



# ArcGIS Enterprise: Common Deployment Patterns

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GIS  
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NEXT

# Assumptions and prerequisites

- You know what the ArcGIS Enterprise product is and understand the capabilities
- You are an IT administrator (or work as one) who architects and/or installs the software

## Recommended prerequisites:

- Prior familiarity with ArcGIS Server
  - E.g. you know what ArcGIS Server 'site' is.

## Bonus prerequisites:

- Prior familiarity with Portal for ArcGIS
  - E.g. you're familiar with the concept of 'federating' an ArcGIS Server site with the portal

# Need more knowledge?

Esri Training Resources



## ArcGIS Enterprise: Configuring a Base Deployment

### Empower Your Organization with ArcGIS Enterprise.

ArcGIS Enterprise is a key component of the ArcGIS platform. It provides you with a complete GIS that runs behind your firewall, in your infrastructure, on-premises, and in the cloud and works with your enterprise systems and policies. [ArcGIS Enterprise Overview](#)

ArcGIS Enterprise is a full-featured mapping and analytics platform that includes a powerful GIS server plus dedicated web-based GIS infrastructure to organize and share your work. You get:

- An enterprise GIS portal for organizing and sharing GIS assets.
- A data store for secure storage and fast access to maps and data.
- Optional GIS capabilities for real-time imagery and large data processing.
- Even more capabilities when you opt for GIS server extensions.
- An enterprise geodatabase, the ultimate in geodata storage and management.

### [ArcGIS Enterprise: Configuring a Base Deployment](#), Instructor-led, 2 days

In this course, you will learn how to install and configure an ArcGIS Enterprise base deployment to enable individuals to securely access, create, and share geospatial resources to boost collaboration and gain location-based insights. You will learn how to license and install the four software components of a base deployment, properly configure an ArcGIS Enterprise portal to manage users, groups, and content sharing privileges, and ensure system security and performance.

**This course is designed for:** GIS Technical Leads, System Administrators and Web Administrators – anyone tasked with supporting the deployment of ArcGIS for Enterprise.

Esri Training Resources



## ArcGIS Enterprise: Administrative Workflows

### New Course Coming Spring 2019

ArcGIS Enterprise puts collaboration and flexibility at the center of your organization's GIS. It pairs industry-leading mapping and analytics capabilities with a dedicated Web GIS infrastructure to organize and share your work on any device, anywhere, at any time. [ArcGIS Enterprise Overview](#)

### [ArcGIS Enterprise: Administrative Workflows](#), Instructor-led, 2 days

This new course will provide GIS and IT professionals with additional knowledge and hands-on experience for administering and managing ArcGIS Server sites federated with an ArcGIS Enterprise deployment. In addition to exploring analysis and data management options of the various server licensing roles, this course will showcase advanced site management concepts including:

- Service tuning and optimization
- Troubleshooting
- Advanced data store setup
- Scripted automation
- System scaling and more!

### Goals of the course:

A learner who completes this course will have the foundation necessary to:

- Identify and implement ArcGIS Server capabilities to match organizational business needs
- Interpret how organization business requirements drive enterprise data management options
- Implement GIS services that satisfy desired outcomes for end-user application
- Examine GIS service performance and apply best practices and tuning strategies
- Develop solutions that automate common administrative task

**This course is designed for:** GIS Technical Leads, System Administrators and Web Administrators or anyone tasked with supporting the deployment and administration of ArcGIS for Enterprise.

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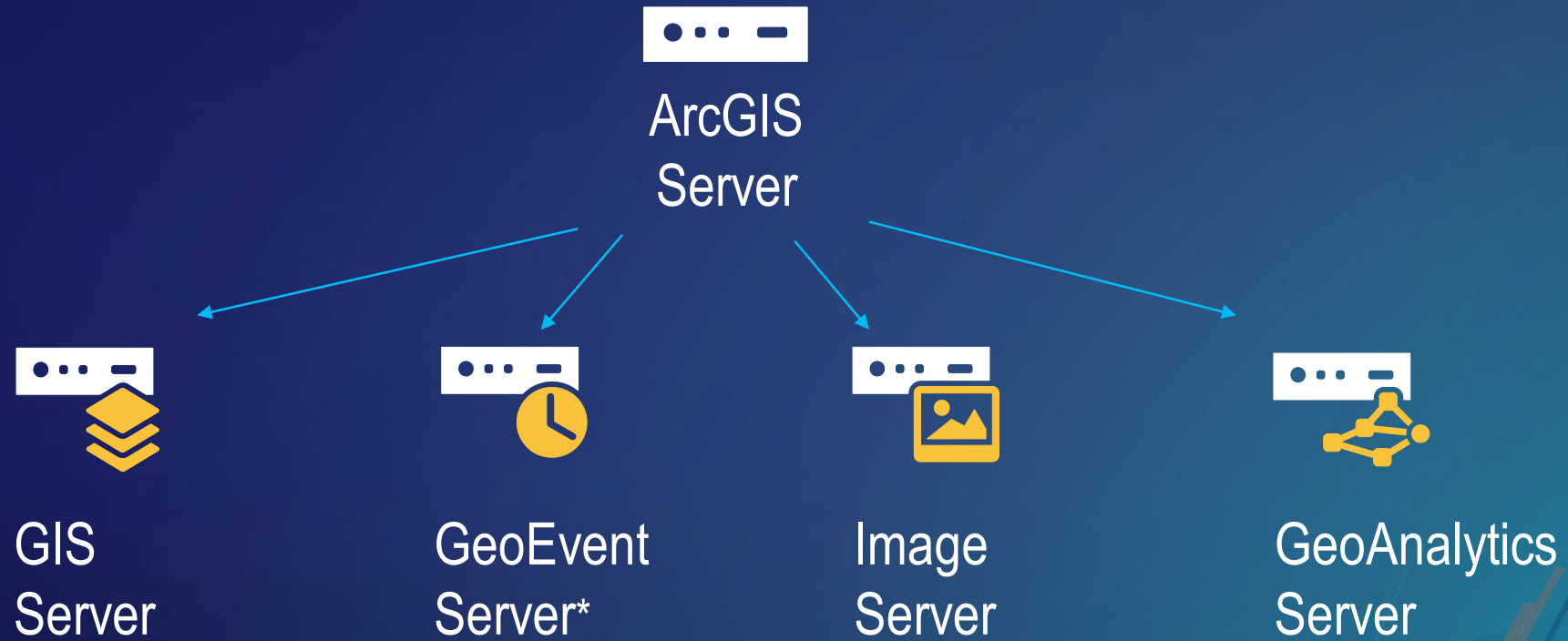
**Don't panic**



# Software Components



# Server Licensing Roles



One software component, multiple server roles

# Components of the base deployment



ArcGIS  
Server

Set up as a GIS Server and configured as the **hosting server**, ArcGIS Server provides the layers, services, and horsepower required to power your Web GIS.



Portal  
for  
ArcGIS



ArcGIS  
Data  
Store



ArcGIS  
Web  
Adaptor

# ArcGIS Enterprise | Components of the base deployment



ArcGIS  
Server



Portal  
for  
ArcGIS



ArcGIS  
Data  
Store



ArcGIS  
Web  
Adaptor

The **web frontend** and **infrastructure backend** that supports a user's interaction and overall experience with your Web GIS.



