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Technical Workshops | July 2011

Best Practices for Designing Effective Map Services

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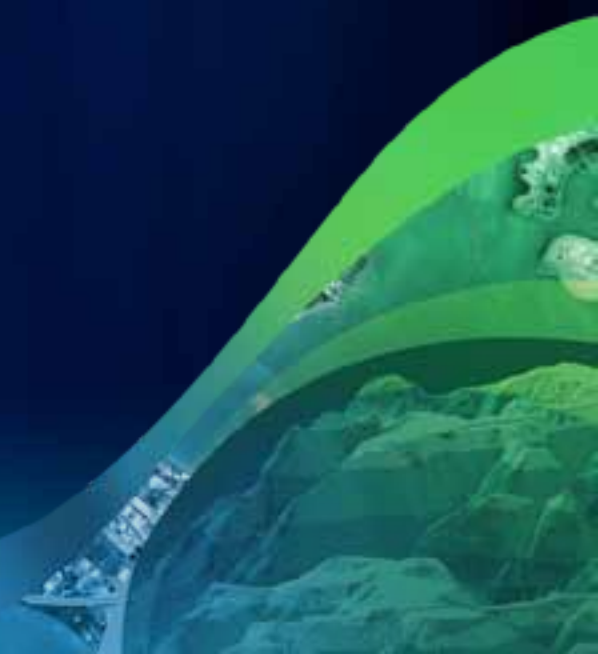
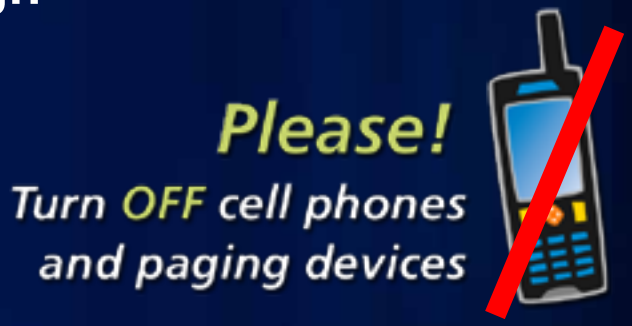
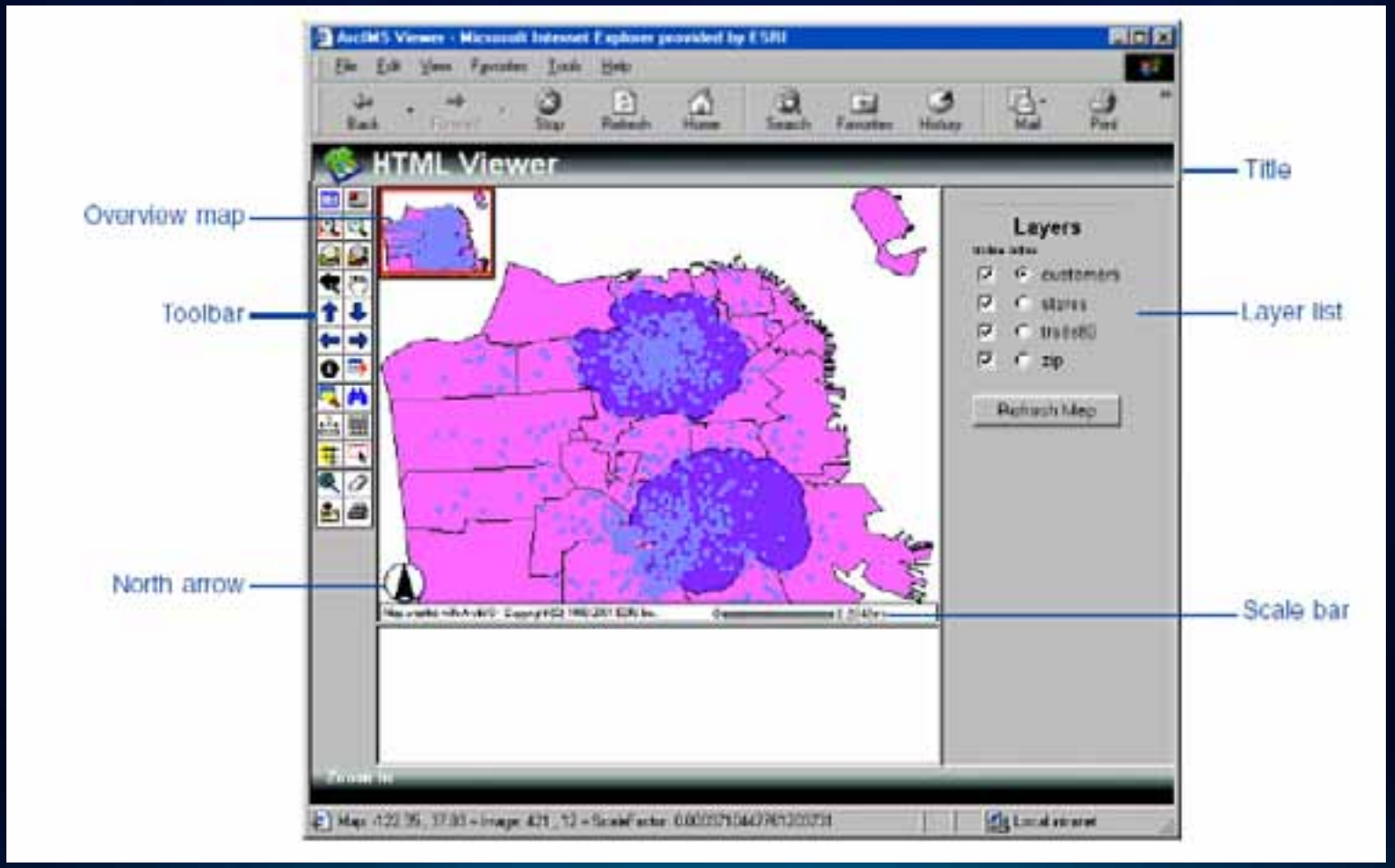


