

# Microsoft SharePoint Products and Technologies Server Farm Architecture

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## Server Farm Architecture Overview

This white paper introduces server farms and how you can use them to address scalability and reliability issues. It explains how you can use Microsoft® Office SharePoint® Server 2007 and Windows® SharePoint Services 3.0 in server farms and describes typical layouts for Microsoft SharePoint Products and Technologies server farms. Finally, it describes how to deploy Office SharePoint Server 2007 and Windows SharePoint Services 3.0 in a server farm environment.

When you deploy a server-side solution, you must plan how your solution will respond to increased workloads, changing user requirements, and server failures. You can use a server farm deployment model to help ensure that your solution is scalable, flexible, and resilient to hardware failures.

In this section, we:

- Explain what a server farm is.
- Describe how to increase scalability with server farms.
- Describe how to increase solution availability with server farms.
- Explain how to improve solution flexibility and manageability with server farms.
- Evaluate real-world server farm scenarios.

### What Is a Server Farm?

A server farm is a collection of networked servers that work together to provide the server-side resources that your organization requires. You can cluster multiple servers in a server farm to represent a single entity or resource, such as a Web server or a specific application server. In these situations, you can configure the server farm to distribute requests among the servers in the cluster according to their workloads and availability. You can also use server farms to provide a degree of redundancy for particular server roles. For example, if a Web server fails, your server farm can automatically route incoming requests to a second Web server. Server farms can often provide a more scalable and flexible alternative to upgrading existing servers by adding hardware.

### Typical Applications

One of the most common applications of server farms is to provide a flexible, scalable Web front-end solution. This is often referred to as a Web server farm or a Web farm. You can use hardware or software network load balancing to distribute incoming HTTP requests evenly between Web servers according to their availability. You can easily add servers to the farm to handle the increase in demand as the number of visitors to your site rises. This approach also enables you to minimize downtime for your site. If a Web server fails, requests are distributed among the remaining servers until the faulty server is online again.

You can move server roles between servers in your farm to handle the demands made on the disks, memory, and processors of individual servers. This enables you to scale your solution as demand increases or changes. For example, in a small Office SharePoint Server 2007 server farm consisting of one front-end Web and application server and one database server, the query and indexing server roles usually run on the front-end Web server. If the number of users or demand increases, you may choose to add an additional front-end Web server and possibly a dedicated application server. In this scenario, you may choose to move the indexing role to the application server and the query role to each of the front-end Web servers. If you determine that the workload of the indexing server increases, you could optionally add another server to the farm, specifically for the indexing role, and move the indexing service from the application server to the new, dedicated index server.

**Note:** The ability to split the query and indexing roles onto separate servers is a feature of Office SharePoint Server 2007; it is not possible in Windows SharePoint Services 3.0.

Finally, you can use server farms to improve database availability. Microsoft SQL Server® 2005 supports four principal techniques that you can use to provide high database availability: failover clustering, database mirroring, log shipping, and replication. You can use all of these techniques apart from replication with the databases in your SharePoint Products and Technologies solution.

There are two types of scenarios to be aware of as relates to database redundancy: high availability for local redundancy and high availability using a standby data center (which is typically distanced from the production data center to account for geographic disasters.) From a SQL Server database standpoint, failover clustering and SQL mirroring are candidates for local high availability, whereas SQL Log Shipping or SQL Mirroring would be candidates for providing high availability in the event of a data center / geographic failure.

**Note:** For more information about how to use failover clustering, database mirroring, and log shipping with SharePoint Products and Technologies, see the white paper, "Backup, Restore, and Disaster Recovery for Microsoft SharePoint Products and Technologies."

## Scaling Solutions with Server Farms

As the demands on your server-side solutions change over time, you must decide whether to upgrade the hardware in your existing servers or add new servers to your server farm. A thorough performance-monitoring strategy will help you to identify physical bottlenecks and understand which system resources are overused. You must also consider whether to include redundant hardware to provide high availability and how your requirements will change over time.

**Note:** For more information about performance monitoring for Windows SharePoint Services 3.0, see another white paper in this series, [Microsoft SharePoint Products and Technologies Operations](#).

## Physical Bottlenecks

Physical bottlenecks fall into four main categories: memory, processor time, disk access, and network. Robust bottleneck detection is a complex subject and is beyond the scope of this paper. However, when you have identified the bottlenecks in your servers, after turning your existing solution for maximum performance (by using options such as caching, IIS compression, Content Database taxonomy, and so on), you may decide how to scale your solution to remove each bottleneck and improve system performance. The following table summarizes the hardware scaling options available to you for each type of bottleneck.

Bottleneck	Details
Memory	<p>In a “typical Office SharePoint Server environment”, with all things being equal, memory shortages are most likely to occur in database servers, search servers, and e-mail servers. Microsoft Windows Server® 2003 includes several performance counters that you can use to monitor how physical and virtual memory are used. You can fix isolated memory shortages simply by adding more RAM to the server. However, if your performance monitor data indicates that processor time is also highly allocated, it may be preferable to add a server to share the workload.</p>
Processor	<p>Processor bottlenecks are also most likely to occur in database servers, search servers, and e-mail servers. However, Web servers can incur more processor load if you use encryption, such as Secure Sockets Layer (SSL), to protect communication with clients or IIS compression to compress data. You can use Windows Server 2003 performance counters to monitor levels of activity at the system level, the processor level, the process level, and the thread level. You can resolve processor bottlenecks by upgrading the processor, by adding additional processors, or by adding a server to share the workload. Although clustered servers are the more expensive solution, you gain additional advantages such as increased fault tolerance and improved performance through network load balancing.</p>
Disk	<p>Disk latency is most likely to affect file servers, database servers, and search servers. From an Office SharePoint Server perspective, the speed and performance of the database servers is of utmost importance as all content is stored there. Page response times can be dramatically affected by the performance and ability of the database server to fulfill user requests. You can use Windows Server 2003 performance counters to measure disk read and write times, queue lengths, and several other indicators at the physical disk and logical disk levels.</p> <p>You can solve disk bottlenecks in several different ways. If you have less than 30% free space on the drive, the disk read and write times will degrade substantially, and you should consider installing an additional disk or moving your data to another disk or server. Windows Server 2003 Distributed File System (DFS) technologies can help you to distribute a file system over multiple servers. Excessive fragmentation will also lead to poor disk performance, so you should ensure that your disks are defragmented on a regular basis.</p> <p>Also, it is important to note that Office SharePoint Server content</p>

Bottleneck	Details
	<p>databases are the container for site collections and everything stored within the site. Therefore, splitting site collections among multiple content databases and increase performance of the database server as the overall size and number of records in the tables for each content database will be reduced.</p> <p>If you still require faster read and write times, you can use disk striping techniques or upgrade to faster disks.</p>
Network	<p>Poor performance in any server application can be due to network bottlenecks. You can use Windows Server 2003 performance counters to measure network usage and other levels of activity. How you solve a network bottleneck depends on the cause of the problem. Additional network cards or faster network cards, better network segmentation, and packet switches can all help to alleviate the problem.</p> <p>Remember; in working to increase overall throughput of your farm, it will only perform as fast as the slowest bottleneck. In the case of network performance, it is critical to ensure that all network cards are performing as expected, and you'll also want to make sure to have a fast network connection between the front-end Web servers and application servers, in addition to the connection between these servers and the database servers as there is a high amount of communication that takes place between these servers.</p>

### Network Load Balancing for Scalability

The most common application of network load balancing technologies is to distribute incoming HTTP requests to front-end Web servers. You can use built-in Windows Server 2003 network clustering tools to create load-balanced clusters with up to 32 hosts, although the performance gains may start to diminish if you add more than 20 to 25 hosts to the cluster. You can use round robin DNS (Domain Name System) to distribute requests between multiple clusters. Round robin DNS is a load balancing technique in which a DNS server distributes incoming requests among a set of Internet Protocol (IP) addresses. The DNS server distributes requests to each server in turn. However, for solutions on this scale you may want to use hardware network load balancing as an alternative, because it sends each request to the least used server and therefore distributes load more evenly.

