



Designing and Using Cached Map Services

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What's covered in this session

Agenda

Why cache maps?

Map cache best practices

Map cache administration

Caching in the cloud



Why Cache Maps

Understanding caching concepts

DEMO

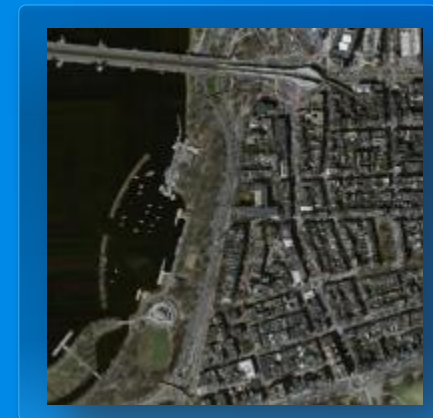
Why cache maps?

What should you cache?

How do you make a map cache?

Choosing image formats

- Let the ArcGIS Service Editor choose for you!
 - Vector only caches (few colors)
 - PNG (auto selects bit depth)
 - Vectors only caches (many colors)
 - PNG (auto selects bit depth)
 - Imagery
 - MIXED with 55 quality
 - Vectors or labels + Imagery
 - MIXED with 90 quality



Does Compression really make a difference?

- Large number of continuous colors
 - JPEG (start with quality = 55)
 - Mixed (if transparency required)

Which one looks better?



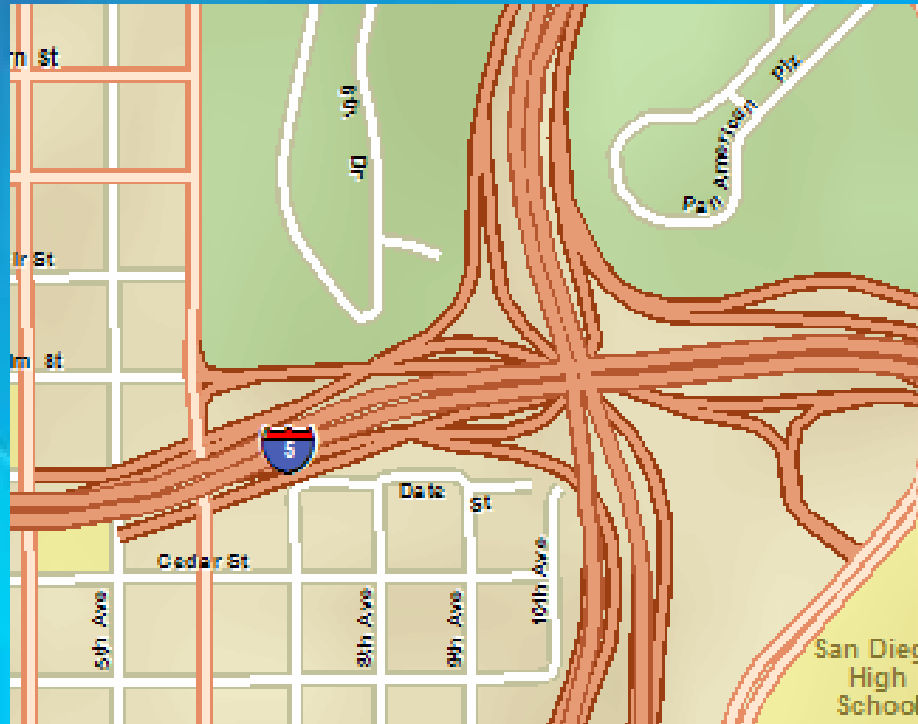
JPEG 90 – 25KB



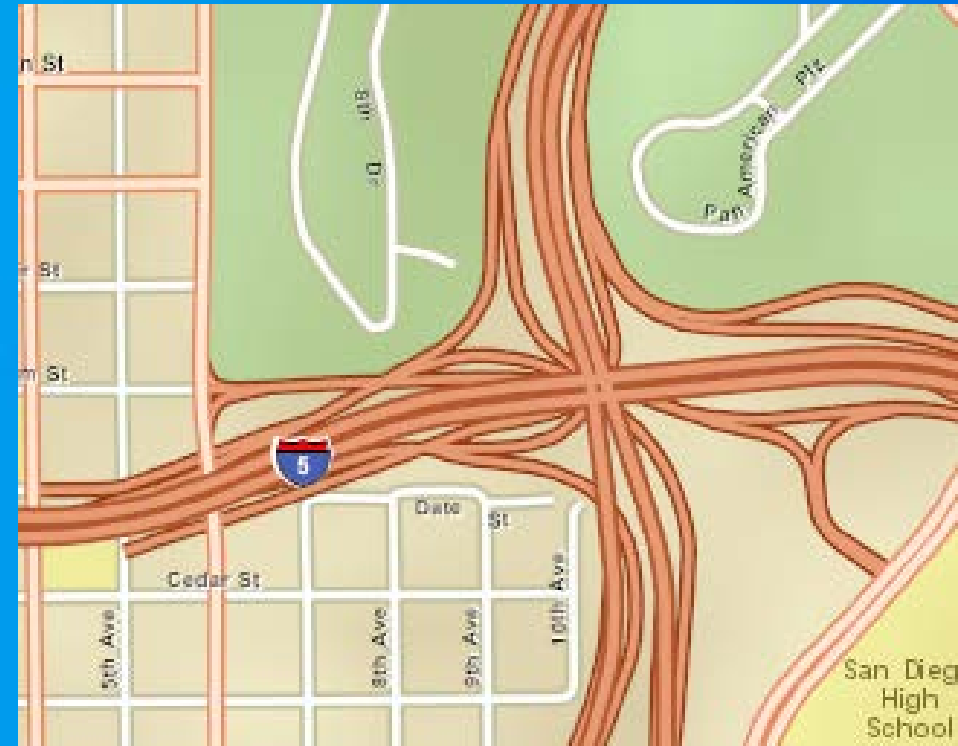
JPEG 90 – 30KB

Does antialiasing make a difference?

