



ArcGIS Enterprise: Architecting Your Deployment

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A large, abstract graphic in the background on the right side of the slide, composed of various 3D geometric shapes like rectangles and cubes. The colors used are primarily shades of blue, teal, and orange. Some of the shapes have topographic contour lines or small dots overlaid on them, giving them a geographical or data-rich appearance. The overall effect is a modern, digital representation of spatial data.

GIS
INSPIRING
WHAT'S
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

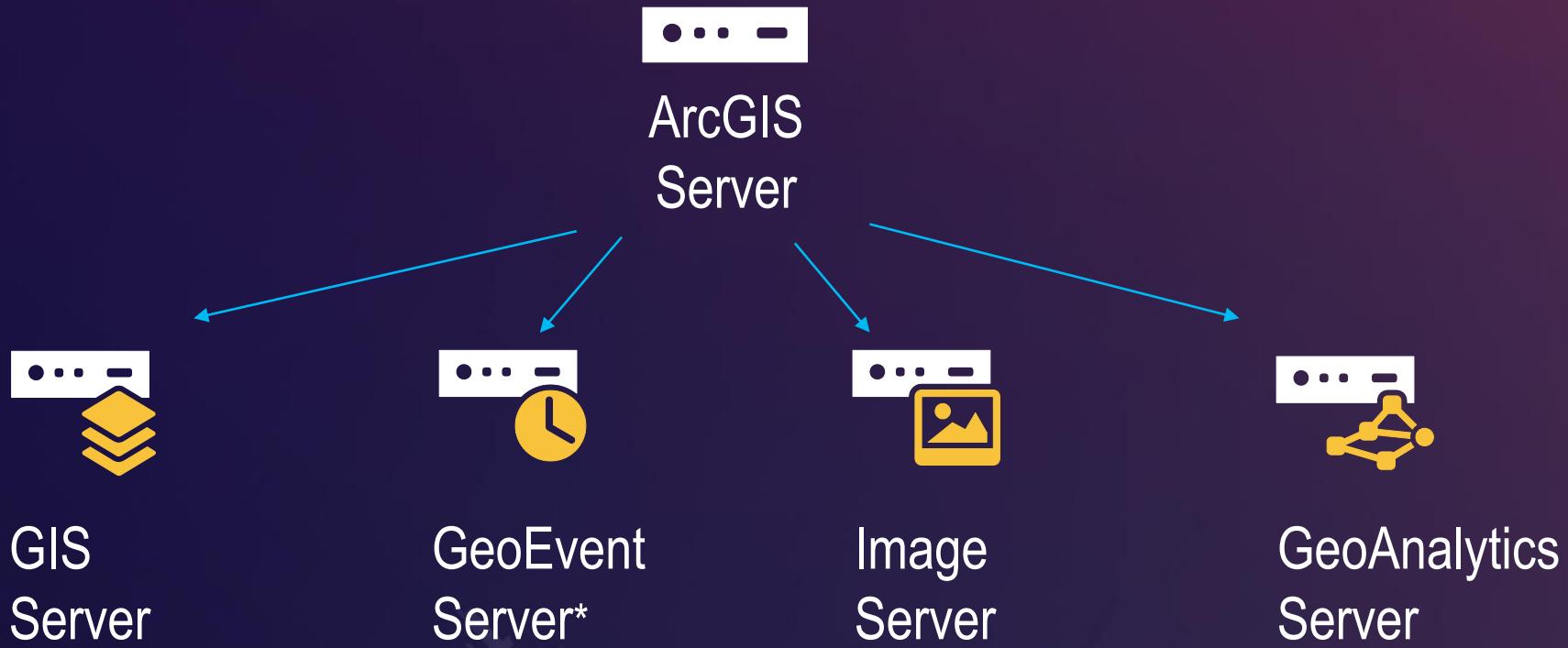
Don't panic



Software Components



Server Licensing Roles



One software component, multiple server roles

Components of the base deployment



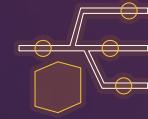
ArcGIS
Server



Portal
for
ArcGIS



ArcGIS
Data
Store



ArcGIS
Web
Adaptor

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.

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



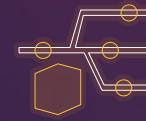
ArcGIS
Server



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



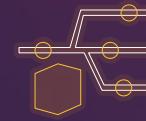
ArcGIS
Server



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

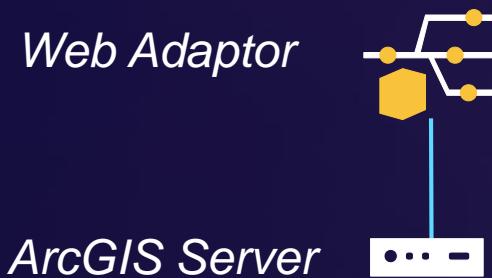


ArcGIS
Web
Adaptor

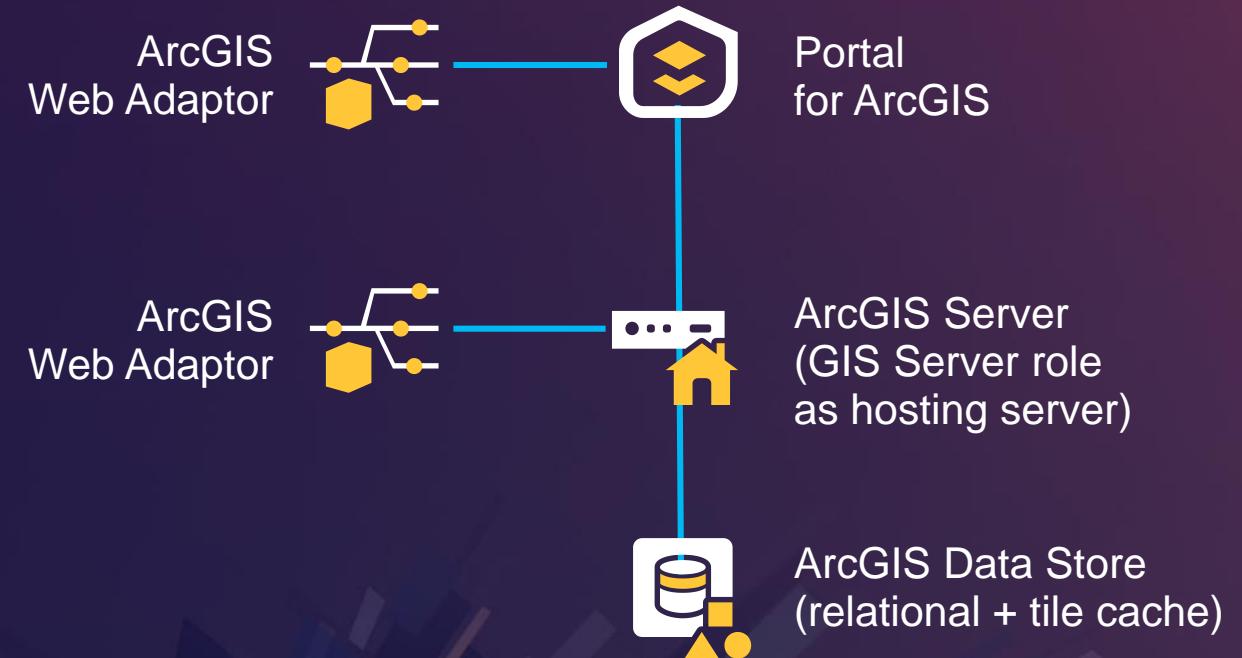
An Esri built software **load balancer** that appropriately directs network traffic and serves as a **reverse proxy** for Web GIS access.

