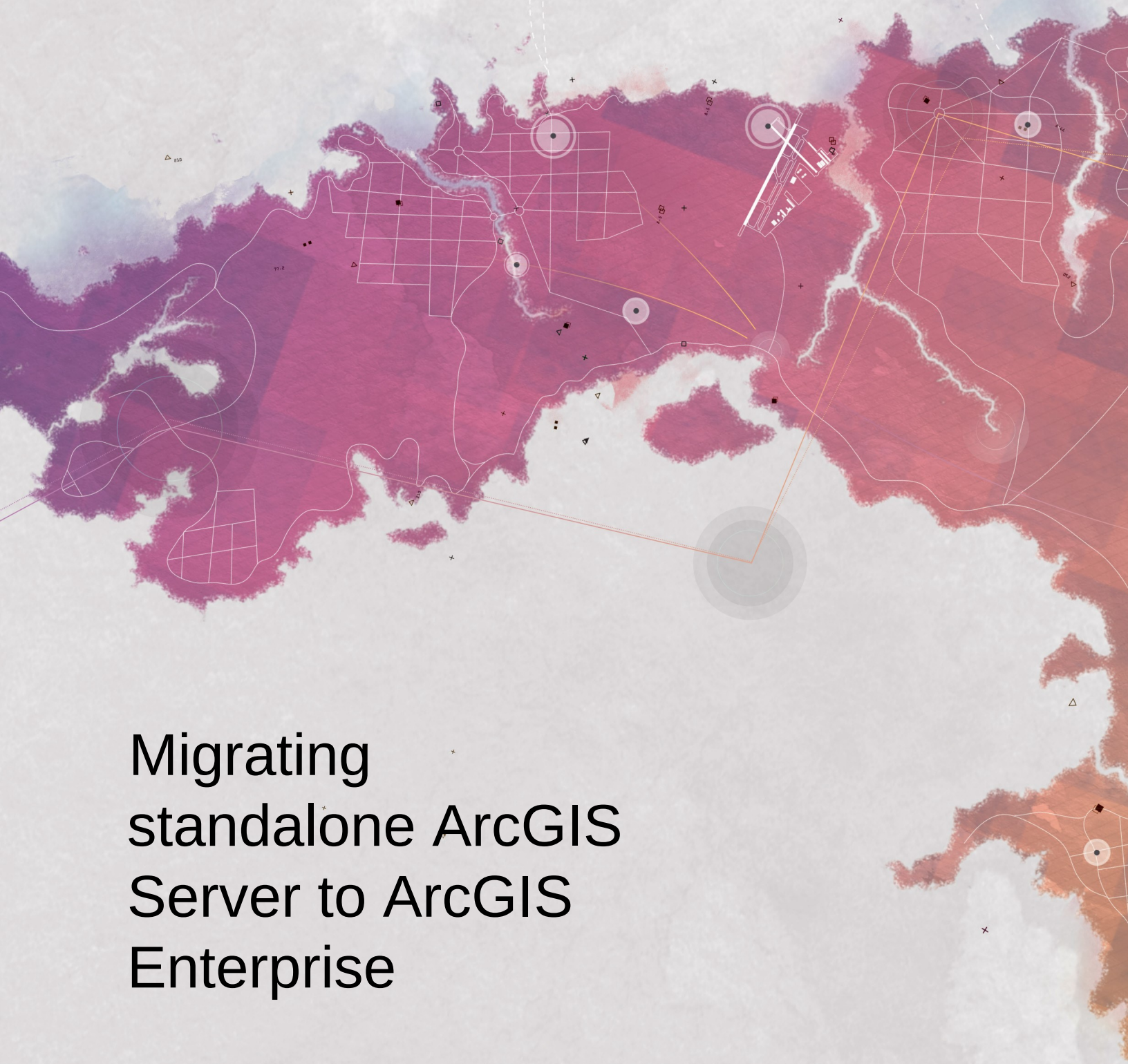

Migrating standalone ArcGIS Server to ArcGIS Enterprise

An Esri White Paper

JANUARY 2018

esri Australia

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Migrating standalone ArcGIS Server to ArcGIS Enterprise

Executive Summary

Organizations can continue to use ArcGIS Server in standalone deployments. However, for many organizations there are great benefits to migrating to ArcGIS Enterprise such as being able to take advantage of the many new capabilities, products, and apps introduced within the ArcGIS platform over the last several years.

