



Professional SharePoint® 2013 Development

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Chapter 1

Architectural Overview of SharePoint 2013

WHAT'S IN THIS CHAPTER?

- Understanding on-premise server farm architecture
- Deploying, configuring, and publishing applications with the service application architecture
- Discovering the improved scalability and redundancy of the search architecture
- Exploring the SQL Server database architecture
- Understanding the cloud-hosted architectures

Microsoft SharePoint Server 2013 introduces a lot of new functionality that you need to understand to write better applications on the SharePoint 2013 platform. Developing new functionality relies on a sound logical and physical architecture. Therefore, you must have a good appreciation and understanding of your SharePoint farm architecture to take advantage of and develop long-lasting SharePoint solutions.

This chapter provides a succinct overview of the common on-premise server farm architectures available for SharePoint 2013. You take a detailed look at service applications and dive into the evolved SharePoint 2013 search architecture. Then, you look at the improvements and updates related to the SQL database tier. Lastly, you take a look at the cloud-hosted farm architectures.

The content presented in this chapter targets architects, lead developers, and developers developing solutions

tailored to their SharePoint 2013 farm topologies, but the chapter is also useful for anyone working with the product. Although all topics covered in this chapter are important, this chapter has been designed to enable you to jump to the sections you are interested in.

WHAT'S NEW FROM AN ARCHITECTURAL PERSPECTIVE?

From an architectural perspective there are a number of enhancements to the SharePoint 2013 topology. These additions and improvements continue to evolve the SharePoint platform capabilities to better handle the ever-increasing workload placed on the SharePoint platform. The key updates include:

- *SQL improvements and shredded storage* — A number of improvements have been made at the database layer to reduce the impact of scenarios that might invoke full table scans, improve usage of advanced indexing features in SQL Server 2008 R2 and SQL Server 2012, and incorporate a new feature called shredded storage that changes the way SharePoint stores and updates files in SQL. Files are now shredded, and only the changed pieces are updated at the database layer. This reduces the impact caused by document updates.
- *Distributed cache service* — A new cache service, based on Windows Server AppFabric Distributed Caching, has been implemented in SharePoint 2013. By default it is enabled on all web front ends and application servers. It improves performance by caching information such as social data authentication tokens.

- *Unified search architecture* — SharePoint 2013 unifies the search offerings available in SharePoint 2010. SharePoint 2013 search provides numerous improvements to content crawling, content processing, analytics processing, indexing, query processing, and search administration components.
- *Integrated Request Management (RM)* — Request Management provides SharePoint more knowledge and control over incoming requests. This includes throttling and routing requests to appropriate web front ends, prioritization and filtering of requests, and load balancing based on weighting schemes.
- *New service applications* — New service applications include the App Management Service to support and manage apps in SharePoint 2013, the Machine Translation Service that supports automated language translation of files, and the Work Management Service that provides task aggregation functionality.
- *Office Web Applications is now a separate product* — Office Web Applications have been split into a dedicated product to provide a uniform application for viewing and editing files, including files not necessarily in SharePoint. The Office Web Apps Server supports the Web application Open Platform Interface (WOPI) that SharePoint implements to support office files hosted in SharePoint.
- *Web analytics platform* — The web analytics platform replaces the web analytics service application that was in SharePoint 2010. It has been completely redesigned and integrated into the search service application of SharePoint 2013.
- *Windows Azure Workflow* — Windows Azure Workflows are now supported for on-premise and hosted deployments in SharePoint 2013.