### Scaling Up vs. Scaling Out

You can scale a server solution to cope with increased demand in two distinct ways. A scaled-up architecture means that you upgrade the hardware in your existing servers, or you replace the server with a more powerful model. A scaled-out architecture means that you add servers to share the workload, so that each server has to handle a smaller proportion of the overall demand. Furthermore, a scaled-out architecture means that specific servers can be dedicated to specific tasks. This reduces contention for resources between processes that have different resource-usage characteristics.

Scaling up is often seen as the default option, because processor performance continues to increase. However, this approach can leave you vulnerable to hardware failure (for example, if you were to scale up your server farm to include one front-end Web server, instead of two front-end Web servers). If your organization requires high availability, you

must ensure that you have redundant systems that can manage the server workload. Scaling out leaves you less susceptible to hardware failure, because the failure of an individual node simply means that the workload is divided among the remaining nodes. Scaling out also provides you with a more flexible architecture, because you can add or remove lower cost servers as required to meet demand. You should generally use the scaled-out model for Web servers and consider it for your SQL databases.

## Increasing Availability with Server Farms

When you deploy a server solution, you must consider the effects of server downtime. If your solution provides a business-critical service, you must plan for high availability by ensuring that a single hardware failure does not affect your operations. For example, you should plan for high availability in the following situations:

- Employees depend on the service to do their jobs.
- Customers use the service.
- Business transactions depend on the service.
- Service Level Agreements (SLAs) require a level of high availability.

In these situations, a standalone installation cannot meet your requirements as it will be very vulnerable to downtime should a hardware component fail, and you must use a server farm deployment.

### Cost of Availability

When you plan for availability, you balance the cost of purchasing and maintaining additional servers against the costs that your organization will incur when services are unavailable. In addition to unplanned downtime, you should also consider the impact of any scheduled downtime that you require to apply updates or service packs.

To estimate the cost of server downtime, first estimate the hourly cost of service outages. These may include lost productivity and loss of sales. Then estimate your annual downtime in hours by calculating your average number of server failures per server per year and the average number of hours it took to bring the server online again for each failure. Factor in your planned maintenance downtime. You can then multiply the hourly cost by the annual server downtime to obtain your estimated annual cost of downtime.

To estimate the cost of an additional server, consider the initial purchase cost, the average annual maintenance cost per server, and the cost of any software licenses.

### Load Balancing for Availability

You can use software or hardware network load balancing solutions to increase availability and to handle more concurrent user requests. In load balancing, many servers which perform the same functionality or provide the same services are connected together to distribute load across the servers. Load balancing, from an Office SharePoint Server perspective, can be particularly useful in distributing requests at the Office SharePoint Server front-end Web topology tier and can also be useful to the query role in Microsoft

Office SharePoint Server 2007, such as hosting the query service on the load balanced front-end Web servers. Other roles, such as the indexing role, will not be candidates for load balancing as they cannot be distributed among multiple servers.

In the Microsoft Windows Network Load Balancing (NLB) service, a software load balancing technology, the active host in a network load balancing cluster sends heartbeat signals to every other host in the cluster (in the case of a typical medium Offices SharePoint Server farm, the front-end Web servers). If a host stops sending heartbeats, the cluster automatically removes the faulty host (in the previous example, a front-end Web server) and any new requests are distributed between the remaining front-end Web servers. It takes a total of around eight seconds for a network load-balancing cluster to detect a server failure and reconfigure itself without the failed host.

Windows NLB solutions can help to protect your deployment from downtime due to hardware or platform failures. However, it does not protect you from individual service failures. For example, if the W3SVC service on a Web server stops, the host will continue to send heartbeat signals and the load balancer will continue to send traffic to the host.

Hardware load-balancers are generally more expensive than software load-balancers, although you can often mitigate the cost by purchasing a hardware load-balancer that is combined with an edge switch, a firewall, or a reverse proxy server. In a hardware-based load balancing solution, a hardware appliance receives requests for the services on a server via a virtual IP address. The load balancer then determines which server it should route the request to.

Load-balancing solutions typically use one of three methods to determine how to allocate requests between servers. The following table lists these methods.

Method	Details
Round robin	A DNS server maintains the IP addresses of multiple Web servers for a single URL. Requests are distributed between the Web servers in turn.
Least connections	The load balancer sends new requests to the Web server with the least active connections.
Fastest response	The load balancer sends new requests to the Web server with the fastest response time.
Weighted Percentage	The load balancer assigns a specific performance weight to each server. It is similar to least connections, however it will assign a higher percentage of requests to servers with a heavier performance weight (usually those with the higher processing power).

Round robin is the least sophisticated technique, and fastest response is the most sophisticated technique. Some load-balancing solutions also enable you to attach weightings to each server. This can be useful in server farm environments where some servers have additional responsibilities, such as running search or indexing services. Additionally, persistence can be configured to ensure that requests from a client machine are always routed to the same front-end Web server.

## Redundancy

If your deployment demands high availability, every possible server role in your Office SharePoint Server application must run on at least two servers. There are certain roles that can/cannot be redundant in SharePoint, such as the index server).

For example, to install a two-tier solution with a Web front-end layer and a database layer, you would require a farm with at least four servers: two load-balanced Web servers and two clustered or mirrored database servers. The front-end Web servers would typically also provide the query service. In addition, you should not expose the Web server or application server that hosts the Central Administration Web site to the Internet. For larger deployments, as such you may determine to add a fifth server to host the application server role (in this scenario, hosting Central Administration, the SSP(s), and possibly the index server role). Remember, you should always seek to design and build redundancy into your capacity planning.

## Database Availability

Failover clustering is the most common way to ensure high database availability for your solutions. You typically install your database on a shared disk array where it can be accessed by two or more clustered database servers. Clients connect to the database cluster as if it were a single server. You can configure the cluster so that if one of the database servers fails, any new queries are distributed between the remaining servers. However, the shared disk array remains a single point of failure.

SQL Server 2005 provides an alternative way to maintain database availability in the form of database mirroring. Database mirroring is implemented on a per database level. Mirroring takes advantage of the transaction logs in SQL Server. As records are added to the transaction log, these records are sent to the mirrored server. The mirrored server adds the records to its transaction log and executes the commands, thus keeping the mirrored server in sync with the production server in near real time.

**Note:** You can use database mirroring in conjunction with other high availability techniques such as transaction log shipping. For more information about the use of database mirroring with SharePoint Products and Technologies, see the white paper, "Backup, Restore, and Disaster Recovery for Microsoft SharePoint Products and Technologies."

## Increasing Flexibility and Manageability with Server Farms

When you plan the deployment of a scalable solution, you must consider how to manage any future expansion. You must also consider how this expansion will affect the manageability of your solution. A scaling-up approach to expansion and a centralized administration model can limit the flexibility and manageability of your solutions as your user base and system requirements grow.

## Incremental Expansion

One of the major advantages of the server farm deployment model is the ease with which you can add servers to cope with an increased workload. If you use one large multiprocessor server, you would typically manage an increase in demand by adding a processors or memory to that server. In terms of flexibility, this approach has several disadvantages:

- The number of processors you can add to a single server is limited. In theory you can add up to 32 processors for a 32-bit system and up to 64 processors for a 64-bit system, although physical limitations of the specific server hardware and configuration are likely to reduce these numbers. For instance, a server's motherboard may contain a set number of RAM or processor modules.
- The system resources of the server are shared with the new processor, which can create bottlenecks in other areas. For example, when you add a new processor, or multiple processors, you may put increased load on RAM, causing it to become a new bottleneck.
- The solution must be taken offline while you perform the upgrade. When upgrading server hardware, you must remove it from production operation to complete the upgrade. In a scenario where you're running only one server for a specific Office SharePoint Server topology tier, removing this server will result in that removal of that specific Office SharePoint Server role from the farm as well.

In contrast, the server farm model enables you to add lower cost, single or multiprocessor servers whenever your circumstances require expansion. You can also add servers without taking your solution offline. For example, when you have installed a new Web server, you can add it to a network load-balanced cluster without interrupting the workload of the existing hosts.

In a Windows SharePoint Services 3.0 or Office SharePoint Server 2007 server farm, you may start with a smaller server farm that consists of a single Web front-end and application server and a single database server. As your user base grows, you can undertake any of the following common expansions without any service interruptions:

- Add an additional Web front-end server and configure load balancing to improve performance and availability.
- Move the indexing service, the search service, or both onto a dedicated server to reduce the workload on the Web front-end servers.