Using ArcGIS Enterprise allows organizations to not only serve information, but also gain insight and create intelligence from their data. Central to ArcGIS Enterprise is the concept of Web GIS, that among other things, allows an organization to increase efficiency by interconnecting workflows and providing a secure centralized location for authoritative content with easier access for users.

Because ArcGIS Enterprise integrates with the entire ArcGIS platform organizations can create a seamless geospatial data experience that can support a variety of users without needing to create custom applications for specific user groups, devices, or use cases.

This document provides a technical overview of ArcGIS Enterprise including software components, key concepts such as *federation*, and outlines three options for completing a migration from a standalone ArcGIS Server deployment to the standard configuration of ArcGIS Enterprise called the base ArcGIS Enterprise deployment. It includes an outline of the key benefits, high-level steps, and important considerations for each migration option.

Why Migrate to ArcGIS Enterprise

Modern technology has ushered in an era of unprecedented data volume and today's tech savvy users expect to have access to this information at their fingertips. The technology and analytics required to process, analyze, and ultimately serve this kind of high volume, high demand data is what ArcGIS Enterprise was engineered to do out of the box.

ArcGIS Enterprise expands on ArcGIS Server technology and combines it with an easy to use Web GIS portal and infrastructure backend that allows organizations to create beautiful and responsive maps, apps, and data products that can be delivered to any device, anywhere, any time – while still running entirely on infrastructure you manage and maintain. If you are running ArcGIS Server as a standalone deployment, then you are familiar with client- server GIS. Web GIS is client-server GIS evolved, rather than simply providing a service or REST endpoint Web GIS delivers a cohesive end-to-end GIS experience that can be used by a wide variety of users. The Web GIS portal included with ArcGIS Enterprise acts as the command center for the user facing portion of your organization's GIS implementation where you do everything from applying security, analyzing data, to creating fully-functional web and mobile apps.

Integrated with the ArcGIS platform, ArcGIS Enterprise can be used to support robust in-your-infrastructure use of the latest innovations from Esri including apps for the field, office, and the latest in analysis and data exploration tools. ArcGIS Enterprise also offers advanced analysis and collaboration capabilities that are not available on standalone servers.

ArcGIS Enterprise Overview

ArcGIS Enterprise provides powerful geospatial server technology that allows you to manage your geodata and serve advanced analytics to your organization. The dedicated Web GIS infrastructure delivers layers, maps, apps, and services to any device, anywhere, at any time – without the need for custom code or device-specific development. ArcGIS Enterprise is deployed on infrastructure you manage – on-premises or in the cloud – and supports both Windows and Linux operating systems.

The standard configuration of ArcGIS Enterprise is called a base ArcGIS Enterprise deployment which comprises four software components: ArcGIS Server, Portal for ArcGIS, ArcGIS Data Store, and ArcGIS Web Adaptor.

- **ArcGIS Server** gives you the ability to publish services and share maps and layers from your GIS and business databases. It provides the layers and services that power your Web GIS. The power and flexibility of ArcGIS Server lies in its various licensing roles (introduced at 10.5; see the ArcGIS Server Licensing section of this document for more information), which add specialties to your deployment such as raster analytics (Image Server) and real-time event stream analysis (GeoEvent Server).
    - **ArcGIS Server acting as a hosting server:** The term *hosting server* was introduced at ArcGIS Enterprise 10.5. Hosting server is a special designation for a federated ArcGIS Server site. A hosting server is required to complete configuration of the base deployment. There is only one hosting server site per base deployment. For more

information on the hosting server, see the Key Concepts section of this document.

- **Portal for ArcGIS** hosts a secure, centralized location to organize and manage location-enabled content, geodata, and user access levels and permissions. This front-end ArcGIS Enterprise portal is powered by the flexible back-end infrastructure of Portal for ArcGIS, which also provides a common application framework that allows the maps and apps you create to be accessible on any device.

