Enterprise GIS Architecture Deployment Options

Andrew Sakowicz
Audience

• Audience
  - Architects
  - Developers
  - Administrators
  - Project Managers

• Level:
  - Beginner / Intermediate
Introduction

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ArcGIS Platform
ArcGIS Platform

Portal for ArcGIS

- Browsers
- PCs
- Devices
- Microsoft Office
- Embed
- <HTML>
- Desktop
- Server
- AGOL Services
- Other Data
- Databases
- Basemaps
  - Features
  - Tiles
  - More...
- APIs
  - SHP
  - CSV
  - KML
  - GPX

Apps
Choosing the option that's right for you
Cloud deployment options
On-Premises, Online or hybrid

- On-premises
- Public Cloud
- Hybrid
Cloud deployment options

Internal site

- Portal for ArcGIS
- ArcGIS Server
- Geodatabase

External users

VPN

Private Virtual Cloud

VPN

ArcGISOnline
- Portal
- Application
- Services

Public users

VPN

Esri Managed Services
- ArcGIS Server
- Geodatabase
On-Premises, Online or hybrid

Apps
- Desktop
- Web
- Device

Portal
- ArcGIS Online (portal)
- Portal for ArcGIS

GIS Servers
- ArcGIS Online (hosted services)
- ArcGIS Server

Ready-to-use Content
- ArcGIS Online Services
- Data Appliance for ArcGIS

On-Premises (Software)

Online (SaaS)
On-Premises, Online or hybrid

• **Online**
  - Fast Start & No Additional Software
  - Likely Lower TCO
  - Some “Metadata” Stored in Cloud
  - Limited Functionality

• **On-premises or hybrid**
  - More Control
  - All Data & Metadata On-Premises
  - More Security Integration Options
  - Additional Software to Manage
  - Architecture Becomes More Complex
Cloud options

Internet Users

Intranet

ArcGIS Online

Internet Users

Intranet

Cloud GIS Server (e.g. Amazon)

ArcGIS Online w/ Cloud GIS Server(s)

Internet Users

Intranet

Esri Managed Cloud Services

ArcGIS Online w/ Esri Managed Cloud Svcs
ArcGIS Online

- Create, share, collaborate
- Subscription-based
  - Named User
  - Credits – pay as you go
- Updates and enhancements occur behind the scenes
ArcGIS Online and Managed Services

- Online Basemaps
- Geocoding, Routing
- Hosted Feature & Tile Map Services
- App Templates

Users
- Desktop
- Web
- Mobile

Esri Managed Services
- Custom Web Apps
- GP, Reporting Services
- Imagery, Large Datasets
- Dynamic Map Services
- RDBMS (Oracle, SQL Server)

ArcGIS Online
- Online Basemaps
- Geocoding, Routing
- Hosted Feature & Tile Map Services
- App Templates

ArcGIS Online front-end, Managed Services back-end
Esri Cloud Hosting Options

Provided by ArcGIS Online and Esri Managed Services

ArcGIS Online
- Web Mapping Platform
- Ready-to-Use Content
- Feature Services
- Tiled Map Services
- Developer API

ArcGIS Online + Advanced GIS Services thru Managed Services
- ArcGIS Online, plus...
- Imagery Services
- Dynamic Map Services
- Analysis Services
- Custom App Hosting

Turnkey GIS Hosting with Managed Services
- Full Service Hosting
- System Design
- Backup and Archive
- Data Management
- 24/7 System Monitoring
Portal deployment options
One or multiple portals

One Portal  Many Portals?
Portal deployment options

Department A Users

Department B Users

Department C Users
Portal deployment options

Department A Users

Department B Users

Department C Users

Shared Services
Portal deployment options

Enterprise or Public Users

Department A Users

Department B Users

Department C Users

Shared Services
High Availability

3rd party load balancer
ArcGIS Server deployment options
Load Balancing options

ArcGIS Web Adaptor
- Provided by Esri
- Works w/ ArcGIS Server sites (not silos)
- Discovers new machines dynamically
- Can’t load balance Portal for ArcGIS

3rd Party Load Balancer
- Not provided by Esri (e.g. F5, CSM, NGINX)
- Works w/ ArcGIS Server sites & silos
- Doesn’t discover new machines dynamically
- Typically already fault tolerant
- Can load balance Portal for ArcGIS
Load Balancing
Recommendations

• Use a third party load balancer, if
  - You have hardware load balancer and support
  - Using silos
  - Windows authentication not required

• Use the ArcGIS Web Adaptor
  - You don’t have available hardware load balancer
  - if web-tier authentication is required
Silo with Web Adapter

- High stability
- Easy horizontal scalability
- Duplicate publication of Web services
- Duplicate Configuration Store, Directories, and Data
- Web services exposed via port 80/443
- Supports Windows Authentication
Single-Site
Web Adapter on a the same tier

- Web applications deployed with server
- Single publication of Web services
- Requires fault Tolerant/HA NAS
- Web services exposed via port 80/443
- Supports Windows Authentication
**Single-Site**

Web Adapter on a separate tier

- **Two-Tier**
- **Supports “tiered” standards (e.g., FISMA)**
- **Utilizes Web Adaptor as a proxy**
  - (DMZ configurations)
Workload Separation