**Note:** you can only separate Index and Query Services on Office SharePoint Server 2007 implementations.

- Add a clustered or mirrored database server to improve performance or database availability.

**Note:** you cannot add multiple database mirrors per content database. When using database mirroring, there is always a 1:1 relationship between the production database and the mirrored database. However, you can add multiple servers to a SQL Server cluster.

## Managing Upgrades

One of the disadvantages of the server farm deployment model is that you must manage non-Office SharePoint Server software updates, and possibly hardware upgrades, on a larger number of servers. However, this can also help you to manage the availability of your solution. For example, suppose you want to apply updates to every Web server in a network load-balanced cluster.

If you want to upgrade a server in an Office SharePoint Server farm, we recommend completely removing the server from the farm, making the update, and then reintroducing it into the farm. This reduces any risks associated with the update and it also prevents administration overhead for the Office SharePoint Server administrator caused by multiple erroneous System Center Operations Manager alerts.

For the purposes of the NLB discussion, you can:

1. Remove a single server from the network load-balancing cluster. If you use Windows Server 2003 network load balancing, use the **nlb drainstop** command to stop a host from receiving new requests without interrupting existing requests. If you use hardware load balancing, remove the server from the load balancer appliance.
2. Apply the updates and reboot the machine, while the remaining hosts in the cluster handle any new client requests.
3. Return the updated server to the cluster and verify that it responds as you expect. If you are using Windows Server 2003 network load balancing, you can use the **nlb start** command to instruct the server to accept new requests again.
4. Repeat the process for the other servers in the cluster.

## Delegated Administration

You can improve the manageability of your server solution by distributing administrative and maintenance tasks to appropriate individuals in your organization. This reduces the burden of ownership on enterprise administrators and domain administrators. It can also improve security, because you can reduce the number of individuals who have enterprise-wide administrative control.

At the farm level, you may delegate the responsibility for creating and managing databases to database administrators (DBAs). The DBA creates the database, creates the accounts that are used to access the database, and configures the surface area of the database to minimize the potential for access by malicious users. In Windows SharePoint Services 3.0, you may choose to delegate administration of the three server roles. To do

this, you can create separate administrative groups for Web front-end servers, application servers, and database servers.

You can distribute administrative responsibilities in Active Directory® domains by creating Organizational Units (OUs) that represent the structure of your organization. For example, you may create a database server OU and then assign a user the administrative rights to create and manage user and computer accounts in that unit.

In Windows SharePoint Services 3.0 and Microsoft Office SharePoint Server 2007, you can delegate administrative rights for sites and site collections to the relevant project managers or departmental heads. These users can then administer role memberships, permissions, and site and content structure for their own team resources without the assistance of IT staff. This substantially reduces the administrative burden on your IT team and enables your organization to manage resources at a more granular level.

Furthermore, Shared Services Providers in Office SharePoint Server 2007 represent a new, delegated management experience for personalization services (user profiles, audiences, and My Sites), the Business Data Catalog, Excel Services, search, and usage reporting.

## **Discussion: Server Farms in the Enterprise**

The instructor will now lead a class discussion. Please ensure that you participate in the discussion, when appropriate, to ensure that you and the other class members benefit from the discussion fully.

### **Discussion Points**

You can use the following questions to help start the discussion. Feel free to discuss other related points as they arise.

- Have you ever designed or deployed a server farm?
- If so, what were some of the challenges? (Things such as determining which tiers to scale out first, where certain roles should be placed, which roles to investment in the most – From an HW perspective.)
- How did you scale the server farm to meet demand?
- Why did you choose to scale certain roles out or up? What business criteria did you use? (Redundancy, Performance, etc.?)
- How did you manage solution availability?
- What measures did you take to improve the manageability of your solutions?

## **Server Farm Topology**

This section describes the topology of Office SharePoint Server 2007 and Windows SharePoint Services 3.0 server farms. It explains the purpose of each server role and details relevant hardware requirements. It also describes typical server farm layouts and explains the architecture of the Shared Service Provider (SSP).

## Objectives

After reading this section, you will understand how to:

- Describe the Windows SharePoint Services 3.0 server roles.
- Describe the Office SharePoint Server 2007 server roles.
- Describe the architecture of the Shared Service Provider.
- Explain the hardware and software requirements for each server role.
- Describe typical server farm layouts for SharePoint Products and Technologies.
- Explain when you would use multiple SSPs in a server farm.
- Explain when you would share an SSP between server farms.

## Windows SharePoint Services 3.0 Server Roles

When you install Windows SharePoint Services 3.0, you can configure three distinct server roles. These are the Web Front-End server role, the database server role, and the search server role. You can install every role on a single machine or distribute the roles across your server farm.

### Web Front-End Servers

In SharePoint Products and Technologies 2007, the front-end Web server role receives and responds to HTTP requests from your users. Front-end Web servers host the SharePoint Web application in Internet Information Services (IIS). Front-end Web servers send queries and updates to database servers in response to user requests. As the front-end Web server is the only server role that is directly exposed to the end user, you typically install it behind a firewall or a behind a hardware load-balancing device in your perimeter network.

As discussed in previously, you can use network or hardware load-balancing solutions to distribute user requests between multiple front-end Web servers.

The front-end Web server contains the majority of .Net .dll files used for accessing content in the database and formatting that content for users' consumption. It also includes the image, JavaScript, IE behavior, and other relevant files needed by the browser. All Office SharePoint Server features, site definitions, and localization files are stored on the front-end Web server.

The folder that contains most of the Office SharePoint Server system files is known as the "12-hive" and is typically located at <Install Drive>\Program Files\Common Files\Microsoft Shared\web server extensions\12. The majority of Office SharePoint Server managed code libraries are stored in the Global Assembly Cache (GAC) which is located at <Install Drive>\WINDOWS\assembly.

Finally, Office SharePoint Server installs a number of Windows services on the front-end Web machines which are used to communicate with other servers in the farm and perform farm admin services. For instance, the Timer service in a Office SharePoint

Server 2007 will check to see if any new IIS Web applications have been created or solutions deployed, if so, it will download the files it needs from the database and make the appropriate changes locally.

When deploying a front-end Web server, many organizations choose to deploy the “Complete” installation type to ensure easier scalability and flexibility in the future (i.e. by choosing “Complete” you can enable other services on the front-end Web in the future, such as the Query service.)

### **Database Servers**

The database server role is performed by the server on which you install the SQL database. The database server queries and updates the database in response to requests from front-end Web servers. In Office SharePoint Server, the database can be local (on the same server) or remote (on a different server) to the server performing the front-end Web role. However, when you move to a Web farm deployment, your first step will usually be to install the front-end Web server role and the database server role on separate machines. This increases redundancy and also makes it much easier to add additional servers to the farm as needed.

For Internet and extranet deployments, you can isolate the database server role from the front-end Web server role to enhance security. You can install your database server in a separate network from your front-end Web servers for security or use a proxy server such as Microsoft ISA Server 2006 to isolate the server roles. Separate database servers are also useful in organizations where there is a separate database administrator team.

### **Search Servers**

In Windows SharePoint Services 3.0, the search service is the only application server role. The search and indexing service maintains an index of the content on your file system and uses this index to respond to user searches.

As stated earlier, in contrast to Office SharePoint Server 2007, in Windows SharePoint Services the search service cannot be split into a query role and an indexing role. By default, the search service runs on one of your front-end Web servers, depending on which front-end Web you configured to perform the indexing during provisioning. You can run the Windows SharePoint Services Search service on only one server per Web application. In a typical five server farm, consisting of two front-end Web servers, two clustered database servers, and one search server, the search service will run on its own, dedicated server.

## Office SharePoint Server 2007 Server Roles

In an Office SharePoint Server 2007 server farm, you can assign servers to the front-end Web server role or the database server role in the same way that you would in a Windows SharePoint Services 3.0 server farm. However, the Office SharePoint Server 2007 deployment model also includes an application server tier. You can assign services to dedicated application servers. For example, you can configure a dedicated index server, one or more dedicated query servers, and one or more servers that host other application services such as Excel Services, InfoPath Forms Services, and the Business Data Catalog.

In Office SharePoint Server 2007, the application server roles are grouped under and managed by a Shared Service Provider (SSP). Each Office SharePoint Server Web application must be associated with a single SSP. It is not possible to use multiple SSPs with a single Web application. However, a single SSP can serve multiple Web applications, thereby making management of the services for those particular Web applications much easier. Later topics in this paper describe SSPs in more detail.