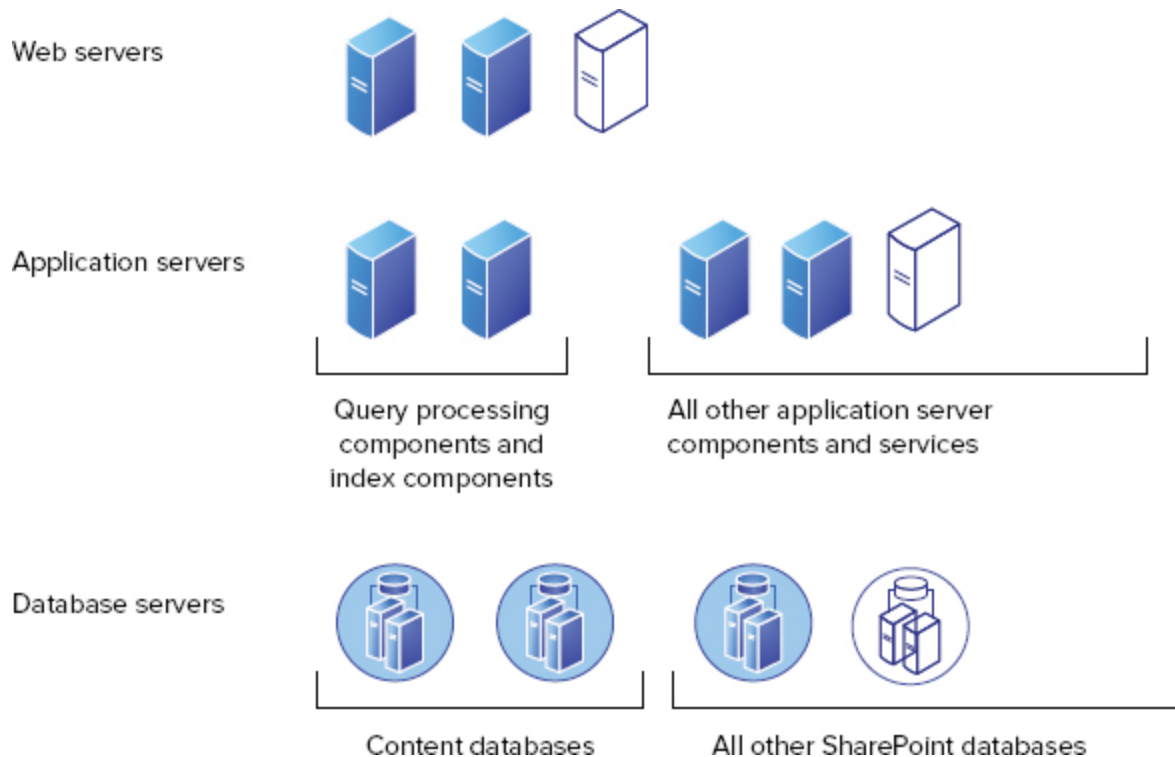
ON-PREMISE SERVER FARM ARCHITECTURE

Server farms represent the topology that delivers SharePoint services to end users. A *server farm* is a collection of server machines acting together to host SharePoint services and workloads.

SharePoint 2013 provides a high degree of flexibility for planning your topology. The core principle behind implementing a server farm is the ability to scale the environment as required to support additional workloads, scenarios, and load placed on the farm by your organization.

Farms can range in size from a single SharePoint server to highly scaled-out architectures hosting server roles on dedicated sets of physical servers. [Figure 1-1](#) shows a typical medium SharePoint server farm, as published in the *TechNet* article “Topologies for SharePoint Server 2013: Model” (<http://go.microsoft.com/fwlink/p/?LinkId=259119>).

FIGURE 1-1



Each tier in a topology represents the purpose of the server machines hosted within it, or the services dedicated to those server machines. The core components of a server farm can be categorized into the following three tiers (refer to [Figure 1-1](#)):

- *Web servers* — Web servers are servers that respond to user requests and render the SharePoint web pages. All web servers in a farm are mirrors of each other and are load balanced.
- *Application servers* — Application servers are used to describe any server that runs back-end application services (for example, servers that host search crawl and query components). Multiple redundant application servers can be load balanced.
- *Database servers* — The database tier hosts nearly all the data of your farm in SQL databases. This includes configuration databases, service application related databases, and content databases. All databases can be

assigned to one database server or spread across multiple servers.

SharePoint 2013 can be deployed in a number of topology configurations. The basic topologies include small, medium, and large — otherwise known as single-tier, two-tier, and three-tier deployments — that define the placement and purpose of individual server machines in your server farm's topology.

Web Server Tier

The web server tier is composed of web servers or other servers that receive and respond to HTTP requests. Web servers host SharePoint web applications in Internet Information Services (IIS). They can support additional services such as the search query component sending requests to database servers in the database server tier, or communicating with application servers in the application server tier to consume services hosted on those servers. Servers in the web server tier are exposed directly to end users and should be secured behind a firewall or within a perimeter network.

Application Server Tier

The application server tier is an optional tier composed of servers that are dedicated to the hosting of service applications associated with SharePoint 2013. Examples of servers in the application server tier include dedicated server machines that host the search service, administration, and query components, in addition to services such as PerformancePoint or Excel Services.

