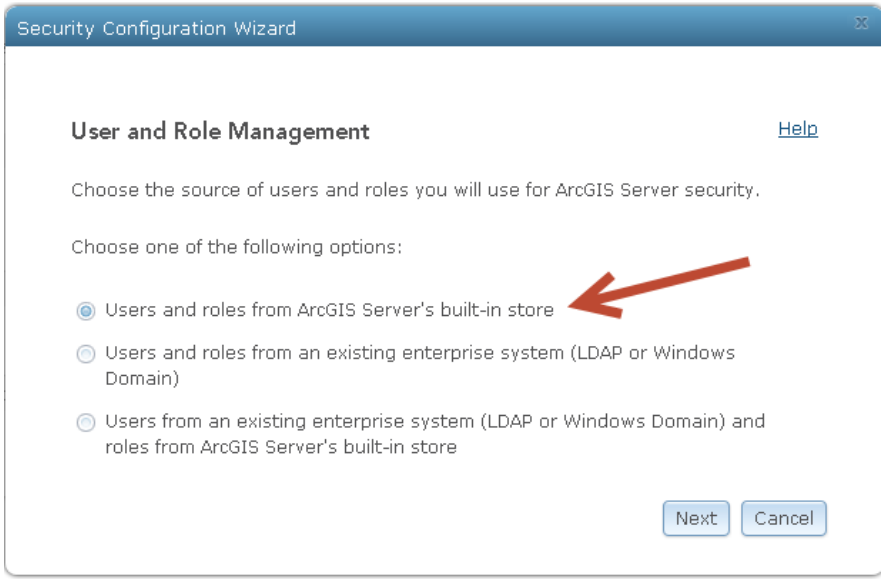
1. Log into ArcGIS Server Manager.



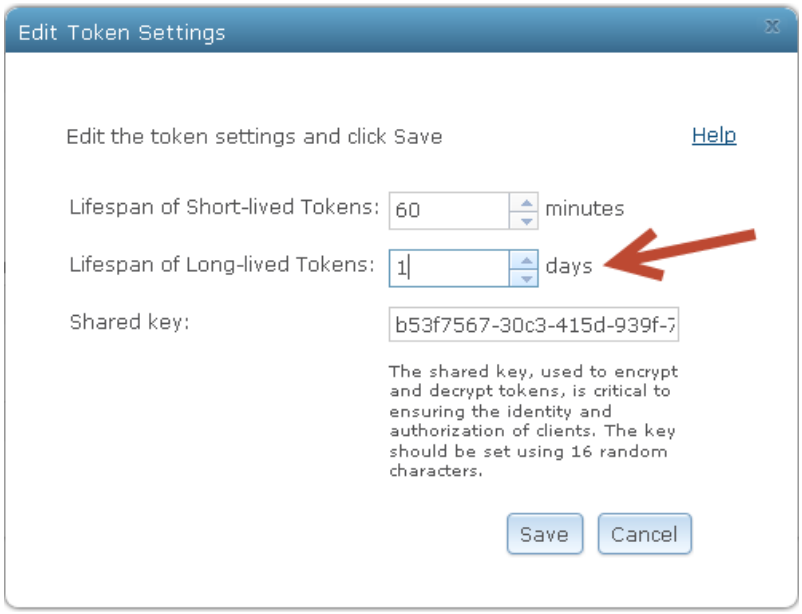
2. Go to the Security menu to configure the security features.
3. Click on configuration settings pencil to configure the type of data store.



4. Again, we will be configuring a built-in store at the ArcGIS for Server level not the web store or the windows domain/LDAP configuration in this example.

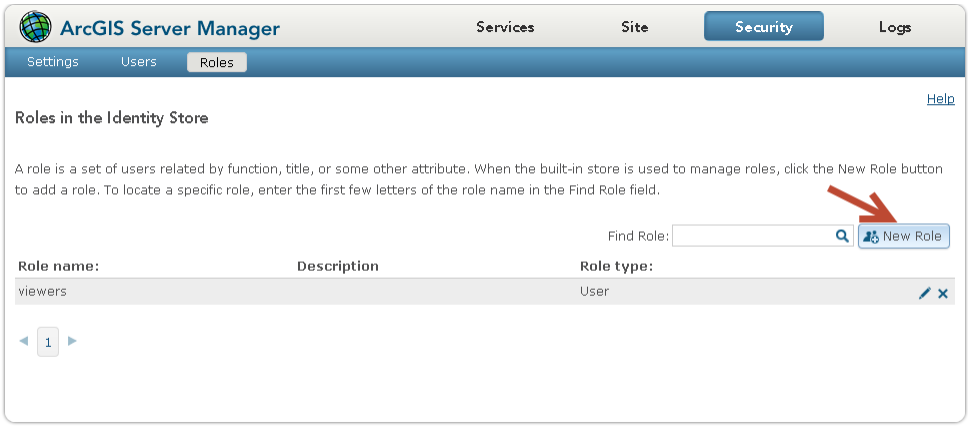


5. Click Next
6. Finish after reviewing configuration
7. Optional (if using tokens), configure your Long-Lived tokens to the appropriate IT policy. In this example, the lifespan for Long-lived tokens will be 1 day.