Initial Deployment

Complete GIS
Site design consideration
Multi-node, high number of services

• Ensure require infrastructure resources
  - Network stability
  - NAS stability for ArcGIS Server and Portal config stores
  - RAM
  - CPU

• Avoid during the working hrs:
  - Publishing high number services
  - Adding/removing nodes

• Distribute recycle times
Site management consideration

• Identify unused services and reduce min (to 0 if possible)
• Tune slow services
• Provide best practices to the publishers
• Monitor resources:
  - RAM and committed memory
  - CPU
  - Network latency

All available as part of System Monitor, https://systemmonitoring-emcs.esri.com/Portal
Disaster
Recovery options
Disaster recovery

Primary Data Center

Secondary Data Center

Portal for ArcGIS

ArcGIS Server

Content Store

Configuration Store

Directories

Global DNS

Identity Store

Hot Backups

Content Store

Configuration Store

Directories
Disaster recover and high availability

- Availability is a spectrum
- High availability & disaster recovery are not the same
- High availability & disaster recovery is not trivial to implement

See related session:
- *Building your Server for High Availability and Disaster Recovery*
  - Thursday, 23 Jul 2015, 3:15pm - 4:30pm
  - Location: Room 05 B
Data management options
Data management strategy
Centralized

- Single data center = lower cost
- Performance depends on network: good bandwidth and low latency
Data management strategy

Distributed

- Good performance - local application and data
- Might require complex replication and synchronization process
- Multiple datacenters = higher costs
Data management strategy

- Geodatabase export / import
- RDBMS export / import
- RDBMS replication
- ETL Tools (e.g. FME, Informatica)
- Geodatabase replication
Network Test
Bandwidth and transport time

- Mbps - Bandwidth
- Mbits / req - Response size
- TH - Throughput (req/hr)

\[
Mbps = \frac{TH \times \text{Mbits}/\text{req}}{3600}
\]

\[
\text{Transport (sec)} = \frac{\text{Mbits}/\text{req}}{Mbps - Mbps_{\text{used}}}
\]

No need to calculate it manually, System Designer Tool does it for you:
### Performance Factors

**Network transport time**

- **Impact of service and return type on network transport time**
  - **Compression**
  - **Content, e.g., Vector vs. Raster**
  - **Return type, e.g., JPEG vs. PNG**

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<th>Service/Op</th>
<th>Content</th>
<th>Return Type</th>
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</table>
Data management strategy

- Full GIS Capabilities
  - Read / Write
  - Geodatabase
  - File
    - Personal
    - Enterprise
  - Desktop
  - Server

- Limited GIS Capabilities
  - Read Only
  - Query Layer
  - RDBMS or Data Warehouse
    - Oracle, SQL Server, etc.
    - Netezza, Teradata, Hana, etc.
  - Desktop
  - Server
Data management strategy
Production and Publication (external access)

- **Pros:**
  - Better security
  - Improved performance
  - Additional capacity

- **Cons:**
  - Requires replication
  - Additional hardware
Publication options
Server Pattern

Web GIS Pattern

App

Services

Web Maps & Layers

portal

App

Services
Publication Strategies
The Role of Portal & Web Layers
Publication Strategies
The Role of Portal & Web Layers

Portal
- Web Layer
- Web Layer
- Web Layer

GeoServices
- Service

Geodata
- Feature Class
Publication Strategies
The Role of Portal & Web Layers

Portal
- Active Wells
- Proposed Wells
- Wells by Status

GeoServices
- Wells

Geodata
- Wells
Publication Strategies
The Role of Portal & Web Layers

Portal
- Active Wells
- Proposed Wells
- Wells by Status

GeoServices
- Wells

Geodata
- Wells
Mobile deployment options
Mobile GIS Deployment
Offline w/ Services Pattern
Mobile GIS Deployment
Offline w/ Services Pattern

Today
Collector user can download map areas to their device
- Choose area to download
- Download the map
- Disconnect and Collect data
- Connect and sync

Future
Field managers can improve field workflows by preparing maps for Collectors
- Create services/map
- Prepare offline map areas
- Share map areas
Desktop deployment options
Desktop GIS Deployment

- Thick Client
- Thin Client
- Web GIS Client
System Management options
System Tools overview

- http://www.arcgis.com
- owner:EnterpriseImp
- Show ArcGIS Desktop Content
Managing Tiered Environments

Development
- Portal
- Caching
- Visualization

Staging

Production
System Management

Monitoring

• System Monitoring
  - Esri product options (e.g. ArcGIS Server statistics, Activity Dashboard)
  - System Monitor Tool
  - Integrating with 3rd party monitoring tools

• Troubleshooting best practices
System Management
Monitoring

Key Performance Indicators:

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Network
Hardware
Web Server
ArcGIS Server
Geodatabase
RDBMS
ArcGIS Server 10.3.1 Statistics

- Total requests
- Average response time
- Maximum response time
- Timeouts
- Maximum running instances
- 30 min resolution reports
ArcGIS Server Logs
http://www.arcgis.com/home/item.html?id=90134fb0f1c148a48c65319287dde2f7
System Monitor – ArcGIS Server Statistics

- https://systemmonitoring-emcs.esri.com/#/arcgis/ESLSRV12
- User: esridemo
- Password: esridemo
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- Answer a few short questions and enter any comments