Coming from ArcGIS Server to ArcGIS Enterprise

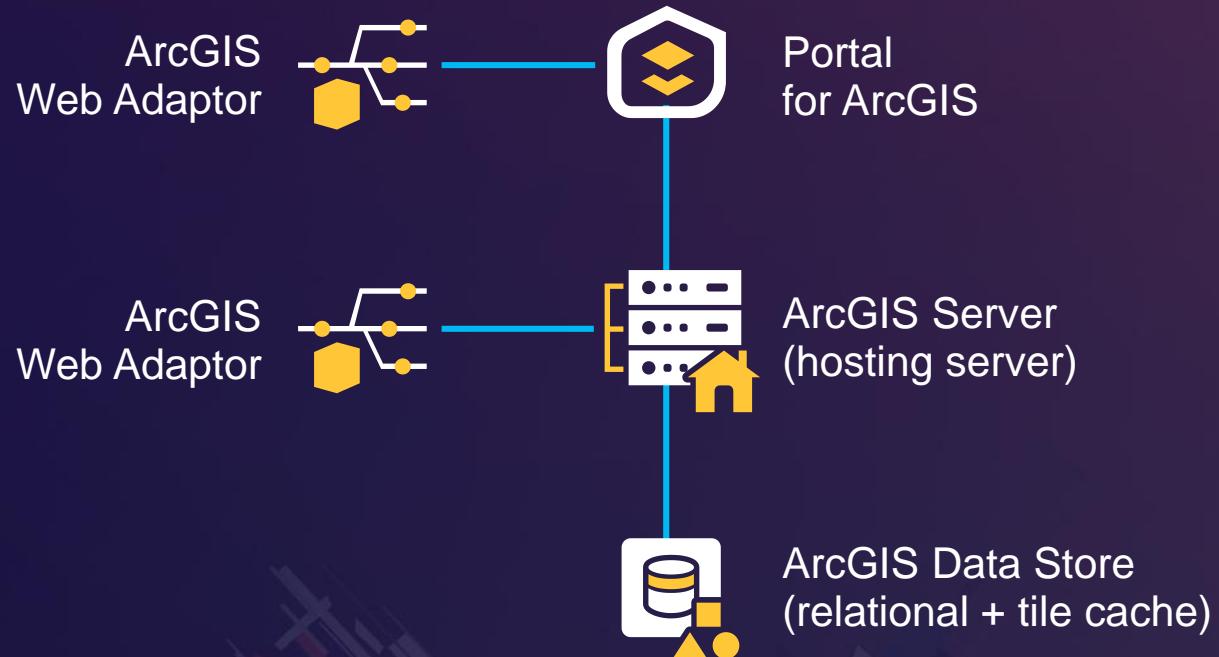
Typical deployment of
ArcGIS Server



Base deployment of
ArcGIS Enterprise



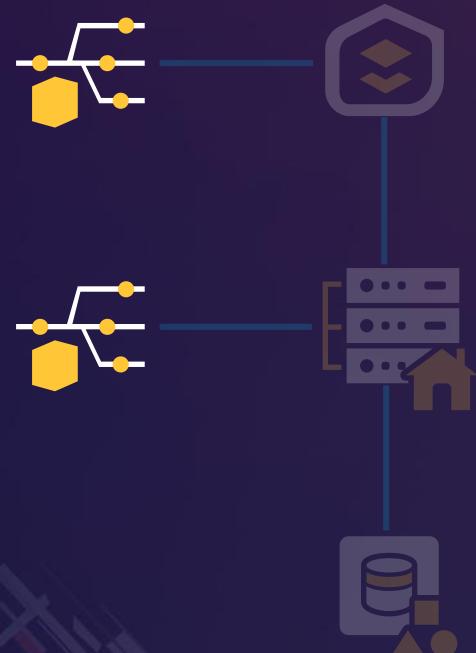
Base Deployment Logical Architecture



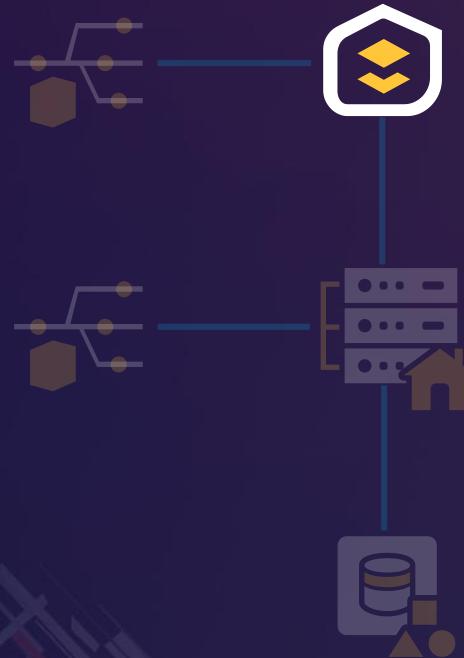
Base Deployment Logical Architecture

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.

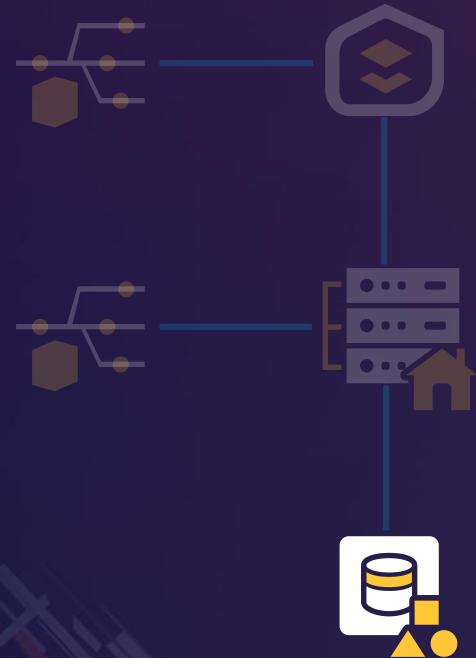
Base Deployment Logical Architecture



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.

