



Configuring a Distributed Installation of ArcGIS® Server (Windows)

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Configuring a Distributed Installation of ArcGIS Server (Windows)

An ESRI Technical Paper

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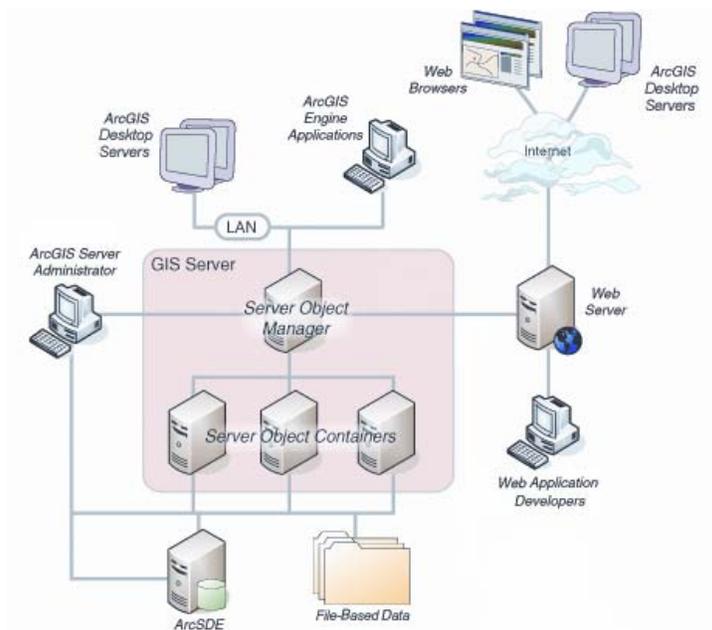
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Configuring a Distributed Installation of ArcGIS Server (Windows)

Introduction ArcGIS® Server has a scalable architecture that allows for deployment sizes ranging from one to many machines. When you first install ArcGIS Server, you will likely choose to install all components on one machine for development and testing purposes. Once you are ready to deploy your ArcGIS Server application, you will need to consider a distributed installation of ArcGIS Server so that you can achieve an acceptable level of performance for the number of users accessing the system.

A distributed installation of ArcGIS Server allows components of one ArcGIS Server system to reside on multiple machines in the same local network. For example, the graphic below depicts a distributed installation in which the Server Object Manager (SOM), Server Object Containers (SOCs), Web server, and administration software (ArcCatalog™) reside on separate machines.

Figure 1



A distributed installation of ArcGIS Server can include many machines, which must be configured to communicate correctly.

A distributed installation of ArcGIS Server gives you the flexibility to scale up your deployment by adding more machines. Since the container processes do the geographic information system (GIS) work and typically consume the most CPU resources, each

SOC machine that you add to your system increases the number of users your GIS server can accommodate.

Wisely distributing the ArcGIS Server components among multiple machines can help make the most efficient use of your hardware resources. For example, if you have a limited number of machines available, you might consider installing the SOM on the same machine as the Web server, since the SOM uses relatively little memory. Your remaining hardware can then be put to use as SOC machines to increase the processing loads that your GIS server can handle.

Performing a distributed installation of ArcGIS Server differs from a regular ArcGIS Desktop or ArcGIS Engine installation because you must configure multiple machines to correctly communicate with each other. The SOM must be able to send a request for a server object to any SOC machine in the system. Since each machine is working with the same set of data and directories, a common naming convention (such as Universal Naming Convention [UNC] paths) must be used so that each machine can refer to the data and directories in the same way.

Security mechanisms can also pose a challenge in communication between machines. For example, an ArcGIS Server Object Container account can require permissions to read or write data on a number of different machines. Because of the open communication required by the ArcGIS Server architecture, firewalls are not recommended between the components of ArcGIS Server (such as between the Web server and the SOM or between a SOC and a data server). This paper contains alternative recommendations for securing your system with firewalls.

Configuring a distributed installation of ArcGIS Server requires you to perform a series of important administrative tasks in the correct order. The purpose of this document is to help you through the process of a distributed installation.

Choose a Configuration

The first step in deploying a distributed ArcGIS Server system is designing the configuration. The SOM, SOC, and Web Application Developer Framework (ADF™) are ArcGIS Server features that can be installed on the same machine or distributed among multiple machines. Additionally, your data and ArcCatalog must be available on the same local area network.

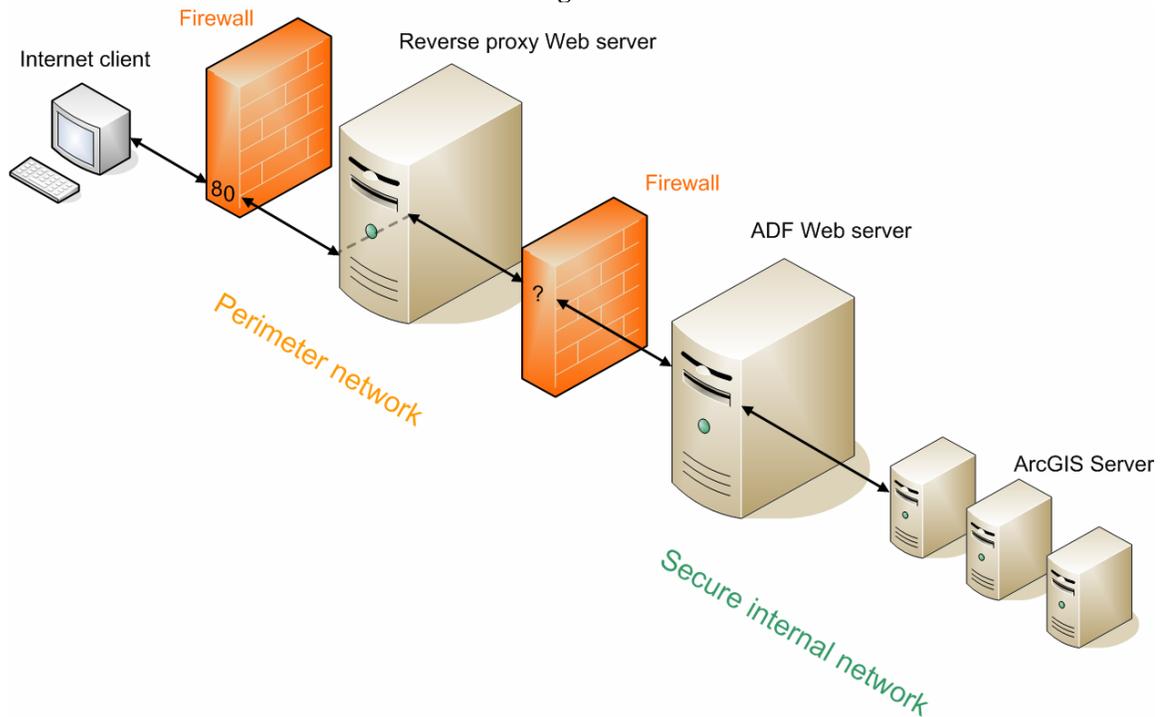
The ADF runtime must be installed on the same machine as the Web server; however, your data and ArcCatalog do not have to reside on the same machine as any other components of your GIS server. The ArcGIS Server Installation Guide contains diagrams of several deployment configurations you might consider when planning your system.