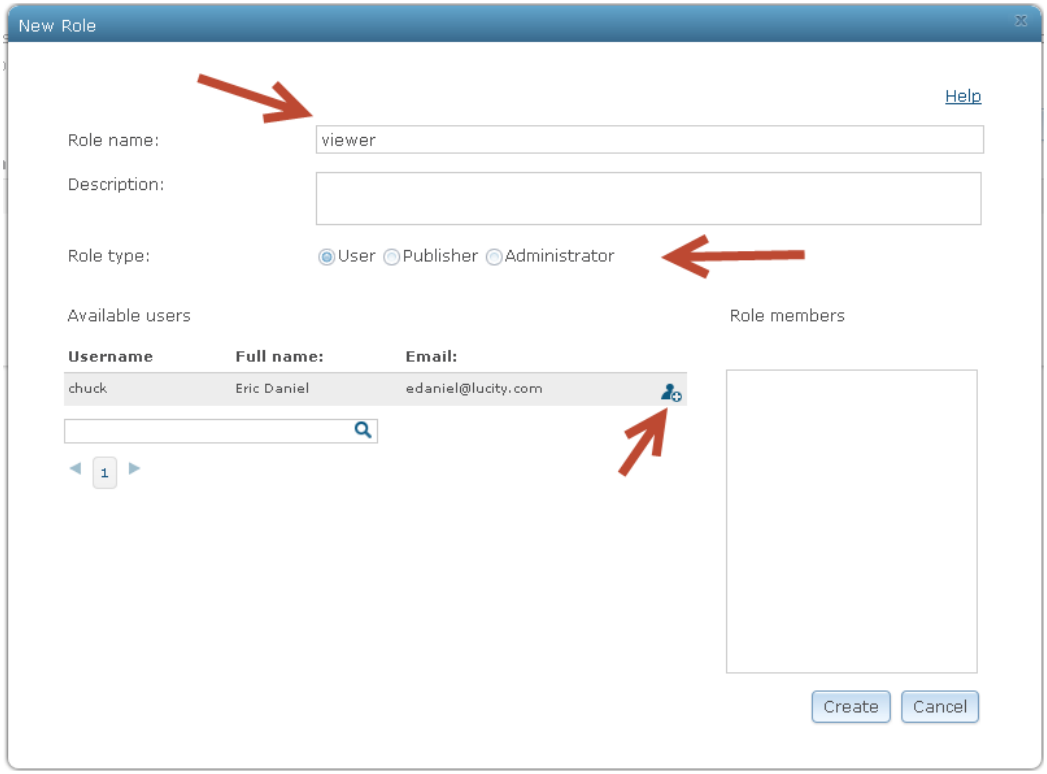


8. Click Save

9. Go to the roles submenu of security

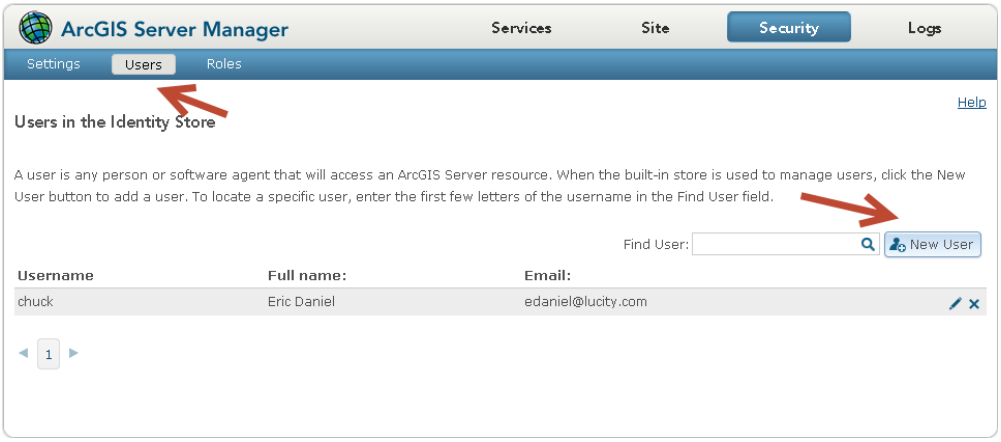


10. Click new role
11. Add a role called ‘viewer’. In this example, we will create a role used for the end user. You can similarly create roles for administrators and publishers in the same way. If you already had a user create, you can add them to the role by clicking the person with the plus sign icon 

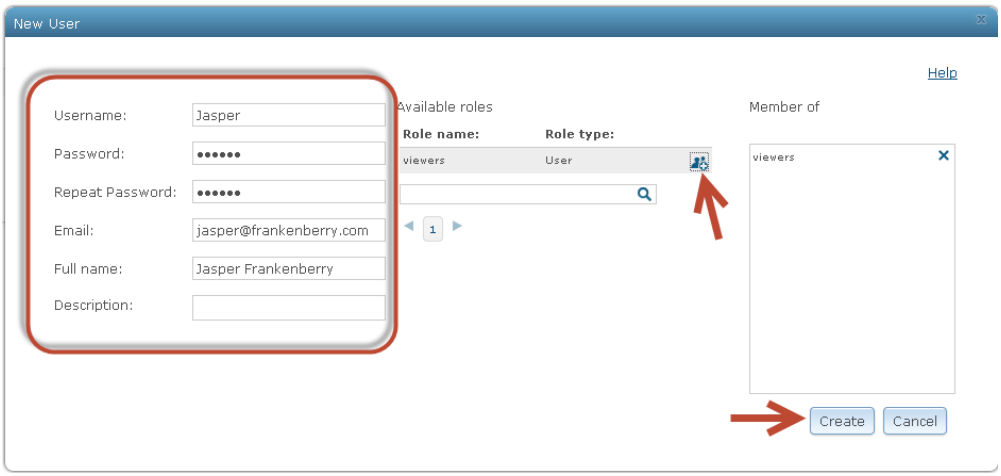


12. Once finished, click on create.
13. In this example, we will create a user. Go to the submenu item called ‘users’.

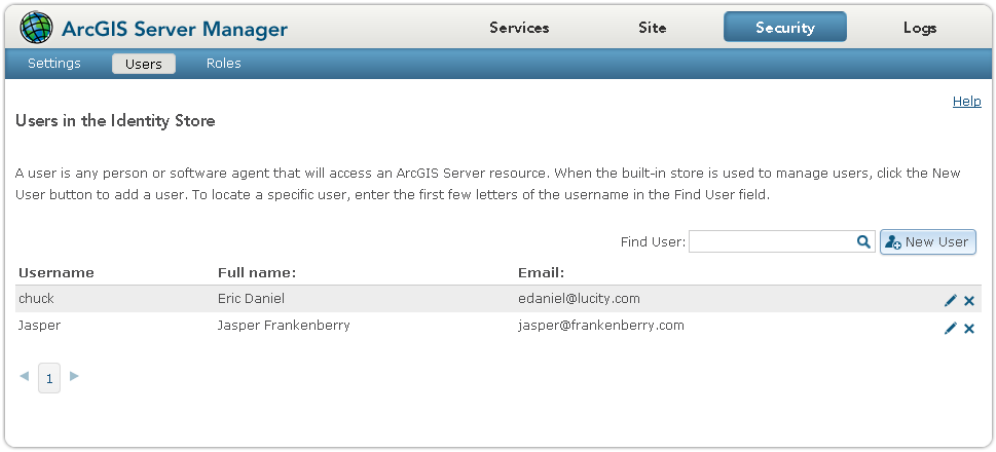
14. Click on new user.



15. Once the 'new user' dialog appears, add the user information. In this example, we will be adding the newly create role to the user during the creation of the user account.
16. Add the information in the 'new user' dialog
17. Click on the person with the plus sign icon 