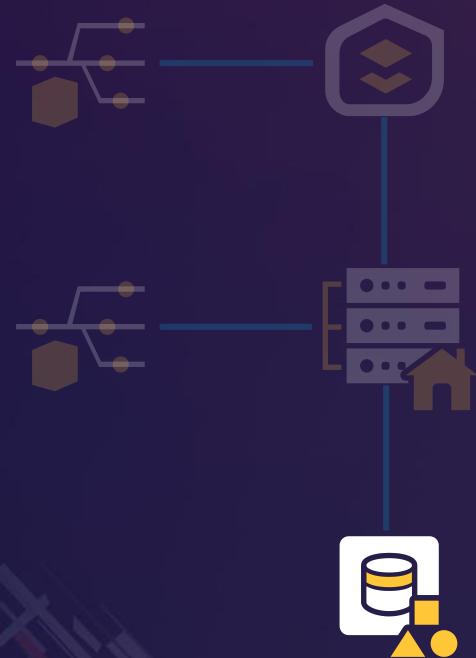
Base Deployment Logical Architecture



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

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▼ 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

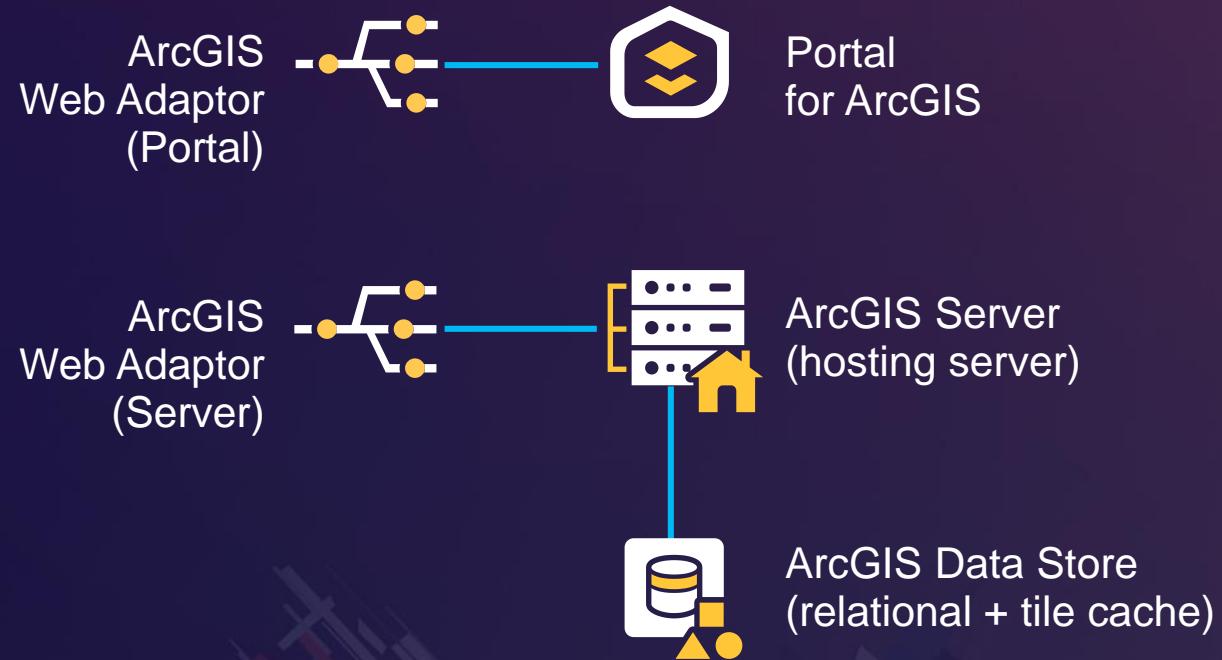
- **Everything from traditional ArcGIS Server**
 - Ability to publish map services, feature services, network services, geoprocessing services, geocoding services, and much more.
 - Ability to publish content from referenced data sources such as file-based data (file geodatabases, shapefiles) as well 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