### Index Servers

The server with the index server role crawls and indexes content sources. During the crawl process, when crawling local content stored within this Office SharePoint Server farm, the index server sends requests for content to a front-end Web server, as the front-end Web server provides data access to the SQL Server backend Office SharePoint Server databases. The front-end Web server responds to the request in the same way that it would respond to any user request. That is, by communicating to the SQL databases via its Office SharePoint Server-managed code libraries. For content not hosted by the local Office SharePoint Server solution, the indexer does not go through its local front-end Web. Instead, the indexer crawls the data source, probably an external site or file share, directly. The index server generates an index on the file system of the content it has crawled and propagates this index to all the servers that host the query server role. In contrast to SharePoint Portal Server 2003, in Office SharePoint Server 2007 the indexing service uses continuous propagation. During the crawl process, new indexing entries are immediately propagated to query servers. This means that your search results are updated far more quickly. The query server maintains an index file together with a set of appended entries; for efficiency, it consolidates the appended entries into the index file at regular intervals.

The index server also maintains a search database (typically hosted on the database server) that contains metadata such as access control lists (ACLs) for the indexed content.

You can only configure one index server per SSP, so it is not straightforward to provide redundancy for the index server role. If the index server fails, your users can continue to use the query service, assuming that the query service is running on a different server and has a copy of the index. However, the search results will grow stale as the index is not updated. Queries are run against a copy of the index up to the point in time where the index server failed.

## Query Servers

Servers with the query server role respond to user searches. When a user performs a search, the front-end Web server passes the query to a query server. The query server searches its local copy of the index and returns search results to the front-end Web server. The front-end Web server then queries the search database to retrieve ACLs and perform security trimming. In security trimming, the front-end Web server removes results that the user is not authorized to access.

You can install the query server role on a single server or on multiple servers.

**Note:** If you install the query server role on the same server that hosts the index server role, the index server does not propagate any of the index changes to other query servers. When scaling out query servers, it is recommended to either scale the query role out to multiple dedicated servers, or to scale the query server role out amongst front-end Web servers, as the front-end Web servers run queries against a local copy of the index to fulfill the search request. However, it should be noted that as this configuration will save network bandwidth, it also requires the front-end Web servers to have large enough disk space to provide for the search index file.

## Other Application Servers

Depending on how people use your Office SharePoint Server solution, you may find that demand for particular SSP services causes bottlenecks in your server farm. In these situations, you can assign individual services to dedicated servers. For example, you may configure one application server to run Excel Services and another to run My Sites and the Business Data Catalog. You may also configure a dedicated application server to host the Central Administration Web site.

**Note:** For a more detailed discussion of SSP services, see the white paper, "Configuring SharePoint Technologies Farms."

## Shared Service Provider Architecture

Office SharePoint Server 2007 groups server roles into three tiers: the Web tier, the application tier, and the database tier. All server roles in the application tier are managed by SSPs. The SSP is designed to provide common services, such as search and indexing, to all the collaboration portals and sites in a SharePoint Web application.

### Shared Service Providers and Web Applications

The relationship between SSPs and SharePoint Web applications is as follows:

- Each Web application can have only one SSP associated with it.
- Each SSP can be associated with multiple Web applications.

This relationship should inform your deployment plan for Office SharePoint Server. For example, if your organization consists of several departments, each department may require its own collaboration portal. However, each department may require similar

functionality such as My Sites, Excel Services, and InfoPath Forms Services, and you may require a consistent search experience across the organization. In this situation, it makes sense to create each departmental portal in a single Web application and with a single SSP.

Alternatively, suppose your organization wants to deploy an intranet portal and an Internet portal. You typically provide your Internet portal with a more restricted set of services and a far more limited search scope, especially as Internet portal users will usually be anonymous. In this situation, it makes sense to create a different Web application for each portal, with a different SSP for each Web application.

In a third scenario, you may want to deploy an intranet portal for office-based employees and an extranet portal for remote workers. You may deploy each portal in a separate Web application due to the different authentication and security requirements. However, office-based workers and home workers are likely to require similar services. In this situation, it makes sense to share a single SSP between both Web applications.

An Office SharePoint Server farm will theoretically support up to 20 SSPs. However, for performance reasons, Microsoft recommends that you create no more than three SSPs in a server farm.

### **Services Provided by the Shared Service Provider**

SSPs provide the following services:

- User profiles and My Sites.
- Search (query and index).
- Audiences for audience targeting.
- Excel Services.
- Business Data Catalog.
- Query usage reporting.

## **Web Front-End Server Requirements**

This topic describes the hardware and software requirements for the Web Front-End server role. When you read the hardware requirements and recommendations, remember that Microsoft recommends 64-bit hardware in the farm and that SharePoint Products and Technologies can support a mixed environment consisting of both 32-bit and 64-bit servers. However, also remember that we recommend that your choice in hardware platform (64-bit or 32-bit) be consistent across topology tiers, although this is not a hard requirement. For instance, if you choose to deploy 32-bit on your front-end Web servers, then we recommend that all front-end Web servers be 32-bit servers, however, you can run an environment that has some front-end Web servers running the 32-bit version of Office SharePoint Server and others running the 64-bit version. It should be noted, however, that there is a risk that the 32-bit front-end Web servers may become overloaded if your network load balancer is configured to use a less-intelligent model

such as round robin. We recommend that you configure your load balancer to manage distribution based on load.

**Note:** For more information about how to configure and install each server role, see the section, "Deploying Windows SharePoint Services 3.0 and Office SharePoint Server 2007 Farms."

## Web Server Requirements

Before you install the Windows SharePoint Services front-end Web server role, you must ensure that each Web server meets the required specifications. The following table lists these specifications.

Component	Requirements
Processor	Minimum processor speed of 2.5GHz required. Dual processors with speeds of at least 3GHz recommended. 64-bit processors optional but highly recommended.
Memory	Minimum 1GB of RAM required. 4GB or more RAM recommended.
Disk	Minimum 3GB of free disk space required. File system must be NTFS formatted.
Network	Minimum 100 Mbps server-server connections required. 1Gbps server- server connections highly recommended.
Platform	Windows Server 2003 operating system required. Service Pack 1 (SP1) or later required.
Software	IIS 6.0 must be enabled. Microsoft .NET Framework 3.0 must be installed. ASP.NET 2.0 must be enabled.

## Database Server Requirements

### Hardware and Software Requirements

Before you install Office SharePoint Server or Windows SharePoint Services databases, you must ensure that each database server meets the required specifications. The following table lists these specifications.

Component	Requirements
Processor	Minimum processor speed of 2.5GHz required. Dual processors with speeds of at least 3GHz recommended. 64-bit processors optional but recommended.
Memory	Minimum 2GB of RAM required. Minimum 4GB of RAM recommended.
Disk	Calculate required disk space as 120% of planned content capacity, excluding any additional space required for your RAID configuration.
Network	Minimum 100 Mbps server-server connections required.

Component	Requirements
	1Gbps server-server connections recommended.
Platform	Windows Server 2003 operating system required. Service Pack 1 (SP1) or later required.
Software	Microsoft SQL Server 2000 (SP3a or later) required. Microsoft SQL Server 2005 (SP1 or later) recommended.

To calculate the disk space you require on a database server, plan for a database capacity equal to 120% of your estimated content storage requirements. For example, if you anticipate that your Office SharePoint Server solution must be able to store 100 GB of content, you should plan for a 120 GB database capacity, excluding any additional space required for your RAID configuration. You must also plan to accommodate future increases in volume of your content. Index sizes will vary enormously according to the type of content that you store, but Microsoft recommends that you specify additional disk capacity of at least 30% to accommodate search indexes. You will also require additional disk space to accommodate the database transaction log.

## RAID Configurations

In many Windows SharePoint Services 3.0 or Office SharePoint Server farm deployments, you will store your database files on a Redundant Array of Independent Drives (RAID array). You can use RAID arrays to improve disk I/O speed, provide redundancy in case of an individual disk failure, or both, depending on how the array is configured.

There are several standard RAID configurations, known as RAID levels, which provide different combinations of I/O performance and availability. The following table lists the RAID levels that you can use to help ensure that your databases remain available. You will typically use one of these levels.