The application server tier is most commonly associated with large server farm environments, in which dedicated compute resources are required to support high search query volumes, large indexes, or to isolate service

applications to free up resources on the web server tier to support high concurrency rates.

Database Server Tier

The database server tier is composed of servers hosting SQL Server. Database servers in the database tier respond to requests initiated by web and application servers, and update the underlying databases that support SharePoint 2013. The database server tier can be scaled both up (to improve performance) and out (to improve performance and provide additional server farm resiliency).

Small or Single-Tier Topology

A small or single-tier topology commonly consists of a single server deployment in which all components required to instantiate a SharePoint environment are installed on one machine including the database server. [Figure 1-2](#) shows an example of a single-tier topology, which is designed to support development or small businesses where scale and redundancy are not concerns.

FIGURE 1-2



All roles on one server,
including SQL Server

A single-tier topology does not provide any level of redundancy. Therefore, it requires an aggressive backup-and-restore strategy to be implemented because this is the extent of data protection that can be provided in this deployment topology. Because all components are installed on a single server, single-tier topologies are the least flexible and do not support seamless scale.

Medium or Two-Tier Topology

A medium or two-tier topology consists of two or more servers that support separation of SharePoint and SQL Server components. This includes one or more web servers installed with SharePoint 2013, and one or more database servers installed with SQL Server. Medium or two-tier topologies benefit from their flexibility in that they can seamlessly scale to meet the changing business needs or the demands of the organization.

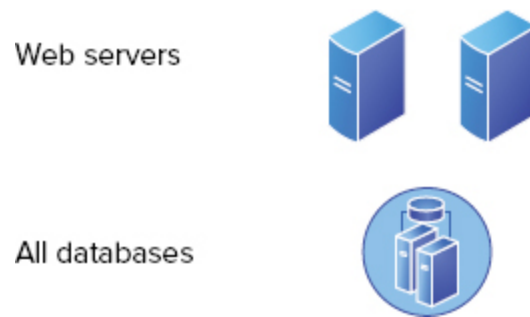
[Figure 1-3](#) shows a minimal two-tier topology composed of one web server running SharePoint Server 2013 in the web tier and one database server running SQL Server 2008 R2 SP1 or SQL Server 2012 in the database server tier.

FIGURE 1-3



[Figure 1-4](#) shows a scaled, two-tier topology that includes two load-balanced web servers running SharePoint Server 2013 in the web server tier and two database servers running SQL Server 2008 R2 SP1 or SQL Server 2012 in the database server tier that can be clustered or mirrored to provide high availability and redundancy.

FIGURE 1-4



The two-tier topology provides the most flexible deployment type and is recommended for organizations of all sizes as a base topology. This topology can be expanded or contracted through the addition or removal of server machines. As such, it is one of the most common deployments of a server farm, providing a flexible and scalable solution. A two-tier server farm enables an organization to seamlessly implement hardware or software load balancing such as Windows NT Load Balancing Service (WLBS) to distribute incoming HTTP requests evenly between web servers. This provides a means to handle an increase in demand as the number of requests submitted to it rise (for example, as the result of a merger or acquisition).

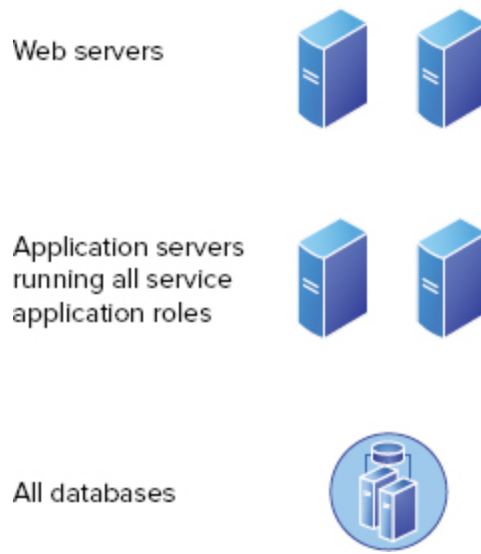
A two-tier server farm can also seamlessly scale at the database server tier through the introduction of additional database servers in a mirrored or clustered configuration. This provides additional resiliency and distribution of load within a server farm environment.

Large or Three-Tier Topology

A large or three-tier topology is designed for large organizations that require performance, scale, and adherence to strict business-continuity management objectives.