A Note about Firewalls

ESRI does not recommend or support firewalls between ArcGIS Server components. The recommended technique for protecting an ArcGIS Server system with firewalls is to configure a reverse proxy Web server within a perimeter network (also known as a demilitarized zone and screened subnet). In this scenario, the reverse proxy Web server receives incoming HTTP requests through a firewall that restricts traffic to a known port (usually port 80). It then sends the request through another firewall—using a port unknown to the end user—to the ADF Web server in a secure internal network. The ADF Web server is then free to establish unrestricted Distributed Component Object

Model (DCOM) communications with the other ArcGIS Server components. In this way, the entire GIS server operates within a secure internal network and does not require firewalls between its components.

Figure 2



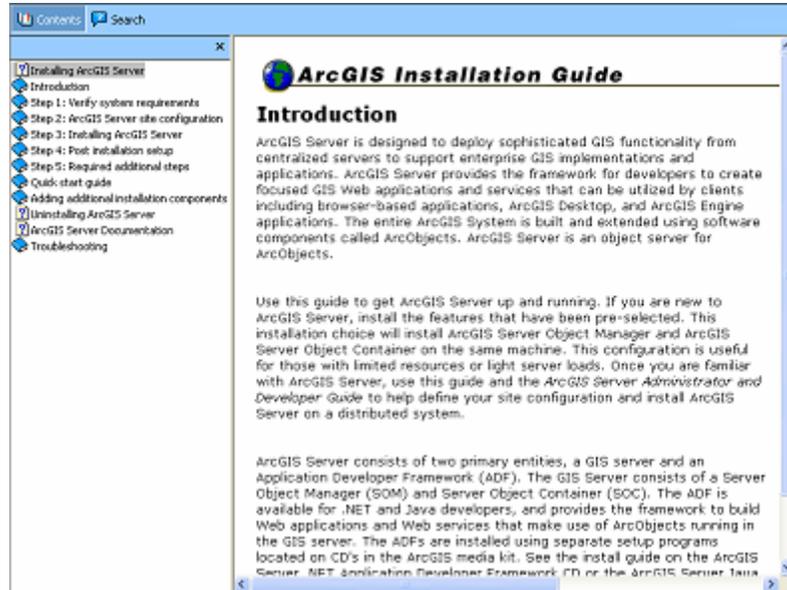
An ArcGIS Server system protected by firewalls. The reverse proxy Web server receives the client request through a known port on the first firewall, then directs the request through a different port on the second firewall to the ADF Web server. The ADF Web server then forwards DCOM requests to the GIS server. The second firewall restricts access through any other port.

In some cases, the firewalls included with Windows XP Service Pack 2 (SP2) and Windows Server 2003 Service Pack 1 (SP1) may need to be configured to work with ArcGIS Server. For more information, see this ESRI Knowledge Base article: <http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=27798>.

Install the Appropriate Features on Each Machine

The ArcGIS Server Installation Guide contains detailed information about the software installation process. It also contains a list of system requirements and prerequisites for ArcGIS Server. You can open the guide by clicking the Install Guide button from the first panel of the ArcGIS Server Setup wizard.

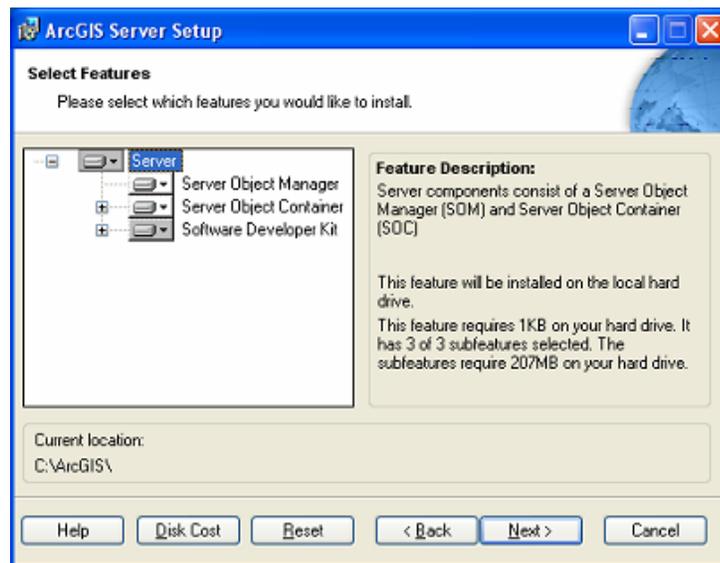
Figure 3



The ArcGIS Server Installation Guide

After installing any necessary prerequisites as detailed in the System Requirements, you can begin installing the ArcGIS Server software on each machine in your system. As you navigate through the ArcGIS Server Setup wizard, you will see a dialog box that allows you to choose which components, or features, of ArcGIS Server to install. For each machine, choose only the features necessary for the machine to perform its function in the system.