- High quality line/label rendering on vector maps
- Web standard (Google, Bing, AGOL)
- Takes **LONGER** to cache



No antialiasing



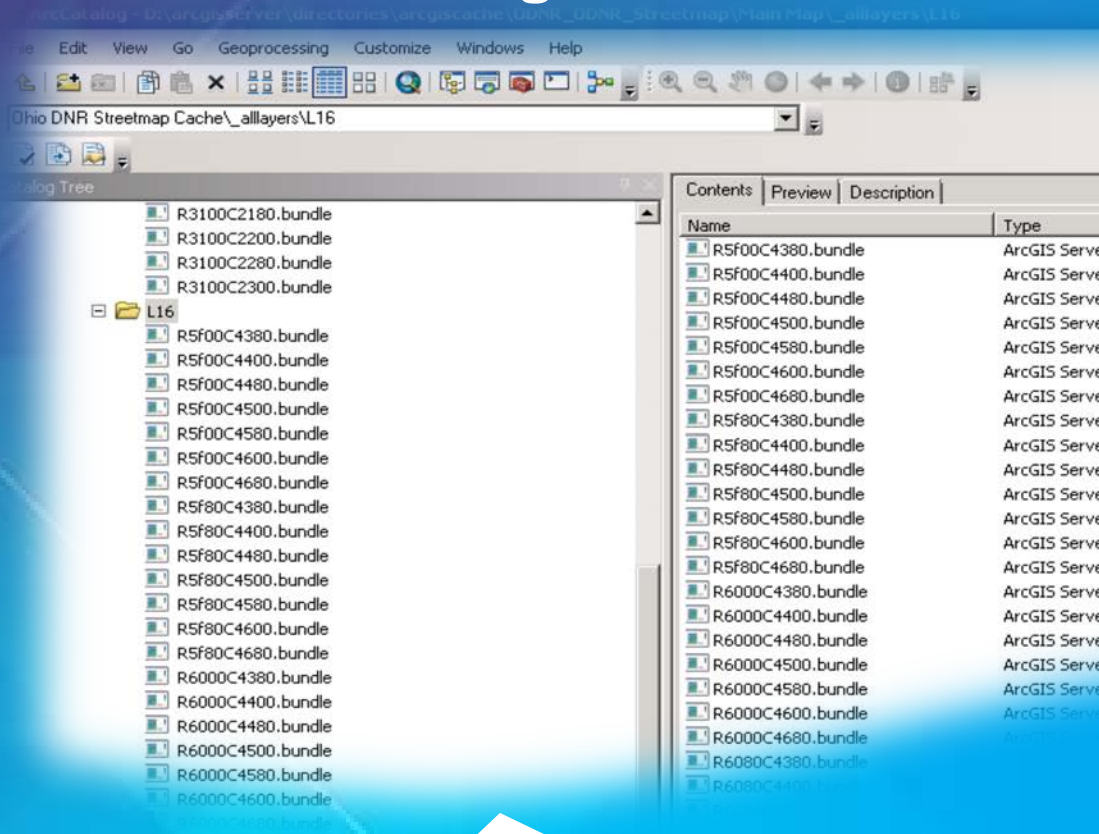
Best antialiasing



Map caching best practices

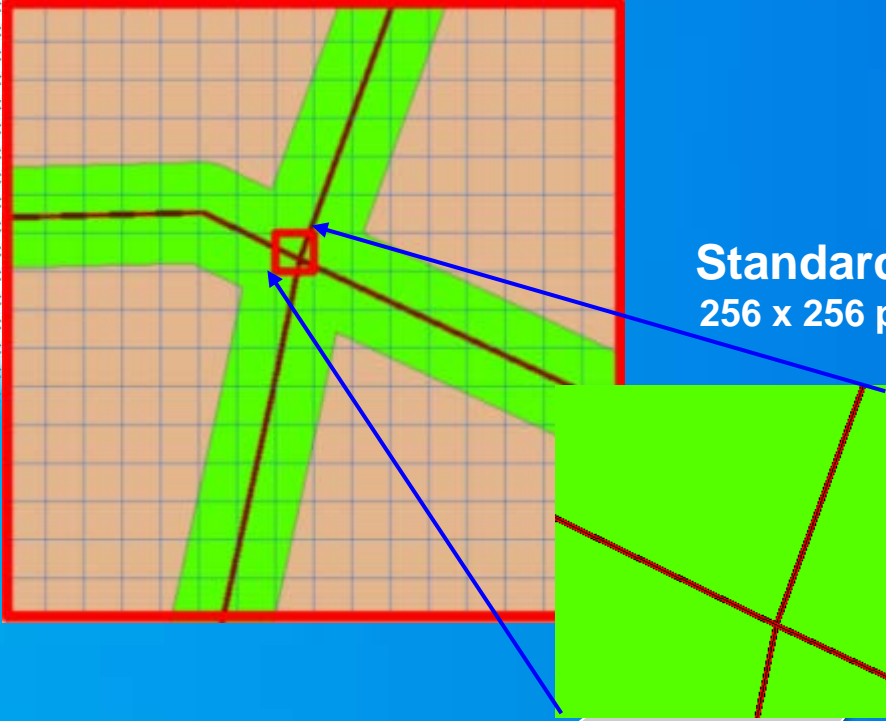
Strategies and techniques

Understanding cache structure



Bundle
8 x 8 Supertiles

Supertile
16 x 16 tiles

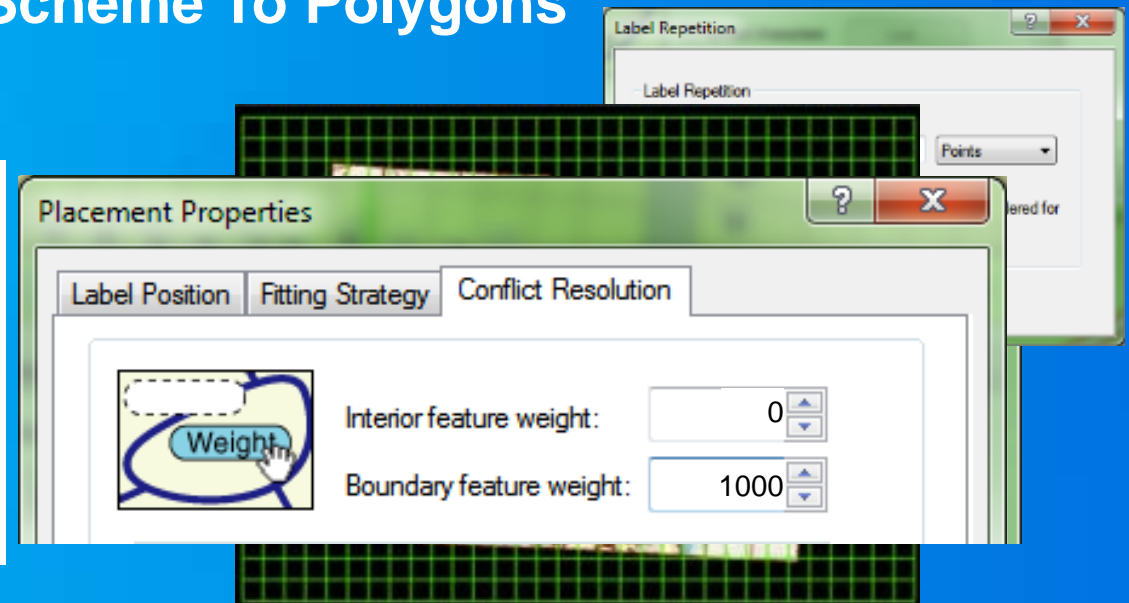
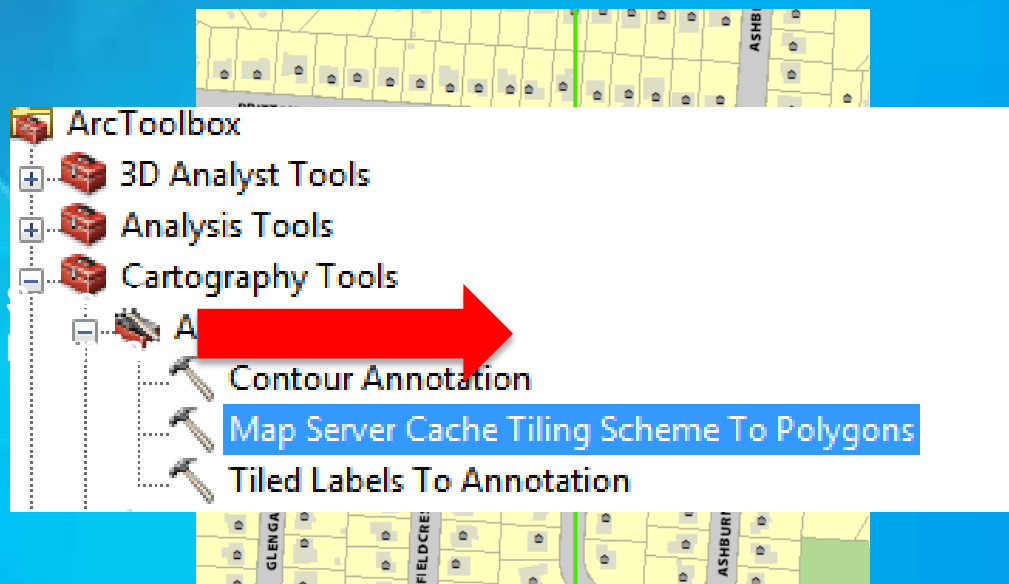