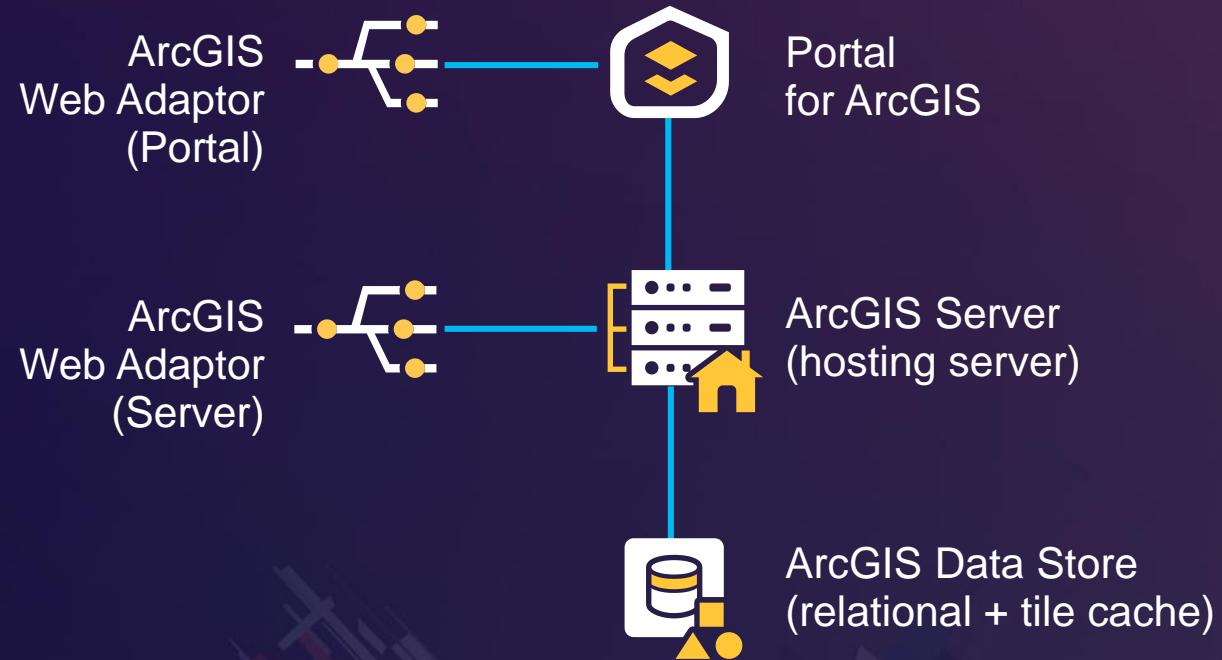
1 configure Web Adaptors

Base Deployment Configuration Quick Steps



2 configure the data store and register with server

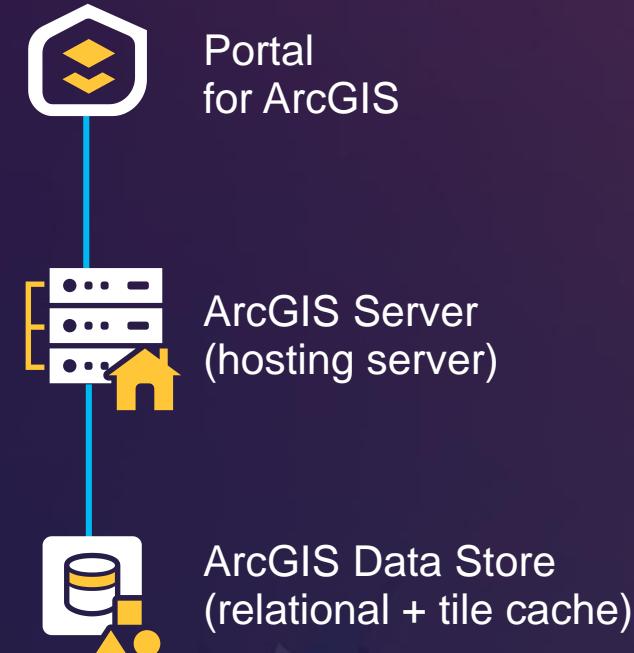
Base Deployment Configuration Quick Steps



3 federate server with the portal and designate as hosting server

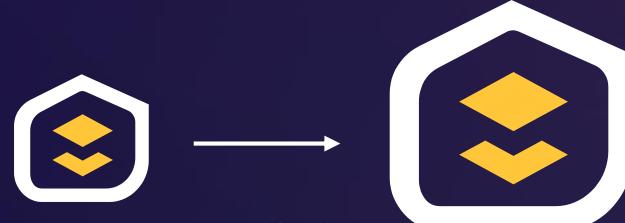
Base Deployment | Choosing a pattern

- **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!

Deploying



ArcGIS Enterprise

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✓ 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



PowerShell DSC

Automate installation and configuration in your infrastructure.