Figure 4



Selecting Which Features of ArcGIS Server Will Be Installed

Run the Postinstallation

Upon completion of the installation on each machine, you will be prompted to run the ArcGIS Server Post Installation Wizard. The sections of the postinstallation you need to complete on each machine may vary. For example, you will only need to authorize ArcGIS Server on machines that will function as SOCs. The ArcGIS Server Post Installation Wizard will disable this section of the postinstallation if you did not install the SOC.

During the postinstallation, you will be prompted to specify the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts. The Server Object Manager and Server Object Container processes will run with the privileges of these accounts. The container account is especially important, since you will need to grant it access to your data and server output directories at a later time.

You should enter the same ArcGIS Server Object Manager and ArcGIS Server Object Container account information on each machine in your ArcGIS Server configuration. You can either specify existing accounts or enter new names and passwords if you want the postinstallation to create the accounts for you. The postinstallation gives you the option to save a configuration file that contains the names and passwords that you entered for the accounts. When you run the postinstallation on other machines, you can use the configuration file to quickly load the same name and password information.

Figure 5

ArcGIS Server Post Installation Wizard

Select from the following options
Select from the following options

Specify the account names and passwords:

ArcGIS Server:

Password:

Confirm password:

ArcGIS Container:

Password:

Confirm password:

I have a configuration file with the account information generated by a previous run of this setup.

Filename:

< Back Next > Cancel Help

This dialog box of the postinstallation prompts you to specify the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts.

For security purposes, ESRI recommends that you make the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts local instead of specifying domain accounts. This ensures that a malicious user could not use the accounts to acquire administrative privileges on other machines in your network.

If your data resides on a machine that contains no components of ArcGIS Server, you may need to use the operating system tools to create the ArcGIS Server Object Container account on that machine. You should give the container account the same user name and password that it has on all of the other machines in your system. Then you can grant the account access to your data.

**Restart or Log Off
Each Machine**

For the account settings created by the postinstallation to take effect, you need to log off and back on to each machine in your system before continuing to configure your ArcGIS Server system.

**Add Users to the
agsadmin and
agsusers Groups**

After running the postinstallation on each machine, you need to specify which users will have administrative and regular-usage access to your server. The postinstallation creates two operating system groups on the SOM: agsadmin and agsusers. The agsadmin group is for administrators; for example, those who will add container machines and server objects to the server. You need to add yourself, and anyone else who will be administering the server, to the agsadmin group on the SOM machine.

The agsusers group is for those who will be using the GIS server but do not need administrative access. You need to populate the agsusers group with a list of authorized users. Accounts already in the agsadmin group do not need to be added to agsusers.

You do not need to add the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts to the agsadmin and agsusers groups. These accounts are only used internally by the GIS server.

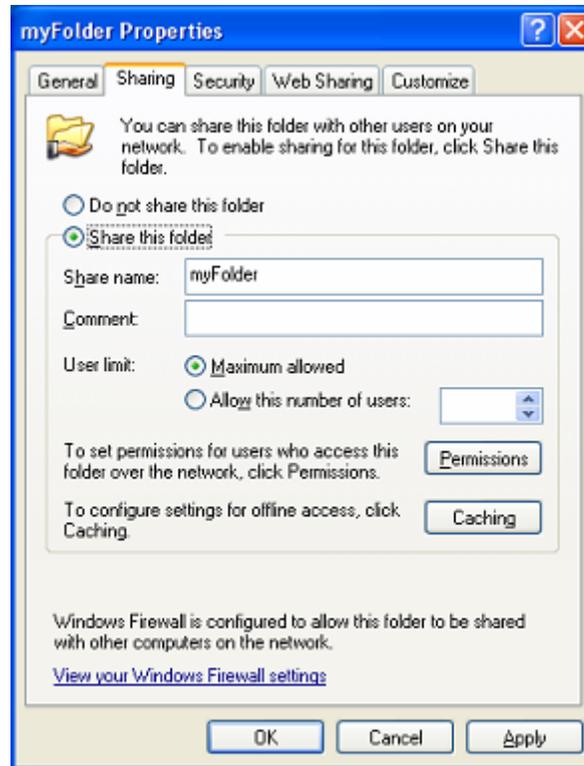
**Prepare Any Server
Output Directories
That Your Server
Will Use**

If your server will write files to a server output directory, you can configure the directory now. A server output directory is a folder to which the server writes temporary files needed to accomplish a certain task. For example, if you have a Web application that retrieves map images through a URL, those images will be placed in a server output directory.

Server output directories are not utilized by geocode server objects and are optional for map server objects. If you do not specify a server output directory for a map server object, its map images will be accessed as Multipurpose Internet Mail Extensions (MIME) data.

Each SOC machine in your system needs to be able to access the server output directories. To make this possible, you can configure the folders representing your server output directories to be shared so that other machines on the network can access them. If you have a folder on your hard drive—at the path C:\ArcGIS\server_output—that you want to make available to any computer on the network, you can share the folder and make it available to other users via a UNC path. In the example above, for a machine named myServer, this path would take the form of \\myServer\server_output. Any machine on the network could access the folder using this naming convention.

