High Availability and Disaster Recovery

Cherry Lin, Jonathan Quinn
Overview of Disaster Recovery
Managing the Twin Risks to your Operations

Data Loss

Down Time
The Three Approaches

**Backups**
- Ability to go back in time

**High Availability**
- No single point of failure
- Machine redundancy

**Disaster Recovery**
- No single point of failure
- Environment redundancy
- Geographic Redundancy
Choosing Between Them

- Complementary
- Build On Each Other
- Cost and Capability
Backup and Restore
Backups are:

- Simple
- Highly Effective
- Not Disruptive
- Under appreciated
ArcGIS Enterprise Backups – WebGIS DR Tool

What the tool backs up

Settings
(Portal, Server, Data Store)

Portal Content

Services

ArcGIS Data Store Data
(relational, scene tiles)
ArcGIS Enterprise Backups – WebGIS DR Tool

What the tool doesn’t backup

- EGDB or file based data
- Traditional cache tiles
How to Backup Web GIS

Web GIS DR Tool

Property File
- Location
- Portal URL
- Credentials
- Scene Cache?

Automate
New at 10.5 and 10.5.1

• Reduced requirements for running the tool
  - Different machine names
  - Different internal URLs

• Incremental backups

• Cloud specific
  - Different regions for primary and standby data centers
  - Azure BLOB storage
  - Ability to save a WebGIS DR backup to an S3 bucket
WebGIS DR Properties – Backup Restore Mode

# Specify the Web GIS backup location if you've set the BACKUP_STORE_PROVIDER to FileSystem.
BACKUP_LOCATION = "\\fileServer\\backups\\full"

# Specify the Web GIS backup mode: full or incremental.
BACKUP_RESTORE_MODE = full
WebGIS DR Properties – Amazon S3

Information for the backup portal content S3 bucket

# If your portal content directory is in Amazon S3, specify Amazon S3 Storage properties for portal backups.
PORTAL_BACKUP_S3_BUCKET = portal-content
PORTAL_BACKUP_S3_REGION = US-East-1
# WebGIS DR Properties – Amazon S3

Storing the WebGIS DR backup in an S3 bucket

```
# Specify a storage provider: FileSystem, or AmazonS3.
BACKUP_STORE_PROVIDER = AmazonS3

# Specify Amazon S3 Storage properties if you've set the BACKUP_STORE_PROVIDER to AmazonS3.
S3_ACCESSKEY = < access key >
S3_SECRETKEY = < secret access key >
S3_ENCRYPTED = true
S3_BUCKET = webgisdr-backup
# IAMRole or accessKey
S3_CREDENTIALTYPE = IAMRole
S3_REGION = US-East-1

# Specify a backup name used for the Web GIS restore only.
# Example:
# April-20-2017-5-04-14-PM-PDT-FULL
# or
# webgisdr-backup/10-5-1/full/April-20-2017-5-04-14-PM-PDT-FULL
S3_BACKUP_NAME =
```
WebGIS DR Properties – Azure

Credentials for the backup portal content container

```
# If your portal content directory is in Azure Blob, specify Azure Blob Storage properties for portal backups.
PORTAL_BACKUP_BLOB_ACCOUNT_NAME = < account name >
PORTAL_BACKUP_BLOB_ACCOUNT_KEY = < account key >
PORTAL_BACKUP_BLOB_ACCOUNT_KEY_ENCRYPTED = true
PORTAL_BACKUP_BLOB_ACCOUNT_ENDPOINT = blob.core.windows.net
PORTAL_BACKUP_BLOB_ENDPOINT URL = https://< account name >.blob.core.windows.net/< container >
```
WebGIS DR Tool – Usage

• Backup
  - Runs concurrently
  - No downtime while exporting
  - Sample syntax
    
    ```
    C:\Program Files\ArcGIS\Portal\tools\webgisdr>webgisdr.bat -e -f webgisdr.properties
    ```

• Restore
  - Runs sequentially
    - Data Store → Server → Portal
  - Downtime while restoring
  - Sample syntax
    
    ```
    C:\Program Files\ArcGIS\Portal\tools\webgisdr>webgisdr.bat -i -f webgisdr.properties
    ```
Scheduling ArcGIS Enterprise backups - Windows
Scheduling ArcGIS Enterprise backups - Windows
Scheduling ArcGIS Enterprise backups - Windows