[Figure 1-5](#) shows a three-tier topology that consists of two or more web servers installed with SharePoint 2013, one or more application servers installed with SharePoint 2013, and two or more database servers installed with SQL Server.

FIGURE 1-5



The physical topology selected for SharePoint 2013 can drive the layout of the service application topology. In many cases, it may be easier to map the service-application topology to a physical topology to help ensure that sufficient resources exist to support the overall deployment.

Geographically Distributed Topology

Geographically dispersed deployments refer to distributing SharePoint resources to support regional or global users. For example, an organization may have its headquarters in Seattle, Washington. However, many users may be distributed globally to support various corporate functions, or to respond to opportunities in specific geographic locations.

In this scenario, it can be costly to deploy a dedicated instance of SharePoint 2013 to support small pockets of users. Therefore, the organization may opt to introduce WAN optimization devices, whether symmetric or asymmetric, to accommodate latency or leverage technologies such as

BranchCache in Windows Server 2008 R2 or Windows Server 2012.

In scenarios in which the geographically dispersed user base is substantial enough to justify the cost of a localized, dedicated SharePoint 2013 deployment, an organization can opt to federate or publish service applications from the centralized server farm to the distributed regional server farms. This provides a unified experience to the remote user base. You could optionally isolate these server farms to support regulatory compliance related to those specific geographic locations.

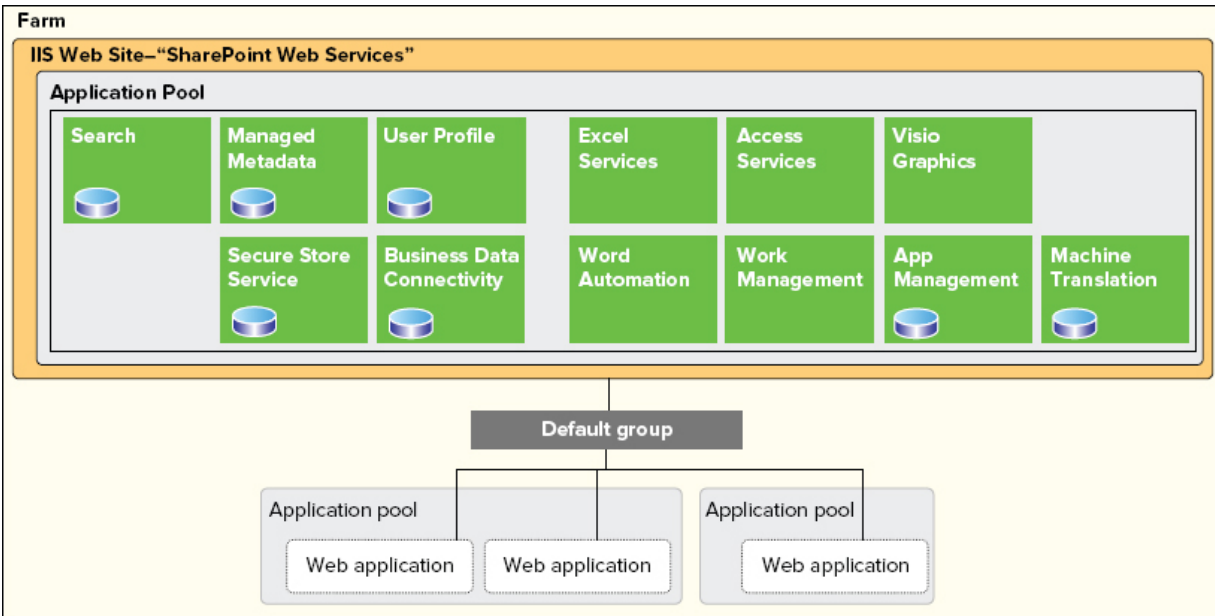
SERVICE APPLICATION ARCHITECTURE

This section focuses on helping you understand services in SharePoint 2013. The objective is to make you familiar with the service application architecture in SharePoint 2013, and how this architecture is used in the platform to offer new and improved functionality.

Service Application Model

SharePoint 2013 uses the service application model first introduced in SharePoint 2010. Starting with SharePoint 2010 and continued in SharePoint 2013, SharePoint Foundation 2013 provides the infrastructure for hosting service applications. [Figure 1-6](#) shows the service application model in SharePoint 2010 and 2013.