Figure 6



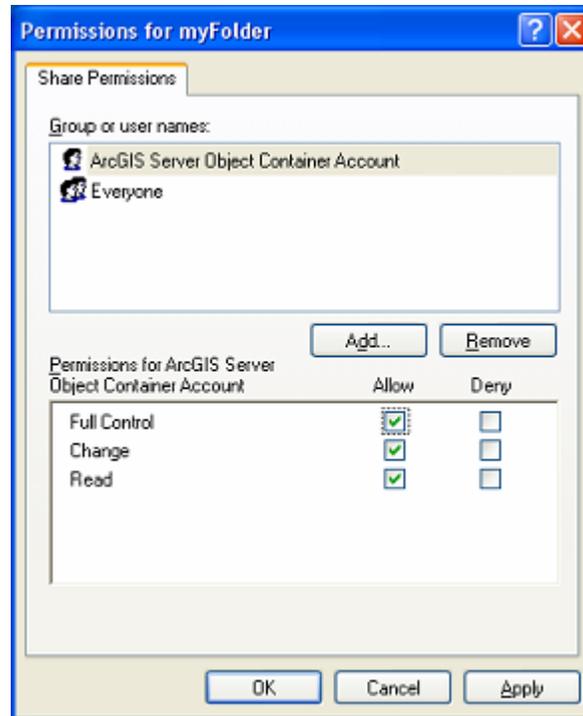
Sharing a Folder in Windows by Using the Sharing Tab on the Folder's Properties Dialog Box

When you choose to share a folder in Windows, you need to specify share permissions and NTFS permissions (file permissions). Share permissions describe the levels of access different users will have to the folder. NTFS permissions describe what users can do with the folder's contents. When a user attempts to access the folder, share permissions are considered first, followed by NTFS permissions. In the case of conflict between the two permissions, the most strict permission is applied.

Grant Share Permissions to the Server Output Directory

For a server output directory, you need to give full control share permissions to the ArcGIS Server Object Container account you specified during the postinstallation. You can set the share permissions in the folder's Properties window on the Sharing tab then clicking the Permissions button. You can then view and edit the folder's share permissions on the Permissions dialog box.

Figure 7

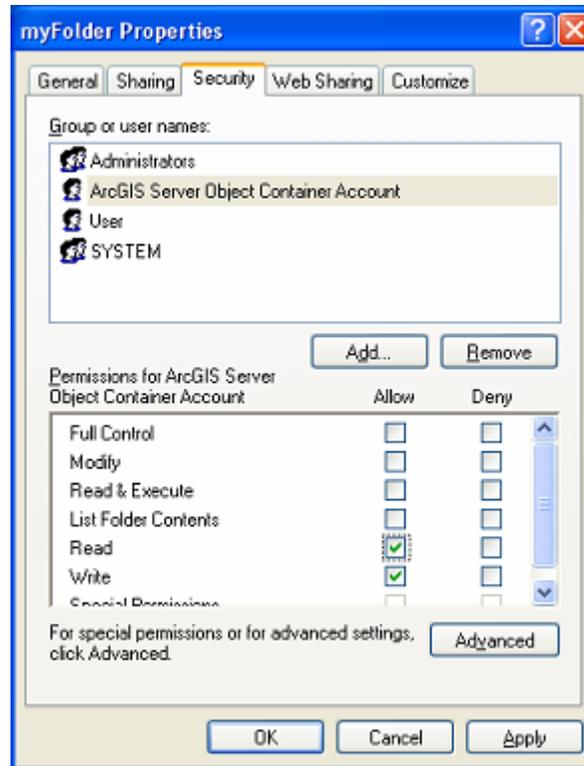


Granting Share Permissions in Windows XP

Grant NTFS Permissions to the Server Output Directory

Server output directories also require that the ArcGIS Server Object Container account have read and write NTFS permissions. You can set NTFS permissions in the folder's Properties window, on the Security tab.

Figure 8



Granting NTFS Permissions in Windows XP

Associate a Virtual Directory with the Server Output Directory

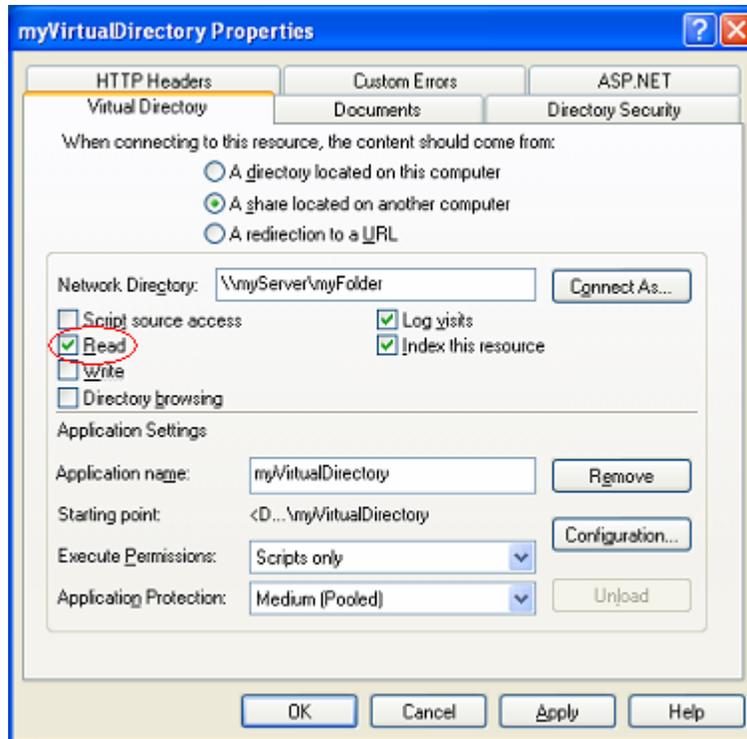
A virtual directory allows Internet users to access the contents of a folder on your computer via a URL. When you associate a virtual directory with your server output directory, you allow your Web applications to make use of the server output directory's contents.

Creating a virtual directory for your server output directory is optional. If you want images returned from your GIS server to be available via a URL, you must configure a virtual directory.

You can create a virtual directory on your Web server machine using your Web server's administration software; however, the server output directory itself does not have to be on the same machine as the Web server. Remember the following points when creating a virtual directory:

- Before you create the virtual directory, make sure that you have shared your server output directory and granted appropriate permissions as described in the previous section.
- When specifying the server output directory that the virtual directory will point to, use a UNC path.
- Make sure the virtual directory has read access enabled.

Figure 9



Verifying That a Virtual Directory Has Read Access Enabled in Internet Information Services (IIS) 5

Grant Permissions to Data Directories

The server objects created by ArcGIS Server rely on existing data in the form of map documents and address locators. All SOC machines must have access to this data. There are two options for ensuring that all SOC machines can access the data.