Scaling out

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



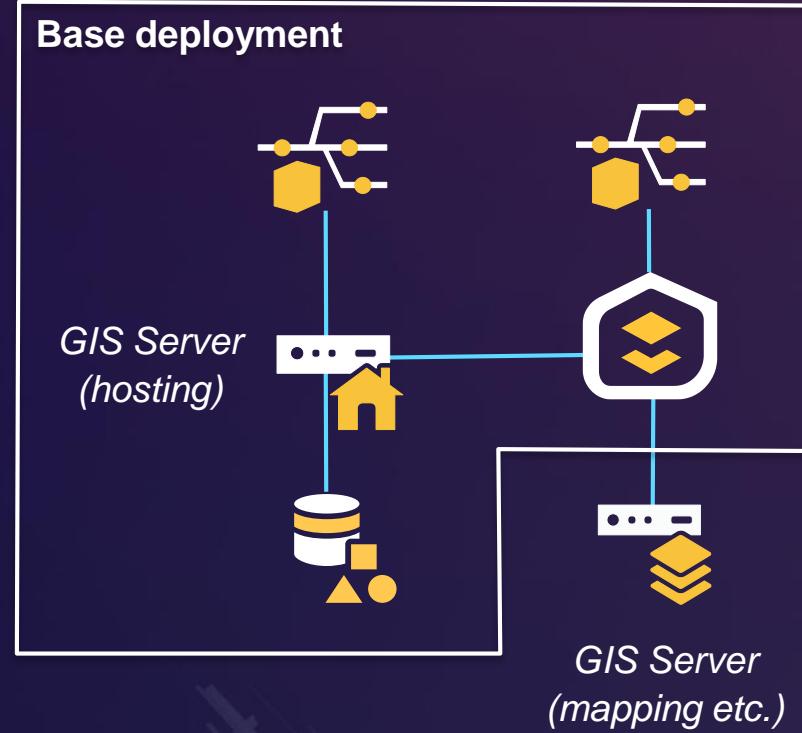
GIS Server



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

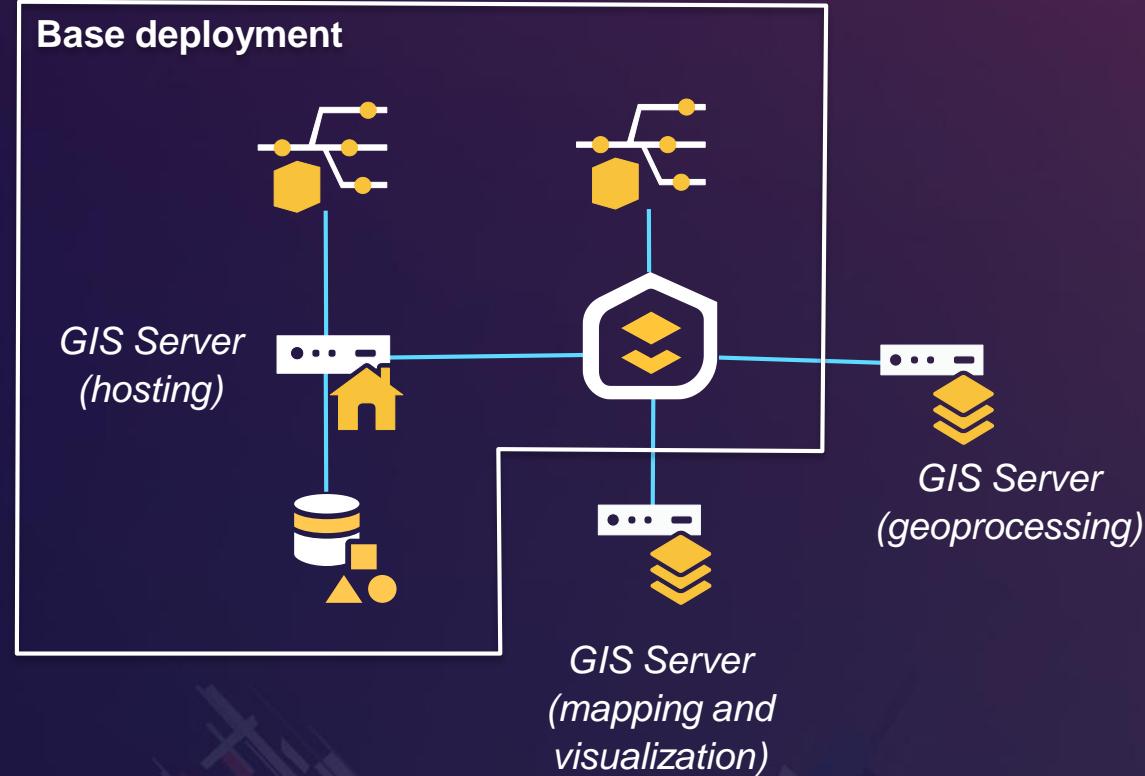
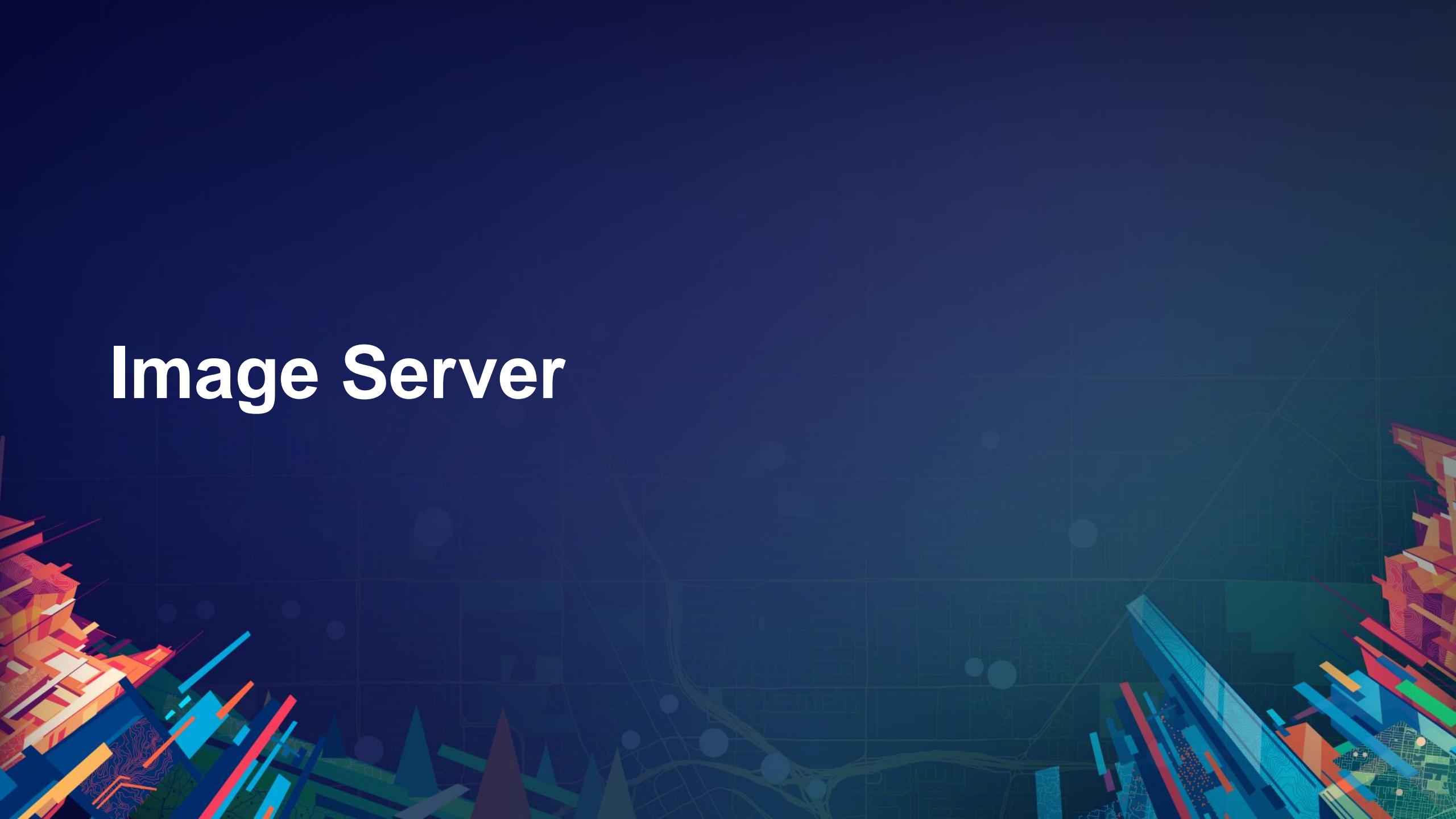


Image Server

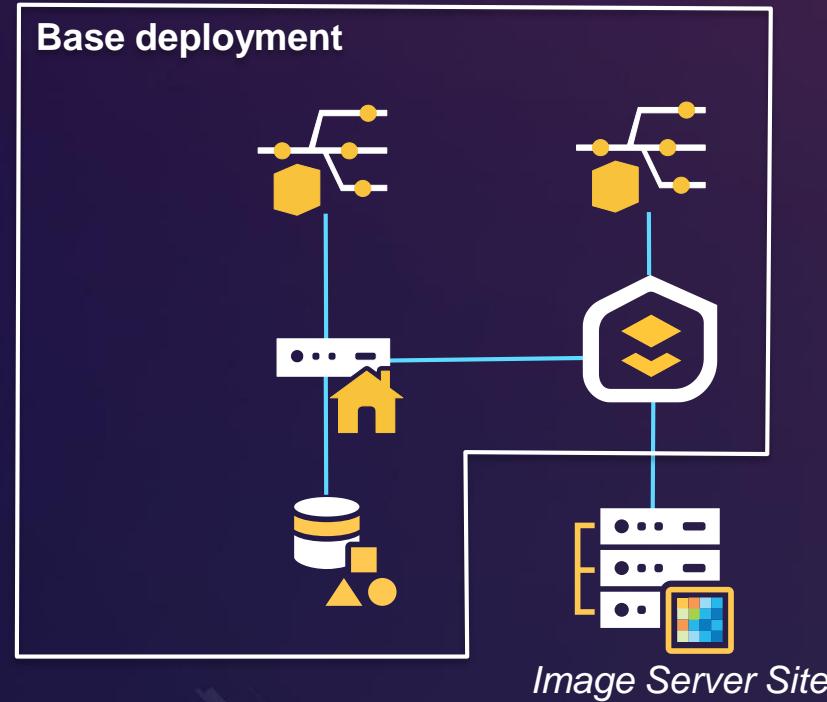


Adding Image Server to your deployment

- **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.