# ArcGIS Enterprise | Components of the base deployment



ArcGIS  
Server



Portal  
for  
ArcGIS



ArcGIS  
Data  
Store



ArcGIS  
Web  
Adaptor

The **ArcGIS managed data repository** that stores the spatial content that has been *copied* to the system

# ArcGIS Enterprise | Components of the base deployment



ArcGIS  
Server



Portal  
for  
ArcGIS



ArcGIS  
Data  
Store



ArcGIS  
Web  
Adaptor

Relational

Tile Cache

Spatiotemporal

# ArcGIS Enterprise | Components of the base deployment



ArcGIS  
Server



Portal  
for  
ArcGIS



ArcGIS  
Data  
Store

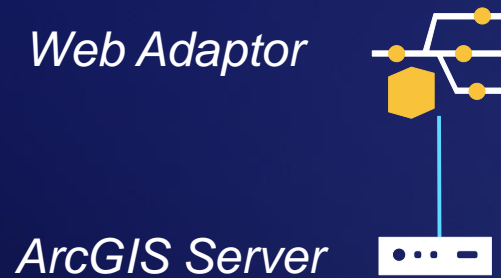


ArcGIS  
Web  
Adaptor

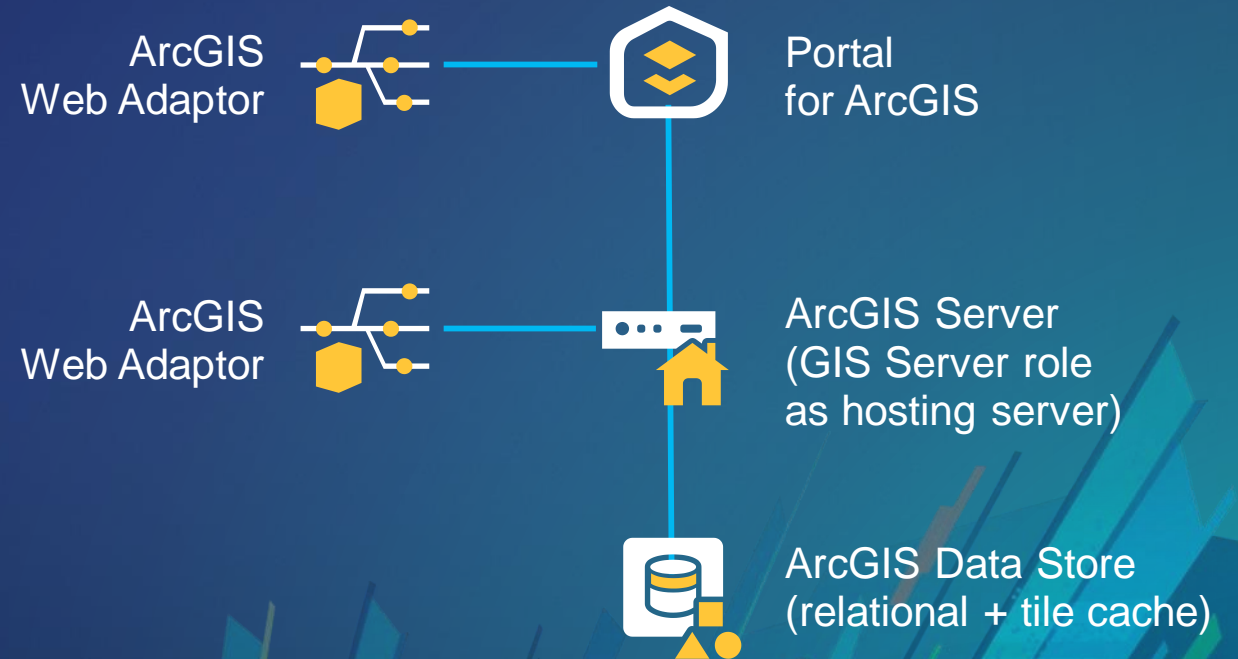
An Esri built software **load balancer** that appropriately directs network traffic and serves as a **reverse proxy** for Web GIS access.

# Coming from ArcGIS Server to ArcGIS Enterprise

## Typical deployment of ArcGIS Server

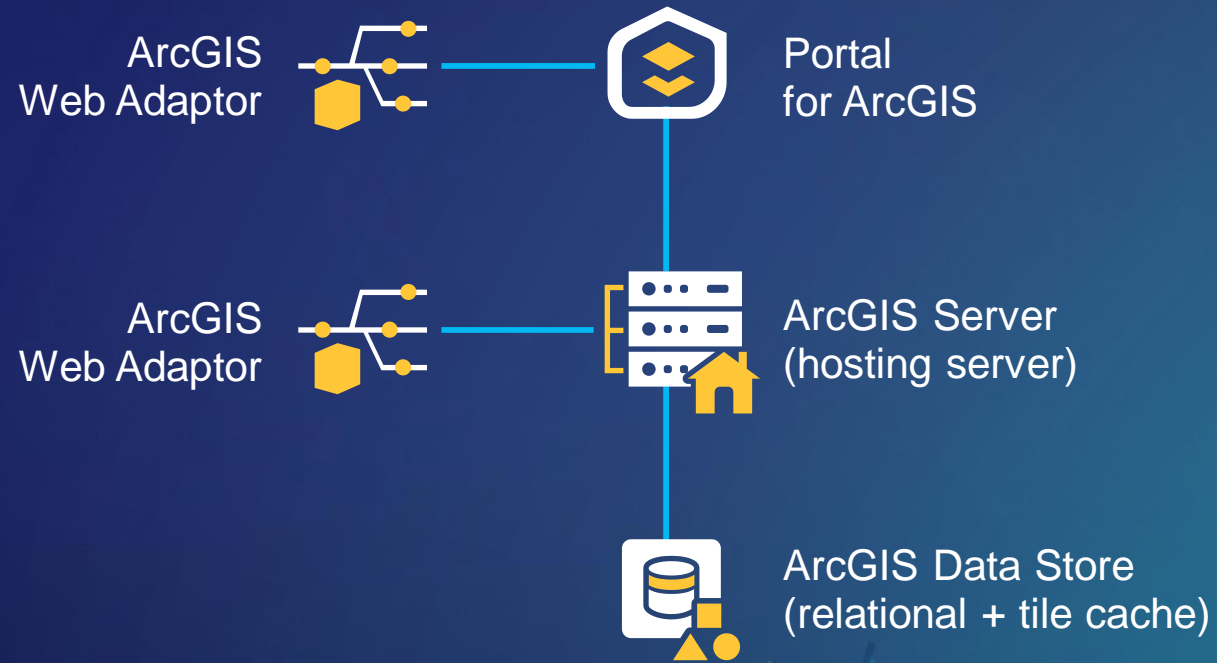


## Base deployment of ArcGIS Enterprise





# Base Deployment Logical Architecture



# Base Deployment Logical Architecture

## ArcGIS Web Adaptor

Integrates with your organization's existing web server to provide a single endpoint that **distributes incoming requests** and enables you to use **web-tier authentication**.



# Base Deployment Logical Architecture



## Portal for ArcGIS

The software component that enables the ArcGIS Enterprise portal. Portal for ArcGIS is the **web frontend and API backend** that supports a user's interaction and overall experience with your Web GIS.

# Base Deployment Logical Architecture

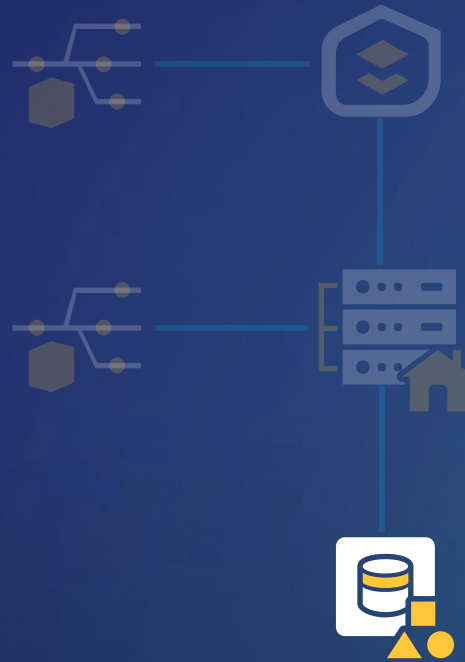


## ArcGIS Server

In a base deployment ArcGIS Server should be configured with a **GIS Server licensing role** and as **the hosting server**. In this capacity it gives you the ability to **publish and share** maps and layers from ArcGIS Pro using your own business databases and by copying data to the server.



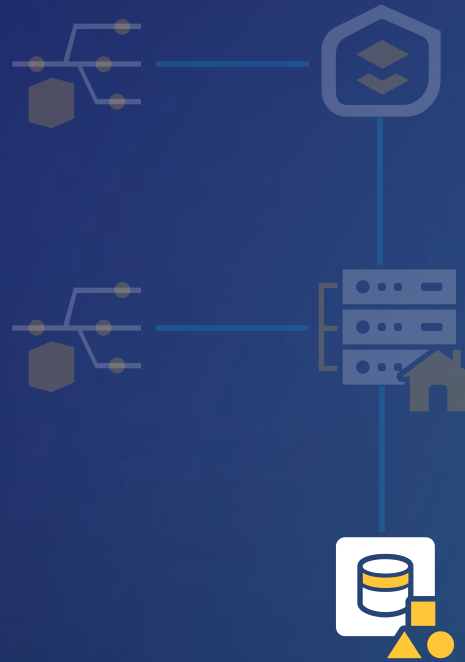
# Base Deployment Logical Architecture



## ArcGIS Data Store

The ArcGIS **managed data repository** that stores the Portal's hosted content. It is not a replacement for your enterprise geodatabases.