FIGURE 1-6



The idea with the service application model in SharePoint 2013 is simple. If you don't need a particular service application, you don't deploy it to your farm — period! In addition, you can deploy multiple instances of the services. Actually, you can create as many instances of a given service application as you like.

The second layer of granular configuration with the service model comes at the web application level. In SharePoint 2013, web applications can be configured with the service applications they want to consume, and in which combination.

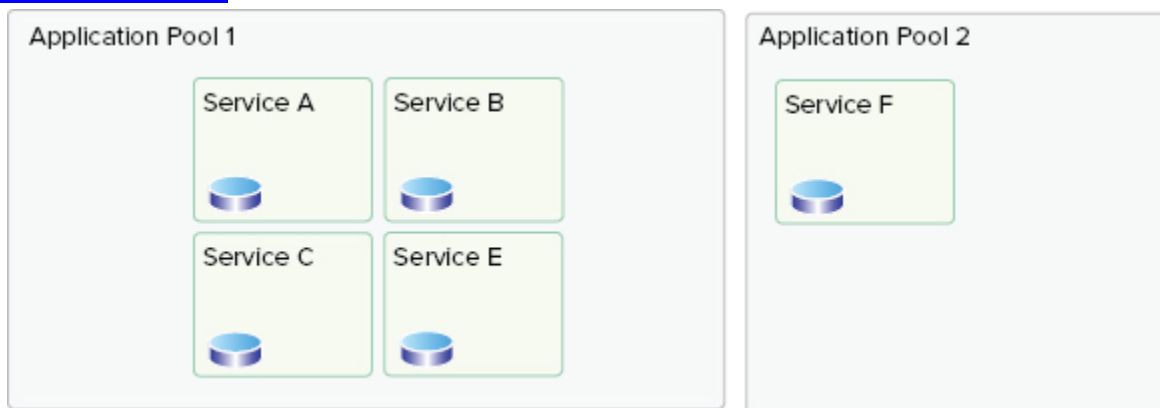
After you have an instance of a service application deployed to your farm, it can be shared across multiple web applications in the same farm, or even across different farms. Regardless of the sharing model, you can always modify the association between a web application and service applications at a later time.

Service applications can be deployed to different application pools to support process isolation. You can pick and choose which service applications should be within the same process, or within separate processes.

NOTE *One possible reason to think about process isolation from performance or security perspectives is when sharing service data across multiple applications.*

[Figure 1-7](#) shows how various services are distributed in two application pools.

FIGURE 1-7



Although in most implementations, the performance of your farm is best optimized if services exist in one application pool; in some scenarios the highest physical isolation of services is required. The SharePoint 2013 service application model enables you to create separate instances of service applications and place them in different application pools.

Service applications provide a better scalability model. You can select which servers host and run a particular service application service using the Services on Server page in Central Administration.

SharePoint 2013 provides a basic load balancer that uses a round-robin algorithm to send requests to service applications. When a web application requests an endpoint for an associated service application (through a *proxy*), the out-of-the-box load balancer returns the first available endpoint. Certain services (such as Excel Calculation Services) provide their own software load-balancing feature

to ensure that no instance of a given service is overloaded at any time.

SharePoint 2013 supports cross-farm service applications. In other words, any farm can both publish and consume service applications from other farms. Each farm can consume services from more than one parent farm. This enables web applications in your SharePoint 2013 farm to use both local and remote service applications.

Available Service Applications

As an architect or developer, you must know what service applications your licensed edition of SharePoint provides. [Table 1-1](#) provides an overview of all the service applications that ship out-of-the-box with different editions of SharePoint 2013, excluding service applications provided by other Microsoft products such Project Server, PowerPivot service, and so on.

TABLE 1-1: Service Applications Available by SharePoint 2013 Editions

SERVICE APPLICATIONS	STORAGE TYPE	SHAREPOINT FOUNDATION	SHAREPOINT STANDARD	SHAREPOINT ENTERPRISE
Access Services	App DBs			✓
Access Services 2010	Content DBs			✓
App Management Service	DB	✓	✓	✓