1. Open Task Scheduler.
2. Create a Basic Task under the Task Scheduler.
3. Configure the task details and schedule.
4. Save and activate the task.
Scheduling ArcGIS Enterprise backups - Windows
Scheduling ArcGIS Enterprise backups - Windows
Scheduling ArcGIS Enterprise backups - Windows
Scheduling ArcGIS Enterprise backups - Windows

Add arguments (optional):
-e -f "C:\Program Files\ArcGIS\Portal\tools\webgisdr\webgisdr.properties"
Scheduling ArcGIS Enterprise backups - Windows

Create Basic Task Wizard

Summary

Create a Basic Task
Trigger: Daily
Action: Start a Program

Finish Program

Name: Backup ArcGIS Enterprise
Description:

Trigger: Daily; At 12:00 AM every day
Action: "%" -e -f "C:\Program Files\ArcGIS\Portal\tools\webgisdr\webgisdr.properties"

Open the Properties dialog for this task when I click Finish
When you click Finish, the new task will be created and added to your Windows schedule.

Finish
Examples:

Run the WebGIS DR Tool at 12:00:00 AM every day:

```
0 0 * * * /data/arcgis/portal/tools/webgisdr/webgisdr.sh -e -f /data/arcgis/portal/tools/webgisdr/webgisdr.properties
```

Run the tool every 12 hours every day starting at 12:00:00 AM:

```
0 */12 * * * /data/arcgis/portal/tools/webgisdr/webgisdr.sh -e -f /data/arcgis/portal/tools/webgisdr/webgisdr.properties
```
High Availability
Overview

• What is High Availability

• ArcGIS Enterprise High Availability

• What’s New at 10.5 and 10.5.1 – Native Cloud implementations

• Other factors for High Availability
High Availability (HA)

- **Definition:**
  - A system or component that is continuously operational for a desirably long length of time. Availability can be measured relative to "100% operational" or "never failing." (SLAs)

- Shorter down time costs more

- Elimination of single points of failure.

- Availability of a system depends on the availability of all components
ArcGIS Enterprise

Portal

GIS Services

Hosted Feature and Tile Data

Portal for ArcGIS

ArcGIS Server

ArcGIS Data Store
Portal for ArcGIS: High Available Deployment

- Load Balancer
- Portal Machines
- Portal Content (shared)
Highly Available Portal

- Two Portal machines
- Both Portal machines take requests
- Internally, there is a difference between the two machines’ role:
  - Primary
  - Standby
- Behaves a little bit differently:
  - Standby machine is down (or Portal service stops) → No interruption
  - Primary is down (or Portal service stops) → A minute or two Portal behaves like the internet is slow.
Portal for ArcGIS: Load Balancing Options

- Provided by Esri
  - Web-Tier Authentication
  - Availability dependent on web servers

- Not provided by Esri
  - Typically already fault tolerant
Portal for ArcGIS: High Availability Deployment Patterns

HA Portal with Load Balancer

- Load Balancer
- Portal Machines
- Portal Content *(shared)*

- Simpler
- Need certain settings on LB
- Doesn’t support Web Tier Authentication

HA Portal with Load Balancer & Web Adaptors

- Load Balancer
- Web Adaptors
- Portal Machines
- Portal Content *(shared)*

- More complex
- Web Tier Authentication
Portal for ArcGIS: Health Check

• Provided by Portal for ArcGIS
  - https://<webadaptor machine>.domain.com/<context>/portaladmin/healthCheck
  - https://<machine>.domain.com:7443/arcgis/portaladmin/healthCheck

• Check if Portal is ready to take request. Not individual component, e.g. service, item, etc.

• Or your own customized health check
Portal for ArcGIS: Key Considerations for HA

- Two Portal machines
  - Primary
  - Standby
  - Behaves a little bit different when one machine is down

- Highly Available Load Balancer
  - Web Tier Authentication
  - No single Web Adaptor

- Health Check provided for Portal for ArcGIS

- Highly Available shared content store
ArcGIS Server: Multiple-Machine Architecture

- Multiple machines
- Identical Roles
- No interruption when any machine is down
- The config-store and server directories need to be accessible to all machines.
ArcGIS Server: High Availability Deployment Patterns

Server Site with Load Balancer

Load Balancer
Server Machines
Config-store Server Directories *(shared)*

Server Site with Load Balancer & Web Adaptors

Load Balancer
Web Adaptors
Server Machines
Config-store Server Directories *(shared)*
ArcGIS Server: Health Check

• Provided by ArcGIS Server
  - https://<.....domain.com>/<context>/rest/info/healthcheck
  - https://<machine>.domain.com:6443/arcgis/rest/info/healthcheck

• Server level health check. Not checking service.