- Option 1: Maintain one copy of the data in a shared folder. All SOC machines will access the data in this folder using a UNC path.
- Option 2: Maintain identical copies of the data on each SOC machine using an identical folder structure. You can then use local paths to refer to the data. This configuration is potentially faster, since a SOC will never have to retrieve data from a different machine; however, it can be difficult to maintain if the data changes often. Also, this option is impractical for large datasets.

For both options, you need to give the ArcGIS Server Object Container account permissions for each folder containing data in the same way that you granted the container account access to the server output directory.

If a folder contains data that will be used by a server object, you need to do the following:

- If the folder is shared, grant full control share permissions to the ArcGIS Server Object Container account for the folder.

- Grant read and write NTFS permissions to the ArcGIS Server Object Container account for the folder.

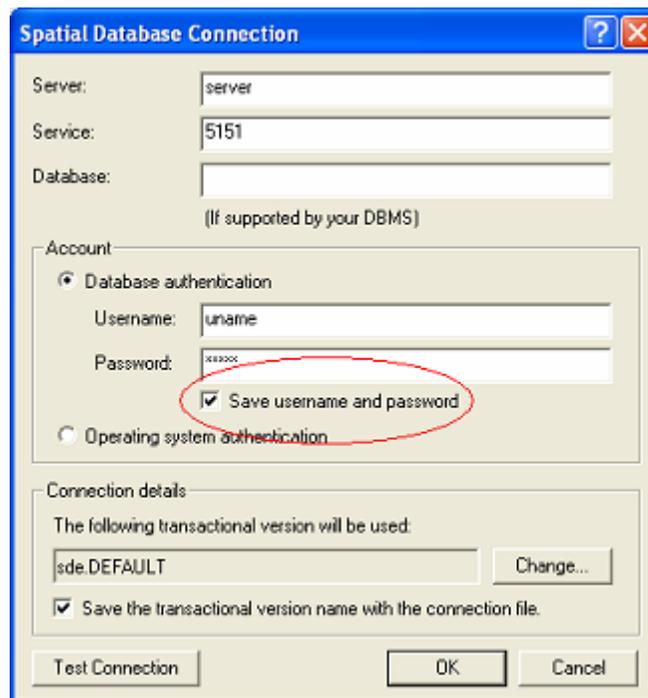
Steps on how to grant permissions were covered previously in this document.

These steps apply not only to folders that contain the source documents but also to folders that contain data referenced within the document. If you have a map document that displays two data layers, and the map document and the data reside in different directories, you should grant permissions as described in the steps above for both the folder containing the map document and the folder containing the data.

A simpler solution would be to store the map document and its data in the same folder. You could then use relative paths within the map document to reference the data. This way you would only have to grant permissions for one folder.

When map data is retrieved from ArcSDE®, the connection information should be saved with the map. You can select the option to save the name and password when you make the connection in ArcCatalog.

Figure 10



Checking the Save username and password check box ensures that the connection credentials are stored with the map.

For geocode server objects, ArcSDE address locators are valid initialization data.

Configure the Log Directory

To aid server administration and troubleshooting, the server writes log files to a specified location. The default location is <ArcGIS install location>\log, and the ArcGIS Server installation gives the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts permissions to this directory. These permissions are sufficient for an ArcGIS Server installation on one machine; however, for a distributed installation, you need to make some extra configurations.

- Share the log directory.
- Ensure that the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts have full control share permissions to the log directory.
- Ensure that the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts have read and write NTFS permissions to the log directory.

When a user queries the log files using the server API, a container process does the work. This container process could reside on any SOC machine; therefore, the above steps are necessary to ensure that it can access the log directory.

If you want the logs to be written to a directory other than the default, you should follow the same steps listed above. Additionally, ensure that the ArcGIS Server Object Manager account has full control share permissions for the directory. If you do not configure the directory correctly, the server will write the logs to the default location.

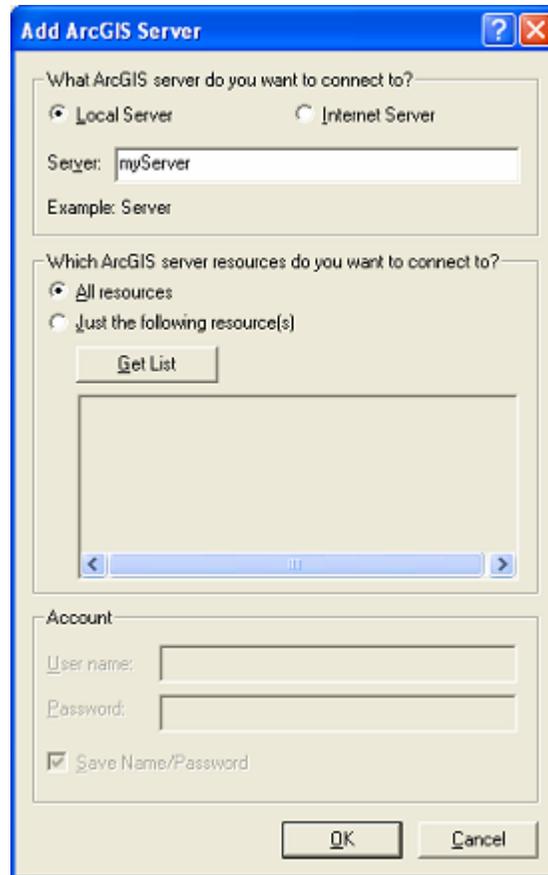
Connect to the GIS Server

At this point you are ready to connect to the GIS server. You will use ArcCatalog to connect to and administer the server. ArcCatalog does not have to be installed on the same machine as any of your other ArcGIS Server components; it just has to be on the same local network and not behind any firewalls.

When you first connect to the GIS server, make sure that you are logged in to Windows with an account that is in the agsadmin group. If this is not possible, you can use the runas command to run ArcCatalog under an account that is in the agsadmin group. See page 56 of *The ArcGIS Server Administrator and Developer Guide* for more detailed instructions.