# Base Deployment Logical Architecture



## ArcGIS Data Store

- Relational
- Tile Cache
- Spatiotemporal

# ArcGIS Enterprise

Home Introduction Installation Guides

Introduction / Introducing ArcGIS Enterprise

## Introducing ArcGIS Enterprise

What is ArcGIS Enterprise?

What's new in ArcGIS Enterprise 10.6.1

Upgrade ArcGIS Enterprise

Base ArcGIS Enterprise deployment

ArcGIS Enterprise Builder

Tutorial: Set up a base ArcGIS Enterprise deployment

## Base ArcGIS Enterprise deployment

ArcGIS 10.6 (Windows) | Other versions

ArcGIS Enterprise comprises four software components. The minimum setup of ArcGIS Enterprise is called a base ArcGIS Enterprise deployment, and consists of the following:

- ArcGIS Server, licensed as ArcGIS GIS Server Standard or ArcGIS GIS Server Advanced and configured as the hosting server for your portal.
- Portal for ArcGIS.
- ArcGIS Data Store, configured as a relational and tile cache data store.
- Two installations of ArcGIS Web Adaptor, one installation for traffic to your ArcGIS Enterprise portal and another for traffic to your hosting server.

### In this topic

Single-machine deployment

Multi-machine deployment

Set up a highly available deployment

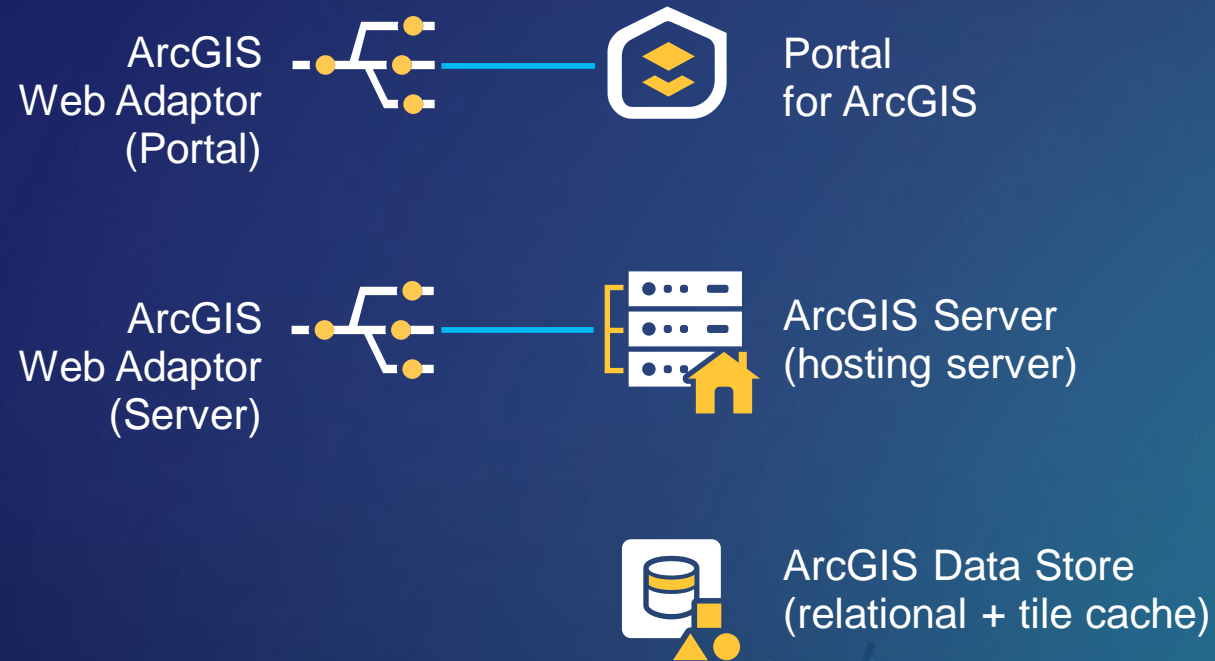
Scaling the base ArcGIS Enterprise deployment

# Functionality of the base deployment

- **Everything from traditional ArcGIS Server**
  - Ability to publish map services, feature services, network services, geoprocessing services, geocoding services, and much more.
  - Ability to publish content from referenced data sources such as file-based data (file geodatabases, shapefiles) as well as enterprise geodatabase and other spatially enabled databases.
- **Ability to give users option to do self-service mapping**
  - Publishing hosted data where users do not need access to enterprise geodatabase or trusted file shares- they can copy data to the system in a seamless fashion similar to the experience from ArcGIS Online
- **Story maps and other configurable app templates**
- **Web AppBuilder for quickly creating customized web apps**
- **Full suite of Esri apps and other custom apps built on the ArcGIS API for Javascript and ArcGIS Runtime SDKs**