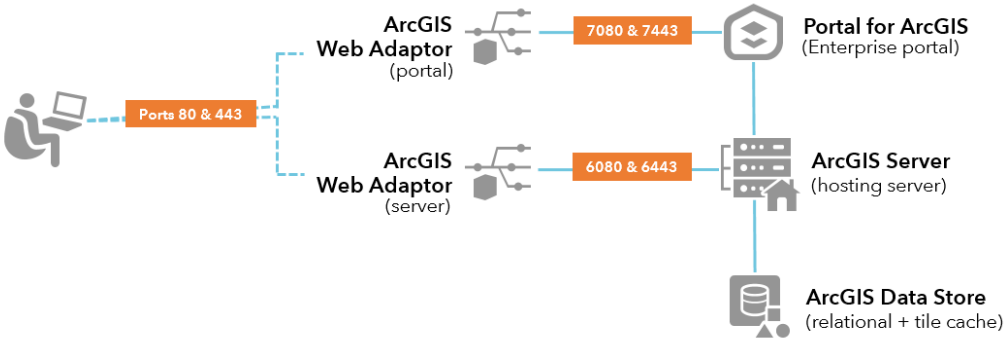
- **ArcGIS Data Store** stores the spatial content that has been copied to and published via ArcGIS Enterprise. It also stores the output of standard analysis tools run within the portal. It does not replace the functionality provided by traditional enterprise geodatabases, which provide the ability to publish data directly from the existing database without copying it to ArcGIS Enterprise.

  There are three types of ArcGIS Data Store: relational, tile cache, and spatiotemporal big data. The relational and tile cache configurations of the ArcGIS Data Store are required for ArcGIS Enterprise deployments. The spatiotemporal big data store is needed only if you add GeoAnalytics Server or GeoEvent Server to your ArcGIS Enterprise deployment. More information on the different types of ArcGIS Data Store can be found in the ArcGIS Data Store help topics.

- **ArcGIS Web Adaptor** functions as a software load balancer, appropriately directing network traffic to your Enterprise deployment resources. The web adaptor also enables web-tier authentication for ArcGIS Enterprise.

To get started with ArcGIS Enterprise, you install each of these components and configure them together to create a base ArcGIS Enterprise deployment. The base deployment is the foundation of ArcGIS Enterprise and creates an end-to-end seamless software experience.

Standing up a base deployment



Logical architecture of the base ArcGIS Enterprise deployment

Before you get started setting up a base deployment, you will need to configure a secure, certificate-based environment and set up your web server to support encrypted HTTPS communication. You must also ensure the individual components can communicate with each other over their default network ports. After the prerequisite certificates are configured and the network communication is verified, the most critical part of standing up a base deployment is configuring the software components to work together.

Base deployment patterns
The base ArcGIS Enterprise deployment can be deployed in either a single machine or multi-machine pattern and can be deployed to support high availability. The base deployment pattern you choose does not affect the migration options or steps for moving from a standalone ArcGIS Server deployment to ArcGIS Enterprise, therefore details on the different base deployment patterns will not be covered here. For more information on base deployment patterns see the Base ArcGIS Enterprise deployment help topic.

Implementing a base deployment
For detailed steps on how to manually set up a base ArcGIS Enterprise deployment, the tutorial Set up a base ArcGIS Enterprise deployment will walk you through the setup. This is useful for understanding the components and how they work together, but it is highly recommended to use the automated tooling provided by Esri whenever possible.

For more hands-on learning Esri Training offers an instructor led course for Configuring a Base Deployment.

Automated tooling to set up a base ArcGIS Enterprise deployment
ArcGIS Enterprise provides tools to automate the deployment process for you:

- **ArcGIS Enterprise Builder** is an installation and configuration wizard to create a single machine base deployment where all software components are located together on a single machine. Because ArcGIS Enterprise Builder can only create a single machine base deployment it is most commonly used for on-premises deployments of small-scale, non-production environments, and prototype environments.

- **Chef** is an infrastructure automation tool that use customizable scripts to automate your infrastructure setup and software configuration. Chef is an ideal tool to use if you are setting up custom deployments, highly available configurations, and deployments that need to be repeated many times. The ArcGIS Enterprise team has created a set of fully supported Chef cookbooks on the Esri GitHub site with recipes that will jumpstart your ArcGIS Enterprise deployment process using Chef. Be aware: The scripts provided on GitHub will require customization to fit your specific system or environment.

- **Cloud tools** help you deploy on Amazon Web Services or Microsoft Azure. Esri offers machine images for these two cloud platforms. You can easily deploy the cloud machine images using Cloud Formation Templates (for AWS deployments) and a Cloud Builder (for deployments on Azure). You can

find the machine images in each cloud provider's respective marketplace, and the tools (Cloud Formation Templates or Cloud Builder) are available through My Esri and via links in the ArcGIS Enterprise documentation for AWS and Azure. The ArcGIS Enterprise cloud deployment tools allow you to easily stand up your cloud infrastructure and completely configure ArcGIS Enterprise at the same time – all you need to do is bring your own license.