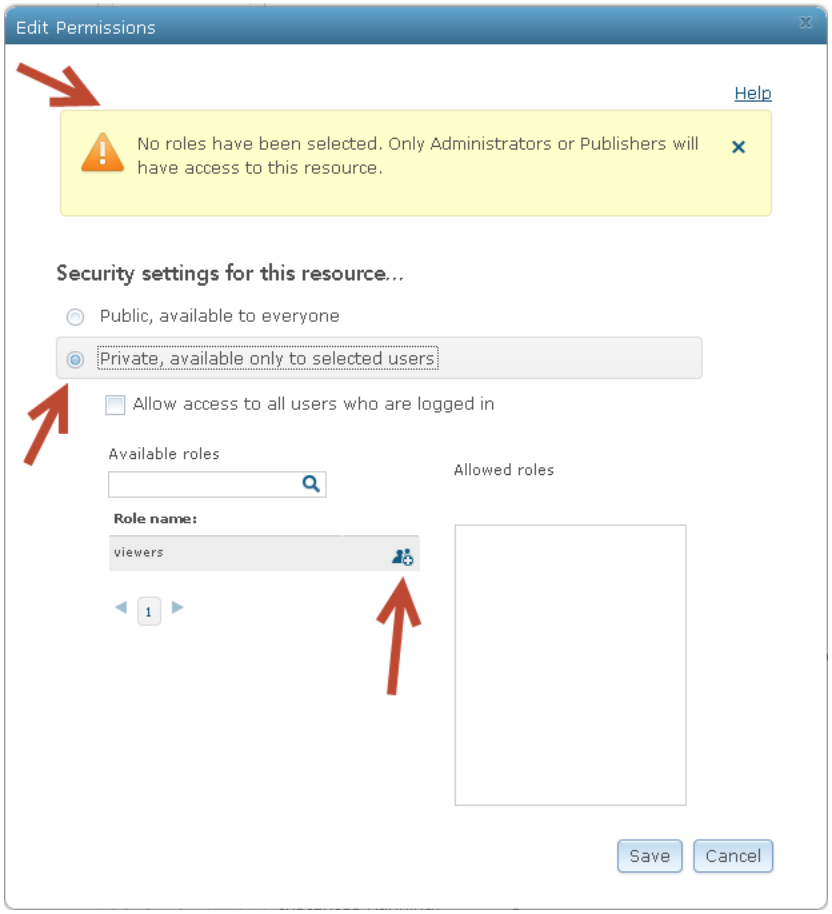


18. Click create
19. We now have the new user added to the users list.

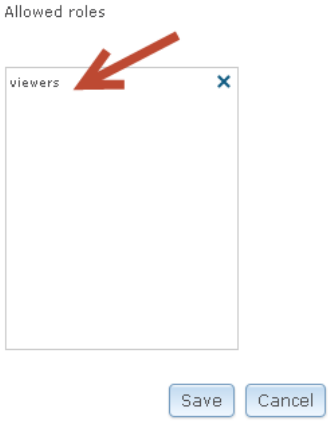


20. Assuming you published a map service for the intention to secure, go to the main menu and click on 'services'

21. Click on the lock icon
22. Click on the radio button 'Private, available only to selected users' to enable security. You have the choice to allow access to all users who are logged in which gives access to all users in the 'built-in' users security store but in this example we only want to use the 'viewers' role.
23. A message will appear 'no roles have been selected'. This is a friendly reminder that there have been no roles selected.

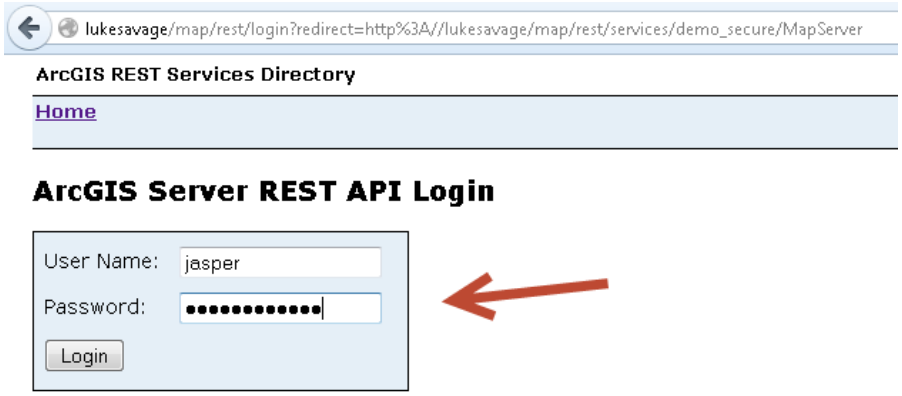


24. Click on the person with the plus sign icon under roles. This will add the 'viewers' role into the 'Allowed roles' dialog.



25. Click Save
26. For the map service, you should now see the lock icon in the locked position.

27. Test the map service security. You can do this by going to the rest endpoint of the map service.
28. Example: http://<servername>/<alias>/rest/services/<nameofmapservice>/MapServer
29. Supply the newly created user credentials and click on login

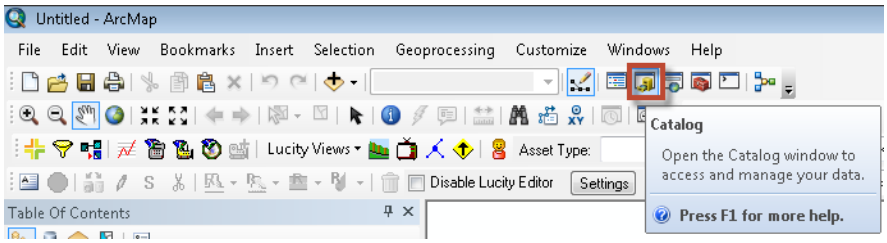


30. If you see the rest service directory open, you have successfully secured your map service.

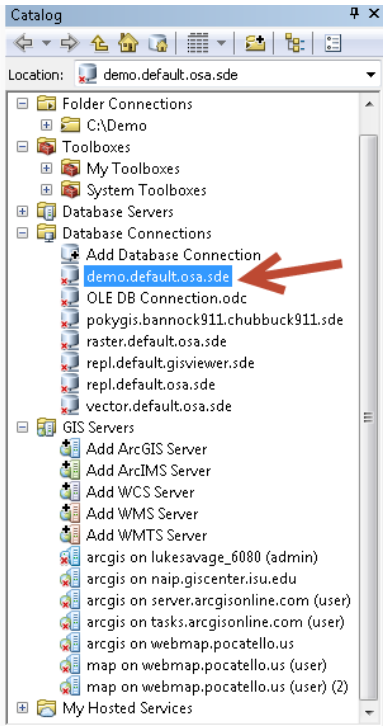
Redlining

To configure the Geodatabase and ArcGIS for Server to enable redlining capability, we must create a feature class or feature classes depending on the type of redlining capability you desire. We support points, lines and polygons. Below we will demonstrate the creation of a feature dataset, three feature classes and published them to a feature service.

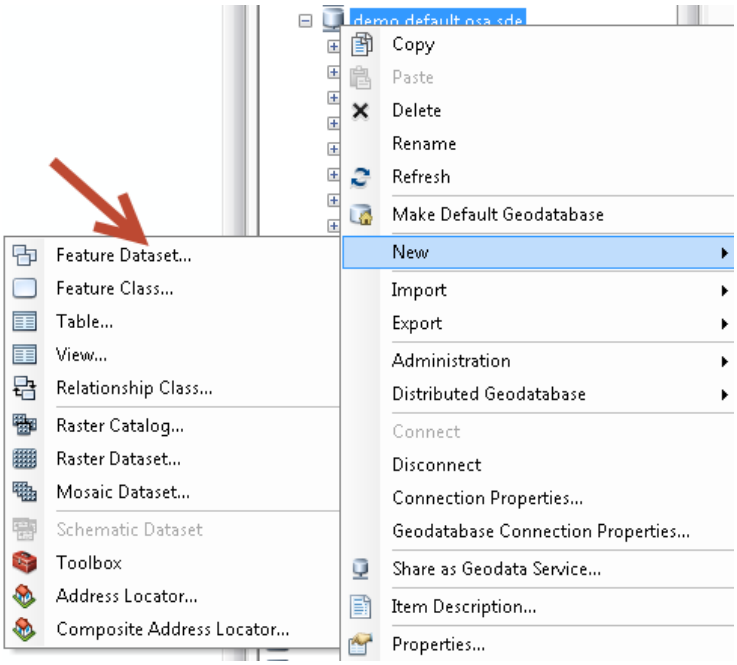
1. Open ArcMap
2. Click on the Catalog button if it is not already open.