RAID Level	Description	Summary
RAID 5	A striped disk array with distributed parity. Data is striped across every disk in the array, which increases disk I/O speed. Parity data is also distributed across every disk in the array. If a single disk in the array fails, the parity data is used to reconstruct the data on the failed disk. However, if a second disk fails, the entire array fails and data will be lost.	<ul style="list-style-type: none"> <li>• Minimum three disks.</li> <li>• Remains available with one failed disk.</li> <li>• Good I/O performance.</li> <li>• Good for small disk arrays.</li> <li>• An <math>n</math>-disk array gives storage capacity of <math>n-1</math> disks.</li> </ul>
RAID 6	A striped disk array with dual distributed parity. RAID 6 is configured in the same way as RAID 5, but it includes an extra parity layer. This enables the array to remain available if a second disk fails. If a third disk fails, the entire array fails and data will be lost.	<ul style="list-style-type: none"> <li>• Minimum four disks.</li> <li>• Remains available with two failed disks.</li> <li>• Inefficient for small disk arrays.</li> <li>• Good for larger disk arrays.</li> <li>• An <math>n</math>-disk array gives storage capacity of <math>n-2</math> disks.</li> </ul>
RAID 10 (RAID 1+0)	A striped disk array that is mirrored by a second striped disk array. RAID 10	<ul style="list-style-type: none"> <li>• Minimum four disks.</li> <li>• Must be an even number of</li> </ul>

RAID Level	Description	Summary
	combines the performance advantages of striping with the availability advantages of mirroring. If one or more disks on one side of the mirror fail, the array will continue to operate. However, if one or more disks fail on opposite sides of the mirror, the entire array fails and data will be lost.	<p>disks.</p> <ul style="list-style-type: none"> <li>• Does not incur the disk-write overhead of RAID 5 and RAID 6 parity checks.</li> <li>• Less robust than RAID 6 for disk failures.</li> <li>• An <math>n</math>-disk array gives storage capacity of <math>n/2</math> disks.</li> </ul>

When you plan for required disk space, you must first consider how much of the disk capacity is usable and then calculate how much of that usable disk capacity is consumed by RAID parity checking or mirroring.

## Application Server Requirements

### Windows SharePoint Services Application Servers

In Windows SharePoint Services 3.0, the search and indexing service runs on a front-end Web server by default. To run the search and indexing service on a dedicated server, you configure the search service to run on the specified dedicated server. Consequently, the system requirements for the front-end Web server role also apply here. However, the search process is particularly intensive on memory at query time and on the processor at indexing time. You can use performance monitoring to determine whether you must add additional RAM or processors to a dedicated search and indexing server.

**Note:** When you plan disk space for a dedicated search and indexing server, you can estimate the size of the content index as approximately 30% of the total size of the content being indexed. This figure will vary according to the nature of your content. For example, a higher number of unique terms will require a larger amount of space.

### Office SharePoint Server Application Servers

In Office SharePoint Server 2007, the minimum hardware requirements for an application server are identical to those for a front-end Web server. However, you should be aware that different application server roles place different demands on your server farm infrastructure. The following list describes some of these demands:

- The index server role is highly processor intensive. The disk hardware should be optimized for writing, and a RAID 10 disk configuration is recommended for the optimal combination of fast write speed and disk redundancy.
- The query server role is memory intensive, as the server will load as much of the index as possible into memory. The disk hardware should be optimized for fast I/O times on disk read operations.
- Excel Services is processor intensive and potentially memory intensive depending upon your Excel Services caching configuration and usage.

- The Business Data Catalog creates demand on the processor, memory, and network when accessing LOB systems. Based on how your organization deploys and uses the Business Data Catalog, you may need hardware above the minimum recommended requirements.

## Typical Server Layouts for Small Deployments

You can deploy Windows SharePoint Services 3.0 and Office SharePoint Server 2007 in a variety of server farm configurations to meet your capacity, availability, and scalability requirements. This topic describes some of the more common deployment models and identifies the advantages and disadvantages of each model.

**Note:** To determine which installation model is most appropriate for your organization, see [“Plan for performance and capacity \(Office SharePoint Server\)”](#).

### Standalone Installation

When you deploy Office SharePoint Server 2007 or Windows SharePoint Services 3.0 as a standalone installation, all software components are installed on the same server. The installer uses the Windows Internal Database to create the configuration database and the content database.

As a general rule, you can use a standalone installation of Windows SharePoint Services 3.0 to support up to 10,000 users, depending on your hardware configuration and the behavior patterns of your users. In Office SharePoint Server 2007 this figure is likely to be substantially lower, depending on how your users consume the additional features and services. The standalone approach limits the manageability and scalability of your solution as it uses SQL Server 2005 Express edition to store its databases. As an alternative, you can configure a SQL Server Enterprise or Standard Edition instance on the same server and use it to store your SharePoint databases. This will improve the manageability of your solution and it also enables you to move the content database to a separate dedicated SQL Server computer at a later date if you want to scale your solution. A standalone installation may be more appropriate if you want to evaluate SharePoint Products and Technologies or if you require a small, non-business critical deployment where high availability is not essential.

### Small Server Farm

A minimal server farm deployment consists of a single combined front-end Web and application server and a single database server. This offers several advantages over the standalone or single-server deployment model. Contention for memory, processor time, and disk access by the front-end Web and application server and the database server role is reduced, so your throughput rate will increase accordingly. You can also use this approach to provide an additional layer of protection for your data, by installing the front-end Web server in your perimeter network and the database server behind the second firewall in your internal network. Alternatively, you can use a proxy server such as ISA

Server 2006 to isolate the database server from the front-end Web server. Furthermore, it is much easier to scale this farm scenario by adding additional servers and assigning designated roles to those servers.

The disadvantage of this deployment model is that it does not provide any server-tier redundancy in case of hardware failures. For instance, if either the front-end Web and application server or database server fails, the entire farm will fail. Generally, when you plan a deployment, you should first consider how many servers you require to meet your minimum availability requirements and then add any additional servers that you require to meet your capacity goals.

## Typical Server Layouts for Medium Deployments

### Medium Server Farm — Windows SharePoint Services 3.0

When you scale up from a small server farm, your first step will usually be to add either a dedicated search server, or a dedicated search server and an additional second front-end Web server. By adding the dedicated search server, you should see better performance but will continue to be vulnerable to a failure at the front-end Web tier, which is why you should also add the additional front-end Web server to the farm. You should configure network or hardware load-balancing to distribute incoming HTTP requests between the two servers. This helps to maximize the increase in capacity that you gain from the second server. It also provides high availability for the front-end Web tier in the event that one of the front-end Web servers fails.

To provide high availability for the database tier, you can also add a clustered or mirrored database server. At this stage, this is likely to be an availability consideration rather than a capacity consideration. On the hardware configurations tested by the SharePoint Products and Technologies Product Group, a single database server comfortably supports up to five front-end Web servers before performance gains start to diminish. However, actual performance will depend on the ratio of overall processing power between front-end Web servers to database servers and on the behavior patterns of your users.

If you have more than one content database, you can divide the search and indexing responsibility between the front-end Web servers by allocating each server a specific database to index. However, this does not provide high availability for the search service. If a server that hosts the search and indexing service fails, the search service will not be available to your users until the server is online again. You should not run the search and indexing service on the same machine as a database server in any server farm environment, because both roles place heavy demands on processor time and memory.

### Medium Server Farm — Office SharePoint Server 2007

In a medium Office SharePoint Server farm, you may need to configure a dedicated application server at an earlier stage of expansion than you would for a Windows SharePoint Services server farm. How you distribute server roles between servers should depend on how people use your solution, and you can only determine the optimal

distribution of server roles through careful performance monitoring. Performance monitoring is discussed in more detail in the white paper “Capacity Planning and Sizing for Microsoft SharePoint Technologies.” However, a typical medium server farm may include:

- Two network load-balanced front-end Web servers.
- A dedicated application server.
- Two clustered or mirrored database servers.

In many scenarios, a single application server will host all the SSP services. However, in some circumstances, it can be beneficial to distribute the query server role between the front-end Web servers and run the index server role and the remaining SSP services on the dedicated application server.