The Catalog tree contains a GIS Server folder that you can use to manage the servers that you connect to. In the Add ArcGIS Server dialog box, choose to connect to a Local Server and enter the name of your SOM machine in the Server text box.

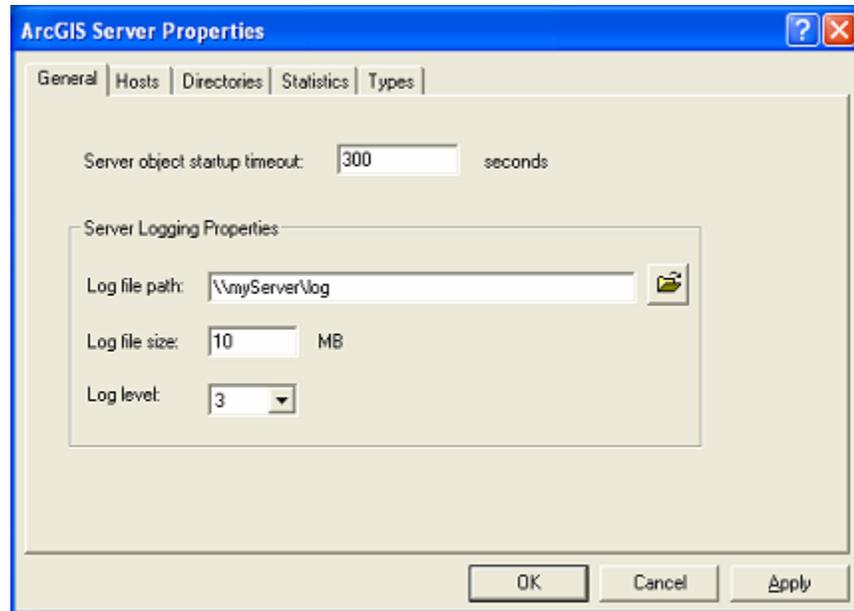
Figure 11

*Connecting to a GIS Server in ArcCatalog*

Specify the Log Directory Location

If you want to use a log directory other than the default location of <ArcGIS install location>\log, you can change it in the server's ArcGIS Server Properties window. The General tab contains a text box to specify the log file path. In a distributed installation, you should change this to a UNC path. Instructions about sharing the log folder and granting it the appropriate permissions were covered earlier in this document.

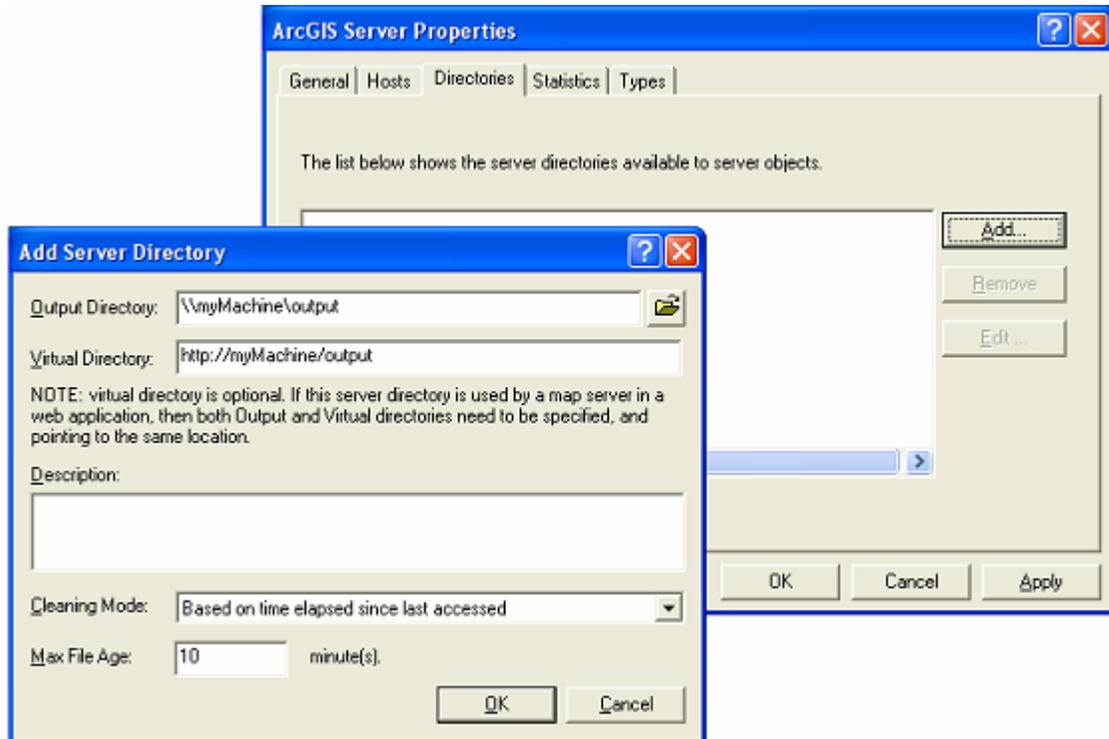
Figure 12

*Specifying the Log Directory Location*

Add Server Output Directories

Once you have connected to the server, you can specify one or more server output directories that it can access. The ArcGIS Server Properties window contains a Directories tab where you can add server output directories. The directory sharing and permissions should already be configured as explained earlier in this document. When you enter the name of the directory, be sure to use a UNC path.