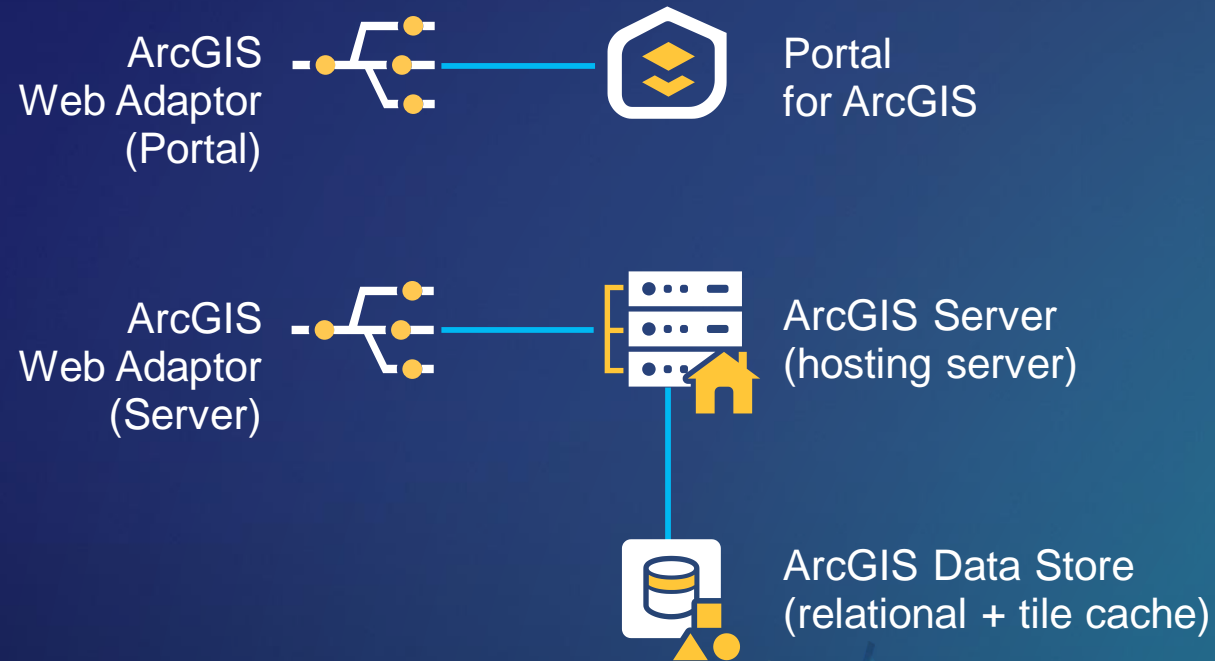


# Base Deployment Configuration Quick Steps



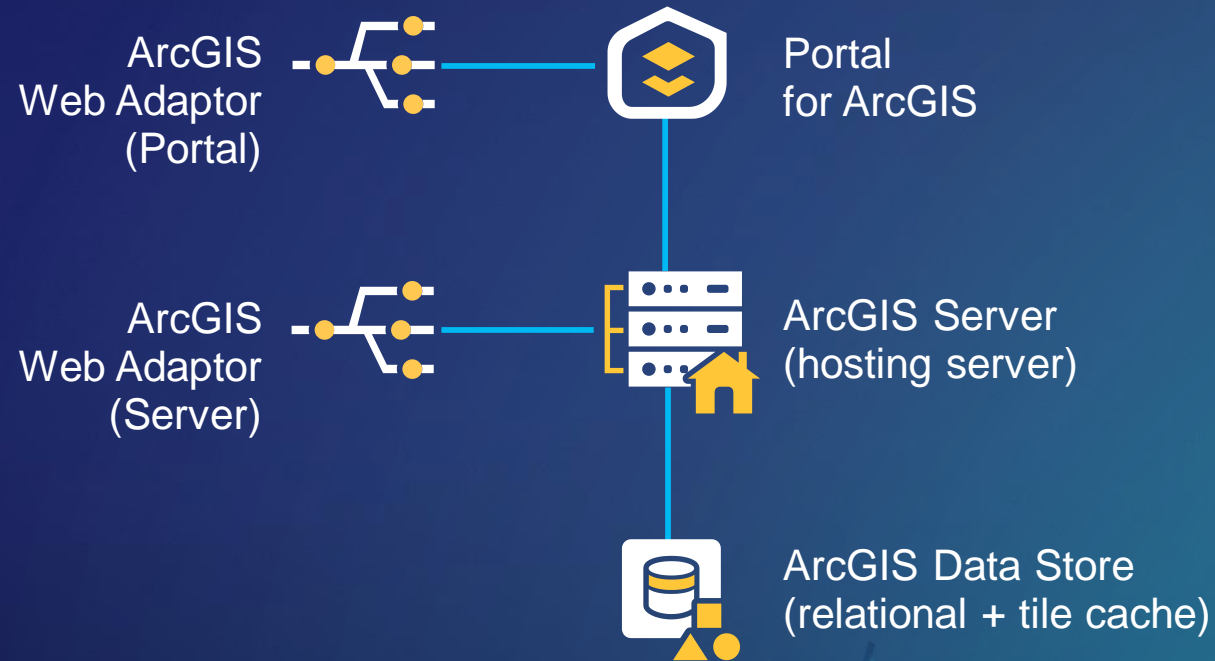
## 1 configure Web Adaptors

# Base Deployment Configuration Quick Steps



**2** configure the data store and register with server

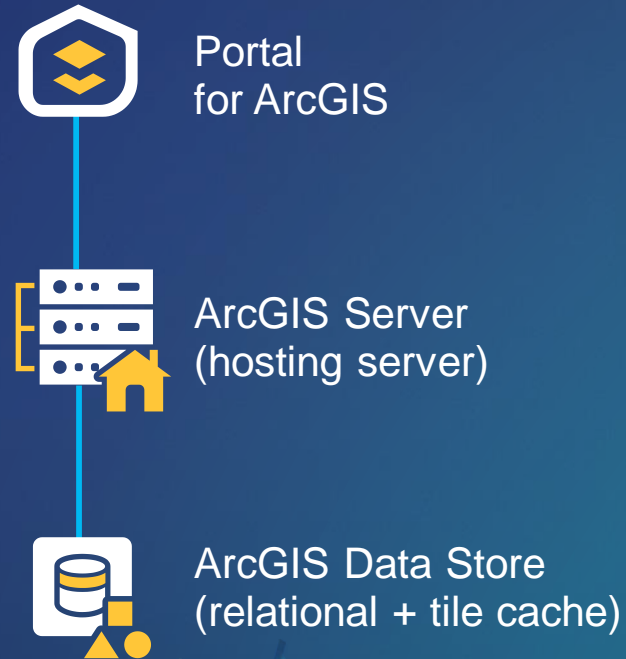
# Base Deployment Configuration Quick Steps



**3** federate server with the portal and designate as hosting server

# Base Deployment | Choosing a pattern

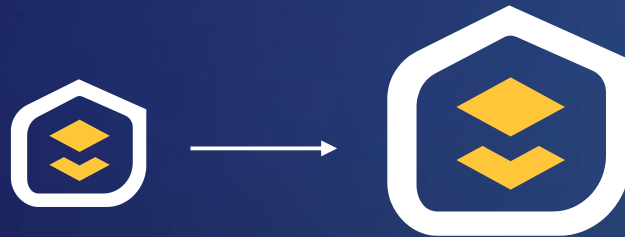
- **Choosing a base deployment pattern**
  - All-in-one single machine deployment
  - Multi-tier deployment
- **Three tiers to consider:**
  - Portal for ArcGIS (web tier)
  - ArcGIS Server (app tier)
  - ArcGIS Data Store (data tier)





# Scaling and expanding the base deployment

- When do you need to scale out the Portal for ArcGIS tier?
  - Rarely!
  - Provide more resources for your existing machine(s)
    - Note: Use two machines with Portal for ArcGIS for high availability purposes *not* for scaling
  - Monitor CPU and memory usage to see if you need more resources



# Scaling and expanding the base deployment

- **When do you need to scale out the ArcGIS Server hosting server site?**
  - If your hosting server is performing double duty:
    - Hosted services
    - Traditional services published from ArcMap or ArcGIS Pro
  - Consider setting up a separate ArcGIS Server site for this purpose!
- If your users are making heavy use of the built-in analysis tools via the map viewer or ArcGIS Pro
- If you have a lot of Insights for ArcGIS users



# Scaling and expanding the base deployment

- **When do you need to scale out the ArcGIS Data Store tier?**

- Two different types of data stores in the base deployment

- **Relational Data Store**

- Hosted feature layers
- Insights for ArcGIS



- **Tile Cache Data Store**

- Scene Layers (3D)



Note: the spatiotemporal big data store is not part of the base deployment. It supports GeoEvent Server and GeoAnalytics Server workflows covered in later slides.

## When to scale relational data store:

- Lots of users requesting data concurrently from many different hosted services: more memory often helpful
- Lots of concurrent requests: CPU can become a bottleneck

- **Monitor for bottlenecks!**

- **Consider ArcGIS Monitor**

Known as System Monitor from Esri Professional Services previously.

- CPU, memory, disk I/O are all important
- Pre-10.5.1 versions do not always handle out of disk space conditions gracefully. Avoid running out of disk space!

The background is a solid dark blue gradient. In the top-left corner, there are several overlapping, semi-transparent geometric shapes in shades of teal, green, and red, creating a layered effect. In the bottom-right corner, there is a complex, abstract graphic featuring a red grid pattern, a dark blue diagonal line, and various colored rectangular blocks in orange, yellow, and green, suggesting a technical or architectural theme.

# Deploying



# ArcGIS Enterprise

Home

Introduction

Installation Guides

Introduction / Introducing ArcGIS Enterprise

Introducing ArcGIS Enterprise

What is ArcGIS Enterprise?

What's new in ArcGIS Enterprise 10.6

Upgrade ArcGIS Enterprise

Base ArcGIS Enterprise deployment

ArcGIS Enterprise Builder

Tutorial: Set up a base ArcGIS Enterprise deployment

Deployment patterns for

## Tutorial: Set up a base ArcGIS Enterprise deployment

ArcGIS 10.6 (Windows) | Other versions

This tutorial provides an overview of setting up a single machine [base ArcGIS Enterprise deployment](#). This configuration is commonly used for testing and prototyping purposes. It enables self-service mapping and can be used with ArcGIS Pro, ArcMap, and other client applications. Although this configuration can be used in a production system, your performance, system architecture, and other requirements will dictate the deployment pattern your production deployment follows.

The resulting deployment will include the following:

# How to deploy

- It's not all about deploying components by hand anymore!

For GIS professionals



## ArcGIS Enterprise Builder

A wizard that installs and configures ArcGIS Enterprise on a single machine.

For those who want to deploy in the cloud



## Machine Images

Easily deploy and configure ArcGIS Enterprise in the two most popular public cloud environments.

For those with DevOps



## Chef

Automate installation and configuration in your infrastructure.