Standard tile
256 x 256 pixels

16,384 tiles

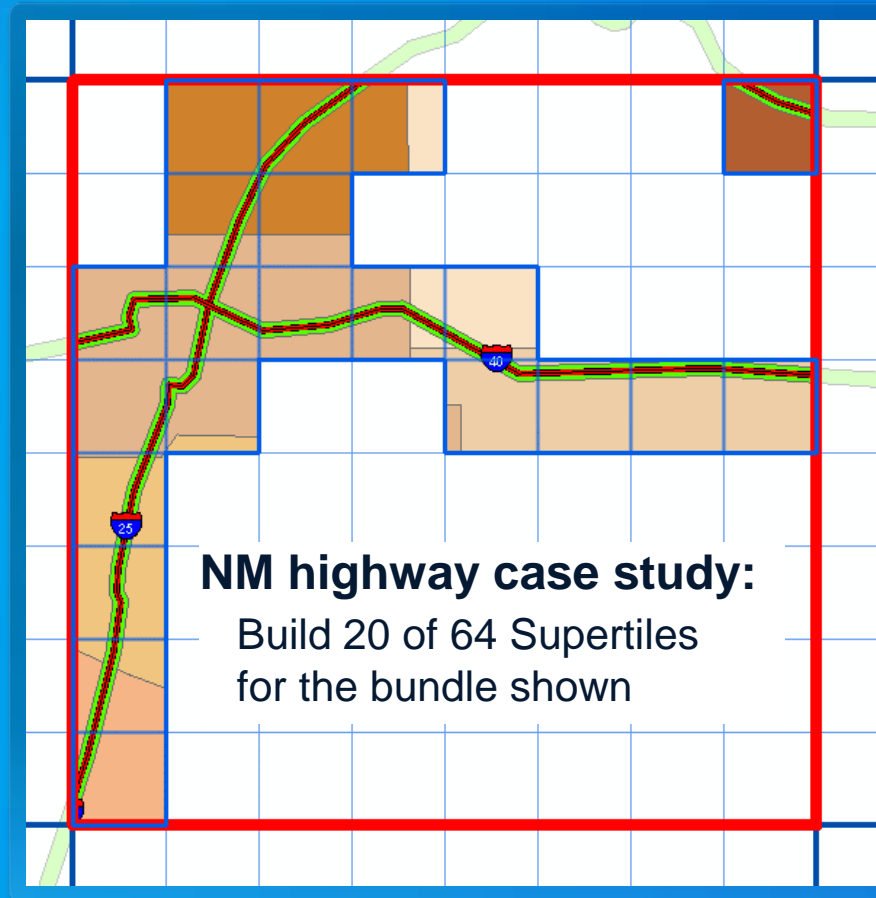
Supertiles and Labeling

- ArcGIS Server Draws Large Areas
 - Reduces duplicate labels
- Duplication May Occur
 - Use Annotation or MapPlex Labels with Rules
 - Use Map Server Cache Tiling Scheme To Polygons