• Or your own customized health check
Portal for ArcGIS and ArcGIS Server: Federation

**Portalurl**: 443

**Services URL**: 443

**privatePortalurl**: 7443

**Administrative URL**: 6443

**Communication**

**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://webadaptor.domain.com/arcgis
- **Administrative URL**: Example: https://gisserver.domain.com:6443/arcgis
- **Username**: 
- **Password**: 

**ADD**  **CANCEL**

```json
{
  "portalUrl": "https://webgistesting.net/portal",
  "privatePortalUrl": "https://webgistesting.net/portal",
  "portalsSecretKey": "29f01bca0ff74b9aecc8208bf3c3c0e2",
  "portalNode": "ArcGIS_PORTAL_FEDERATION",
  "serverUrl": "https://webgistesting.net/server"
}
```
Portal for ArcGIS and ArcGIS Server: Federation

Portalurl: 443

Load Balancer

Portal Machines

Load Balancer

privatePortalurl: 7443

Services URL: 443

Load Balancer

Server Machines

Load Balancer

Administrative URL: 6443
ArcGIS Server: Key Considerations for HA

- Multiple machines for scalability

- All machines have identical roles
  - All Active roles
  - No interruption when any machine is down or Server stops

- Highly Available Load Balancer
  - Web Tier Authentication
  - No single Web Adaptor
ArcGIS Server: Key Considerations for HA

• Highly Available shared config-store and server directories

• Health Check provided for ArcGIS Server

• Highly Available URLs when communicating with Portal
  - Portal URL
  - Private Portal URL
  - Services URL
  - Server Administrative URL
ArcGIS Data Store: High Availability Architecture

Server Site: ArcGIS Data Store's Load Balancer

“Highly Available ArcGIS Data Store”

Primary ➔ Standby

Backups (shared)
ArcGIS Data Store: Failover Scenarios

- Primary ArcGIS Data Store stops working: Define Failure
  - Computer crashes
  - Gets unplugged
  - Lose network connectivity
  - etc

- Not “gracefully” shutdown
  - Data Store service stops

ArcGIS Enterprise High Availability Deployment

- **Load Balancer**
  - "Highly Available Portal"
    - Portal Content (shared)
  - Site
  - Configuration Store Server Directories (shared)
- "Highly Available ArcGIS Data Store"
  - Primary
  - Standby
  - Backups (shared)
What’s New at 10.5 and 10.5.1 – Native Cloud Implementations

• Portal Content Store
  - Azure Blob
  - AWS S3

• Create Portal through portaladmin

• Use Esri deployment tools
  - Azure Cloud Builder
  - Esri Amazon Cloudformation templates
What’s New at 10.5 and 10.5.1 – Native Cloud Implementations

- **Server config-store**
  - Azure Table and Azure Blob
  - AWS DynamoDB and S3

- **Create Site through serveradmin**

- **Use Esri deployment tools**
  - Azure Cloud Builder
  - Esri Amazon Cloudformation templates
What’s New at 10.5 and 10.5.1 – Native Cloud Implementations

• Cloud Store
  - Amazon S3
  - Azure Blob

• Caching Directory
  - Consume Cache
  - Cache management is coming in future release

• Data Input Directory

• Backup/Restore to Cloud Storage
ArcGIS Enterprise HA: Part of Your HA Architecture

• Your Data
  - Enterprise GeoDatabase
  - File based Data

• Software
  - Web Server
  - Software Load Balancer

• Hardware
  - File Server
  - Network

• People
  - HA?
  - IT strong?
ArcGIS Enterprise HA: IT Governance

- Ensure the effective and efficient use of IT

- Policies and procedures highly disciplined
  - Planned and updated in a timely manner
  - Documented clearly
  - Tested Properly
  - Exercised with staff
ArcGIS Enterprise HA: Spectrum, Not a Switch