ArcGIS Server Licensing

While the ArcGIS Server you use in your standalone deployment is the same ArcGIS Server software component that is used within ArcGIS Enterprise, the licensing options for ArcGIS Server as part of ArcGIS Enterprise are different. Whereas before you needed only one license file to unlock all ArcGIS Server capabilities, beginning at ArcGIS Enterprise 10.5 you will need to choose which type of ArcGIS Server you need and license the software based on the *server licensing role*. Similar to how a user role determines what a user can do within your GIS, a server role determines what the ArcGIS Server will be able to do. You will need to get a new license file when you upgrade to ArcGIS Enterprise.

There are currently five ArcGIS Server roles:

- ArcGIS GIS Server
- ArcGIS Image Server
- ArcGIS GeoEvent Server
- ArcGIS GeoAnalytics Server
- ArcGIS Business Analyst Server

Each server role unlocks a different set of capabilities geared towards solving different types of geospatial problems. You can add as many roles to your ArcGIS Enterprise deployment as desired, but at a minimum ArcGIS GIS Server is required (this is what will support the hosting server in the base deployment). Each server role can be scaled independently and if you choose multiple server roles can be combined in a single ArcGIS Server site. However, there are architectural considerations and best practices to keep in mind prior to combining server roles in a single ArcGIS Server site. The UC presentation ArcGIS Enterprise: Architecting Your Deployment (PDF, video) may be a helpful resource. Note that each additional server role you add to your ArcGIS Enterprise deployment adds cores to your overall deployment.

Despite the repackaging of ArcGIS Server when you migrate to ArcGIS Enterprise you will not lose any capabilities. All capabilities you currently use as part of a standalone ArcGIS Server deployment are included in the ArcGIS GIS Server role – upon upgrade your current ArcGIS Server license will be converted to an ArcGIS GIS Server license. If you had licensed an ArcGIS Server Image Extension, it will become an ArcGIS Image Server license upon upgrade. Likewise, if you had licensed an ArcGIS Server GeoEvent Extension, it will become an ArcGIS GeoEvent Server license upon upgrade.

To learn more about the capabilities unlocked with each server role, review the What is ArcGIS Enterprise help topic. For information on system requirements or for guidance on how to deploy any of the ArcGIS Enterprise server licensing roles, refer to the Deployment patterns for ArcGIS Enterprise help topic.

Key Concepts

Hosting server

As you begin the configuration and review architecture diagrams of the base ArcGIS Enterprise deployment you will notice that the ArcGIS Server is called a hosting server. Hosting server is not a server licensing role, rather it is a designation that you give to one of your federated ArcGIS GIS Server sites to construct the base deployment. There is only one hosting server per deployment. The hosting server is where all hosted services reside.

Hosted services are those services served from the hosting server and are most commonly created when data is copied to ArcGIS Enterprise or from the output of an analysis tool run from the ArcGIS Enterprise portal and sometimes ArcGIS Pro. In addition to simply being services that reside on the hosting server, hosted services are different from federated services in that the lifecycle of the service is managed by ArcGIS Enterprise. This means the data is stored and managed by the system, and that if you delete the layer in the portal, the underlying service is also deleted.

Because the hosting server is an ArcGIS GIS Server it can always be used as a traditional GIS Server as well. Keep in mind that having a hosting server pull double duty by acting as both the hosting server and GIS Server may not be ideal for every deployment. Larger deployments (users and/or service counts) may need to separate out the traditional GIS Server capabilities from the hosting server capabilities in what is called *workload separation* by deploying a separate ArcGIS GIS Server site that is federated with your base deployment.

Federation

As you go through the configuration process for the base deployment, you will come across the term *federation*. If you are coming from a standalone ArcGIS Server deployment, this may be a new term for you. All this term means is you are setting up a trust relationship between your ArcGIS Server site(s) and the Portal for ArcGIS software component. If you are coming from a more IT-centric background, the term *federation* may make you think of identity management. There is a tie-in between federation as defined by the IT industry and as used within ArcGIS Enterprise. The tie-in is that once you federate your ArcGIS Server site to an ArcGIS Enterprise portal, the ArcGIS Enterprise identity based security model will take over, meaning any security you had previously set on your ArcGIS Server site will be bypassed by the identity-based security you set within the portal.

Once you have federated an ArcGIS Server site to Portal for ArcGIS, security is handled by the portal; only users who have an identity in your portal will be able to view secured content. Therefore, when you migrate a standalone ArcGIS Server site to ArcGIS Enterprise you will need to recreate your security structure using the ArcGIS Enterprise security model and give everyone who requires access an identity within the portal. Effective January 1, 2018, if you are using ArcGIS Enterprise Standard and Advanced you can provide viewer access to as many users as you need at no additional cost. You can contact your account manager for more information pertaining to the licensing changes around the Level 1 Viewer accounts in ArcGIS Enterprise. For information on the roles and privileges you can assign each user within ArcGIS Enterprise, see the Levels, roles, and privileges help topic.