## PowerShell DSC

# Scaling out

The background is a solid dark blue gradient. In the top-left corner, there are several thin, parallel diagonal lines in shades of teal, green, and red. In the bottom-right corner, there is a complex, layered geometric design featuring a red rectangular area with a white grid pattern, overlaid with various colored shapes in orange, yellow, green, and dark blue, creating a sense of depth and movement.

# Expanding out from the base deployment

A couple of starting points:

- You can have any number of federated ArcGIS Server sites within your ArcGIS Enterprise deployment
- Different server roles have different recommendations and restrictions



# Expanding out from the base deployment

- Multiple reasons and ways to add to the base deployment

## 1. Adding additional GIS Server sites



- Isolate hosting server site from traditional GIS Server duties
- Have dedicated GIS Server sites for various purposes: heavily used map services, geoprocessing services, ...

## 2. Adding additional capabilities

- Image Server
- GeoEvent Server
- GeoAnalytics Server



# GIS Server

The background is a solid dark blue gradient. In the top-left corner, there are white, thin, irregular lines resembling topographic map contours. Along the bottom-right edge, there is a series of overlapping, colorful geometric shapes, including rectangles and polygons in shades of orange, yellow, green, and dark blue, creating a sense of depth and movement.

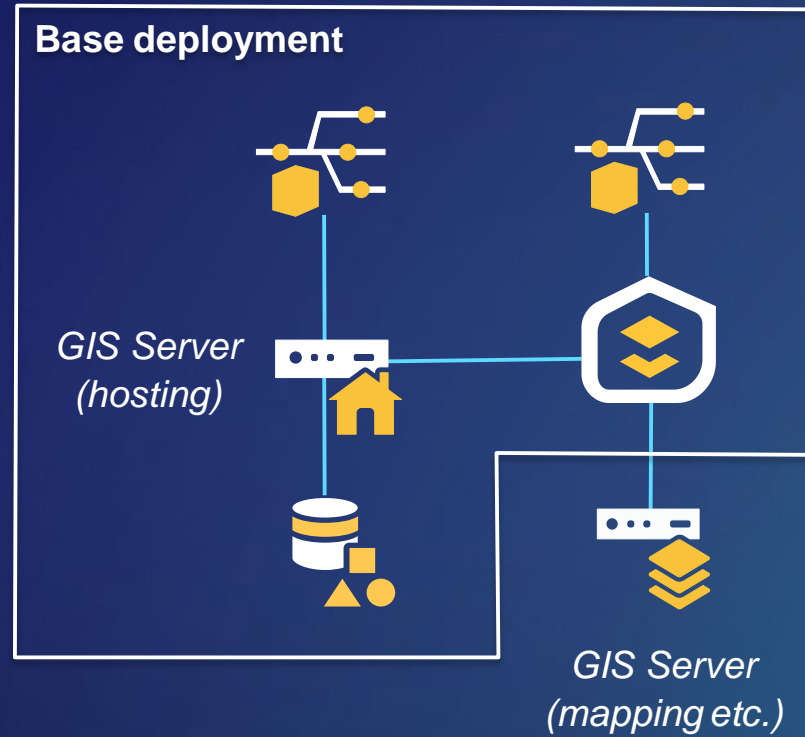
# Adding additional GIS Server sites to your deployment



## - GIS Server

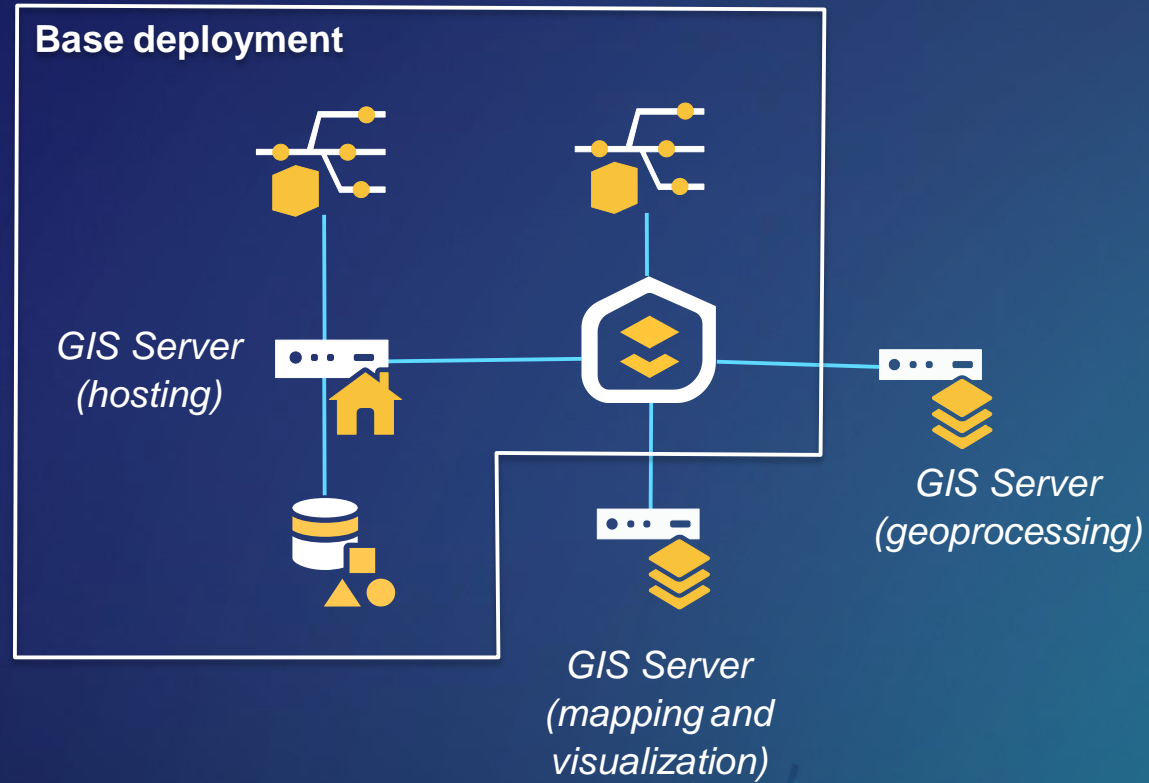
- You already have a GIS Server site as part of the base deployment
- Consider if you need additional sites- you can setup as many sites as make sense for your particular deployment following workload separation recommendations
- Common workloads that benefit from separate site(s):
  - Highly used sets of dynamic map services
  - Heavy-weight geoprocessing
  - CPU-intensive routing services
  - Mission critical services that have different SLAs than other services

# Adding additional GIS Server site to your deployment





# Adding additional GIS Server site to your deployment



# Image Server

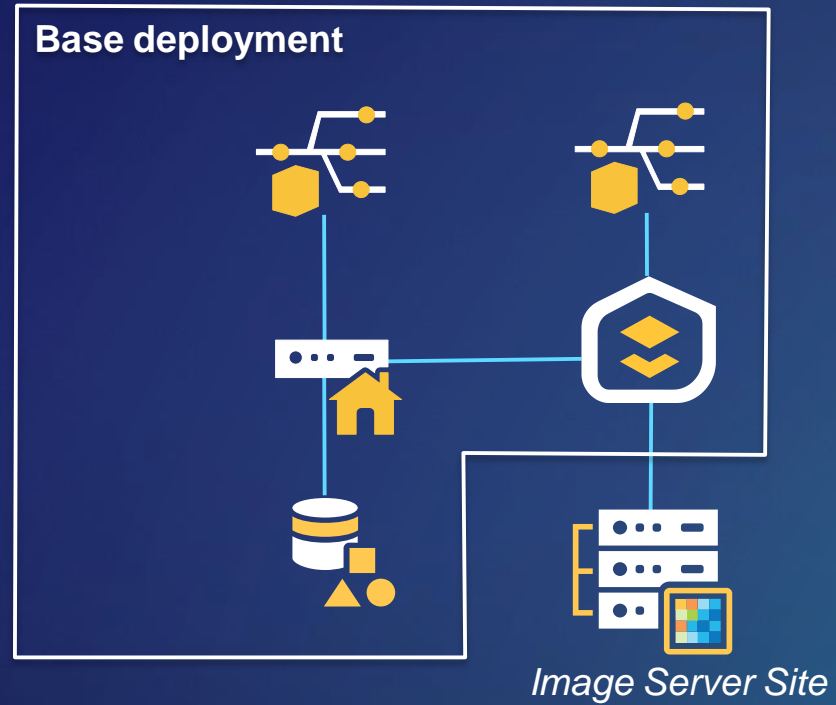
# Adding Image Server to your deployment

- Image Server provides two distinct capabilities



- Dynamic image services from your own mosaic datasets
  - Serve large collections of imagery and rasters with dynamic mosaicking and on-the-fly processing
  - $N$  number of sites
- Raster Analytics
  - Extracting information from imagery- distributed processing and analysis of imagery and rasters creating new persisted output at full source resolution
  - Only 1 site can do raster analytics
  - Choose whether to have separate site for raster analytics or one site for both traditional dynamic image services and raster analytics.
  - At 10.5-10.6 the results of raster analytics will always be hosted out of the raster analytics site. Beginning at 10.6.1, you have the option of designating a separate *image hosting* site that will be the site that hosts results from raster analytics.