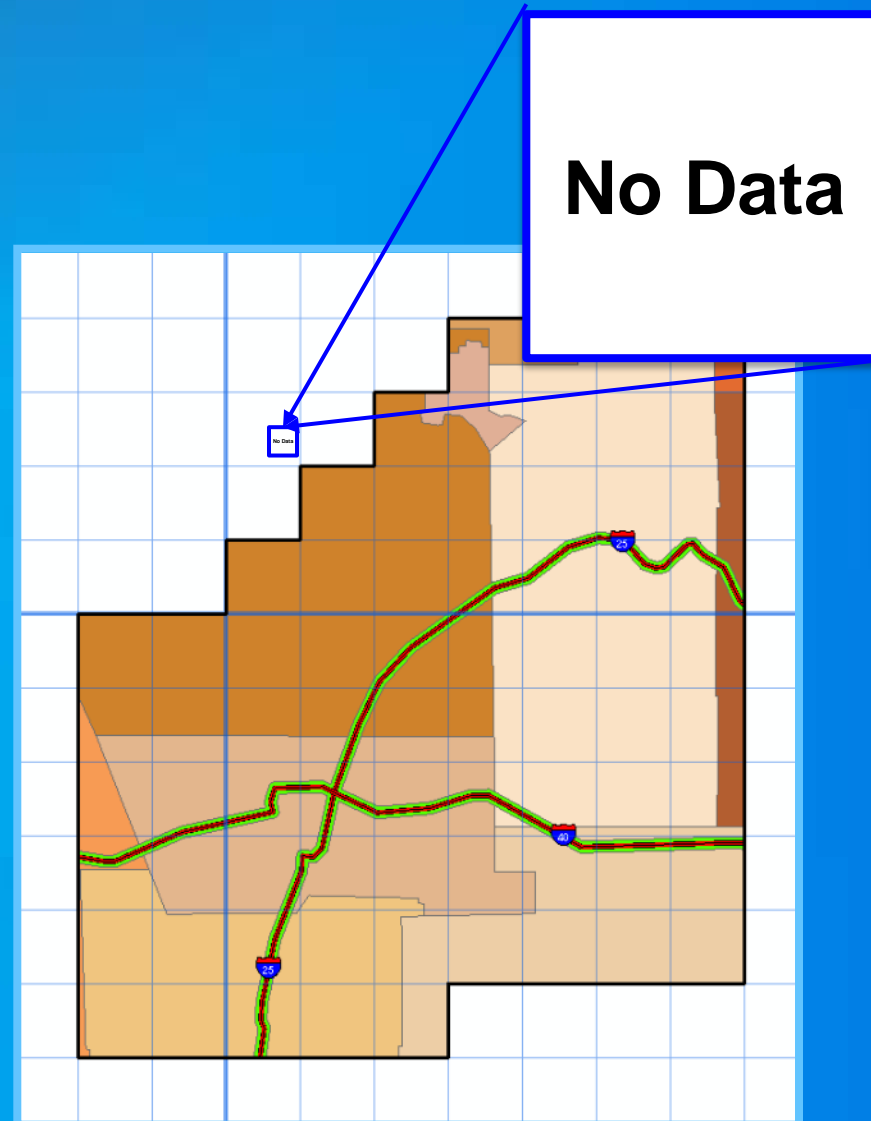
You don't need to generate everything

- Cache by feature
 - Polygon features
 - Generates all tiles for intersecting supertiles
- Saves on...
 - Generation time
 - Processor resource
 - Disk usage



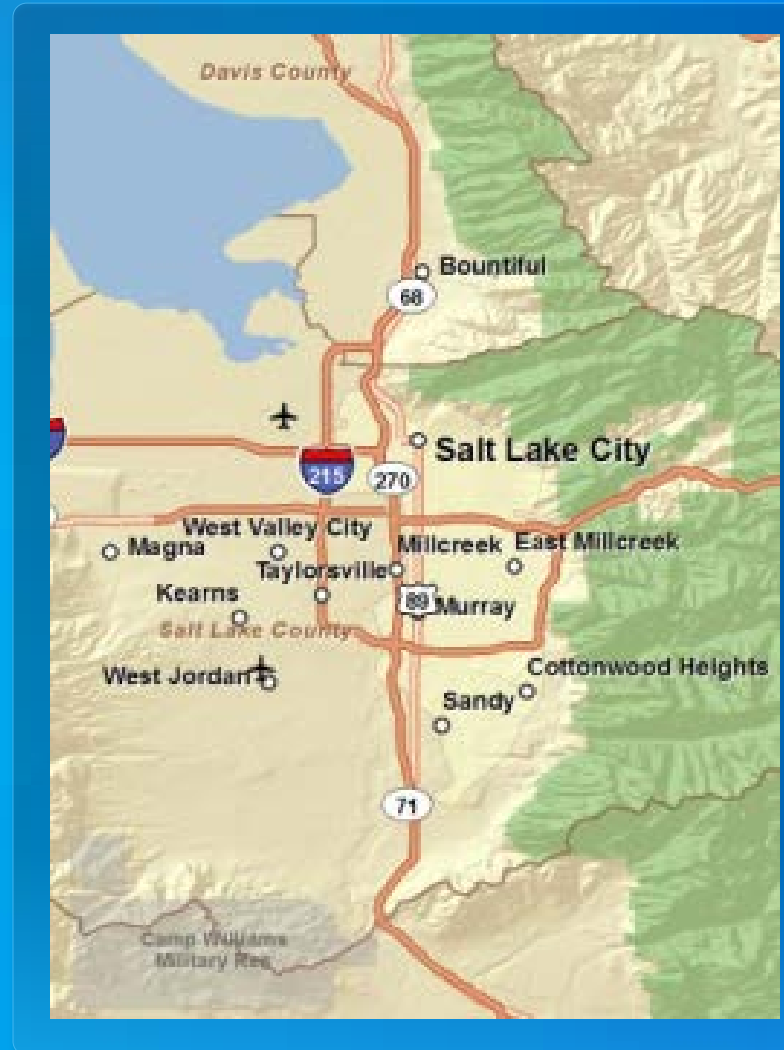
Handling tiles you do NOT create

- Create “No Data” tile
 - Same image format (JPG or PNG)
 - Same size (256 x 256)
 - Save in cache folder
 - ...\`<dataframe>`_alllayers
- How to
 - Knowledge base article [36939](#) has sample files



Build a test cache and note the following

- Creation time
- Appearance
- Client performance
- Cache size validation



Tracking cache status & fixing errors

The screenshot displays the ReportingTools interface for a Geoprocessing Service. The left pane shows a file explorer view of the local drive C:\agsLocal, with a folder named 'Cache Analysis' containing several files: 'Status.gdb', 'CacheStat', 'JobDetails', 'JobStatus', and 'TaskStatus'. The 'Status.gdb' file is highlighted with a red box. The right pane shows the service details for 'ReportingTools', including its status (Started), instances running (0), instances in use (0), and maximum instances (3).

The 'Cache Status --- Streetmap' dialog box is open, showing a summary of the cache analysis: '49.1% of the tiles are present.' and 'Tile generation is not in progress.' The dialog has two tabs: 'Cache Status' and 'Job Status'. The 'Job Status' tab is active, displaying a table of job details:

Job ID	Status	Errors
jbc6a2010feda43f5be4c9a14a0475e80	Done	14:37
j8e6114a1874b462a97aba4e787815c37	Done	44:14
j8e6114a1874b462a97aba4e787815c37	Done	44:14

A context menu is open over the 'Job Status' tab, with the following options: 'Cancel Job', 'Complete Job', 'Report Errors...', 'Fix Errors', 'Export Errors to File...', and 'Details...'. The 'Report Errors...' option is highlighted with a red box.

In the background, a table with columns 'ActualTi' and 'StartTime' is visible, showing data for various jobs:

ActualTi	StartTime
1	6/24/2013 6:58:08 PM
1	6/24/2013 6:58:08 PM
2	6/24/2013 6:58:08 PM
4	6/24/2013 6:58:08 PM
9	6/24/2013 6:58:08 PM



Map cache administration

Generate and update techniques

Setting the Number of Instances

- Cache Tools Geoprocessing Service
 - Start with N
 - N = CPU's per server
 - See cloud session for Amazon recommendations

The image displays two screenshots side-by-side. The left screenshot is the 'Service Editor' window for the 'CacheTools' service. In the 'Pooling' tab, the 'Maximum number of instances per machine' is set to 8, which is highlighted with a red box. A green arrow points from this box to the right, where the text '8CPU's = 8 Instances' is written. The right screenshot is the 'Windows Task Manager' window, showing the 'Performance' tab. The 'CPU Usage' section is highlighted with a red box, and the text '8 CPU' is overlaid on the CPU Usage History graph. Below the graphs, system statistics are visible, including Physical Memory (7167 MB total, 1698 MB free) and System handles (29801).