Note that ArcGIS Enterprise does not include built-in tools that can automatically recreate your server security settings using the ArcGIS Enterprise security model, so you will need to account for user migration and security verification as you plan your overall move to an ArcGIS Enterprise deployment.

How to federate
You can find more detailed information in the ArcGIS Enterprise help documentation, but the high-level steps are:

1) Install and configure your ArcGIS Server site.
2) Log into your Enterprise portal as an administrator.
3) Under the Organization tab, navigate to Edit Settings, then choose Servers.
4) Under the Federated Servers section, click Add Server, then provide the Services URL, Administration URL, and the admin username and password.
5) Click Add to complete the process of federating your server site to your ArcGIS Enterprise deployment.

Once you have federated an ArcGIS Server site, do not unfederate. Unfederating is not recommended and can cause breaking changes in your ArcGIS Enterprise deployment.

Migrating your deployment to ArcGIS Enterprise

Now that you understand the concepts, components, and some of the licensing of ArcGIS Enterprise, you are ready to plan the migration of your standalone ArcGIS Server site to ArcGIS Enterprise.

Overview of Migration Options:
This document describes three options for migrating from a standalone ArcGIS Server site to ArcGIS Enterprise.

Option 1: Upgrade your standalone ArcGIS Server site to ArcGIS Enterprise and use it as the hosting server site within your base ArcGIS Enterprise deployment.

Option 2: Create a new ArcGIS Enterprise deployment on new infrastructure and migrate services from your standalone ArcGIS Server site as needed.

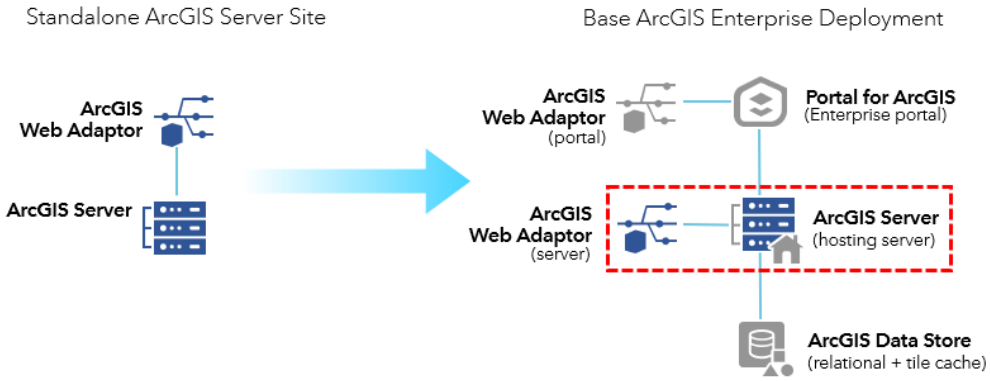
Note: Under the Esri standard license agreement you can run parallel ArcGIS Server sites for upgrade and service migration for up to 6 months.

Option 3: Create a base ArcGIS Enterprise deployment separate from your existing ArcGIS Server site on new infrastructure, then upgrade and federate your existing ArcGIS Server site to the new ArcGIS Enterprise deployment.

Remember that no matter the migration option you choose all ArcGIS Enterprise deployments use the ArcGIS Enterprise identity-based security model and will bypass any server/service level security you have set. In order to have effective content security you will be required to reestablish the security settings under this new model. You can find more information on ArcGIS Enterprise security in the ArcGIS Enterprise security model help topic.

Option 1

The result of Option 1 is a base ArcGIS Enterprise deployment. The primary benefit of this option is that it allows you to repurpose your existing infrastructure to create an ArcGIS Enterprise deployment. Meaning services will not need to be republished and service URLs will not change. However, when you take your existing ArcGIS Server site and make it the hosting server site for your base deployment, your server site will be doing double duty – acting as both a traditional GIS server and a hosting server. Depending on your use cases and workflows, this may not be problematic, but it is something to keep in mind as your deployment, number of services, and/or number of users grows. At some point, you may need to scale your ArcGIS Server site by adding more cores so that it can fully serve both functions – or you may choose to create a separate ArcGIS Server site to enforce true workload separation.