- Business Interruption
- Workday Interruption
- Momentary Interruption

Downtime (decreasing)
Disaster Recovery
Geographic Redundancy
Overview

- What is geographic redundancy
- Using the Web GIS DR tool
- Roadmap to being geographically redundant
- Recovering from failover
Overview

- Geographically separate data centers

- Components within data centers are typically highly available

- Duplicated configurations and data between the two data centers

- WebGIS DR Tool is used to move snapshots of data from primary to standby

- Complex disaster recovery option
Geographic Redundancy

Public Portal URL - https://mysite.esri.com/portal
Services URL – https://mysite.esri.com/server

Public portal URL and services URL need to be the same
Referenced data paths need to be the same
Geographic Redundancy

East coast data center (primary)

West coast data center (standby)
Geographic Redundancy

Traffic Manager

East coast data center (primary)

West coast data center (standby)
Geographic Redundancy

Traffic Manager

East coast data center (primary)

West coast data center (standby)
Geographic Redundancy

Traffic Manager

East coast data center (primary)

West coast data center (standby)
Roadmap for geographic redundancy

1. Duplicate the deployment between primary and standby data centers

2. Create snapshots of the primary data center

3. Apply snapshots to the standby data center

4. Monitor your standby data center
Duplication

- Number of machines should be the same
- Identical URLs between data centers
  - Public Portal URL
  - Services URL
- Identical paths to data and connections to databases or enterprise geodatabases
Creating snapshots

• Full snapshot
  - Create an initial snapshot of all of the data within the ArcGIS Enterprise
  - Internally defines a base time that will be used for an incremental snapshot

• Incremental snapshot
  - Creates a snapshot of all of the data that has been created or modified since the last full backup
  - Decreases the time it takes to synchronize content, services, and data between primary and standby
Creating incremental snapshots

- Creates a snapshot of all data added or modified since the last full snapshot
Creating incremental snapshots

- Creates a snapshot of all data added or modified since the last full snapshot
  - Portal
  - Server
  - Data Store

```bash
# Specify a shared location to store the Web GIS backup file. This is where the backups for
# individual components will be saved to before being moved to the storage that you specify
# for the BACKUP_STORE_PROVIDER property
# The following accounts must have read and write permissions on the shared location:
# 1) The domain account used to run the web GIS software.
# 2) The account to run this tool.
SHARE_LOCATION=\\\fileServer\\backupLocation

# Specify a storage provider: FileSystem, or AmazonS3.
BACKUP_STORE_PROVIDER = FileSystem

# Specify the Web GIS backup location if you've set the BACKUP_STORE_PROVIDER to FileSystem.
BACKUP_LOCATION =\\\fileServer\\backupLocation\\incremental

# Specify the Web GIS backup mode: full or incremental.
BACKUP_RESTORE_MODE = incremental
```
Monitoring and Failover

- QA process on standby ArcGIS Enterprise
  - Checking the index within Portal
  - Validating federated Servers
  - Validating data stores using Server Admin
  - Checking important services or applications

- Detecting when components fail within a data center
  - Monitoring the healthCheck URLs of Portal and Server

- Failing over data centers should be a manual, deliberate decision

ArcGIS REST Services Directory

Home > healthCheck

Server Health Check

Health Check successful, the site is ready
Recovering from a failure

Traffic Manager

East coast data center (primary)

West coast data center (standby)
Recovering from a failure – Bringing the primary back online
Recovering from a failure – Move data back to primary
Recovering from a failure – Point traffic manager back to primary
Recovering from a failure – Resume applying snapshots to standby
Geographic Redundancy – Cloud deployments
Geographic Redundancy – Cloud deployments

*Support to store WebGIS DR backups in an Azure container coming at 10.6
Takeaway points

- Important to understand the requirements of geographic redundancy as a disaster recovery option
- Take advantage of the Web GIS DR tool to move snapshots of the deployment from primary to standby
- Geographic redundancy is a complex disaster recovery option
Success Stories with HA or DR

• Let us know if you have a success story to share
Please take our Survey
Your feedback allows us to help maintain high standards and to help presenters.

Find your event in the Esri Events App

Find the session you want to review

Scroll down to the bottom of the session

Answer survey questions and submit