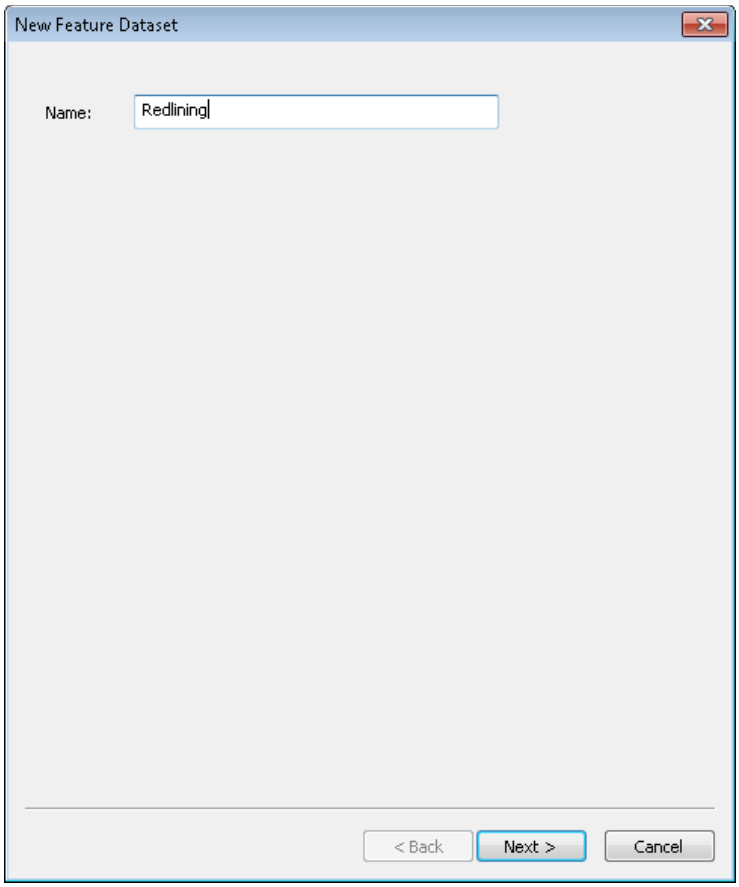
3. In the Catalog Tree, go to database connections and open your production GIS database.



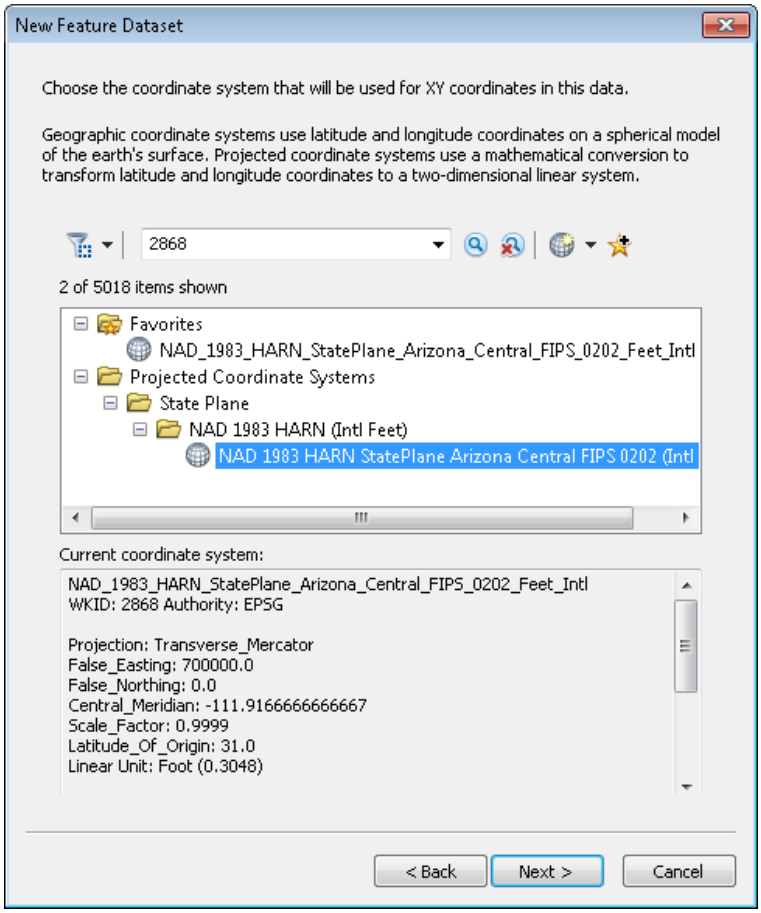
4. Right click on the connection and choose new and a submenu will appear.
5. Click on Feature Dataset



6. Give the Feature Dataset a name. In this example we will call it Redlining

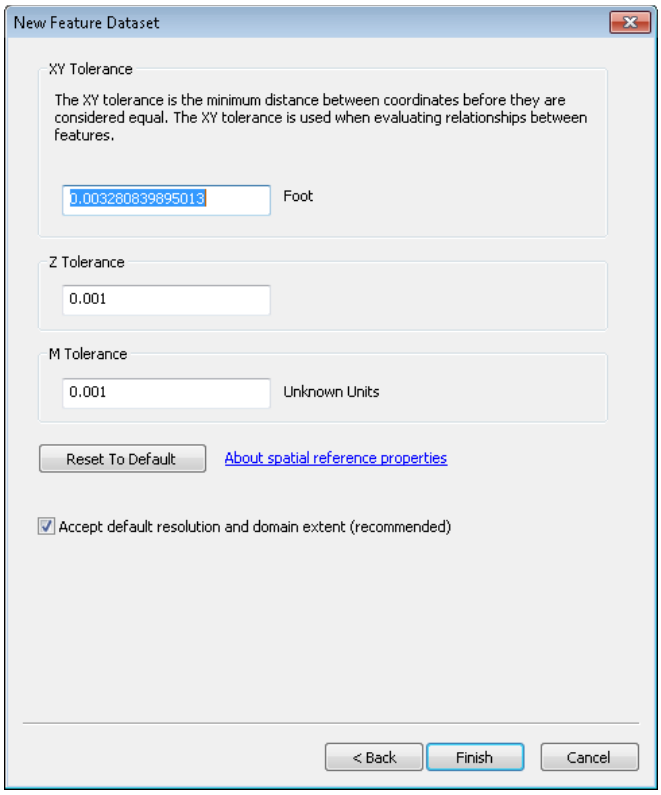


7. Click Next
8. Set your coordinate system for the feature dataset



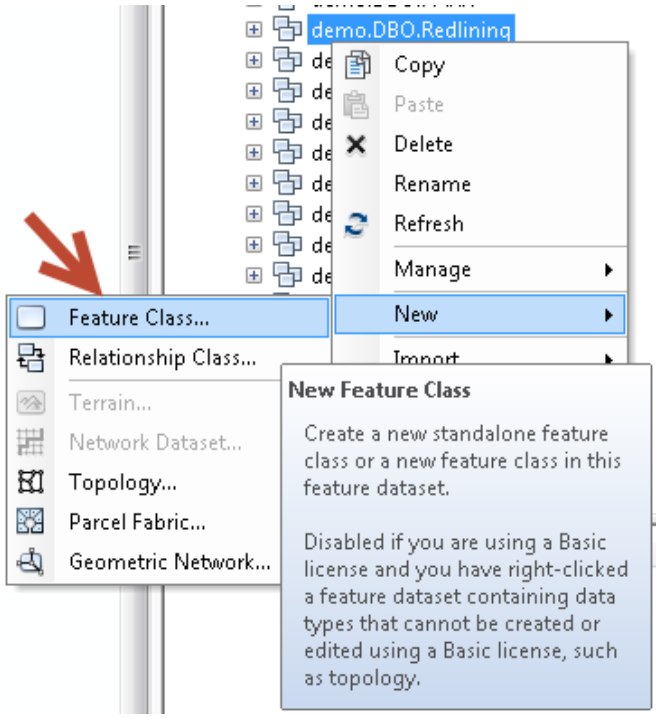
9. Click Next
10. Click Next unless you need vertical coordinate systems applied to the data