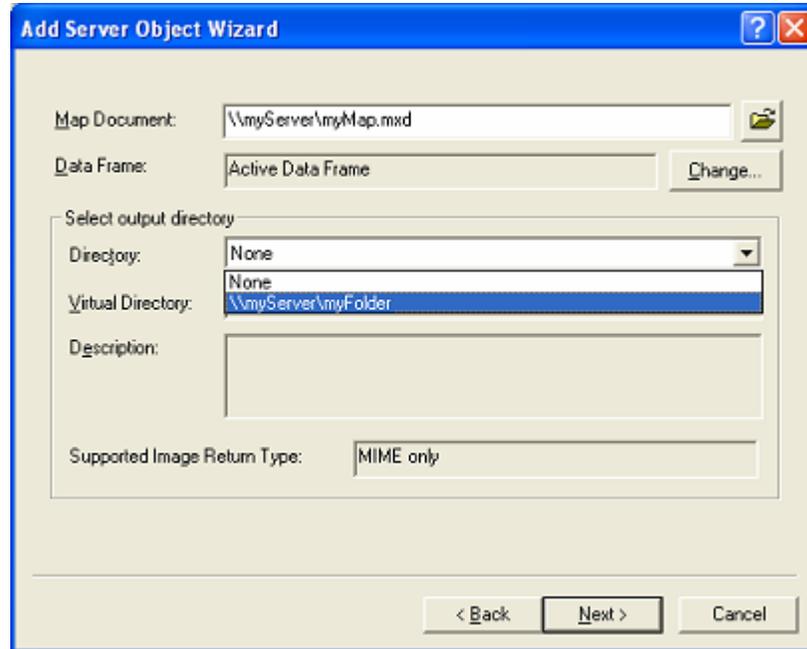
Figure 13



Adding a Server Output Directory

When you create a server object, you can choose which server output directory it will use. If you select None, map images will be accessed using MIME data.

Figure 14



Selecting the Server Output Directory That a Server Object Will Use

Add Container Machines

The GIS server cannot function without machines that host SOC processes. Although you installed the SOC component of ArcGIS Server on at least one machine, you must manually add each SOC to the server before it can function. Before adding the SOC machines to your server, make sure that you have run the postinstallation on each machine and have granted the ArcGIS Server Object Container account permissions to the data and server output directories that it will need to access.

To add a SOC machine, follow the instructions on pages 65–66 of *The ArcGIS Server Administrator and Developer Guide*. Remember that the ArcGIS Server Object Container account names must be identical on each SOC machine that you add.

Add Server Objects

With a connection to the server established and server output directories, server data directories, and container machines in place, you can begin publishing GIS resources on your server in the form of server objects. To add a server object, follow the directions on pages 58–61 of *The ArcGIS Server Administrator and Developer Guide*. When you specify the initialization data for the server object (for example, a map document for a map server object), you can use either

- A UNC path
- A local path, if all SOC machines have their own local copies of the data available at the identical local path

If the GIS server has been configured successfully, it should be able to start an instance of a server object. To test this, create and start the server object in ArcCatalog. You can

verify that a map server object was successfully started by clicking the Preview tab and viewing the map. For a geocode server object, you can view the log files to ensure that the server object was started successfully. Look for a message with code 3013 (server object configuration started) with no errors preceding or following the message.

Troubleshooting

With the many deployment possibilities of ArcGIS Server, the multiple steps involved in setting up the system, and the uniqueness of environments in each organization, troubleshooting is often a necessary part of the install process. Your biggest help when troubleshooting will be the log files. These are found in <ArcGIS install location>\log. For information on how to set the logging level and interpret the log files, see "Appendix B—Configuration and Log Files," in *The ArcGIS Server Administrator and Developer Guide*.

The following sections contain help for problems or error messages that you may encounter when working with ArcGIS Server, especially during the distributed installation process.

Problems

This section describes some common problems when configuring ArcGIS Server and suggestion solutions.

When previewing a server object in ArcCatalog, you see a white screen. The coordinates adjust correctly when you move the mouse, but nothing is visible. This problem can occur if your map document contains invalid data layers. Verify that the data exists at the path specified in the map document.

You may also see a blank screen when the server output directory is configured correctly, but its associated virtual directory is not. For example, if you configured a server output directory with an associated virtual directory and the virtual directory was later deleted, you could encounter this situation. To solve the problem, open IIS Manager and verify that the virtual directory exists, points to your server output directory, and has the correct permissions applied.

Remote connections to the SOM and SOC fail after upgrading to Windows XP SP2 or Windows Server 2003 SP1.

Support for this problem can be found in ESRI Knowledge Base article 29385:
<http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=29385>.

Server configuration and/or server objects are lost when ArcGIS Server Object Manager service is restarted.

If you need to restart the SOM service, an error may occur with the Microsoft XML parser version. ESRI Knowledge Base article 29524 gives more details:
<http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=29524>.

Error Messages

Error messages may appear in the log files, on your screen, or both. Below are some of the most common error messages with suggestions for troubleshooting them.

"Access denied" or "The connection could not be made."

These messages sometimes appear as parts of the more detailed messages listed below. You can find general support for these errors at ESRI Knowledge Base article 29042:
<http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=29042>.

If an "Access denied" error occurs after upgrading to Windows XP Service Pack 2 or Windows 2003 Server Service Pack 1, see ESRI Knowledge Base article 29385: <http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=29385>.

"The connection could not be made. Access denied: The SOM service on machine xxx is not started and does not allow startup by this user."

This error will appear if you fail to log out and back in to your machine after running the postinstallation. Certain DCOM permissions settings related to the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts are modified during the postinstallation. You need to log out, then log back in, for these to take effect.

"The connection could not be made. Access denied: The SOM service is not registered on machine xxx."

This error appears when the SOM component is not installed on the machine that you are attempting to connect to. If you have installed the SOM, verify that you have run the postinstallation, followed by logging off and back on to your machine.

"Server failed to find a place for a new instance."

This error may appear when no SOC hosts have been added to the server. Check the Hosts tab of the ArcGIS Server Properties window to see if any hosts are connected to your GIS server. If the ArcGIS Server Properties window shows that you have added the hosts, verify that they are online and connected properly.

"Machine xxx is not a valid server container. Error: 0x80070005 (Access is denied)."

This error appears when you are attempting to add a SOC host. Verify that you have installed the SOC component of ArcGIS Server on the machine you are attempting to add. This error message will also appear if you have not run or completed the ArcGIS Server postinstallation on the SOC machine or if each SOC machine does not have identical names and passwords for the ArcGIS Server Object Container account.