## Typical Server Layouts for Large Deployments

### Large Server Farm — Windows SharePoint Services 3.0

In general, you should add front-end Web servers to manage an increase in user load and add database servers to manage an increase in data load. A single database server can accommodate up to eight front-end Web servers, although Microsoft test cases for collaboration scenarios have revealed that performance gains beyond five front-end Web servers per database server are limited. As a general guideline, Microsoft recommends that you add a database server for content databases for every four front-end Web servers.

You can also use a dedicated application server to run the search and indexing service. Windows SharePoint Services 3.0 does not provide a direct installation for dedicated search and indexing servers. To configure a dedicated search and indexing server, you must:

1. Install the Windows SharePoint Services 3.0 “Complete” installation on the server.
2. Run the SharePoint Products and Technologies Configuration Wizard to connect the server to your existing server farm.
3. Start the search service on the new server.

**Note:** You can start the search service through the SharePoint Central Administration Web site. On the Operations page, click Servers in farm, and then click the name of the server that you have added. On the Services on Server page, in the Windows SharePoint Services Search row, click Start. If you have not already configured the Search service, you will be prompted to provide user account information, details of the search database, and an indexing schedule. Central Administration will then attempt to start the search service on the new server.

In this way, the application server is a server that runs the query and indexing service and provides search features to all sites in web applications that are stored in the

corresponding content databases connected to that server. For extremely large or search-intensive deployments, you can use the same approach to deploy multiple dedicated Search servers, each with responsibility to maintain an index on specific content databases. However, it is important to note that this does not enhance the availability of the search service as you can only associate a specific content database to one and only one search server at time.

You can also run the Central Administration service on more than one server. To ensure high availability for the Central Administration Web site, you should use a load-balanced URL in a separate DNS zone from your SharePoint site collections.

### **Large Server Farm — Office SharePoint Server 2007**

In Office SharePoint Server 2007, scalability considerations for the Web tier and the database tier are similar to those for Windows SharePoint Services 3.0. The principal difference is that in Office SharePoint Server, you have complete flexibility over how you allocate application server roles. The following list provides some examples of how you can allocate server roles in particular scenarios:

- If your search service creates a bottleneck, you can configure a dedicated index server and one or more dedicated query servers. Alternatively, you can distribute the query server role between your front-end Web servers.
- As Excel Services and the index server role are both processor intensive, you can configure one or more dedicated Excel Services servers. Alternatively, you can run the query and index server roles on one server and Excel Services and other scalable SSP services on another server

**Note:** Certain services provided by the SSP cannot be targeted to other servers, such as audience compilation or profile import.

- If the indexing service is overloading your front-end Web servers, you can add one or more dedicated front-end Web servers solely to respond to requests from the index server. To do this, you exclude the dedicated front-end Web server from the load-balancing cluster that responds to user requests. You then specify the dedicated front-end Web server in the Search Settings section of the SSP configuration options in Central Administration. However, if you take this approach you should be aware that you won't be able to run any additional services on this server as it will modify the HOSTS file.

In a large Office SharePoint Server farm, you can provide redundancy for every server role except the index server.

## Multiple Shared Service Providers in a Farm

### Why Use Multiple Shared Service Providers?

In most scenarios, you will use a single SSP to provide all the shared services required by your Office SharePoint Server 2007 deployment. However, there are some circumstances when you may require additional SharePoint Web applications with different SSPs. Generally speaking, you create a new Web application with a new SSP when you want to provide a different set of services to a different group of users, especially when this requirement is governed by specific security concerns. These scenarios may include:

- Deployment of Internet and intranet portals on the same server farm.
- Deployment of collaboration portals for different business units with disparate requirements.

When you create additional Web applications and SSPs, you incur a performance and maintenance overhead. You should consider adding an SSP only when there is a specific need for securely isolated services.

### Creating Multiple Shared Service Providers

Before you create an additional SSP in a server farm, you must first create a new Web application to host the SSP Administration site collection. Microsoft recommends that you create a new application pool for each Web application that hosts an SSP. This ensures each SSP operates in isolation, which improves security and helps to avoid contention for resources. Additionally, if a service provided by a particular SSP is causing throughput bottlenecks, it makes it somewhat easier to identify as the application pool will run under a unique identity.

You can create a new SSP through the SharePoint Central Administration site. This process is described in the white paper “Configuring Microsoft SharePoint Technologies Farms.”

### Associating an SSP with a Web Application

When you have created an SSP, it is straightforward to change the associations between your SSPs and your Web applications.

#### ► To associate an SSP with a Web application

1. In the Central Administration site, on the **Application Management** tab, click **Manage this Farm's Shared Services**.
2. On the menu bar, click **Change Associations**.
3. Under Shared Services Provider, select the SSP that you want to re-associate from the list.
4. In the Web Applications section, select the Web application or Web applications that you want to associate with the SSP.

## Sharing SSPs between Farms

### Why Share an SSP?

Office SharePoint Server 2007 enables you to share SSPs between server farms through Inter-Farm Shared Services. It is often asked whether or not an SSP can be shared for geographically distributed farms. You cannot share an SSP over the Wide Area Network (WAN). For example, you cannot share an SSP from a farm in Europe with a farm in North America. This is not supported as the connection and network latency can cause tremendous throughput bottlenecks in this scenario, because the servers in the farm communicate with the SSP on a very frequent basis. However, there are some circumstances where it can be beneficial to configure multiple farms in a single location or data center and share an SSP between them.

For example, some organizations use separate server farms to host development, test, staging, and production environments. In this situation, you can use a single SSP to provide consistent services across each farm.

### Configuring Inter-Farm Shared Services

To use Inter-Farm Shared Services, you configure an SSP in one farm to provide services to an SSP in another farm. This creates a parent-child relationship between the farms. One parent SSP can provide shared services to multiple child SSPs. In the previous example, you may configure the production environment SSP to provide services to the development farm, the test farm, and the staging farm. Inter-Farm Shared Services can be useful in many situations, as you should only use multiple SSPs where there is a proven need for isolated security.

#### ► To share an SSP between farms

1. In the Central Administration Web site for the parent farm, on the **Application Management** page, click **Grant or configure shared services between farms**.
2. On the Manage Shared Services between Farms page, select **This farm will provide shared services to other farms**.
3. In the Provide Shared Services section, add any additional process accounts that will require access to the SSP.
4. In the Central Administration Web site for the child farm, on the **Application Management** page, click **Grant or configure shared services between farms**.
5. On the Manage Shared Services between Farms page, select **This farm will consume shared services from another farm**.
6. In the Consume Shared Services section, specify the database server details for the parent farm as prompted.

**Note:** You cannot share Excel Services between server farms.

## Deploying Server Farms

This section describes how to deploy SharePoint Products and Technologies in a server farm environment. It explains how to prepare servers for the deployment, how to conduct the deployment, and how to script deployments. It also describes how to protect your deployment with Microsoft Forefront™ Security for SharePoint.

After reading this section, you will be able to:

- Describe how to prepare a server farm for a SharePoint Products and Technologies deployment.
- Explain the order in which you must install SharePoint Products and Technologies servers.
- Describe how to deploy SharePoint Products and Technologies in a server farm environment.
- Explain how to use the config.xml file to script a SharePoint Products and Technologies deployment.
- Describe how to use Forefront Security for SharePoint in a server farm environment.

## Preparing Servers

To deploy Office SharePoint Server 2007 or Windows SharePoint Services 3.0 in a server farm, you must have at least one computer acting as a database server and at least one computer acting as a combined front-end Web server and application server.

### Database Servers

The following table lists the tasks you must complete to configure the database server.

Task	Details
Ensure SQL Server is installed and up to date	Windows SharePoint Services 3.0 requires that the database server is running SQL Server 2000 with Service Pack 3a or later or SQL Server 2005 with Service Pack 1 or later. This course assumes that you use SQL Server 2005 SP1 or later.
Configure SQL Server 2005 surface area settings	SQL Server 2005 must be configured to: <ul style="list-style-type: none"> <li>• Accept remote connections</li> <li>• Use both TCP/IP and named pipes</li> </ul>
Check SQL Server collation options	The SQL Server collation must be: <ul style="list-style-type: none"> <li>• Case insensitive</li> <li>• Accent sensitive</li> <li>• Kana sensitive</li> <li>• Width sensitive</li> </ul> <p>This is the <b>LATIN1_General_CI_AS_KS_WS</b> collation sequence.</p>

You should run the SQL Server service accounts under a domain user account. The minimum privileges required for service accounts are described in the paper: "Securing Microsoft SharePoint Technologies Systems."