11. Set your Z, M and XY tolerance. In this example, we will take the defaults.

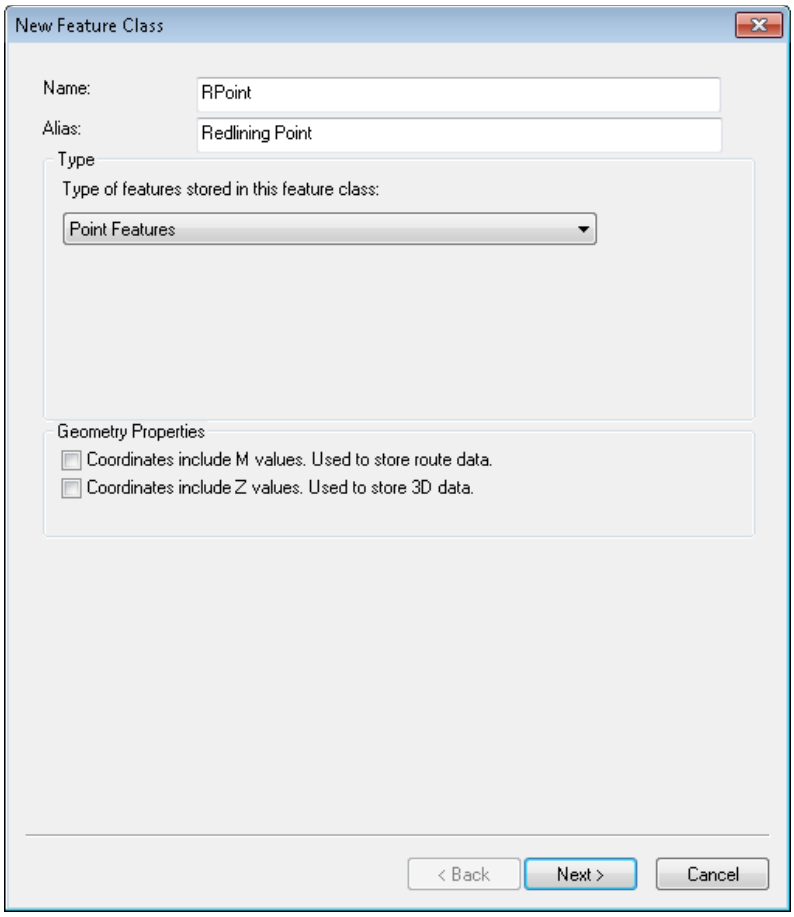


12. Click Finish

13. In the Database Connection, right click on the newly created Feature Dataset and choose new and submenu Feature Class

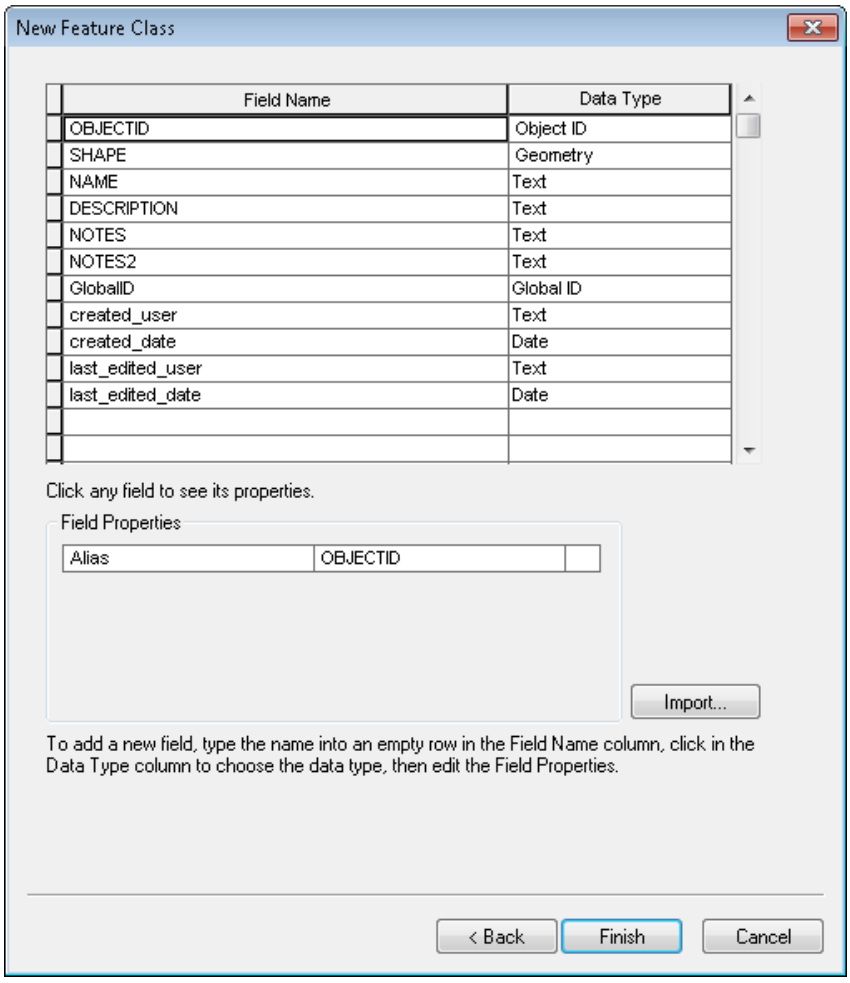


14. In this example we will create a point Feature Class and call in RPoint



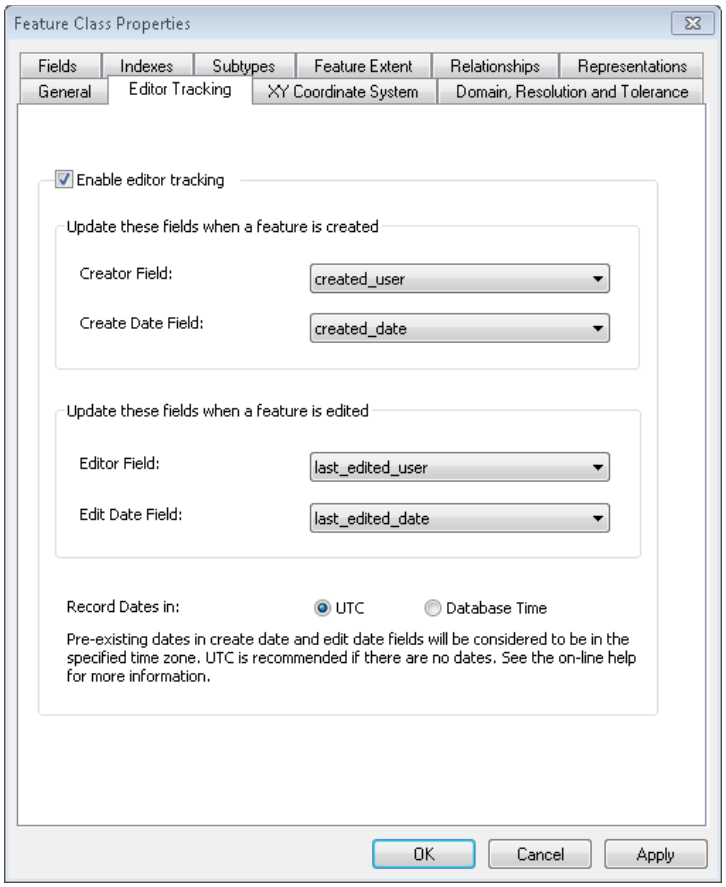
15. Click Next
16. Except defaults unless you are using configuration keywords
17. Click Next

18. Add desired fields to your redlining point feature class. If you plan on using editing user, date and last editing fields, make sure you turn on editor tracking after creating the feature class.



