ArcGIS Enterprise: Architecture and Deployment

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1 Web GIS
ArcGIS | Enabling GIS for Everyone

- Knowledge Workers
- Executive Access
- Public Engagement
- Work Anywhere
- Enterprise Integration

ArcGIS Services:
- GIS Professionals
- Web GIS
Web GIS | Transformation of the ArcGIS Platform

Web GIS

Desktop

Apps

Server GIS

Web Maps
Web Scenes
Layers

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<th>Transformation of the ArcGIS Platform</th>
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Web GIS
Web GIS | How is it Different from Server GIS?

**Server GIS**
Silo’d use of GIS services within custom applications

**Web GIS**
Pervasive use of web layers, scenes, and maps within all of the ArcGIS apps

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**Diagram:***
- **App**
- **Services**
- **Data**

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**Diagram:***
- **Users**
- **Apps**
- **Web Maps**
- **Web Scenes**
- **Web Layers**
- **portal**
- **Services**
- **Data**

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... n+1
Web GIS | How to Get a Portal

**ArcGIS Enterprise**

- **Software**
  - Portal for ArcGIS as part of ArcGIS Enterprise
  - Releases 1-2 times per year
  - Upgraded manually *(by organization)*
  - Organization controls SLA

- **Core Web GIS functionality** *(visualization, smart mapping, analysis…)*

- **Enterprise Integration**

- **Esri-provided content and services**
  - Basemaps, Living Atlas
  - GeoEnrichment, Routing, …

**ArcGIS Online**

- **SaaS**
  - [www.arcgis.com](http://www.arcgis.com)
  - Releases 3-4 times per year
  - Upgraded automatically *(by Esri)*
  - Esri controls SLA

- **Core Web GIS functionality** *(visualization, smart mapping, analysis…)*

- **Enterprise Integration**

- **Esri-provided content and services**
  - Basemaps, Living Atlas
  - GeoEnrichment, Routing, …
Overview of ArcGIS Enterprise
What is ArcGIS Enterprise

• Next evolution of the ArcGIS Server product line
• How you get Esri server technology
• How you deploy Web GIS in your infrastructure
Why do you need ArcGIS Enterprise?

- New server capabilities will only work if you have deployed Web GIS via ArcGIS Enterprise
- New apps, such as Insights for ArcGIS, require Web GIS via ArcGIS Enterprise in order to run
Basics of ArcGIS Enterprise (1 – 2 – 3 – 4 – 5)

- 1 product
- 2 user levels
- 3 data store types
- 4 software components
- 5 sever roles
1 Product

ArcGIS Enterprise

ArcGIS Server  Portal for ArcGIS  ArcGIS Web Adaptor  ArcGIS Data Store

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

Level 1  Level 2

Relational
- Tile Cache
- Spatiotemporal

software components

server roles

data store types

named user levels
2 User Levels

Level 1

Applicable built-in roles: Viewer

Can view content, including maps, apps, and data.

Cannot create or own content.

Level 2

Applicable built-in roles: Viewer, User, Publisher, Administrator

Can create, view, share, and own content, including maps, apps, and data. Specific permissions will vary depending on privileges granted.
3 Data Store Types

- **Relational**
  - Use for most spatial data types

- **Tile Cache**
  - Use for 3D data

- **Spatiotemporal**
  - Use with GeoEvent Server and GeoAnalytics Server
  - Handles high volume data
4 Software Components

ArcGIS Enterprise = ArcGIS Web Adaptor, Portal for ArcGIS, ArcGIS Server, ArcGIS Data Store

All of these components existed in the software pre-10.5
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

The web frontend and infrastructure backend that supports a user’s interaction and overall experience with your Web GIS.
The ArcGIS managed data repository that stores the spatial content that has been *copied* to the system.
ArcGIS Web Adaptor

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

One software component, multiple server roles
3 Federation & Hosted Server
ArcGIS Server & Portal Integration Levels

• Registering (adding) services
• Federating a server
• Designating a hosting server
Federating a server

• Federation is optional but essential if you want to do the following:
  - Provide portal members access to functionality that comes with ArcGIS GeoEvent Server, ArcGIS GeoAnalytics Server, ArcGIS Image Server, or Insights

• When you federate a server, authorization to access the services delegates to the portal.

• Services published to the federated server are automatically shared with the portal. Also, portal users are used to access both the portal and the federated server
Federating a server (cont.)

Add ArcGIS Server

Enter the URLs for accessing and administering your ArcGIS Server site. Also enter credentials for an administrator of the ArcGIS Server site.