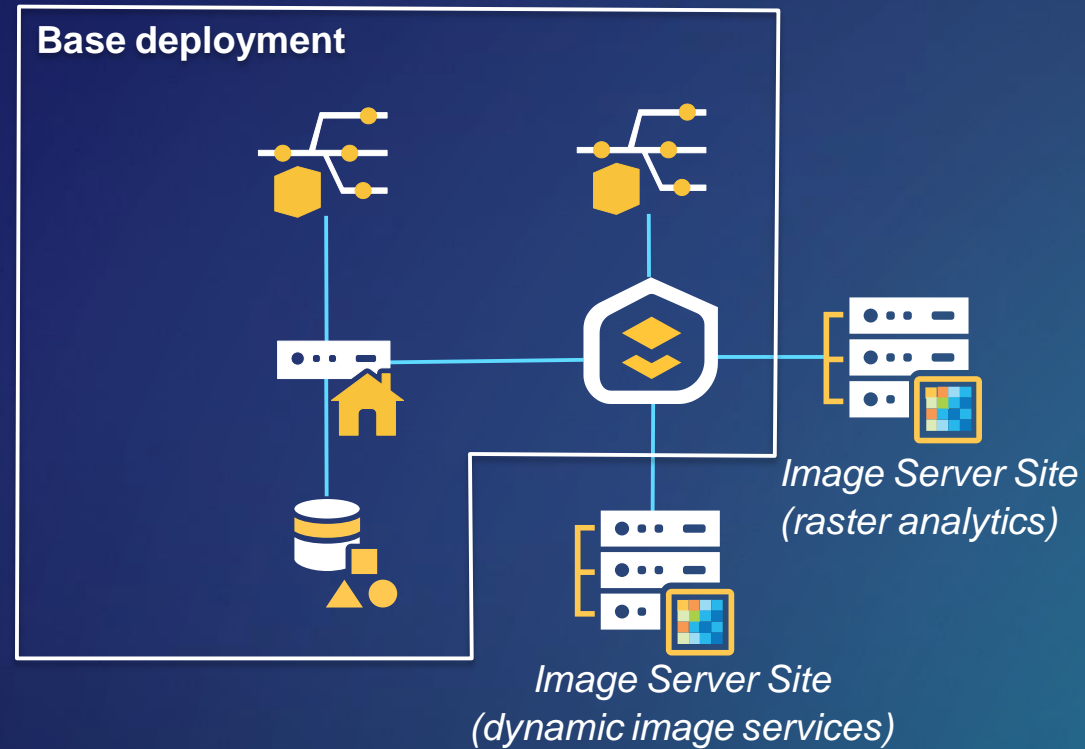
# Adding Image Server to your deployment



*One Image Server site for both capabilities*



# Adding Image Server to your deployment




*Separate Image Server sites for each capability*

# GeoAnalytics Server

The background features a dark blue to teal gradient. On the left, there are white, thin contour lines resembling a topographic map. On the right, there are several overlapping, semi-transparent geometric shapes in shades of orange, yellow, and light blue, creating a sense of depth and movement.

# Adding GeoAnalytics Server to your deployment

- GeoAnalytics Server provides distributed computing infrastructure for processing large volumes of vector and tabular data 
  - One site for GeoAnalytics Server
  - Requires spatiotemporal big data store to be configured with the base deployment
    - Note: ArcGIS Data Store (relational, tile cache, spatiotemporal) is always configured with *the hosting server site*
    - Provide at least 16 GB memory and at most 64 GB for spatiotemporal big data store
- Many variables go into sizing multi-machine deployment
  - More machines or more cores or more memory does *not* always mean faster processing!

# GeoAnalytics Server performance considerations

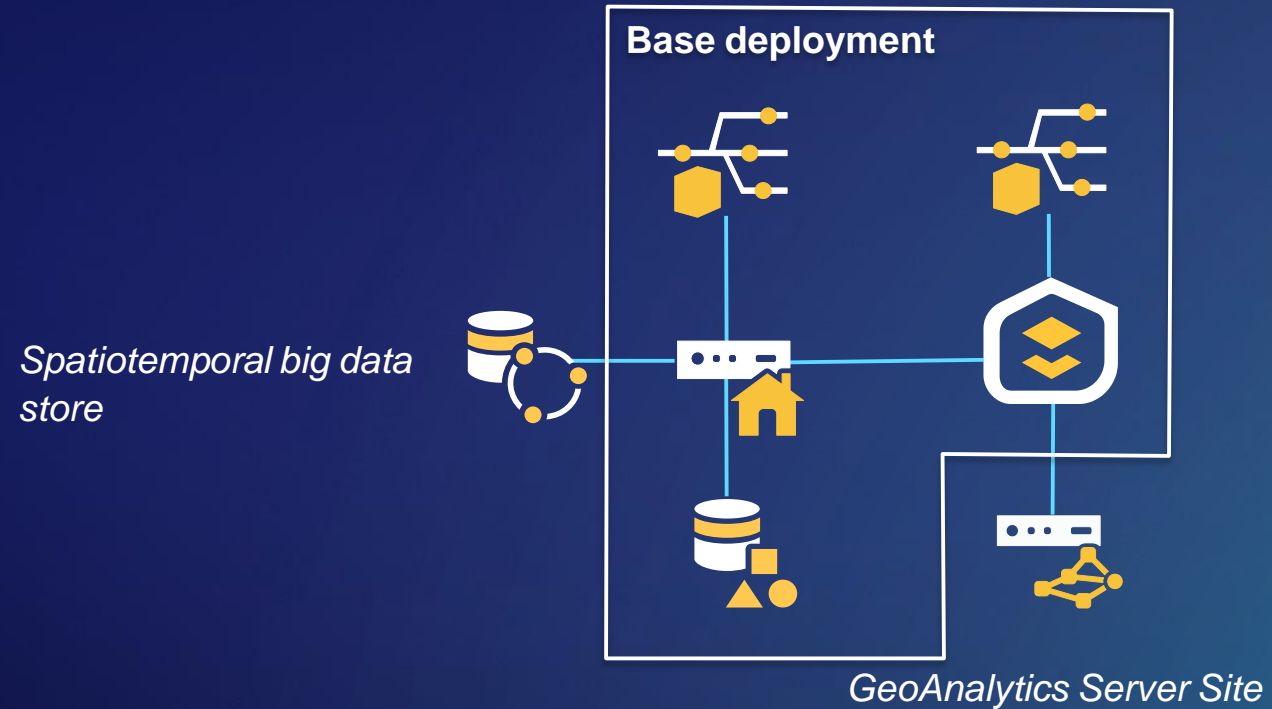
- Variables that affect performance

- Type of data: file-based (CSV, shapefiles) vs. web-based (feature service) vs. big data store (HDFS, Hive, Azure Data Lake)
- Location of data: local (low latency) vs. on network (higher latency)
- LAN characteristics: 100 mbps vs. 1 gbps, latency between machines and data source
- Characteristics of data storage system: SSD vs. traditional HDD (disk I/O)
- Size of data: tens of MB vs. hundreds of MB vs. gigabytes vs. terabytes
- Ratio of CPU cores to amount of memory per core
- Ability to write result data as fast as it is being generated (scale spatiotemporal big data store too!)
- Likely many more..