Business Data Connectivity Service	DB	✓	✓	✓
Excel Services	Cache			✓
Machine Translation Services	DB		✓	✓
Managed Metadata Service	DB		✓	✓
PerformancePoint	Cache			✓
PowerPoint Automation			✓	✓
Search Service	DB		✓	✓
Secure Store Service	DB		✓	✓
State Service	DB		✓	✓
Usage and Health Data Collection	DB	✓	✓	✓
User Profile	DB		✓	✓
Visio Graphics Service	Blog Cache			✓
Word Automation Services	DB	✓	✓	✓
Work Management Service			✓	✓
Subscription Settings Service	DB	✓	✓	✓

NOTE *Office Web Application Services is now a separate product and no longer provided as a service application. Web analytics service application is now managed as a key component of the search service application.*

Following are descriptions of each service application:

- *Access Services* — This service application enables you to create, view, edit, and interact using either the access 2013 office client or in the browser.
- *Access Services 2010* — This service application enables continued maintenance of SharePoint 2010 Access service applications by using Access 2010 and 2013 Office clients. It does not enable users to create new applications.

- *App Management Service* — The App Management Service enables you to install apps from the internal App Catalog or the public SharePoint store.
- *Business Data Connectivity Service* — The Business Connectivity Service (BCS) enables you to upload data (BDC) models that define interfaces of other enterprise line-of-business (LOB) systems and enables connectivity to those systems.
- *Excel Services* — This service application enables viewing and interacting with Excel files from within the browser.
- *Machine Translation Services* — This service provides automatic machine translation of files and sites.
- *Managed Metadata Service* — This service application enables you to manage taxonomy hierarchies, keywords, and social tagging features of SharePoint 2013. This service application also handles content-type publishing across site collections.
- *PerformancePoint* — This service application supports configuration and monitoring of PerformancePoint as a business intelligence (BI) product integrated with the Enterprise edition of SharePoint 2013.
- *PowerPoint Automation Service* — This service application enables server-side presentation conversions to and from a variety of file formats.
- *Search Service* — As its name implies, this service application (which comes with its own topology management configuration) is used to index content and serves search queries performed by users or custom code.
- *Secure Store Service* — This is a credential mapping service to access other enterprise-level service applications or back-end enterprise systems.
- *State Service* — The State Service provides temporary storage of any data that deals with a user session.

- *Usage and Health Data Collection* — This service application provides storage usage and health information at the farm level, and provides various reporting functionality on such data.
- *User Profile* — This user profile service application is one of the core service applications in SharePoint 2013. This service application supports features such as My Sites, My links, Colleague tracker, profile pages, personal tags and notes, and other social features.
- *Visio Graphics Service* — This service application enables viewing, interacting, and refreshing of Visio diagrams within a browser.
- *Word Automation Services* — This service application enables you to view and edit Word documents in a web browser. It can also be used for document conversions.
- *Work Management Service* — This Work Management Service enables key user-related information to be aggregated to a central location. The service supports a provider model to enable other systems to leverage this service.
- *Subscription Setting Service* — This is the key enabling component of the Multitenancy features provided by the SharePoint 2013 platform.

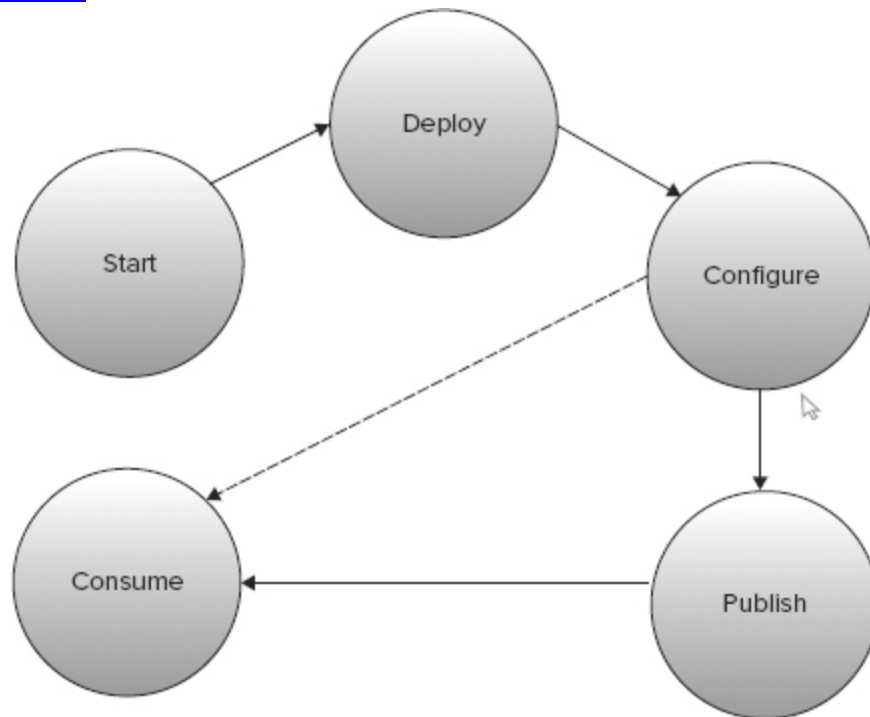
Now that you are familiar with service applications in different editions of SharePoint, consider the life cycle of a service application.