19. Click Finish
20. Repeat steps 13 through 18 to create polygon and line Feature Classes if desired.
21. Make sure to assign credentials for access to the newly create feature dataset and optional versioning before publishing.
22. Optional: Right click on each feature class that you would like to enable edit tracking and choose properties.
23. Go to the tab Editor Tracking and click on Enable Editor Tracking
24. Map the fields to the appropriate Feature Class fields

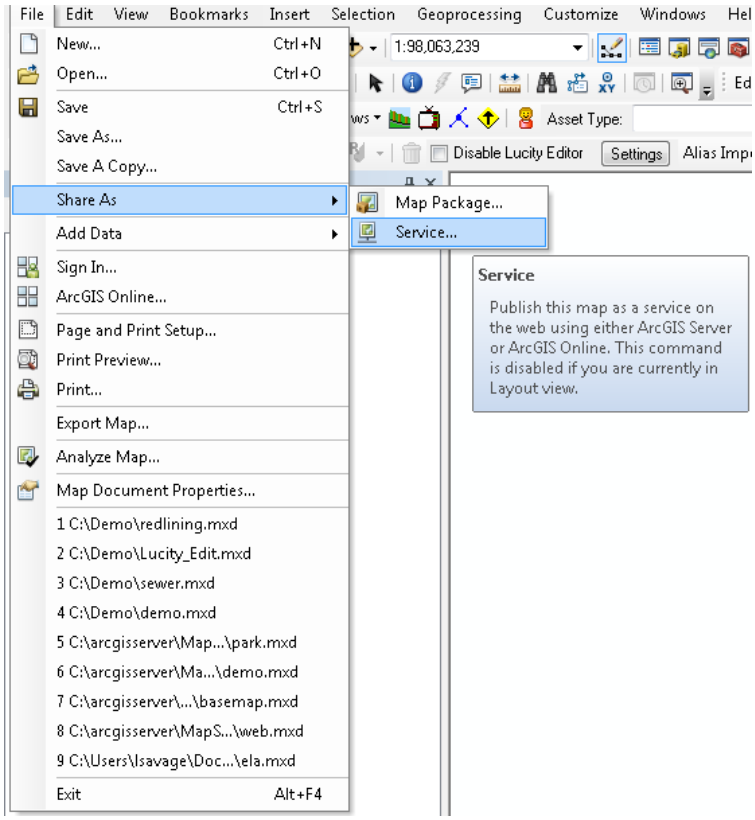
25. We only use UTC



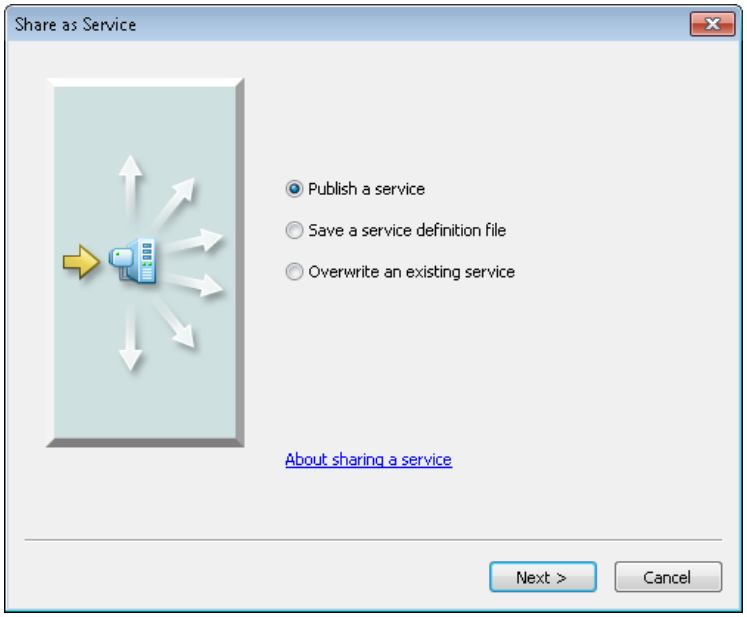
26. Click Apply or ok.