System caching services

- System services
 - Caching Tools: Sets caching instance per machine
 - Caching Controllers: Assign cache jobs to instances
- Manage Map server Cache Tiles
 - Controls instances per job
 - Set to -1 to use all instances

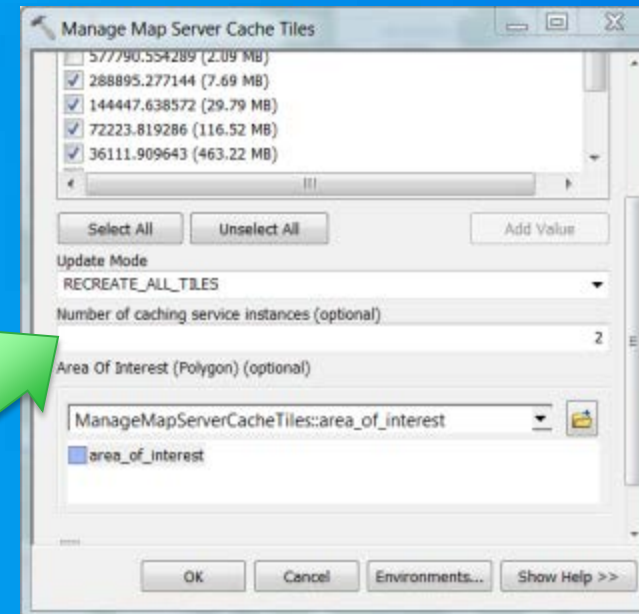


CachingTools (Geoprocessing Service)
The CachingTools service is used by ArcGIS Server Image service caches.
Status: Started
Instances Running: 0
Instances in Use: 0

CachingControllers
The CachingController service is used by ArcGIS Server Globe and Image services.
Status: Started
Instances: 3
Instances Running: 3
Instances in Use: 3
Maximum Instances: 3

Per machine

Per job



Manage Map Server Cache Tiles

- 577790.554289 (2.09 MB)
- 288895.277144 (7.69 MB)
- 144447.638572 (29.79 MB)
- 72223.819286 (116.52 MB)
- 36111.909643 (463.22 MB)

Select All Unselect All Add Value

Update Mode: RECREATE_ALL_TILES

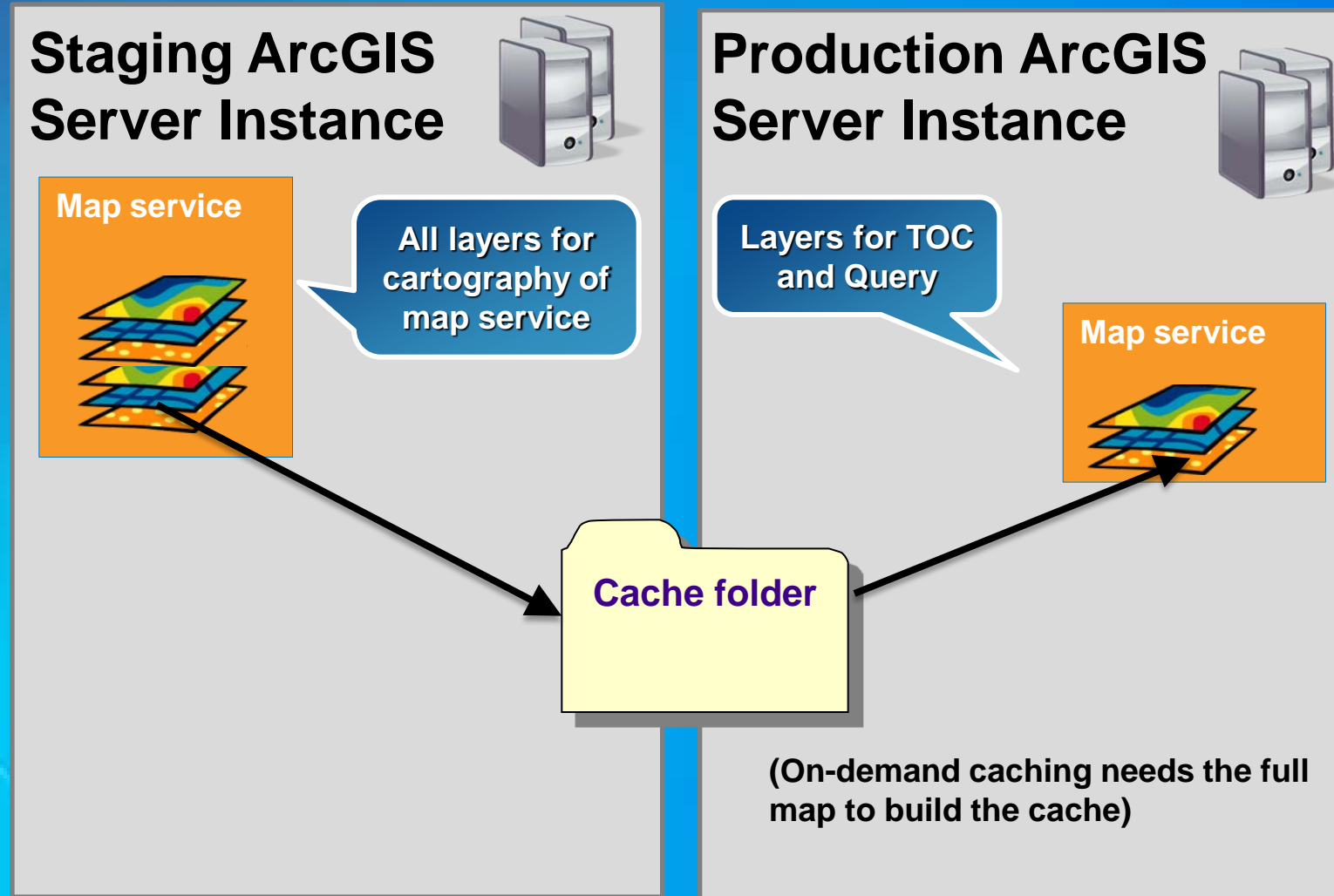
Number of caching service instances (optional): 2