Service Application Life Cycle

A typical life cycle for a service application consists of several stages. When you plan your service application, consider each stage of this cycle. For example, you should understand when you should use the Configuration Wizard to provision your service applications or use Windows PowerShell, and when you should create a custom proxy group for your service applications.

[Figure 1-8](#) shows the stages in a life cycle for a service application.

[FIGURE 1-8](#)

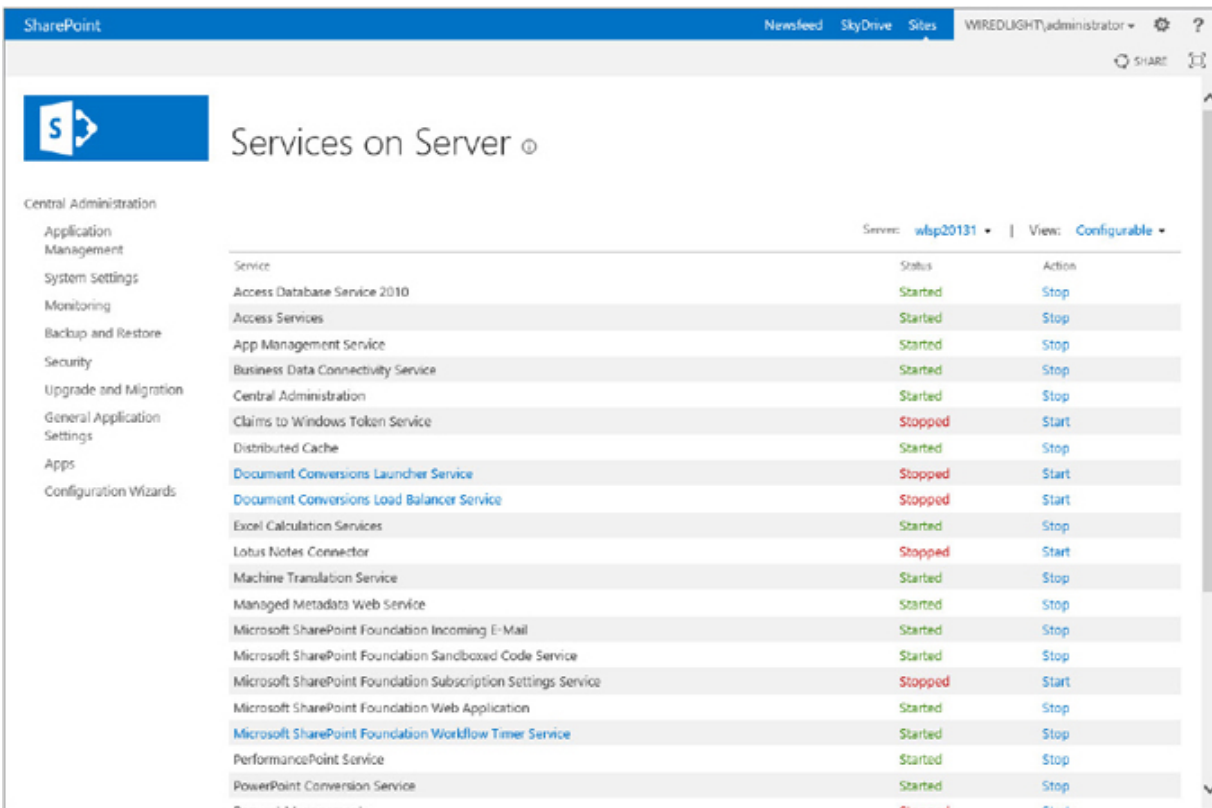


Starting Services

Although service applications are different from services, they still confuse many people working with SharePoint 2013.