Publishing a Feature Service

1. Go to the File/Share As/Service menu option to create a service

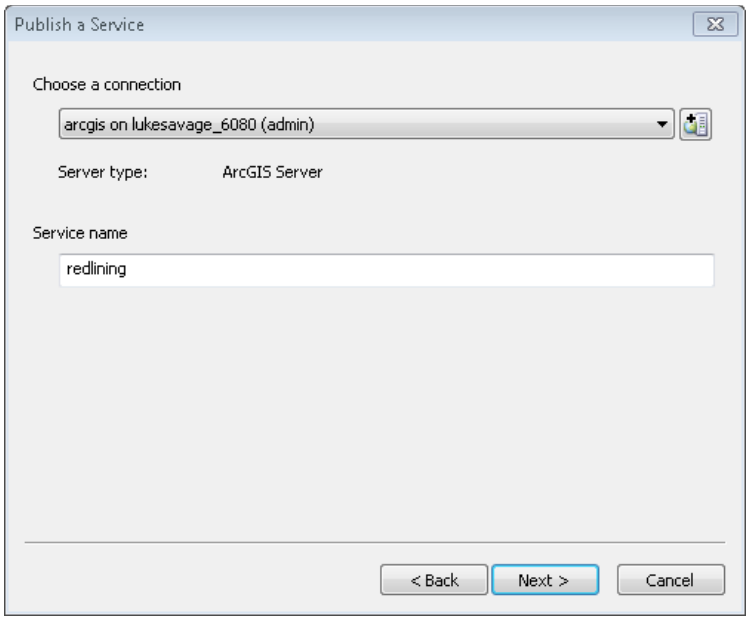


2. Select Publish a Service

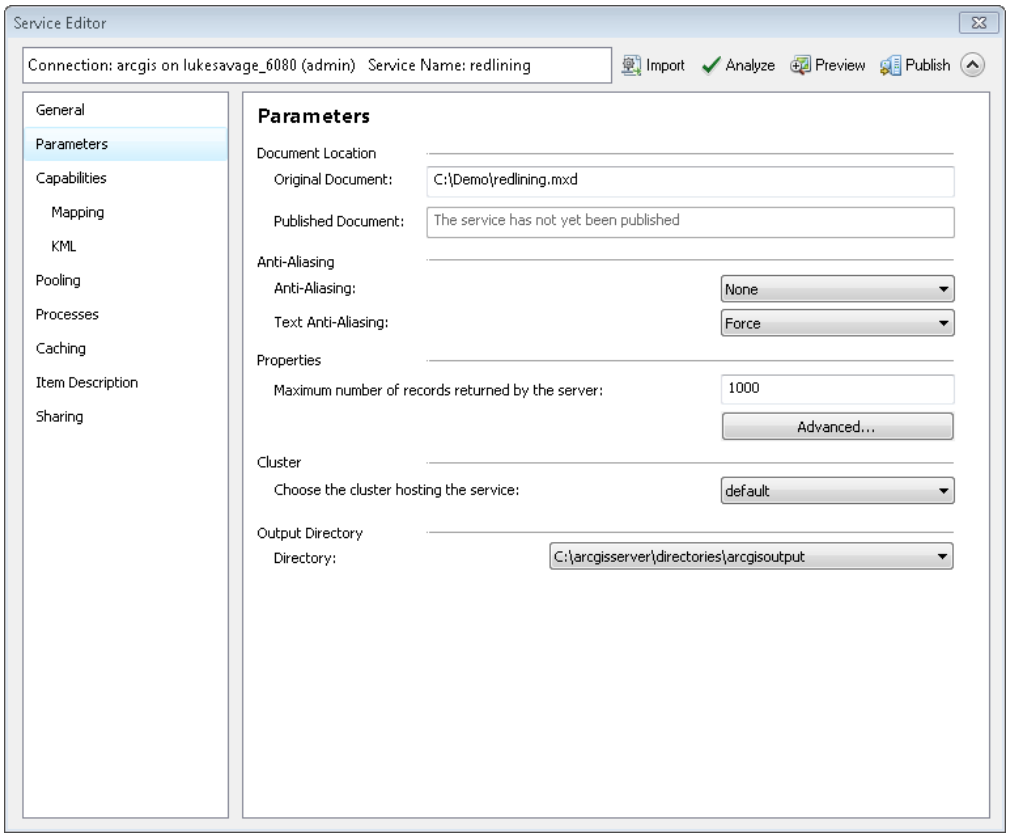


3. Click Next

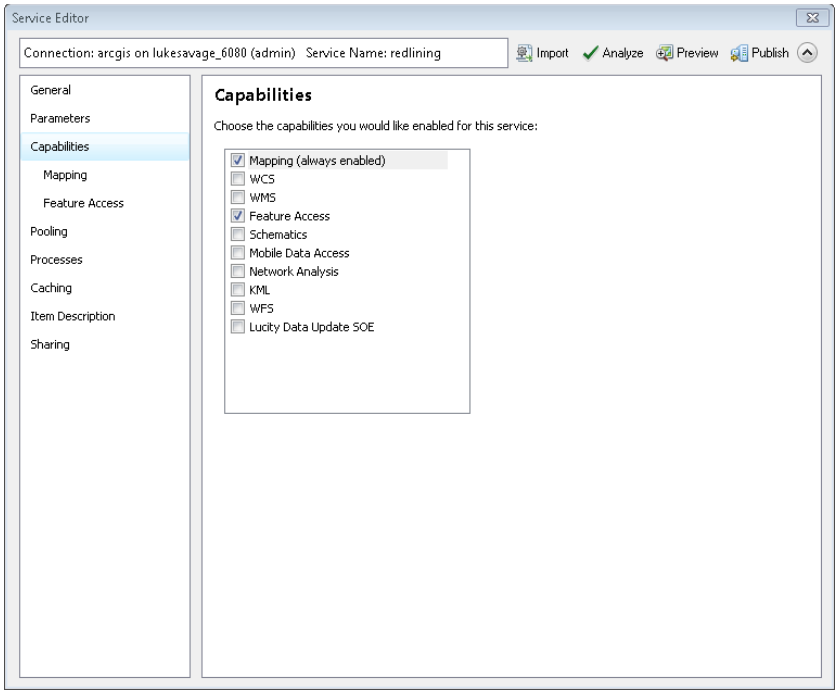
4. Choose server connection and create service name



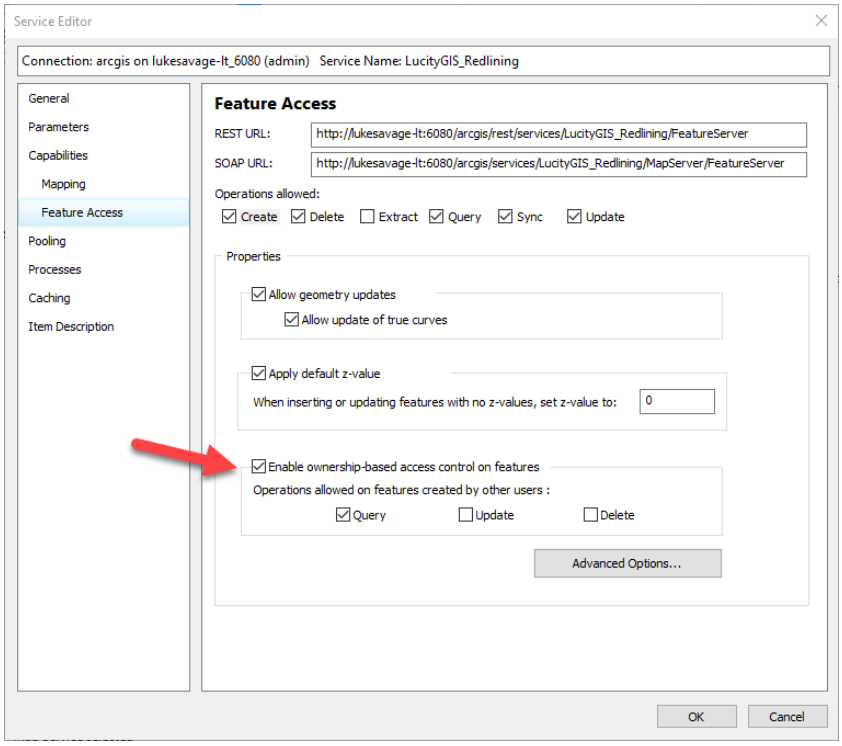
5. Click Next
6. Use in folder or in the root of ArcGIS service directory
7. Click Continue
8. Go to Parameters and click on Advanced



9. Click Ok
10. Go to the Capabilities tab and make sure Mapping and Feature Access is selected.



11. Click on the submenu tab ‘Feature Access’ and add the selection ‘Enable ownership-based access control on features’. This option will only allow the created user features to be updated by the owner of the features but only allow the other users to query the created data.



12. Analyze to make sure no errors are present.
13. Click Publish
14. Optional: If you wish to secure the feature service, go to the below section of ‘Security a Map Service’ and add each user account to have access to the newly created map/feature service.
15. For Editing feature services, go through the same process above. Make sure you are using an edit user when publishing.

Publishing an Offline Feature Service

In order to support offline mode, we must prepare the data and configure the feature service. Below, we will demonstrate the setup for supporting offline feature services.

Prepare Data

- Add GlobalIDs
- Enable geodatabase archiving
    - Make sure there is enough space for your database to grow before enabling archiving on your enterprise geodatabase
- You have the capability to add create, delete, query, sync and update.
    - For Lucity, we currently do not plan to provide offline map edits.