Area Of Interest (Polygon) (optional): ManageMapServerCacheTiles::area_of_interest

area_of_interest

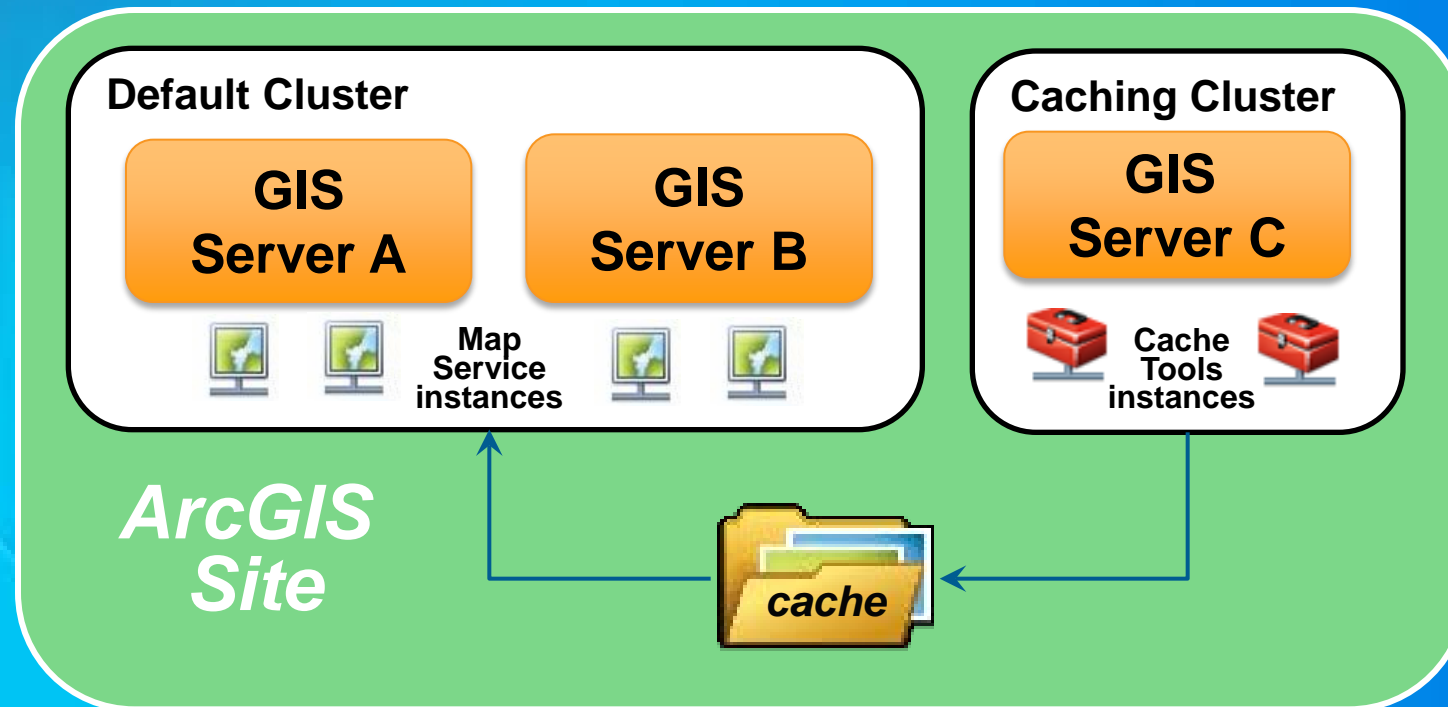
OK Cancel Environments... Show Help >>

Update a cache using a staging server



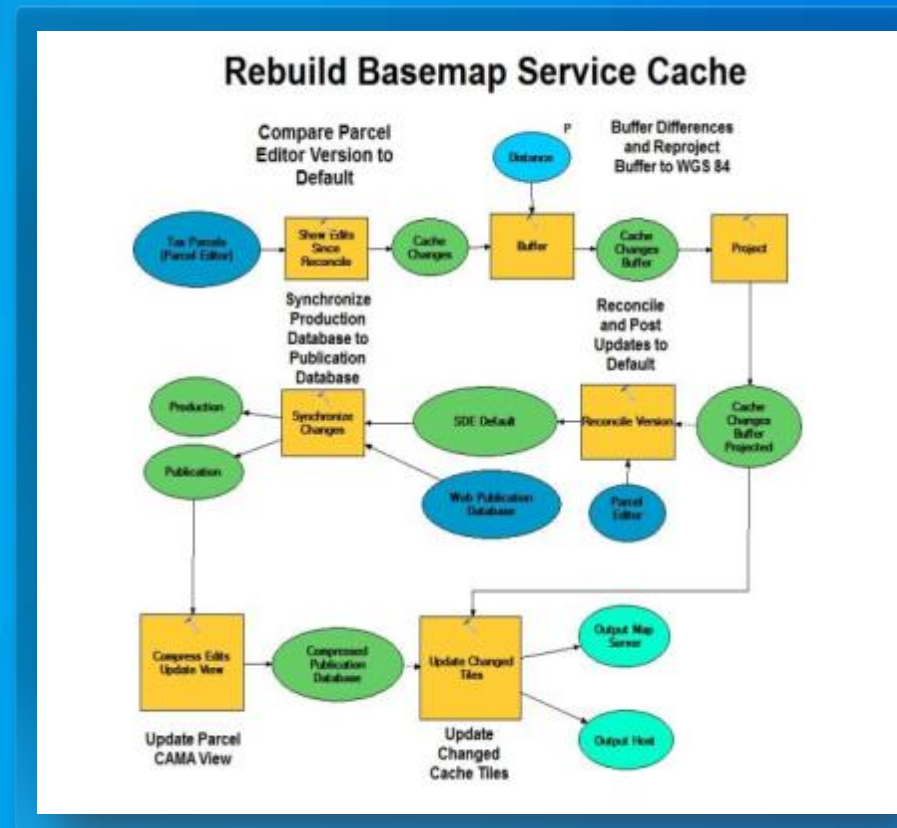
Isolate caching to certain servers

- Organize GIS Servers into Clusters
 - Generate Cache on its own cluster
 - Scale or reconfigure while caching