## Front-end Web Servers and Application Servers

The preparation steps for front-end Web servers and application servers are identical. The following table lists the tasks that you must complete.

Task	Details
Install and configure IIS 6.0	Use Administrative Tools to install and enable IIS. If you are upgrading from IIS 5.0, you must ensure that you configure IIS to run in IIS 6.0 worker process isolation mode. This is the default mode for new installations of IIS.
Install .NET Framework 3.0	You can obtain the Microsoft .NET Framework 3.0 Redistributable Package from the Microsoft Download Center Web site. Ensure that you download and install the appropriate version (x86 or x64) for your server.
Enable ASP.NET 2.0	You can enable ASP.NET 2.0 through Administrative Tools or by typing the following at a command prompt. <code>aspnet_regiis -i</code>

When you have completed these tasks on the database servers and at least one front-end Web and application server, you are ready to deploy Office SharePoint Server 2007 or Windows SharePoint Services 3.0.

## Order of Installation

You can make your SharePoint Products and Technologies server farm deployment smoother by installing server roles in the recommended order. If you have planned your deployment effectively, you can easily add servers to your server farm or move services between servers.

### Recommended Order of Installation for Office SharePoint Server

Microsoft recommends that you install the Central Administration Web site on an application server. The Office SharePoint Server installer will install the Central Administration Web site on the first computer you add to a new farm. Because of this, if your deployment plan includes a dedicated application server, you should install Office SharePoint Server on that computer first. If your deployment plan includes more than one application server, you should install the Central Administration Web site on the computer with the lowest anticipated load. You can extend the Central Administration Web site to more than one server for high availability, if required, at a later date.

When you have completed the preparatory tasks described in the previous topic, you should install server roles in the following order:

1. The application server that will host the Central Administration Web site.
2. Every front-end Web server.
3. The index server.
4. The query servers.
5. Any other application servers.

All application server roles require a complete installation of Office SharePoint Server 2007. The front-end Web server role and the Central Administration Web site can run on either a complete installation or a front-end Web installation. For more flexibility, you should run the front-end Web servers on a complete installation of Office SharePoint Server, because the front-end Web server is a scaled-back installation that installs only the binaries for running services to render sites to users. This enables them to host additional services such as the query server role if required at a later date.

## Recommended Order of Installation for Windows SharePoint Services

In Windows SharePoint Services 3.0, you must initially configure every server except the database servers as a front-end Web server. The Windows SharePoint Services 3.0 installer will install the Central Administration Web site on the first front-end Web server that you configure. Consider where in your network topology you want to run the Central Administration Web site, and install Windows SharePoint Services 3.0 on this server first. For example, you may want to run the Central Administration Web site from within your internal network and use your front-end Web servers to respond to user requests from the perimeter network. In this situation, you should initially configure the Central Administration server as a front-end Web server, add the perimeter network front-end Web servers to the farm, and then create a network load-balancing cluster for the perimeter network front-end Web servers that exclude the Central Administration server. In this way, the Central Administration server will not receive any user requests and will solely serve the Central Administration Web site.

## Performing the Deployment

### Installing the First Server

**Note:** This section applies to Office SharePoint Server 2007 server farms. For Windows SharePoint Services 3.0 server farms, certain features are not available. For instance, Windows SharePoint Services does not provide certain application servers, such as Excel Services or the Business Data Catalog.

When you install Office SharePoint Server 2007 on the first server in a server farm, you must specify a complete installation regardless of whether the server will function as a front-end Web server or an application server. When setup is complete, you must run the SharePoint Products and Technologies Configuration Wizard and specify that you want to create a new server farm. You will be prompted to specify:

- The name of the initial database server.
- A name for the configuration database.
- A user name for the server farm account. This should be a domain user account without any administrative privileges.
- A port number for the Central Administration Web Application.

- An authentication method for the Central Administration Web Application.

### Adding Servers to the Farm

To add an application server to a server farm, you must run the Office SharePoint Server 2007 installer and specify a complete installation. To add a front-end Web server to a server farm, you can specify either a complete installation or a Web Front-End installation. However, if you choose a Web Front-End installation, you will not be able to move additional services such as the query server role onto that front-end Web server without rerunning the installer package.

When setup is complete, you must run the SharePoint Products and Technologies Configuration Wizard and specify that you want to join an existing server farm. You will be prompted to specify:

- The name of the server that hosts the configuration database.
- The name of the configuration database.
- The user name for the server farm account that is used to connect to the database.

You do not need to specify which servers will run specific services or function in specify roles at this stage. You can move services between servers from the Central Administration Web site at any point.

**Note:** For detailed procedural steps on the installation process, see "[Install Office SharePoint Server 2007 and run the SharePoint Products and Technologies configuration wizard.](#)"

### Moving the Central Administration Web Site

In many scenarios, an organization will start with a small Office SharePoint Server 2007 server farm and then progressively add servers as the load on the solution grows. As the topology of your server farm changes, you may need to move the Central Administration Web site between servers or host the site on multiple servers for high availability.

#### ► To move the Central Administration Web site

1. Run the SharePoint Products and Technologies Configuration Wizard on the server that currently hosts the Central Administration Web site.
2. In the Advanced Settings section, select **Do not use this machine to host the Web site.**
3. Run the SharePoint Products and Technologies Configuration Wizard on the server that will host the Central Administration Web site.
4. In the Advanced Settings section, select **Use this machine to host the Web site.**

Microsoft recommends that you backup the Central Administration Web site before you move the service. To do this, backup the

<Drive>\Inetpub\wwwroot\VirtualDirectories\<central admin port number>\ directory. If

you have modified the Web.config file or made other changes to the Web site in IIS, you must restore your backup to the new server.

### Installation with DBA-Created Databases

In many large organizations, database administrators (DBAs) create and manage databases. In this situation, you divide the installation tasks between the DBA and the farm administrator. The following table shows the high-level installation tasks for a typical initial deployment, the administrative role with responsibility for each task, and the order in which the tasks should be performed.

Task	Role
Create the configuration database.	DBA
Create the content database for the Central Administration site.	DBA
Install Office SharePoint Server on each front-end Web server and application server in the server farm.	Farm administrator
Configure the databases by using the <b>psconfig</b> command-line tool.	Farm administrator
Run the SharePoint Products and Technologies Configuration Wizard on each front-end Web server and application server.	Farm administrator
Create the search database.	DBA
Configure the search database and start the search service by using the <b>stsadm</b> command-line tool.	Farm administrator
Create and configure the content database for the portal site Web application.	DBA
Create the Web application for the portal site and configure the content database by using the <b>stsadm</b> command-line tool.	Farm administrator
Create the SSP content database and the SSP search database.	DBA
Create the SSP and configure the SSP databases by using the <b>stsadm</b> command-line tool.	Farm administrator

**Note:** For more information about each of these tasks, including how to configure user accounts and how to use the command-line tools, see "[Deploy using DBA-created databases.](#)"

### Scripted Installs

In Office SharePoint Server 2007 and Windows SharePoint Services 3.0, you can use the Config.xml file together with the setup.exe installer to specify the configuration for your installation. This is a useful approach in a server farm environment as you can provide a consistent, automated setup and server configuration across multiple servers.

To specify a config.xml file when you install Office SharePoint Server, use the **/config** modifier when you run the installer package. You can use the following command:

```
setup.exe /config [path and file name]
```

## Typical Scenarios

The Office SharePoint Server Product DVD includes seven Config.xml files for typical installation scenarios. The following table lists these files.

Scenario	Details
Setup	Installs a standalone deployment of Office SharePoint Server 2007 and displays the installer user interface.
SetupFarm	Installs Office SharePoint Server 2007 for a server farm deployment and displays the installer user interface. You can use this server as an application server or a front-end Web server.
SetupFarmSidebySide	Installs Office SharePoint Server 2007 for a server farm deployment side-by-side with the existing Windows SharePoint Services 2.0 installation and does not display the installer user interface.
SetupFarmSilent	Installs Office SharePoint Server 2007 for a server farm deployment and displays the installer user interface. You can use this server as an application server or a front-end Web server.
SetupFarmUpgrade	Upgrades an existing Windows SharePoint Services 2.0 installation to an Office SharePoint Server 2007 installation for a server farm deployment and does not display the installer user interface.
SetupSilent	Installs a standalone deployment of Office SharePoint Server 2007 and does not display the user interface.
SetupSingleUpgrade	Upgrades a SharePoint Server 2003 standalone deployment to an Office SharePoint Server 2007 standalone deployment and does not display the installer user interface.