"Server context creation failed."

This error often signifies that the server cannot read from or write to a directory. Check your server output and log directories to verify that they are shared and referenced through a UNC path. Also, ensure that the ArcGIS Server Object Container account has appropriate share and NTFS permissions to the directories as described earlier in this document.

Data directories should also be shared and referenced through a UNC path, unless copies of the data are located on each SOC machine at identical local paths. The ArcGIS Server Object Container account requires permissions to read and write to the data directories, no matter what type of path is used to reference them.

"Server context creation failed on machine xxx. Access to output directory is denied."

This error appears when the ArcGIS Server Object Container account does not have write permissions to the server output directory. See ESRI Knowledge Base article 26554: <http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=26554>.

"Server context creation failed on machine xxx. File yyy does not exist."

The most likely cause of this error is that the server cannot find the file, such as a map document, you specified as initialization data for your server object. Check the server object properties to make sure that a valid path to the data was entered. Then, check the data itself to make sure that the ArcGIS Server Object Container account has appropriate share and NTFS permissions to access it, as described earlier in this document. You may also try checking your server output directory to make sure that the container account has appropriate permissions for it and that any virtual directories pointing to the server output directory are configured correctly.

"Your selection cannot be displayed in the current view."

This error appears in the preview window of ArcCatalog when attempting to preview a server object. It is most commonly caused by incorrectly configured directories for server output and data. If you see this error, check the server object properties to verify that the server output directory and initialization data are referencing valid paths. Share and NTFS permissions for the directories should be configured as described earlier in this document.

Further help for this error can be found in the following articles:

- ESRI Knowledge Base article 29502
<http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=29502>
- ESRI Knowledge Base article 29506
<http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=29506>

"Machine xxx is not a valid server container. Error: 0x80040154 (Class not registered)."

The probable cause of this error is that a machine you are trying to add as a SOC host does not have the SOC component of ArcGIS Server installed. To correctly configure the SOC host, install the SOC software and run the postinstallation, ensuring that the ArcGIS Server Object Manager and ArcGIS Server Object Container accounts have the same names and passwords as they do on the other machines in your configuration. Then log out and back in to the machine.

"GIS server is not running on machine xxx."

This error can occur if you enter an invalid machine name or it can indicate a DCOM permissions problem, as described in ESRI Knowledge Base article 29385:
<http://support.esri.com/index.cfm?fa=knowledgebase.techarticles.articleShow&d=29385>.

"The connection could not be made. GIS server is not running on machine xxx."

This error may actually signify that ArcCatalog cannot locate machine xxx. Make sure you have entered the name of a valid machine on your network that would be accessible to the machine running ArcCatalog.

"The selection cannot be previewed."

This message may be displayed if an irrelevant node is clicked in ArcCatalog such as Add Server Object.

Summary

ArcGIS Server has a scalable architecture that allows for a distributed installation among any number of machines. The most direct way to add computing power to your GIS server is by adding Server Object Container machines. The machines in an ArcGIS Server system must be able to freely communicate with each other, unhindered by firewalls, file naming conflicts, or restricted permissions to data and folders.

To facilitate a successful distributed installation of ArcGIS Server, remember the following key points:

- The ArcGIS Server Object Manager and ArcGIS Server Object Container accounts must exist and have consistent names and passwords on all machines in your GIS server.
- After running the postinstallation, log off and back on to the machine before continuing to configure your system.
- At a minimum, you must add yourself to the agsadmin group so that you will be able to connect to and configure the server.
- The ArcGIS Server Object Container account must have both share permissions and NTFS (file) permissions to server output directories, data directories, and the log directory.
- Grant read and write access in Internet Information Server to any virtual directories that you create.
- Use UNC paths to refer to server output directories and log directories.
- Grant the ArcGIS Server Object Container account read and write permissions to all data.
- Use the log files and the information in this document to troubleshoot any error messages that may appear.



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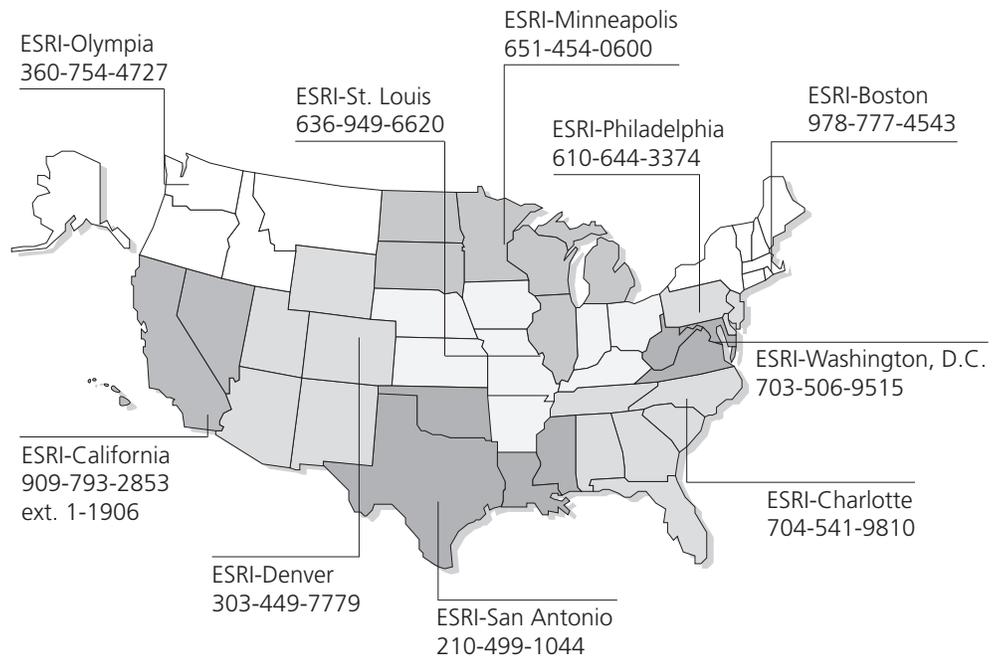
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