A high-level overview of the steps you would take to complete Option 1 include:

1) Upgrade your existing ArcGIS Server site to ArcGIS Enterprise (10.5 or higher).
2) Install and configure the other components of the base deployment on the same (or different) infrastructure.
    a. Note: if you already have an ArcGIS Web Adaptor configured with your ArcGIS Server site, you can still use that Web Adaptor. However, you will need to upgrade the version of the Web Adaptor to match the version of the server. You will need to install a new additional Web Adaptor to use with the portal. The Web Adaptor for the server and the Web Adaptor for the portal can be on the same or different machines.
3) Configure ArcGIS Data Store as the relational and tile cache types and register it with your ArcGIS Server site.
4) Federate your upgraded ArcGIS Server site with the Enterprise portal.
5) Designate the ArcGIS Server site as the hosting server site.
6) Migrate and set up your users – onboard users, set membership levels, apply user roles, and set up groups within the portal as needed.
7) Apply your security configuration.
    a. Once you have migrated to the base deployment, the ArcGIS Enterprise security model will take over. Be sure to set the correct security within the Enterprise portal by sharing services to the appropriate groups.

   b. By default, post-federation security for services coming from a pre-existing ArcGIS Server site will have access limited to only the administrative account that executed the federation.

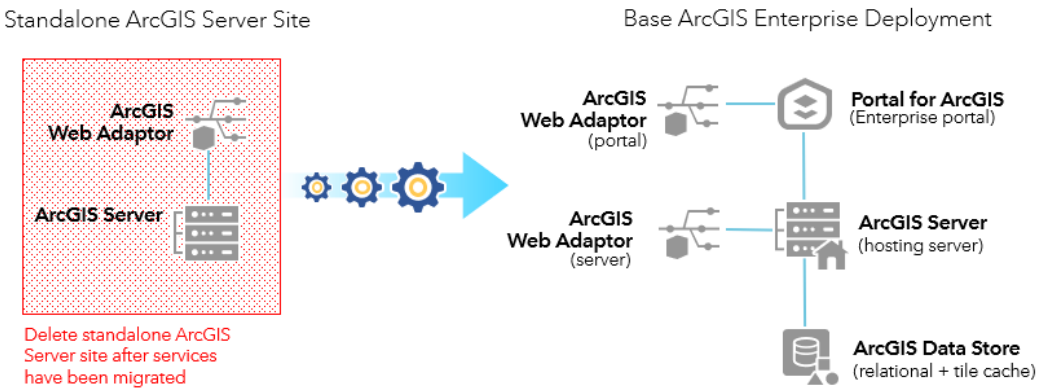
8) Share services –By default, all services already on your ArcGIS Server site will be locked down to the administrative account that ran the migration. You will need to share with the appropriate groups as necessary. For public content that can be viewed by anonymous users, use the “Share with Everyone” option.

Under Option 1, all the service URLs from your ArcGIS Server site remain the same, so there is no risk to dependent apps or other clients. However, once the server is federated to your ArcGIS Enterprise portal, the ArcGIS Enterprise security model takes effect and security is set within the portal rather than on the server. Be sure to validate that user access and content security is as expected prior to moving to production.

Option 2

The result of Option 2 is a base ArcGIS Enterprise deployment. However, rather than repurposing infrastructure as described in Option 1, Option 2 uses new infrastructure. Option 2 is good for organizations that want a more gradual migration, and it’s a more likely approach for customized implementations and deployments with multi-machine sites. However, because you are deploying on new infrastructure services will need to be republished and service URLs will change. It will be important to verify that dependent apps and clients are not disrupted when your changes move to production.

Under Option 2 you run two ArcGIS Server sites in parallel during the migration process then delete the original server site once migration is complete. Note, that under the standard Esri licensing agreement you can run these two sites concurrently for a period of up to six months.