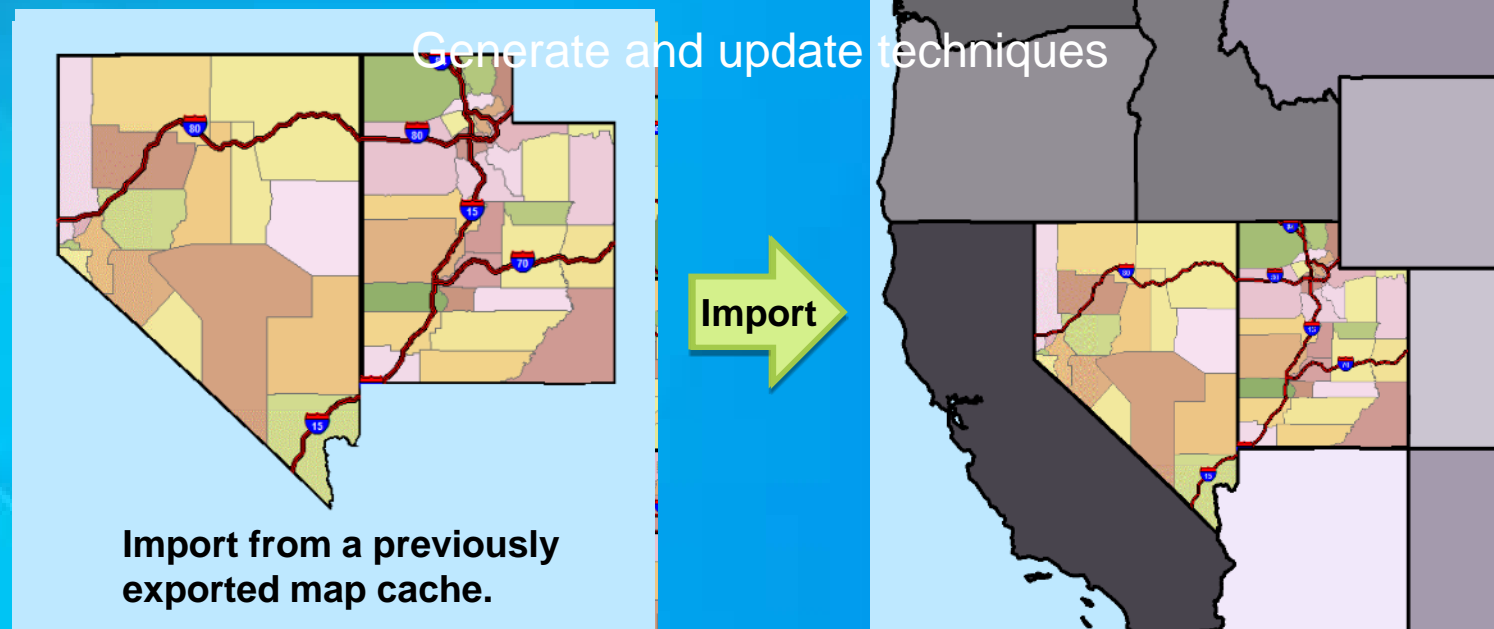
Cache update automation

- Use Model Builder to script update automation
 - Rebuild Specific Tiles
 - Export to Python
 - Schedule Run Time
- Useful update tools
 - [Compare feature classes](#)
 - [Show edits since reconcile](#)
- See demo theater
 - Automating Cache Workflows and Building Tile Usage Heat Maps



Cache export & import tools

- ~~Export~~ Export tiles
 - Based on extent or polygon features
 - ~~Most versatile storage format~~ Most versatile storage format
 - Use for cache import or as a disconnected cache



What is image service caching

- **Fast access to images as a tiled service**
 - **Out performs / scales mosaic dataset and raster dataset**
 - **Imagery is not processed on the fly**
- **Uses image extension**

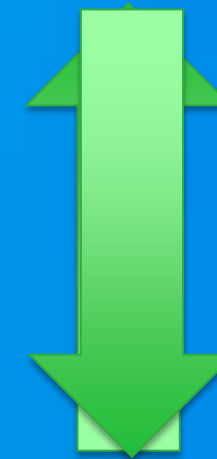


Why should I cache image services

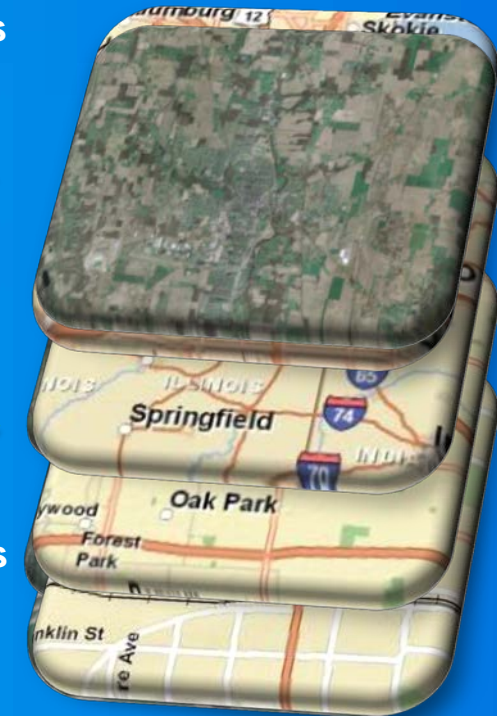
- Improved performance for basic images
 - Can not modify mosaic methods
- Skip overview generation
 - Tiles generate from large scales to small scales
- Improve performance for slow formats
 - Recommended for highly compressed formats – e.g. JPEG2000, MrSID
- Caching image services is much faster than caching map services with imagery
 - Faster rendering engine for imagery

Image Services

Small Scales



Large Scales



Caching in the Cloud

ArcGIS Online Map Caching

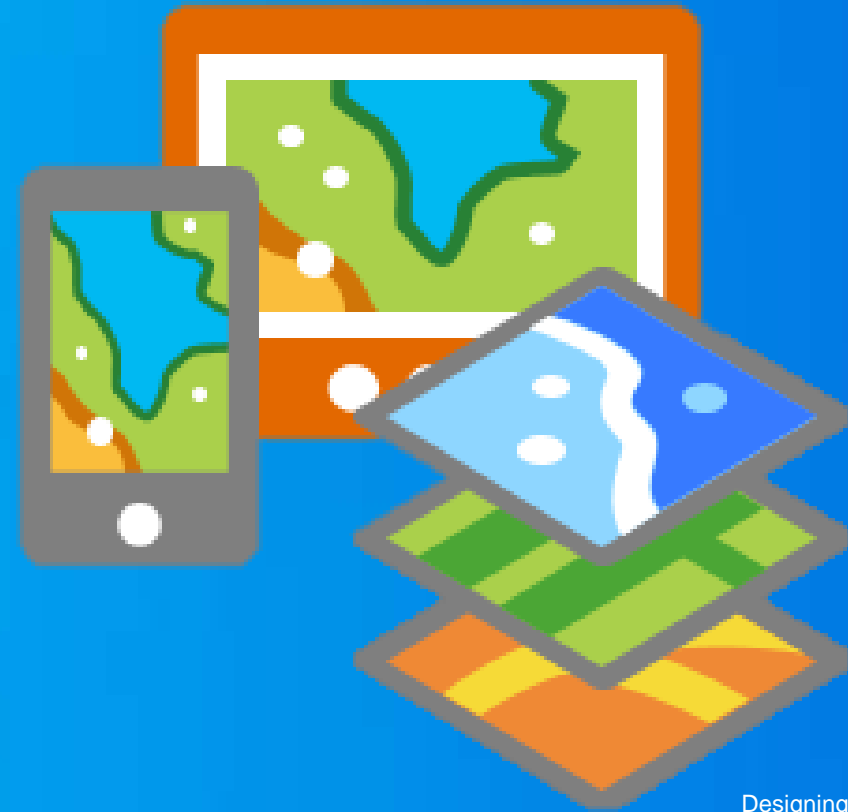
Caching in ArcGIS Online

- ArcGIS Online subscription allows for caching
- No need to worry about capacity
- Charged by tile creation and storage
- Two approaches
 - Upload data to AGOL
 - Build and store cache with AGOL
 - Upload tile package to AGOL
 - Build cache on premises (ArcMap) but store with AGOL
- Understanding credit usage:
<http://www.esri.com/software/arcgis/arcgisonline/credits>