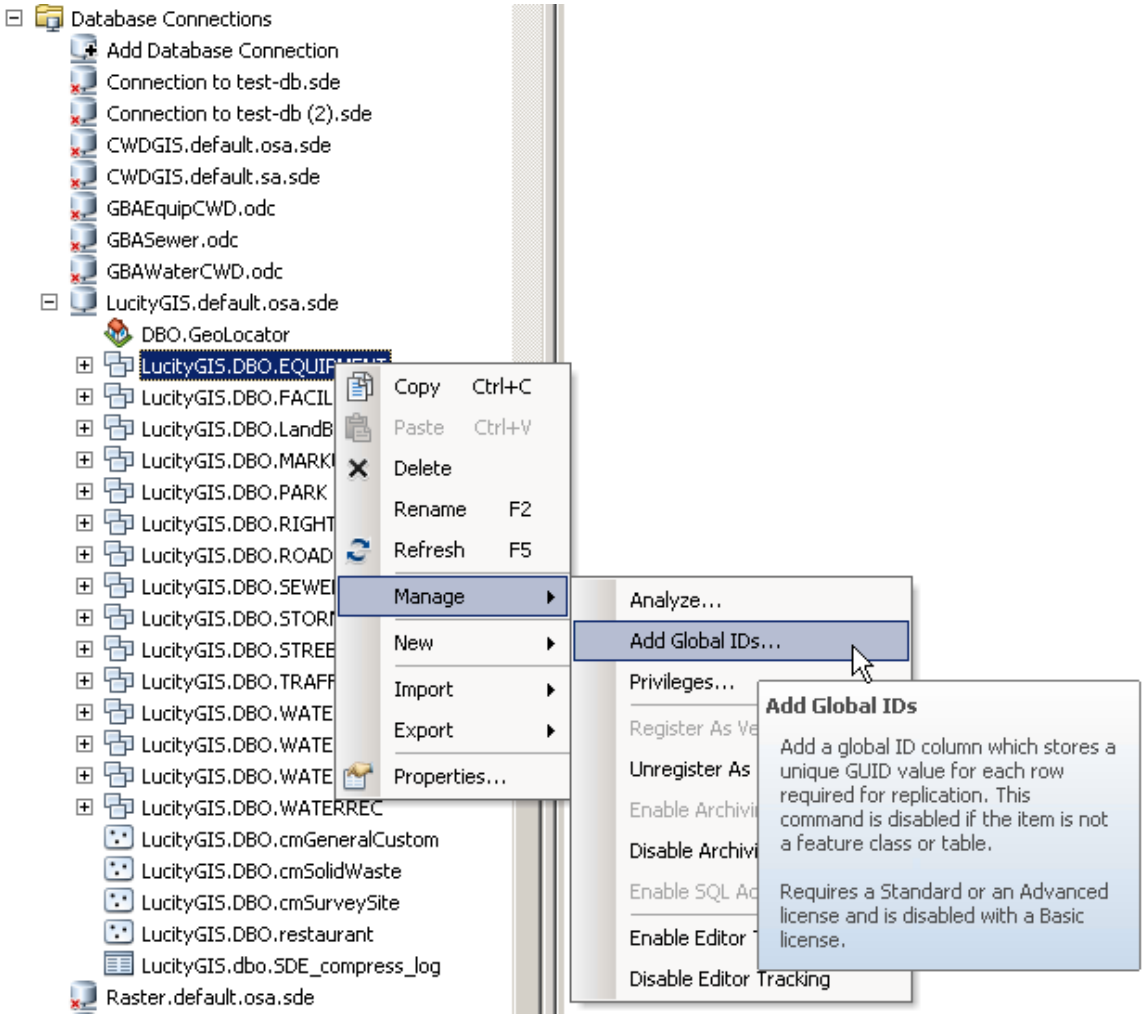
Publishing Preparation

- Consider symbology
- Feature Services will lock database for any schema changes.
- Needs to be an edit user to database when publishing map
- Consider securing feature service
- Remove Joins
    - Joins and Relates are not accessible through Feature Services
- Ensure all layers are in the same versioned/un-versioned state
    - Layers in the TOC cannot have mix match of versioned and un-versioned data

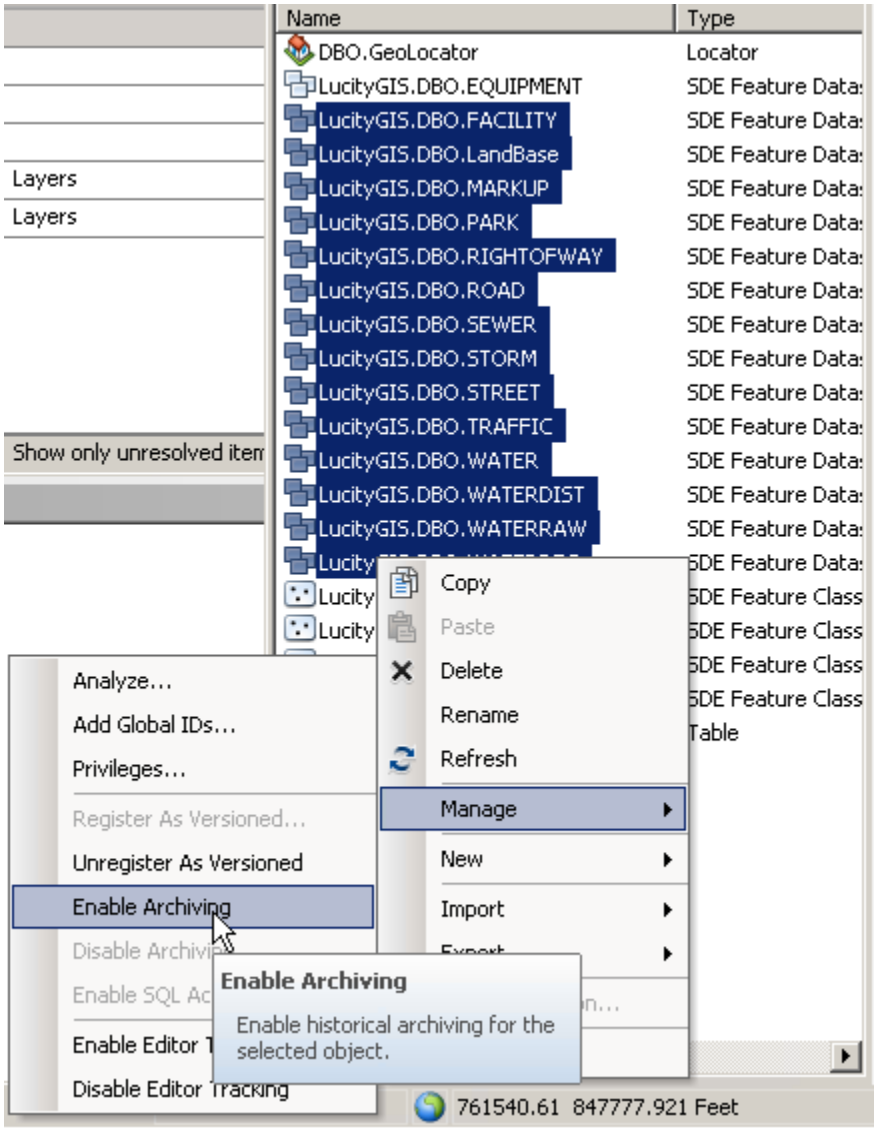
End Users

- Make sure you are connected to a fast internet connection or LAN line when checking out map data

1. Open ArcCatalog. Right click on your feature classes or feature datasets and choose manage, Add GlobalIDs.



2. To enable archiving, right Click on Feature Datasets or Feature Classes You can either publish a new map/feature service or enable the feature service within an existing map service. In order to have sync capability, make sure you log in as an edit user.



3. Once complete, add data to map document.

4. Like with Redlining, go through the process of publishing a feature service but adding sync capability. You can have create, delete, query, sync and update enabled.