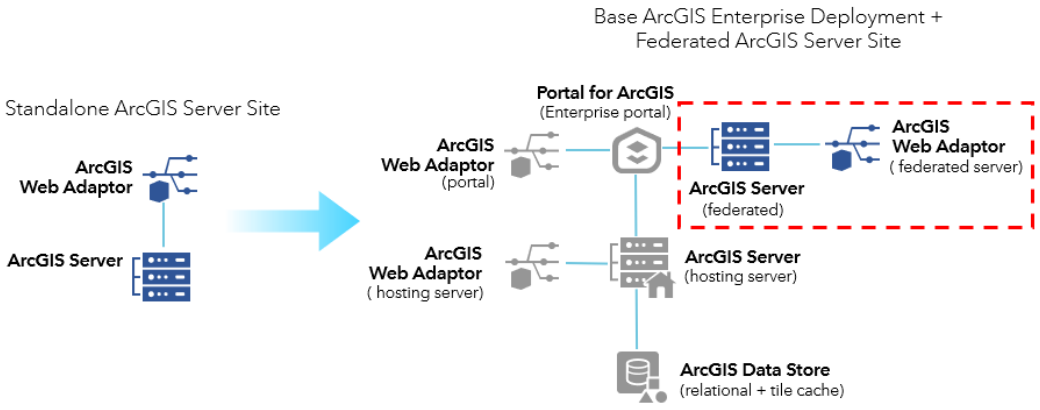
A high-level overview of the steps involved in Option 2 include:

1) Install and configure a base ArcGIS Enterprise deployment on separate infrastructure (this can be a single machine or multi-machine base deployment; choose what best fits your needs).

2) Migrate and set up your users – define and authorize users, set membership levels, apply user roles, and set up groups within the portal as needed.
3) Migrate your server's services.
    a. The order in which you choose to do this is up to you. However, whatever method you choose, be sure to inventory which services you have migrated and cross-reference this list with your original inventory to be sure that no service was left behind.
        i. To publish services as hosted services using ArcMap, refer to the Use ArcMap with your portal help topic.
        ii. To complete this process using ArcGIS Pro, see the Publish hosted feature layers help topic.
4) Apply your security configuration.
    a. Once you have migrated to the base deployment, the ArcGIS Enterprise security model will take over; be sure to set the correct security within the Enterprise portal by sharing services to the appropriate groups.
5) Repair URLs in apps and clients
    a. Because you are standing up new infrastructure, your service URLs have changed, and you will need to go into your dependent apps and clients and repair the URL paths to make sure everything returns to a functional state.
6) Once security has been set and dependencies have been repaired and confirmed as functional, you can promote your new base ArcGIS Enterprise deployment to production.
7) After the move to production is complete, delete your original ArcGIS Server site in accordance with the license agreement. Remember, you have up to 6 months to run the two systems concurrently.

Option 3

The result of Option 3 is a base ArcGIS Enterprise deployment with an additional ArcGIS GIS Server site. Option 3 uses new infrastructure for the base deployment and upgrades your existing ArcGIS Server site to a federated GIS Server site within the ArcGIS Enterprise deployment. As in Option 1, the key benefit of Option 3 is that it does not require that existing services be republished, and service URLs are not changed. However, because you are adding new, separate, infrastructure for the base deployment you will need to purchase additional cores of ArcGIS Server.



A high-level overview of the steps to complete Option 3 include:

1) Install and configure a base ArcGIS Enterprise deployment on separate infrastructure (this can be a single machine or multi-machine base deployment, choose what best fits your needs).
    a. Note: Even if your current ArcGIS Server site is configured with an ArcGIS Web Adaptor, you will still need two new Web Adaptors – one for the hosting server site in the base deployment and one for the portal.
2) Migrate and set up your users – define and authorize users, set membership levels, apply user roles, and set up groups within the portal as needed.
3) Upgrade your existing ArcGIS Server site to ArcGIS Enterprise (10.5 or higher).
4) Federate your upgraded ArcGIS Server site to the Enterprise portal (this is now considered a federated server, as opposed to a hosting server).
5) Apply your security configuration.
    a. Once you have migrated to the base deployment, the ArcGIS Enterprise security model will take over; be sure to set the correct security within the Enterprise portal by sharing services to the appropriate groups.
    b. By default, post-federation security for services coming from a pre-existing ArcGIS Server site will have access limited to only the administrative account that executed the federation.
6) Share services from your federated server – By default, all services already on your ArcGIS Server site will be locked down to the administrative account that ran the migration. You will need to share with the appropriate groups as necessary. For public content that can be viewed by anonymous users, use the "Share with Everyone" option.

Under Option 3, the services URLs from your original ArcGIS Server site are maintained, but security is now handled by the Enterprise portal. The ArcGIS Server site that acts as the hosting server site will power the analyses of the base deployment and store all its hosted services.