*Prototype deployment using your own data and workflows*

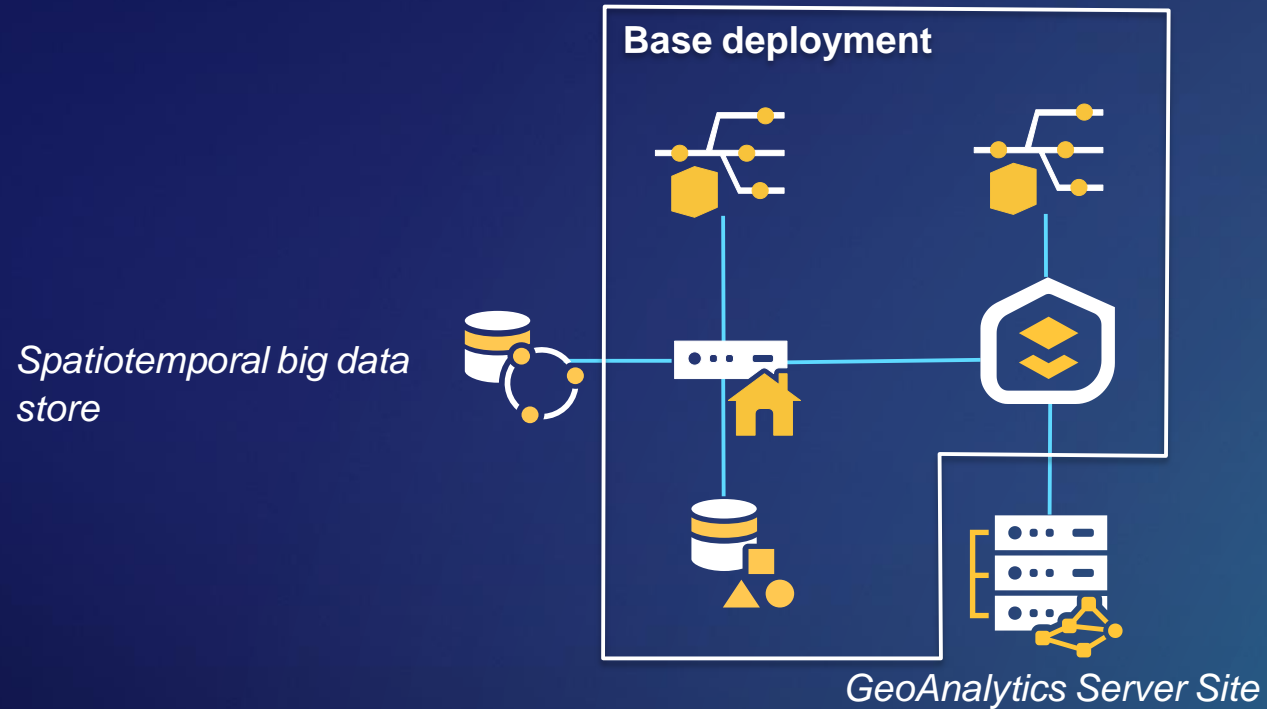


# Adding GeoAnalytics Server to your deployment



*Minimum 3 machines to support GeoAnalytics; scale massively beyond that*

# Adding GeoAnalytics Server to your deployment





*Remember to scale spatiotemporal big data store with additional nodes when adding additional GeoAnalytics Server machines*

# GeoEvent Server

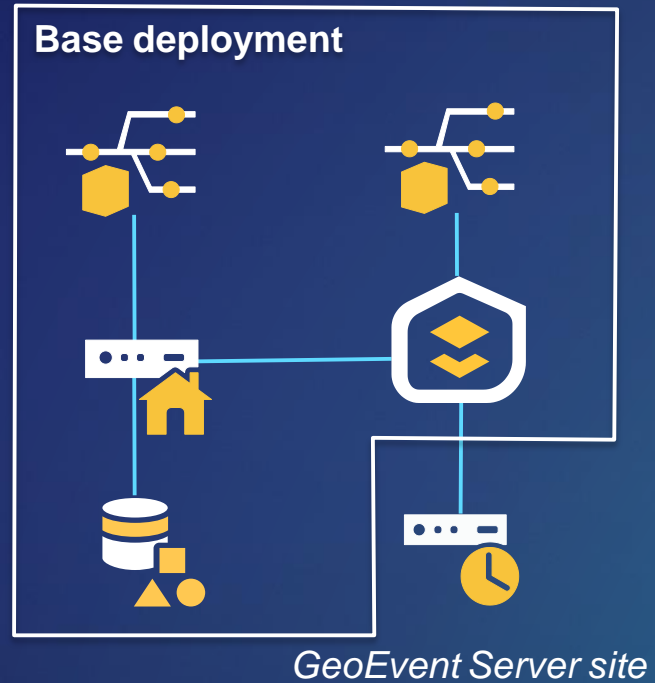
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# Adding GeoEvent Server to your deployment

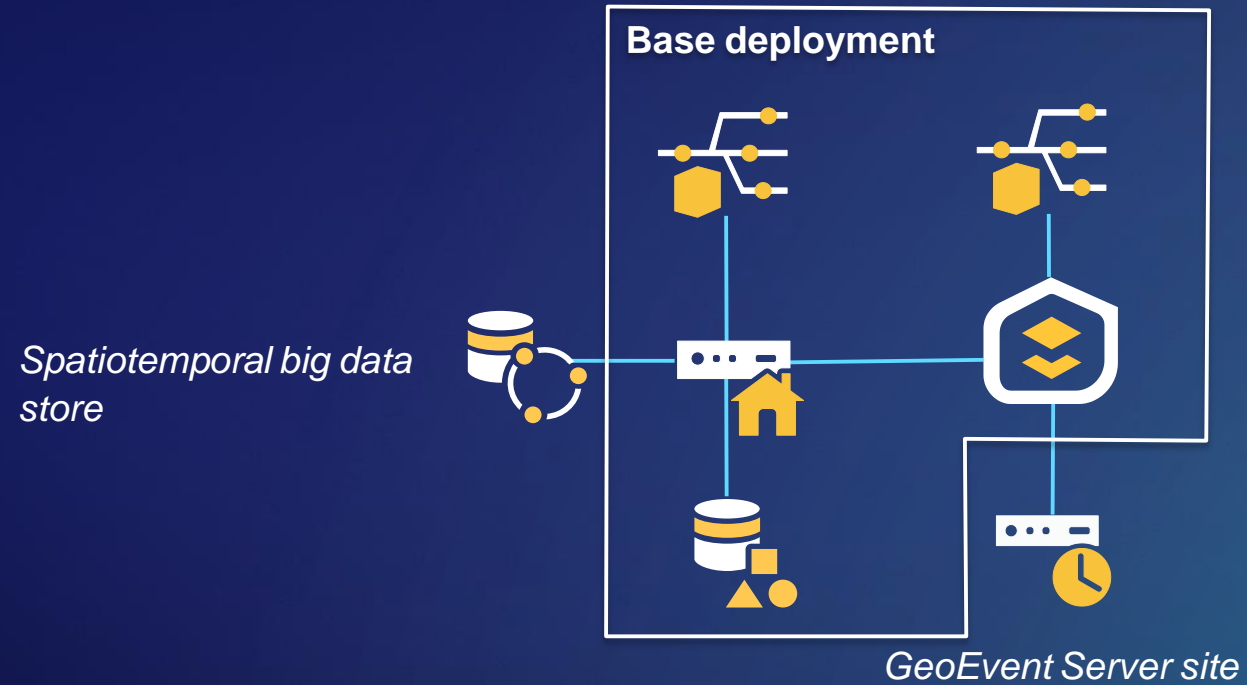
- GeoEvent Server provides the ability to create GeoEvent services to process real-time data ingestion and processing  
- At GeoEvent Server 10.5 and prior the strong recommendation is to use *single machine* sites. With GeoEvent Server 10.6 and up it is possible to scale out a site.
- Each site must be powerful enough to handle peak throughput for the combined set of GeoEvent services (scale up!)
- To handle multiple input stream that go beyond a single site: use additional separate GeoEvent Server sites
- Archiving large volumes of data: use spatiotemporal big data store