Services URL: [Example: https://webadapter.domain.com/arcgis]

Administration URL: [Example: https://gisserver.domain.com:6443/arcgis]

Username: 
Password: 

Add one or more servers to your portal.

Servers

- https://neenterprise.esri.com:6443/arcgis

Validate Servers  Add Server

Add  Cancel
Federated Server - Example

ArcGIS REST Services Directory

Home > services

Folder: /
Current Version: 10.5
View Footprints In: ArcGIS Online map viewer

Folders:
- Cumberland
- Hosted
- Lancaster RealTime
- Redlands Avi
- System
- Utilities

Services:
- ChesterTiles (MapServer)
- Cumberland_test (MapServer)
- MODA POC_Out (StreamServer)
- NEARC DEMO STREAM_1 (StreamServer)
- NYC_FINAL (StreamServer)
- Parks (FeatureServer)
- Parks (MapServer)
- Python Avi_Out (StreamServer)
- python_out (StreamServer)
- Redlands Avi (StreamServer)
- Redlands Avi (StreamServer)

Supported Interfaces: REST SOAP Sitemap Geo Sitemap

Not Federated

Federated
Designate as a hosting server

- Publish hosted tile layers to the portal.
- Publish hosted feature layers to the portal.
- Publish hosted WFS layers to the portal.
- Publish scene layers to the portal (ArcGIS Data Store tile cache data store required).
- Share layers and maps from ArcGIS Maps for Office (ArcGIS Data Store relational data store required).
- Add a zipped shapefile, CSV file, or GPS Exchange Format file to the portal map viewer.
- Batch geocode addresses from a CSV file.
- Perform feature analysis or big data analytics in the portal map viewer or through Insights for ArcGIS or ArcGIS Pro (ArcGIS Data Store relational data store required).
- Perform raster analysis from the portal map viewer or ArcGIS Pro (ArcGIS Data Store relational data store required)
Designate as a hosting server (cont.)

- Need a relational ArcGIS Datastore registered with a Federated ArcGIS Server before designating as a hosting server
4 Deployment Patterns
Base Deployment | Choosing a pattern

- Choosing a base deployment pattern
- Three tiers to consider

Diagram:

- Single Machine
- Hosted ArcGIS Server
- Relational/Tile Cache Data Store
- Portal

Ports:
- 7080
- 7443
- 6080
- 6443
- 443
- 80
Base Deployment – (Multi-Tiered)

- Hosted ArcGIS Server
  - Machine 2
- Portal
  - Machine 1
- ArcGIS Web Adaptors
  - Machine 4
- Relational/Tile Cache Data Store
  - Machine 3

Ports:
- 80, 443
- 7080, 7443
- 6080, 6443
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.
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)
  - 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 multiple functions
  - 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)

  - Monitor for bottlenecks!
    - 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!
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
2. Adding additional capabilities
Deployments Note

• A base ArcGIS Enterprise deployment, which can be configured with a single machine or with multiple machines is represented by this icon.
Additional Deployment – ArcGIS Servers

ArcGIS Servers (3 Machine Site)
ArcGIS Server Roles: GIS Server
Additional Deployment – Image Server (Single Machine)

ArcGIS Server Role: Image Server
Additional Deployment – Image Server (Multi-Tiered)

ArcGIS Servers (3 Machine Site)
ArcGIS Server Roles: Image Server

ArcGIS Server Roles: Image Server
Additional Deployment – GeoAnalytics (Minimum)
Additional Deployment – GeoAnalytics (Recommended)

Cluster: Spatiotemporal Data Stores

ArcGIS Servers (3 Machine Site)
ArcGIS Server Roles: GeoAnalytics Server
Additional Deployment – GeoEvent (Single Machine Deployment)

Cluster: Spatiotemporal Data Stores

ArcGIS Server Role: GeoEvent Server
Additional Deployment – GeoEvent (Independent Site Deployment)

Cluster: Spatiotemporal Data Stores

ArcGIS Servers (3 Separate Machines)
ArcGIS Server Roles: GeoEvent Server
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*
5 Implementation
Installs – Upgrades – Adoption
Best Practices to consider while adopting ArcGIS Enterprise

- Application Implementation Strategies
- Portal Implementation Considerations
- Automation
- Enterprise Integration
- Environment Isolation
- Essential Patterns of a Location Strategy
- High Availability
- Infrastructure
- IT Governance
- Load Balancing
- And More…..

https://www.esri.com/~/media/Files/Pdfs/products/arcgis-platform/architecting-the-arcgis-platform
Installing
Installing
System Requirements

- Portal

Hardware requirements

- Processor: 4 cores for 100 concurrent users
- Memory/RAM: 4 GB or more
- Disk space: A base installation of Portal for ArcGIS requires a minimum of 3.2 GB of available disk space. All content created by your users will also be stored on disk. Carefully consider how data will be uploaded and created by your users and allocate disk space accordingly. If desired, you can change the location of where the portal stores its content after installing the software.