You can use these files as starting points to create a config.xml file for your own custom installations.

To help you understand the syntax of the config.xml file, the following code example shows the SetupFarmSilent version of the file for the Office SharePoint Server 2007 installer.

```
<Configuration>
  <Package Id="sts">
    <Setting Id="LAUNCHEDFROMSETUPSTS" Value="Yes" />
    <Setting Id="REBOOT" Value="ReallySuppress" />
    <Setting Id="SETUPTYPE" Value="CLEAN_INSTALL" />
  </Package>
  <Package Id="spswfe">
    <Setting Id="SETUPCALLED" Value="1" />
    <Setting Id="REBOOT" Value="ReallySuppress" />
    <Setting Id="OFFICESERVERPREMIUM" Value="1" />
  </Package>
  <Logging Type="verbose" Path="%temp%" Template="Office Server Setup(*).log" />
  <Display Level="none" CompletionNotice="no" />
  <PIDKEY Value="Enter PID Key Here" />
  <Setting Id="SERVERROLE" Value="APPLICATION" />
  <Setting Id="USINGUIINSTALLMODE" Value="0" />
</Configuration>
```

This setup file gives the installer package the following instructions:

- Do not reboot after installation.
- Create a new installation of Office SharePoint Server, as opposed to an upgrade.
- Create a verbose log file in the %temp% directory.
- Install the application server role on this server (this is effectively a full installation of Office SharePoint Server, so the server can be used as an application server or a front-end Web server).
- Do not display the user interface during installation.
- Do not notify the user when the installation is complete.

You should also note the two package IDs, **sts** and **spswfe**. Office SharePoint Server 2007 is represented by **spswfe** and Windows SharePoint Services 3.0 is represented by **sts**. As Office SharePoint Server is built on Windows SharePoint Services, the installer must first install Windows SharePoint Services and then install Office SharePoint Server.

### Editing the Configuration File

The syntax for the Config.xml file consists of eight elements. You can modify these elements to control every aspect of your installation. The following table describes the purpose of each element.

Element	Details
<b>ARP</b>	You can use the <b>ARP</b> element to specify whether users can remove or modify Office SharePoint Server. You can also provide additional information such as technical support details.
<b>Command</b>	You can use the <b>Command</b> element to specify a command that should run when Office SharePoint Server has installed, such as the <b>psconfig</b> tool.
<b>Configuration</b>	This is a mandatory top-level element. The <b>Configuration</b> element is the parent of all other elements.
<b>DATADIR</b>	You can use the <b>DATADIR</b> element to specify a file location for the configuration and search databases.
<b>Display</b>	You can use the <b>Display</b> element to specify the level of user interface that is displayed during the installation.
<b>Logging</b>	You can use the <b>Logging</b> element to specify a file location for the installer log and to control the amount of information that is written to the log.
<b>Package</b>	The <b>Package</b> element identifies the product to install. For Office SharePoint Server, the Package ID is <b>spswfe</b> . You must also specify the Windows SharePoint Services Package ID as <b>sts</b> .
<b>Setting</b>	You can use the <b>Setting</b> element to control various properties of the installation. This

Element	Details
	includes the type of installation (clean install or upgrade), the server role, and whether the server should reboot when installation completes.

**Note:** You can find specific attributes and values for each element in the [Config.xml technical reference](#).

## Protecting Content with Microsoft Forefront

Microsoft Forefront™ Security for SharePoint is a purpose-built product that you can use to protect your Office SharePoint Server 2007 or Windows SharePoint Services 3.0 deployment from malicious code, undesirable content, and disclosure of confidential information.

Forefront Security for SharePoint uses multiple virus scan engines from various security software vendors to scan files as they are uploaded to, or downloaded from, SharePoint lists and document libraries. Forefront Security for SharePoint can automatically select an optimal combination of virus scan engines for a particular scan and automates the signature update process for each engine.

Forefront Security for SharePoint scans Microsoft Office documents for inappropriate content by searching for keywords that you define in a security policy. This includes IRM-protected files and documents in compressed file packages. You can also filter specific file types and detect files with modified extensions.

### Threats Specific to SharePoint Products and Technologies

Inadequate control of content in your SharePoint Products and Technologies deployment can expose your organization to two principal types of threat: proliferation of malicious code and breach of regulatory compliance obligations. If you upload an infected document to a SharePoint document library, the malicious code will be propagated to any other employees or partners who download a copy of the document. Similarly, if you inadvertently upload a document that contains confidential information, you potentially distribute the leak of information to every user with read privileges for that document library. You can largely obviate both of these threats by scanning files and their contents both as they are uploaded and as they are downloaded from a document library or a list.

### Defense in Depth

When a new virus or malicious code enters circulation, the time that elapses before different antivirus software vendors release updated signatures varies from threat to threat. The use of multiple virus scan engines can help you to increase the probability that a particular threat will be detected and contained. It also provides continuity: while one virus scan engine is being updated, the remaining virus scan engines continue to provide protection.

You can also use other products in the Microsoft Forefront range to provide protection at the client level and the network perimeter level. By varying the combination of scan engines used at each point, you can provide a more layered, comprehensive level of protection for your organization.

## Deploying Forefront Security for SharePoint

To protect your deployment with Forefront Security for SharePoint, you should run the installer on each front-end Web server in the server farm. You can use the Forefront Server Security Management Console to do this simultaneously from a single location.

The minimum server requirements are similar to those for front-end Web servers and application servers, but you must also install a Messaging Application Programming Interface (MAPI) client such as Microsoft Outlook®. This provides the MAPI interface that Forefront Security for SharePoint requires to parse mail messages. The following table lists minimum server requirements.

Component	Requirements
Processor	Minimum processor speed of 2.5GHz required. Dual processors with speeds of at least 3GHz recommended. 64-bit processors optional but supported.
Memory	Minimum 1GB of available RAM required. Minimum 2GB of available RAM recommended.
Disk	550MB of free disk space required. File system must be NTFS formatted.
Platform	Windows Server 2003 operating system required. Service Pack 1 (SP1) or later required.
Software	IIS 6.0 must be enabled. Microsoft .NET Framework 3.0 must be installed. ASP.NET 2.0 must be enabled.

You can install Forefront Security for SharePoint without stopping or restarting SharePoint Products and Technologies services on the server.

You can use the Forefront Server Security Administrator tool to configure Forefront Security for SharePoint on local or remote servers. You can launch the Forefront Server Security Administrator from the Start menu or from a command prompt by running `fsaclient.exe` in the Forefront Security for SharePoint install directory. You can configure general settings, filtering policies, and reporting through the Forefront Server Security Administrator user interface.

You should configure these key settings as part of the deployment process:

- Select up to five of the available scan engines for each scan job (manual and real-time).
- Select a bias setting for each scan job, from Maximum Performance to Maximum Certainty.

- Review the real-time antivirus configuration settings and make any required changes.
- Create file filters to detect undesired file types and specific filenames.
- Create any required keyword filters.
- Configure notifications and reporting, such as through Forefront Security for SharePoint Notification Web Parts.

**Note:** For further information about each of these tasks, see the [Forefront Security for SharePoint user guide](#).

## Managing Forefront Security for SharePoint

When you install service packs or updates to servers, you must first disconnect Forefront Security for SharePoint.

### ► To apply updates to servers

1. Stop all SharePoint Products and Technologies services and Forefront Security for SharePoint Services on the server.
2. Run the following command at a command prompt to disconnect Forefront Security for SharePoint.

```
fscutility /disable
```

3. Install the update.
4. Restart all SharePoint Products and Technologies services and ensure that they work properly.
5. Stop all SharePoint Products and Technologies services again.
6. Run the following command at a command prompt to reconnect Forefront Security for SharePoint.

```
fscutility /enable
```

7. Restart all SharePoint Products and Technologies services.

**Note:** Review the best practice guidance for [Forefront Security for SharePoint](#).