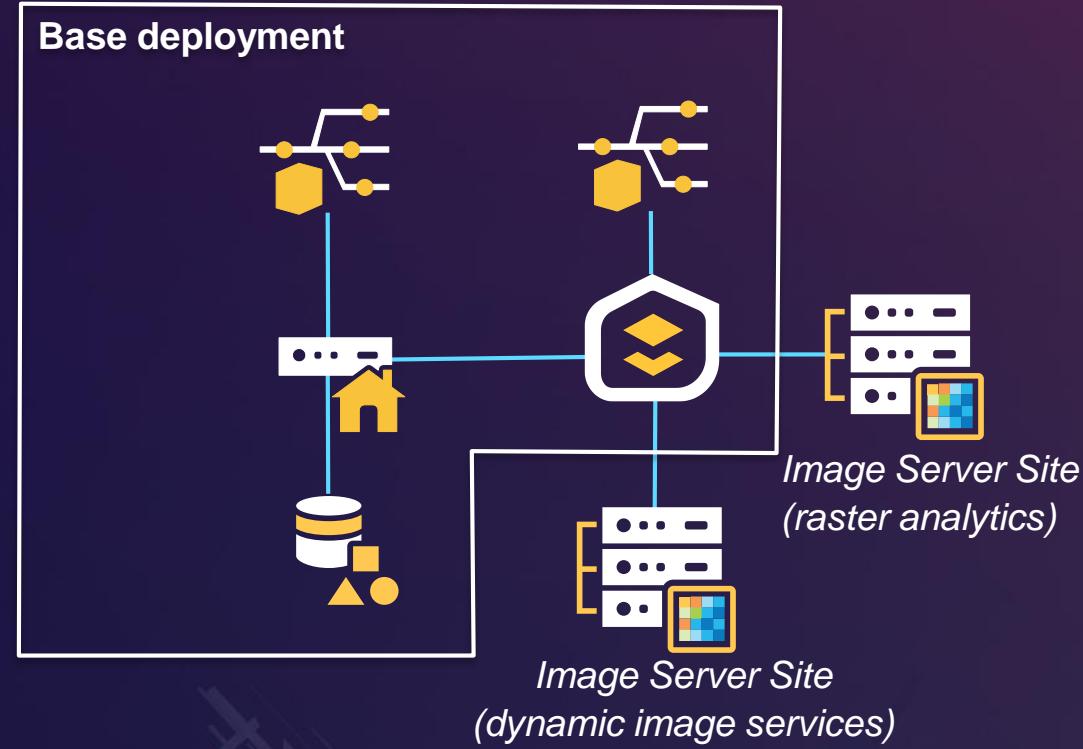


Adding Image Server to your deployment



One Image Server site for both capabilities

Adding Image Server to your deployment



Separate Image Server sites for each capability

GeoAnalytics Server



Adding GeoAnalytics Server to your deployment

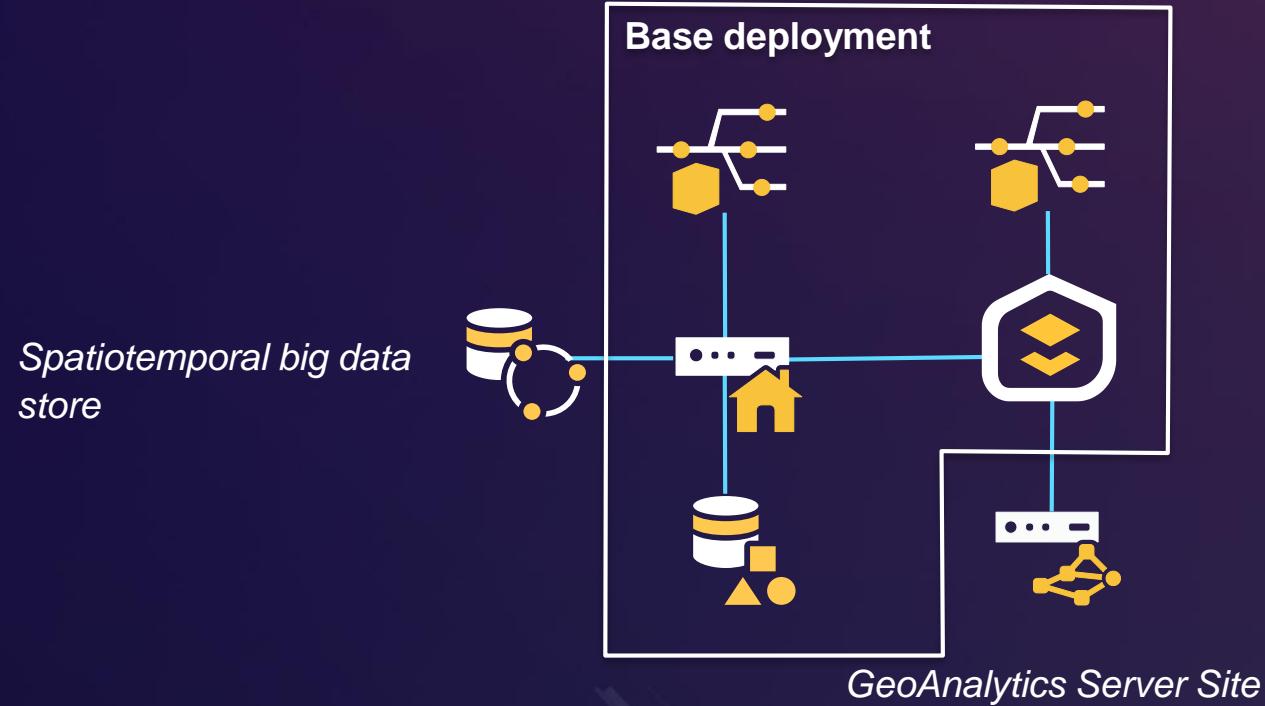
- **GeoAnalytics Server provides distributed computing infrastructure for processing large volumes of vector and tabular data**
 - One site for GeoAnalytics Server
 - Requires spatiotemporal big data store to be configured with the base deployment
 - Note: ArcGIS Data Store (relational, tile cache, spatiotemporal) 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

