Best Practices for Designing Effective Map Services

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What’s in this session

• Planning and design strategies
• Publishing using ArcMap
• Consuming the services in a web map or application
• Performance tips

Please!

Turn OFF cell phones
Demo #1
The first attempt 😞
Demo recap
- Publishing wizard and analyzer
Organize data into logical groupings

**Operational Layers**
- Show a focused item of interest
- Support functionality of the application
- Displayed on top of base map

**Basemaps**
- Geographic frame of reference
- Contain static vector and raster data
- Reusable in multiple applications
Three options for displaying map services

<table>
<thead>
<tr>
<th>Logical groups in WebMap</th>
<th>Options to display map service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basemap layers</td>
<td>As tiled/cached map service</td>
</tr>
<tr>
<td></td>
<td>- Pre-drawn map tiles</td>
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<tr>
<td></td>
<td>- Industry standard for basemaps (e.g. ArcGIS Online, Google, Yahoo, Bing Map etc.)</td>
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<tr>
<td>Operation layers</td>
<td>As dynamic map service</td>
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<tr>
<td></td>
<td>- Server retrieves data, draws an image, sends image to client</td>
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<td>As Feature Layer (aka client side graphics)</td>
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<td>- Drawn on the client side</td>
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<tr>
<td></td>
<td>- Server sends features with geometries and attributes</td>
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</tbody>
</table>
What should you cache?
Pre-draw map tiles and serve them to clients

- **Benefits**
  - Best performance and scalability
  - Map image tiles leverage fast browser retrieval
  - Use complex cartography without extra overhead

- **Ideals:**
  - To serve large volume of traffic
  - For dataset that don’t get updated often

- **Disadvantages**
  - Requires additional efforts to maintain cache as data gets updated
What should you use dynamic map service for?
Pre-draw map tiles and serve them to clients

• Benefits
  - No additional overheads upfront
    - and when data gets updated

• Ideals:
  - For real-time or frequently changing data
  - To serve medium volume of traffic

• Disadvantages
  - Additional expense to read data and generate images for each request
Feature layer / Client side graphics
Features drawn in browser

• Benefits
  - Server off loads works to the client app

• Ideals:
  - Interactive operational layers for mashups
  - Query or geoprocessing results
  - Layers that need to be thematically symbolized on the fly
  - Web editing: Feature Services

• Disadvantages
  - Not suitable for larger dataset

• Source Service types:
  - Map services
  - Feature services
Demo #2
Making basemaps
JavaScript API code to draw dynamic images off a TiledMapService

```javascript
var url = "http://{machine}/arcgis/rest/services/myTiledMapService/MapServer";

//Layer#1 - a tiled map service layer
var layer1 = new ArcGIS.TiledMapServiceLayer(url,
                                           {
                                           displayLevels: [0, 1, 2, 3]});

//Layer#2 - same tiled map service as a dynamic map service layer
var layer2 = new ArcGIS.DynamicMapServiceLayer(url);
layer2.setMinScale(1155581);
```
Demo recap

- Created two basemaps
- Dynamic images from titled map service
Demo #3

- Creating map service for operation layer
- Thematic mapping and large data visualization
Dynamic layers
New at 10.1

• Simple updates to the map service  
  - Remove layers or reorder layers

• Thematic mapping  
  - Updates to renderers  
  - Change data sources – including joins

• Adding content to the map service  
  - Add data from registered workspaces  
  - Including query layers

• per-request changes to the map  
  - Server side change  
  - Stateless

• Optional capability of map services
SQL Statement to aggregate and show results per county

```sql
SELECT
c.objectid,
c.shape,
a.total
FROM mysde.map.COUNTIES AS c
INNER JOIN (SELECT
  FIPS, COUNT(*) AS total
FROM mysde.map.TORNADOES
GROUP BY cf) AS a
ON c.FIPS = a.FIPS
```
Demo recap

- Create map service for operation layers
- Fixed more analyzer warning
  - Migrated to Enterprise Geodatabase
  - Converted XY Event layer to a table with spatial column
- Query Layer
- Thematic mapping (aka DynamicLayer capability)
- Static Layer/Table ID
Demo #4

Put map services in use in a web application
Demo recap

- Use the map service in a web application
  - Thematic mapping
- Update the table with new records
- Added new layers
- Perform analysis using map server query capabilities
Performance Tips

Mapping

• Cache
• Prefer Annotation over dynamic labeling
• Avoid on-the-fly projection
• Scale dependent layer visibility
Performance Tips
Geodatabase

- Use File Geodatabase over Enterprise Geodatabase
  - Use local copy on GIS server over network share

- For joins
  - Keep both target and destination tables in the same database

- Enterprise Geodatabase tips
  - Tune e.g. update statistics
  - Use direct connection
Index

- Update Spatial Index

- Have indexes on Field(s)
  - Used in attribute query
  - Used as ‘primary’ or ‘foreign’ fields in a join

- Note:
  - Indexes are ignored when a field is used in a SQL methods etc.
  - e.g. WhereClause is “\texttt{month(date) = 10}”
Query tips

- Avoid requesting all attributes unless you have to
Feature and layer level security

- Use Server Object Interceptor (SOI)

- *Can be used for other purposes e.g. watermarking etc.*
Automating publishing map services with Python

- Automate publish, start, stop map services
  - http://tinyurl.com/nnz4obq
  - http://tinyurl.com/opp2glg
  - http://tinyurl.com/nqj5h43

- The Server Admin Toolkit
  - http://tinyurl.com/78hg32c
Review

- Analyzed the map document
- Split map into multiple maps for basemap and operation layers
- Replaced XY Event layer with Enterprise Geodatabase
  - ... and update data taking advantages of database triggers
- Strategies to show large data efficiently
  - Use Hex Bins or County polygons to show aggregated data at smaller scale
Review

• Used dynamicLayers capability for
  - Thematic mapping and
  - Adding new layers

• MapServer query supports
  - Page thru results  *(and get the top features)*
  - Summary statistics
Thank you…

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