Migration Option Summary

Option	Description	Benefits	Considerations
1	Repurpose existing ArcGIS Server site	• No new infrastructure • No republishing services • Service URLs do not change	ArcGIS Server site is serving as both hosting server and a traditional GIS server
2	Create a new base ArcGIS Enterprise deployment	• Gradual migration • Good choice for custom deployments and multi-machine sites	Services will need to be republished and service URLs will change
3	Create a new base ArcGIS Enterprise deployment, federate existing site.	• Workload separation • No republishing services • Service URLs do not change	Must purchase additional cores of ArcGIS Server

Conclusion

Migrating to ArcGIS Enterprise will help your organization to continue to meet user expectations in an age of big data, smart communities, where everything is location enabled and people want access to analytics and fast, reliable data at their fingertips no matter where the job takes them. ArcGIS Enterprise was designed to meet this challenge and will allow your organization to leverage more of what the ArcGIS platform has to offer, including integrated apps and advanced analytical tools.

When it comes to migrating your standalone ArcGIS Server site, there are three options each with its own benefits and considerations. Which option you choose will depend on your how your ArcGIS Server site is being used today – including any app and/or client dependencies and what makes the most sense for your organization. Remember, all ArcGIS Enterprise deployments use the ArcGIS Enterprise security model, but now with Viewer level access included with ArcGIS Enterprise Standard and Advanced adopting this new model is attainable for every organization.

The ArcGIS Enterprise help documentation is a great resource for any questions unanswered by this white paper.

About the Authors

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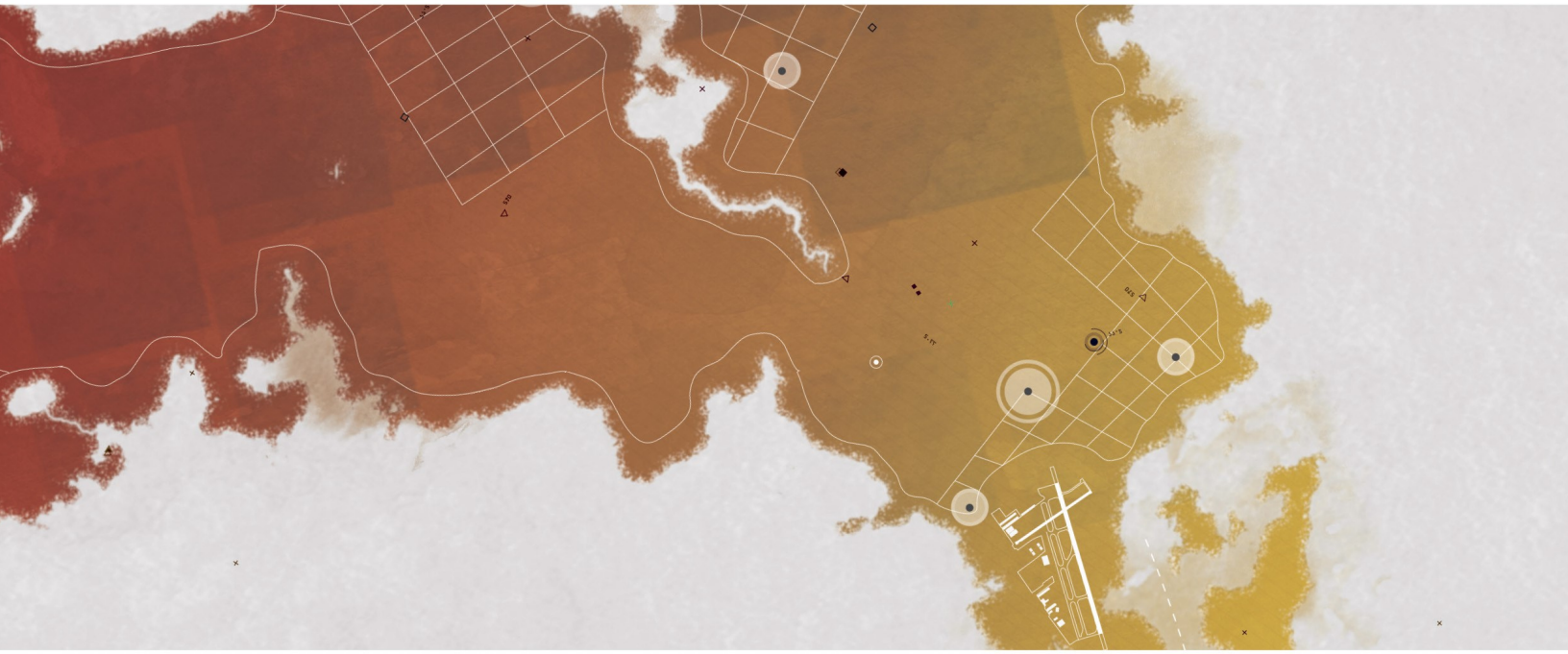

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