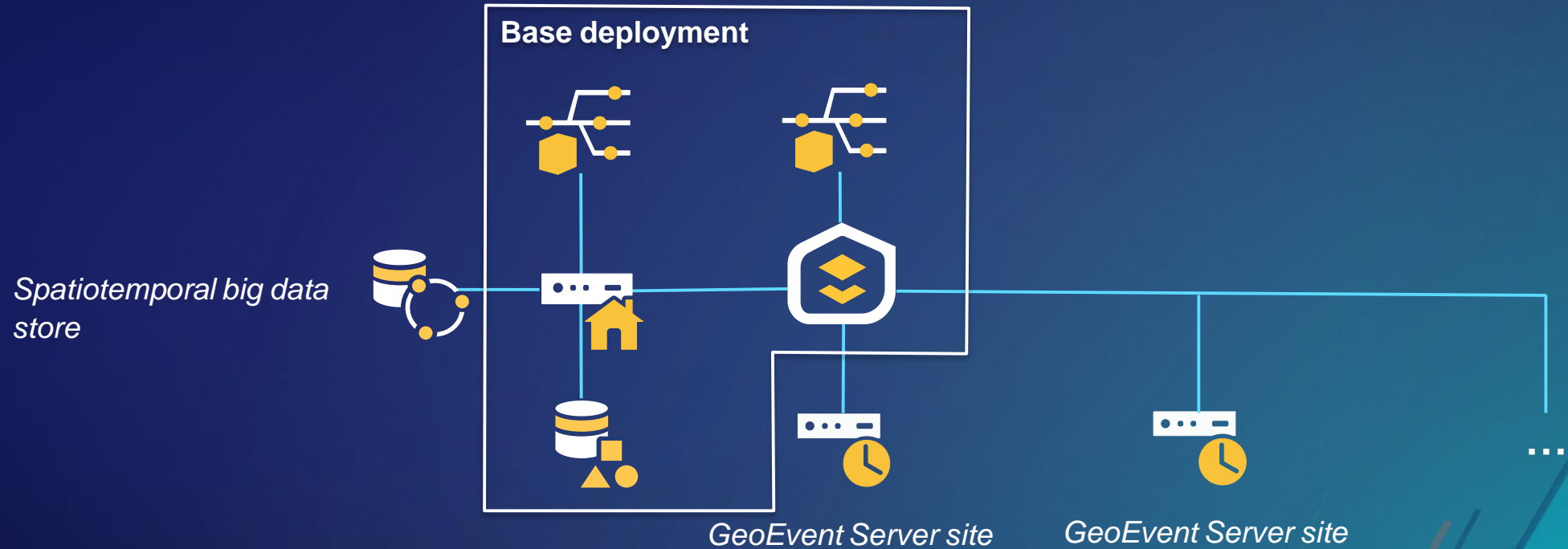
# Adding GeoEvent Server to your deployment



# Adding GeoEvent Server to your deployment

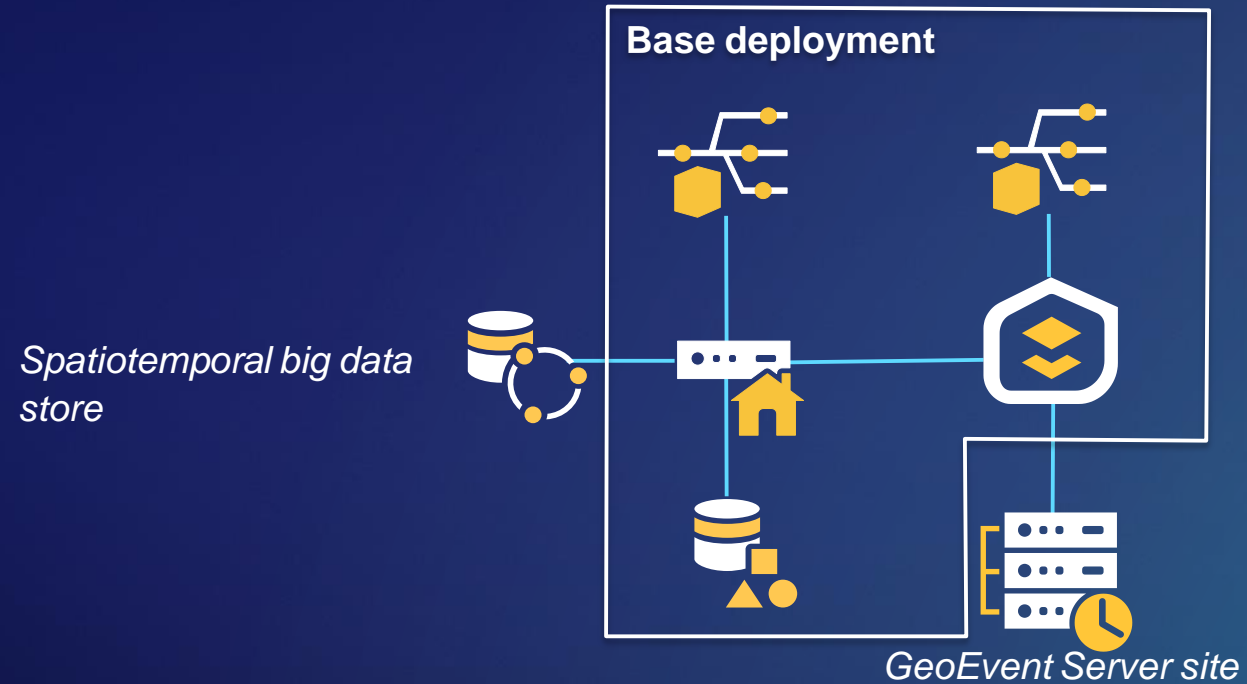


# Adding GeoEvent Server to your deployment



*Use multiple single machine sites to scale for 10.5.x; don't use multi-machine sites for GeoEvent Server 10.5.x and prior*


# Adding GeoEvent Server to your deployment



*For 10.6 and higher: scale out individual GeoEvent Server sites with multiple machines*



# Recap: expanding out from the base deployment

- GIS Server 
  - as many sites make sense for your particular deployment following workload separation recommendations
  - E.g. separate sites for different sets of map services, separate sites for heavy-weight geoprocessing, separate sites for CPU-intensive routing services, ..

- Image Server 
  - as many sites make sense for your particular deployment of *dynamic image services*
  - *there can only be one site for raster analytics*

- GeoAnalytics Server 
  - *there can only be one site for GeoAnalytics Server*

- GeoEvent Server 
  - as many sites as makes sense for your particular deployment
  - *at 10.5 and prior: strong recommendation to use single machine sites*

# Other important topics

# Dispelling old myths and updating best practices

- **Do *not* use silo'ed ArcGIS Server sites! (cloned machines)**
  - Significant improvements in multi-machine site performance and stability in 10.3.1+
  - Silo'ed sites do not work in the federated model and with ArcGIS Pro
- **Do *not* use clusters!**
  - Discouraged on any version. Officially deprecated as of 10.5.1. Will not be supported in 10.7!
- **Do federate your ArcGIS Server sites**
  - Required for the modern deployment patterns
- **Do use the web adaptor unless there's a good technical reason not to**
  - Simplifies a lot of configuration that otherwise has to be done manually.

# Dispelling old myths and updating best practices

- **“Windows can only run ~250 service instances (SOC processes)”**
  - This is a Windows imposed limitation that can be lifted by changing Windows settings
  - Edit the registry: <http://support.esri.com/technical-article/000001218>
- **“Linux can only run 250 service instances (SOC processes)”**
  - Issue at 10.3.x: upgrade to 10.4 or higher



# Takeaways

- Understand the base deployment
- Don't overcomplicate things unnecessarily: small to medium-sized organizations can often use a single machine deployment in production.
- Stay up to date on best practices. They change over time!
  - What was good advice for 10.2/10.3/.. is not necessarily as good for 10.5/10.6/..
- ArcGIS Enterprise is designed for the federated server model
  - Features that require the federated server model:
    - ArcGIS Pro publishing up to and including Pro 2.2 and Enterprise 10.6.1
    - 3D scene layers, Utility Network, Parcel Management (coming at 10.7)
    - Raster Analytics and GeoAnalytics
    - Archiving large volumes of data from GeoEvent Server
    - ...
- Understand the individual server roles and the recommendations and requirements of each- they're not all the same!



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**Don't panic**



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THE  
SCIENCE  
OF  
WHERE