Advanced ArcGIS Server Map Caching topics and workflows

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What to expect in this session

• Basic to advanced topics

• Outline
  – Cache clients
  – Building a globe cache
  – Caching strategies
  – 9.3 improvements
  – Questions?
Using caches in Desktop

• **ArcMap**
  - High level of control over tile appearance
    - **Continuous zoom**
    - **Reprojection**
      - Can easily overlay with other services and data

• **ArcGIS Explorer**
  - Can overlay 2D cache on globe surface
  - ArcGIS Online tiling scheme recommended

• **Must clear local cache after update**
Desktop clients and cache updates

- ArcGIS Desktop and ArcGIS Explorer maintain local caches
- Users must clear local cache to see updates
- User can disable local caching
- Server administrator can also disable local caching
  - New at 9.3
  - Overrides client settings
Globe caches

- 3D globe caches give optimal performance in ArcGlobe and ArcGIS Explorer
- Image format and tiling scheme is pre-configured
- Requires a globe service and use of globe caching tools
Creating a 3D globe cache from a 2D map cache

• Create a 3D cache from a globe containing a draped 2D map cache
  – Gives better cartographic quality and performance than you would get if you authored the .3DD in ArcGlobe
  – This is how ESRI created the ArcGIS Online globe caches
  – For instructions see ArcGIS Server Development Blog post: Creating a 3D globe cache from a 2D map cache
Caching strategies
Cache size affects strategy

- **Small caches**
  - Create all tiles
  - Update all tiles frequently

- **Large caches**
  - Create only the most important tiles
  - Create tiles on demand
  - Update strategically
Do you really need to cache the whole state down to 1:2500?

- At street level scales, some tiles might never be used.

http://hotmap.msresearch.us
Cache by feature class

• **Cache only within boundary of features you supply**
  – You can supply a feature class with just one feature
  – Avoid numerous features or geographically small features

• **Saves time and disk space**

• **Manage Map Server Cache Tiles tool**

• **Optionally, track the status of which features have been cached**
How the server draws tiles

- Server draws a large area or “supertile” before cutting individual tiles
  - 4096 x 4096
  - 2048 x 2048 if using antialiasing

- Supertile necessary to
  - Reduce duplicate labeling
  - Reduce requests to map service when caching
Caching by feature class is most effective...

- At large scales
- When time and disk space are limited
- When area of interest is irregularly shaped
- When data is limited in some areas
More tips for caching by feature class

• Feature class coordinate system should match map you’re caching

• Avoid numerous small features
  – Aggregate Polygons tool
  – Dissolve tool

• Avoid excessive vertices
  – Simplify Polygons tool
On-demand caching

- Creates tiles as they are visited by users and adds them to your cache
- First visitor to an area must wait for tiles to be created
- Pre-create tiles for areas that you anticipate will be most popular
- Set as a service property in ArcCatalog or Manager
How do you know which tiles will be popular?

- Study usage patterns of your maps
- Examine known example of MS Hotmap
  - Urban areas
  - Roads
  - Coastlines
  - Points of interest
Popular areas can be modeled

MS Hotmap

Modeled “hot” areas: Urban, roads, coasts, POIs

Tiles created using model output
Updating the cache

- Necessary if you want to see changes in your data
- Gives you the performance benefit of caching, even with changing data

- Update with Manage Map Server Cache Tiles tool
  - Execute manually or via a scheduled script
  - See the Help for an example Python script
Strategic updates

- Geoprocessing model can be used to update only areas that have changed
- Custom Geoprocessing tool:
  - Show Edits Since Reconcile
  - Use geodatabase versioning to track changes
  - Generate a feature class of where changes have occurred
  - Update the cache using feature class output
- Repeat on a regular basis
Update a cache using a staging server (scenario)

Production ArcGIS Server Instance

Map service on production server has layers to support queries and TOC

File Geodatabase

Cache folder

Queries

Staging ArcGIS Server Instance

Map service on staging server has all layers to support cache creation

Cache folder

File Geodatabase

Query

#1

Show Edits Since Reconcile + Cache rebuild Python Script

#2

Xcopy, or Securecopy, or …

#3

One way replication

Multi-user versioned Geodatabase
Strategic caching demo

1. Build full cache at small scales

2. Build partial cache at large scales
   - Based on feature class boundary
   - Enable cache on demand
9.3 improvements
Caching tab is also available in Manager in 9.3

- You can use it to:
  - Define the tiling scheme for a service
  - Enable cache on demand

- You cannot use it to launch the caching tools
Add and remove scales from an existing cache

- Use the Manage Map Server Cache Scales tool
- Edits the cache configuration and the cache folders on disk
Improvements to ArcMap as a client

- Improved display of resampled cached tiles
  - Improves the look of ArcGIS Online Street Map
  - Helps eliminate issues like “disappearing boundaries”: 
WMS services take advantage of cache

1. Enable WMS capability on a cached map service
2. WMS service uses cached images instead of generating an image on the fly
   - If all layers are requested
   - Only uses cache when there is no need to change projection, layer order, layer visibility, background, etc.

- Cache tiles are resampled to fit the scale of the client
  - Best performance when client requests cached scales
Globe caches easier to build and deploy

- All data types can be cached using ArcGIS Server tools
- On demand caching now available for vectors
- Redesigned caching tools let you control which levels of detail get cached for each layer
- Easier workflow for deploying caches to production servers
  - Just copy the globe document and caches to the production server
  - Don’t need to use .lyr files or the Globe Deployment Wizard
Updated documentation

- **Caching help section** greatly expanded between 9.2 and 9.3

- Web help is constantly updated
  - [http://webhelp.esri.com](http://webhelp.esri.com)

- **ArcGIS Server Development Blog** addresses specific problems. Content is later moved to the web help
Training

• **ArcGIS Server: Web Administration Using the Microsoft .NET Framework**
  – Two full lessons on map caching

• **Free Recorded Lice Training Seminars**
  – Implementing and Optimizing ArcGIS Server Map Caches
    • [http://training.esri.com/campus/seminars/recordings.cfm](http://training.esri.com/campus/seminars/recordings.cfm)

• **Visit training.esri.com for more information**
Questions?