If you browse to the Services on Server page in SharePoint Central Administration, that page lists all services that can be started and stopped on specific servers of the farm, as shown in [Figure 1-9](#).

[FIGURE 1-9](#)



These services are mostly SharePoint wrappers around Windows services and may or may not have an associated service application. For example, Central Administration is just a service that can be started on a server of the farm to turn it into a server that can host the Central Administration site — there is no service application associated with it.

As mentioned earlier in this chapter, a service application represents a specific instance of a given service that can be configured and shared in a particular way. Service applications are composed of Windows services, timer jobs, caching, SQL databases, and other stuff. They are just a broader concept than Windows services.

Deploying Service Applications

You can deploy service applications within a farm by using the following methods:

- Selecting the service applications in the Initial Configuration Wizard of your farm

- Adding new service applications or new instances of the existing service application in the Central Administration site
- Using Windows PowerShell

[Table 1-2](#) describes the Windows PowerShell commands that you can use to manage service applications.

TABLE 1-2: Service Application Windows PowerShell Commands

COMMAND	DESCRIPTION
Install-SPService	Installs the services in the farm. It runs once per farm.
Get-SPServiceInstance Start-SPServiceInstance Stop-SPServiceInstance	Operations related to managing the services instance for a specific server or the entire farm.
Get-SPServiceApplication Publish-SPServiceApplication Remove-SPServiceApplication Set-SPServiceApplication Unpublish-SPServiceApplication	Operations related to managing service applications deployed to a farm (such as sharing the specified local service application outside the farm).
Get-SPServiceApplicationProxy Remove-SPServiceApplicationProxy Add-SPServiceApplication ProxyGroupMember	Operations related to managing service application proxies.
Get-SPServiceApplicationPool New-SPServiceApplicationPool Remove-SPServiceApplicationPool Set-SPServiceApplicationPool	Operations related to managing the logical architecture of service applications.

Regardless of your deployment approach, service applications can be isolated. To do so, during the provisioning process, you can either specify to use an existing application pool, or create a new application pool and have the service application run in its own worker process.

Configuring Service Applications

After the service applications are configured at the farm level, they can all be managed in the Central Administration site. When you click Manage Service Applications, you are taken to the Service Applications page, as shown in [Figure 1-10](#).

FIGURE 1-10

	Name	Type	Status
Application Management	Access Services 2010	Access Services 2010 Web Service Application	Started
	Access Services 2010	Access Services 2010 Web Service Application Proxy	Started
System Settings	Access Services	Access Services Web Service Application	Started
	Access Services	Access Services Web Service Application Proxy	Started
Backup and Restore	App Management Service	App Management Service Application	Started
	App Management Service	App Management Service Application Proxy	Started
Upgrade and Migration	Application Discovery and Load Balancer Service Application	Application Discovery and Load Balancer Service Application	Started
	Application Discovery and Load Balancer Service Application Proxy, 4e9d014f-5347-4498-a576-9dea7cb2f52	Application Discovery and Load Balancer Service Application Proxy	Started
Apps	Business Data Connectivity Service	Business Data Connectivity Service Application	Started
	Business Data Connectivity Service	Business Data Connectivity Service Application Proxy	Started
Configuration Wizards	Excel Services Application	Excel Services Application Web Service Application	Started
	Excel Services Application	Excel Services Application Web Service Application Proxy	Started
	Machine Translation Service	Machine Translation Service	Started
	Machine Translation Service	Machine Translation Service Proxy	Started
	Managed Metadata Service	Managed Metadata Service	Started
	Managed Metadata Service	Managed Metadata Service Connection	Started
	PerformancePoint Service Application	PerformancePoint Service Application	Started
	PerformancePoint Service Application	PerformancePoint Service Application Proxy	Started
	PowerPoint Conversion Service Application	PowerPoint Conversion Service Application	Started
	PowerPoint Conversion Service Application	PowerPoint Conversion Service Application Proxy	Started
	Search Administration Web Service for Search Service Application	Search Administration Web Service Application	Started

In the Service Applications page, you should note three things:

- All deployed service applications are listed.
- All service application connections (proxies) are listed.
- You can add new service applications by clicking the New button on the Ribbon.

When service applications are provisioned, if you open up the Internet Information Services (IIS) manager, you can see that there is a web application called SharePoint Web Services, and underneath that web application are a bunch of virtual directories. Each of those virtual directories is seen