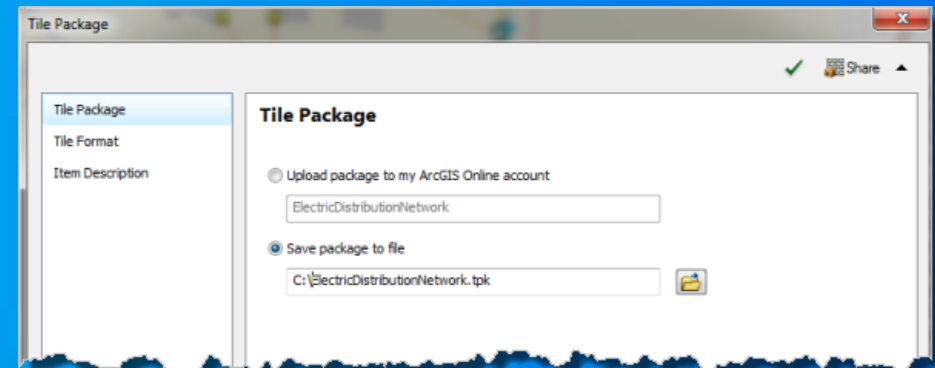
Why create a tile package?

- Local cache for Desktop, Runtime and productivity applications (Collector)
- Transport a map cache
- Upload a map cache to ArcGIS Online



Creating a tile package

- ArcMap Options > Sharing > Enable ArcGIS Runtime tools
- Three options for creation
 - Create tile package within ArcMap
 - Single processor
 - File > Share As > Tile Package
 - Create Cache with ArcMap & Geoprocessing
 - Parallel Processing
 - Data Management > Tile Cache Toolset
 - Manage Tile Cache
 - Export Tile Cache
 - Create cache with ArcGIS Server
 - Tile Cache > Export Tile Cache
 - Uses Parallel Processing Factor Geoprocessing Environment setting



DEMO

ArcGIS Online Caching



Indiana State Fairgrounds Example Credit Usage

- **ArcGIS Online Tile storage = 1.2 credits per 1 GB per month**
 - 1 Credit is 10 cents or less
- **This cache = 8.91 MB**
- **Credits per month**
 - $8.91 \text{ MB} / 1024 \text{ MB} * 1.2 \text{ Credits}$
 - $0.01044 \text{ Credits} * 10 = 0.1044 \text{ Cents}$
- **$0.1044 \text{ cents per month} * 12 \text{ months} = 1.25 \text{ cents per year}$**
- **... In 20 years this cache will cost a quarter**

It's QUIZ TIME!

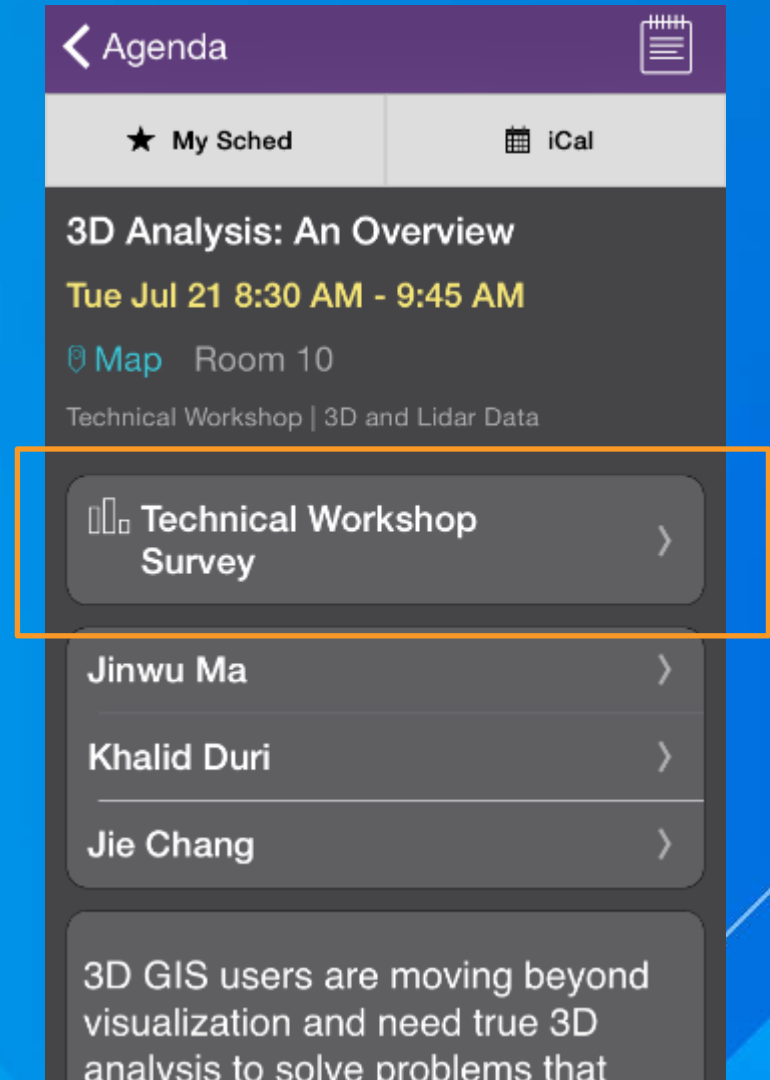
- Open a browser and navigate to <http://kahoot.it>

Or scan this if it is easier



Thank you...

- Please fill out the session survey in your mobile app
- Select “Designing and Using Cached Map Services” in the Mobile App
 - Use the Search Feature to quickly find this title
- Click “Technical Workshop Survey”
- Answer a few short questions and enter any comments



Want to learn more?

- **Documentation**

- [Creating a cached map service](#)
- [Creating a map cache \(Help\)](#)

- **Related Esri Training and Tutorials**

- [Building and Updating Map Caches with ArcGIS Server](#)
- [Sharing Cached Imagery in ArcGIS](#)

- **Related Sessions**

- **Road Ahead for Vector Mapping (vector tiling)**
 - **Room 3 Thursday 7/23 3:15 PM – 4:30 PM**



Understanding our world.