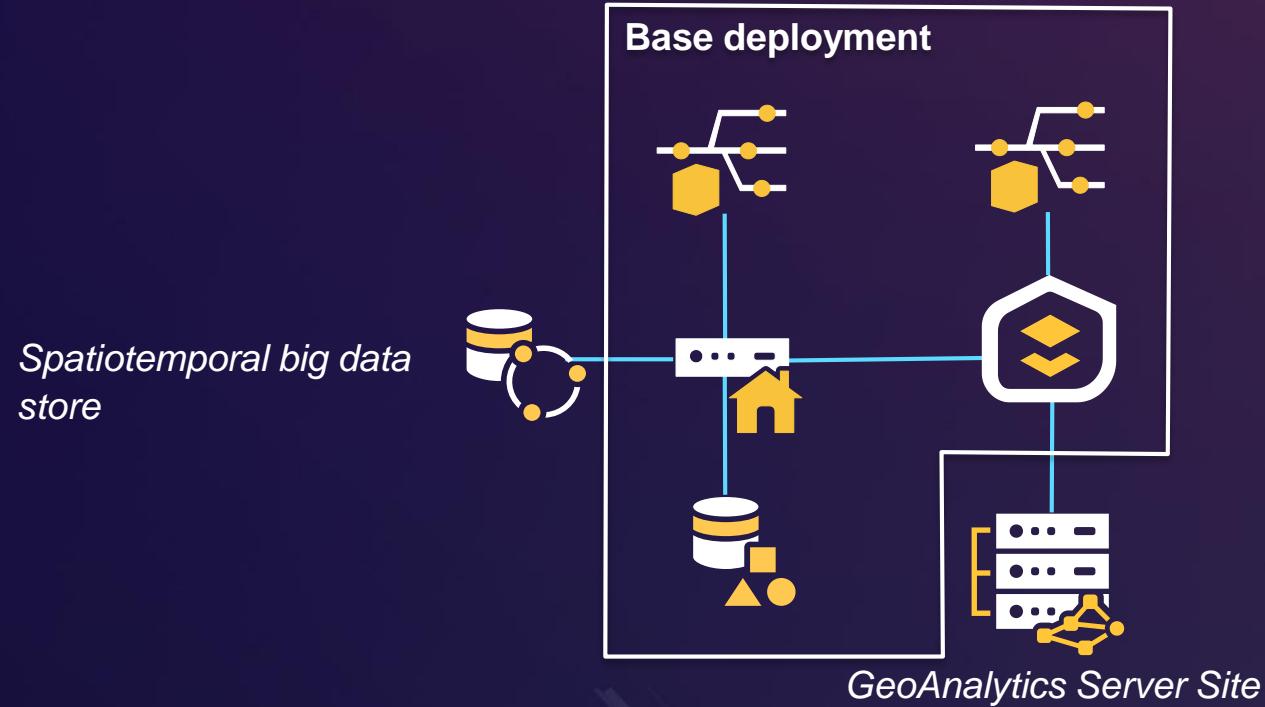
- **Variables that affect performance**
 - Type of data: **file-based (CSV, shapefiles) vs. web-based (feature service) vs. big data store (HDFS, Hive, Azure Data Lake)**
 - Location of data: **local (low latency) vs. on network (higher latency)**
 - LAN characteristics: **100 mbps vs. 1 gbps, latency 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..

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



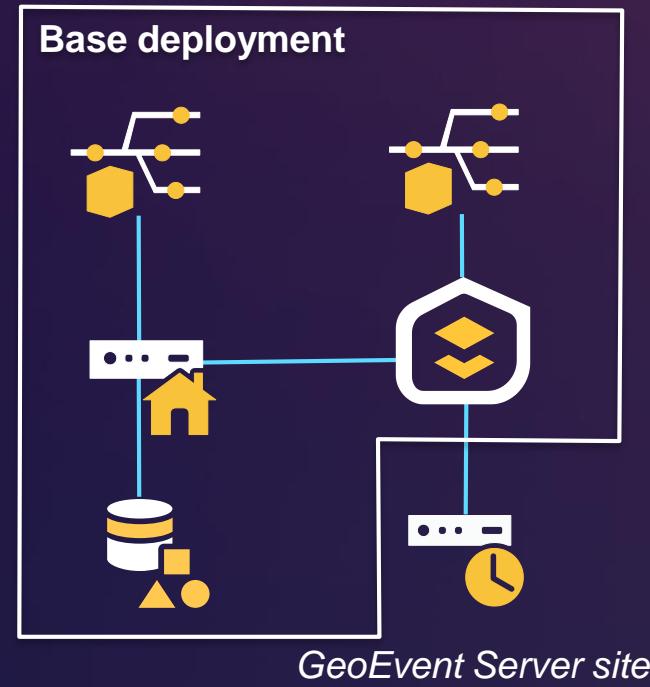
Adding GeoEvent Server to your deployment

- **GeoEvent Server provides the ability to create GeoEvent services to process real-time data ingestion and processing**

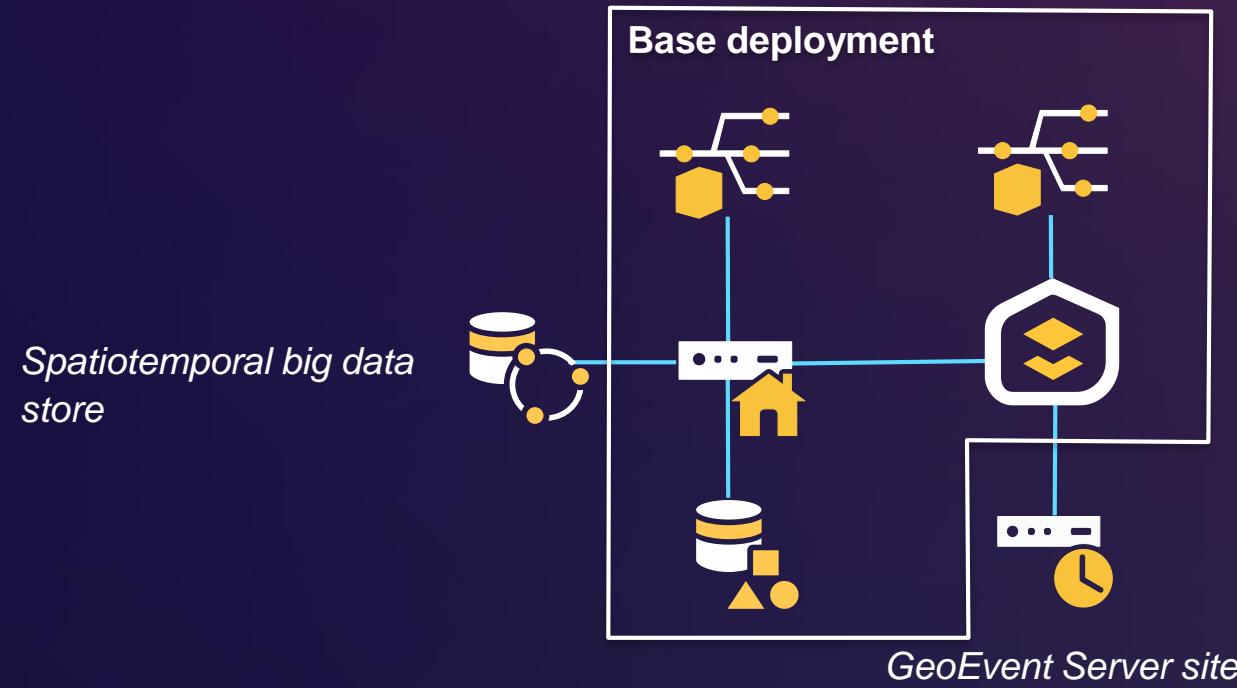


- At GeoEvent Server 10.5 and prior the strong recommendation is to use *single machine sites*. With GeoEvent Server 10.6 and up it is possible to scale out a site.
- Each site must be powerful enough to handle peak throughput for the combined set of GeoEvent services (scale up!)
- To handle multiple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