Installing

System Requirements

- Server

Hardware requirements

The minimum RAM requirement is 4 GB. If you are using the software with ArcGIS GeoEvent Extension for Server, the minimum RAM requirement is 8 GB. These requirements are based on a typical development server with the following environment:

- Two cached map services
- One dynamic map service
- One locator service
- One geoprocessing service
- Geometry service
- PrintingTools service
- SQL Server Express
- ArcGIS Web Adaptor

For a production environment, minimum hardware requirements are not listed because the user and business needs of the software may vary. These requirements must be considered in determining hardware needs to meet performance and scalability expectations. For assistance designing an ArcGIS infrastructure that will meet your specific requirements, see System Design Strategies.

Installing

**System Requirements**

- Data Store

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**Disk space requirements**

**Pre-10.5**

ArcGIS Data Store installation requires a minimum of 709 MB of available disk space on the system drive; however, this space does not take into account the data you will store in the data store.

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**Disk space requirements**

**10.5**

To install and configure ArcGIS Data Store requires a minimum of 11 GB of available disk space on the system drive. This is the minimum disk space requirement for a machine with one empty data store type; it does not take into account the data you will store in the data store or backup files that might be stored on the machine.

**Note:** When the machine contains less than 10 GB of free disk space, ArcGIS Data Store begins logging warnings that you are running out of disk space. Once the disk drive contains less that 1 GB of free space, relational data stores are placed in read-only mode, and tile cache and spatiotemporal data stores are shut down.

To determine the amount of disk space needed on an ArcGIS Data Store machine, you need to take all of the following into consideration:

- The software installation uses 700 MB.
- Each data store uses an additional amount of space when created (and still empty):
  - Relational data store = 300 MB
  - Tile cache data store = 1 MB
  - Spatiotemporal big data store = 200 MB
- You need to estimate the amount of disk space needed for the data stored in the data stores.
- Backups stored on the data store machine also consume disk space. If you do not configure backups to be written to a shared system drive, you must plan for this additional use of disk space.

Installing
Data Store Configuration Wizard

• Ability to configure all data store types from Data Store Wizard
Upgrades
Upgrades

Things to Consider Before Upgrading

- Take a snapshot of all environments
- Take backups of the content stores
  - C:\arcgisportal, C:\arcgisdatastore, C:\arcgisserver
- Run export operation on each component

DO NOT UNFEDERATE!
Upgrades

*Recommended Order of Upgrade*

1. Upgrade Portal for ArcGIS
2. Upgrade your Portal’s ArcGIS Web Adaptor
3. Upgrade ArcGIS Server
   1. In a multi-node site, it is recommended to upgrade one server at a time
4. Upgrade your Server’s ArcGIS Web Adaptor
5. Upgrade ArcGIS Data Store
   1. First upgrade the Primary Data Store
   2. Second upgrade the Standby Data Store

*You do not need to upgrade through all releases*
Portal Adoption
Basic – Adding Portal

- Upgrade to ArcGIS Server to 10.5
- Add Portal for ArcGIS (no federation or Data Store)

Benefits
- Web GIS internal
- User Entitlements
- Discover/Use/Make/Share Content

Drawbacks
- Can’t add additional Server Roles/Capabilities
- No hosted feature layers
- Manually register items in Portal
Base Deployment

- Upgrade ArcGIS Server
- Add ArcGIS Data Store
  - Managed by ArcGIS Server
- Add Portal for ArcGIS
  - Designate ArcGIS Server as Hosting
- Benefits (In addition to Basic)
  - All ArcGIS Server Services Available
  - Additional Roles/Functionality
- Drawbacks
  - New identity management to consider
Parallel Deployment

• Upgrade Current Deployment
• Parallel Base Deployment
• Register Current Services
• Benefits
  - Fully functional Base Deployment
  - No change to existing deployment
  - Project based migration
  - Use lower cost term-license during migration
• Drawbacks
  - Multiple servers/end points to manage
  - Split identity management
Takeaways

• Stay up to date on best practices. They change over time!
• ArcGIS Enterprise is designed for the federated server model
  - Features that require the federated server model:
    - ArcGIS Pro publishing
    - Raster Analytics and GeoAnalytics
    - Archiving large volumes of data from GeoEvent Server

• Understand the base deployment
• Understand the individual server roles and the recommendations and requirements of each- they’re not all the same!
• Leverage your Esri Account Team