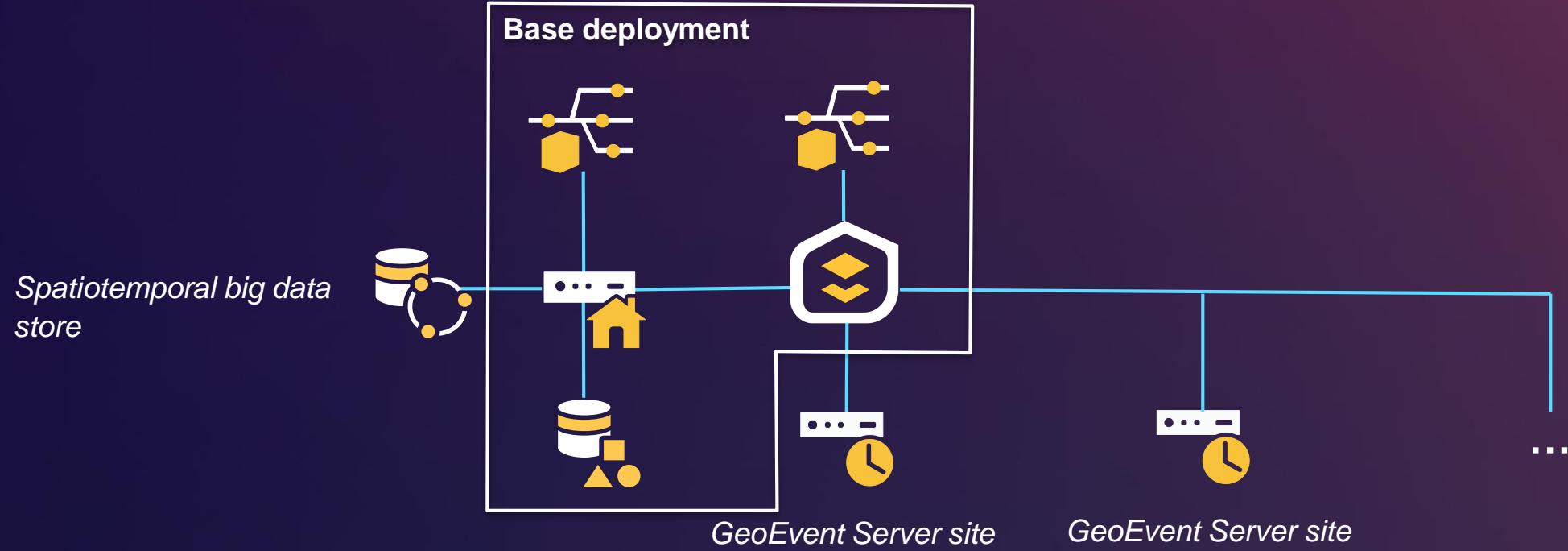
Adding GeoEvent Server to your deployment



Adding GeoEvent Server to your deployment

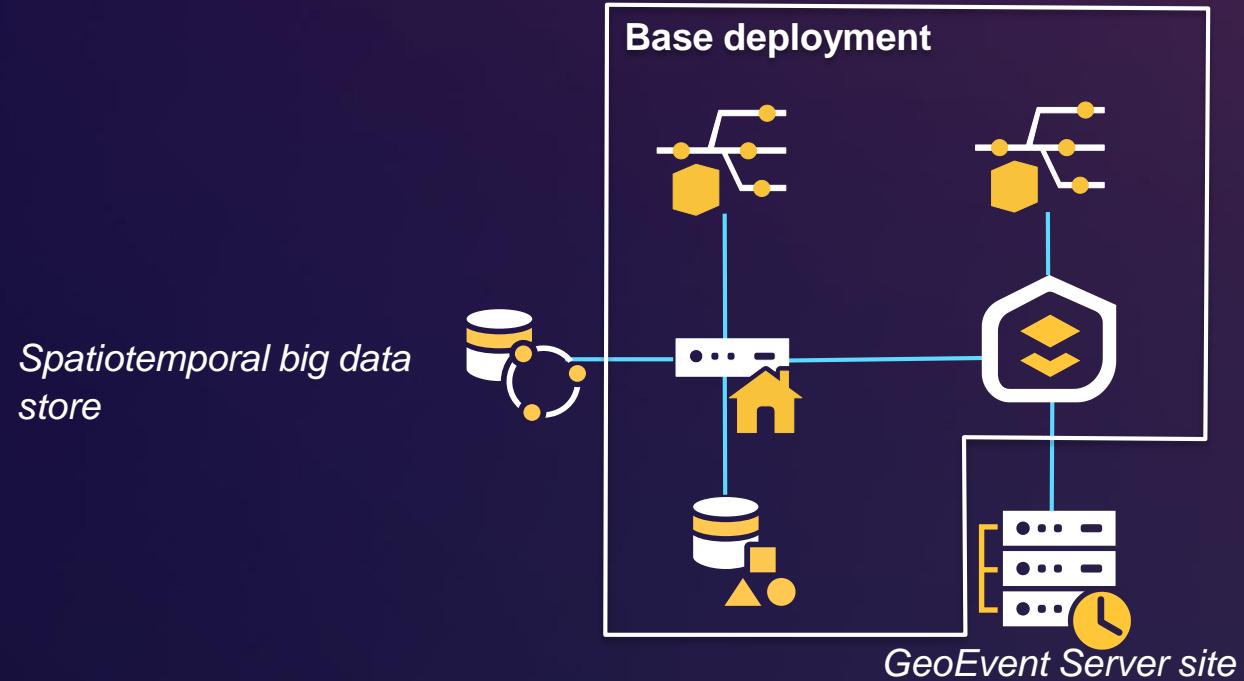


Adding GeoEvent Server to your deployment



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!



Don't panic





THE
SCIENCE
OF
WHERE