What's in this session

- Map service planning and design
- Ways to serve your maps
  - Cached tiles
  - Dynamic map service
  - Client-side graphics
- Authoring a good Web map
- Performance tips for map services



How Web maps have changed!



Organize data into logical groupings

Basemaps

Geographic frame of reference

Contain static vector and raster data

Reusable in multiple applications

Operational Layers

Show a focused item of interest

Support functionality of the application

Displayed on top of base map

Case study: Google Maps

Google Maps base maps

“Map”

- Highways
- Streets
- Ferries
- Railroads
- Transit centers
- Cities
- Parks
- Military reservations
- Municipal boundaries
- Lakes
- Rivers
- Golf courses
- Hospitals
- Shopping centers
- Airports
- Colleges
- Cemeteries
- Amusement parks

“Terrain”

- Shaded relief
- Vegetation
- Highways
- Streets
- Cities
- Parks
- Military reservations
- Municipal boundaries
- Lakes
- Rivers
- Golf courses
- Hospitals
- Shopping centers
- Airports
- Colleges
- Cemeteries
- Amusement parks

“Satellite”

- Imagery
- Source information

Google Maps operational layers

- Street overlay for imagery
- Traffic
- Photos
- Videos
- Wikipedia
- StreetView coverage
- Web cams
- Bicycle routes

Some ArcGIS Server examples

- Orange County Property Appraiser Map
- City of St George
- North Vancouver Projects
- Solar Boston
- City of Greeley Property Information Map

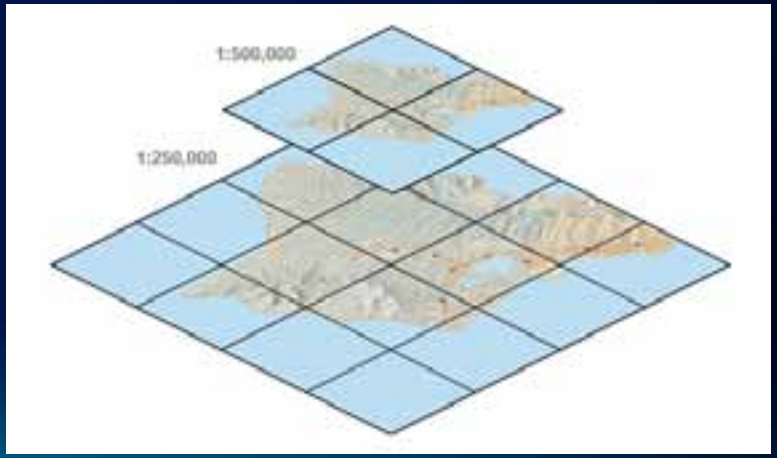
Ways to serve your maps

Three options for displaying map services

- As cached tiles
- As a dynamically drawn image
- As client-side graphics

Cached tiles

- Pre-draw map tiles and serve them to clients
- Best performance and scalability
- Standard for online maps (Google, Bing, Yahoo, etc)
- Requires you to create and maintain cache



What should you cache?

- Base maps

- Operational layers that satisfy one of the following:
  - High volumes of traffic
  - Don’t change often
  - Cover small scales only

Cache image formats

- MIXED for most basemaps
  - High quality (~90) for vectors
  - Lower quality (55 – 75) for imagery
- PNG for overlay networks (boundaries, roads)
- PNG 8 for classified rasters < 256 colors

Related Session

- Designing and using cached map services
  - Wednesday, 8:30 AM Room 6C
  - Thursday, 3:15 PM Room 8
- Advanced map caching topics
  - Wednesday, 1:30 PM Room 2

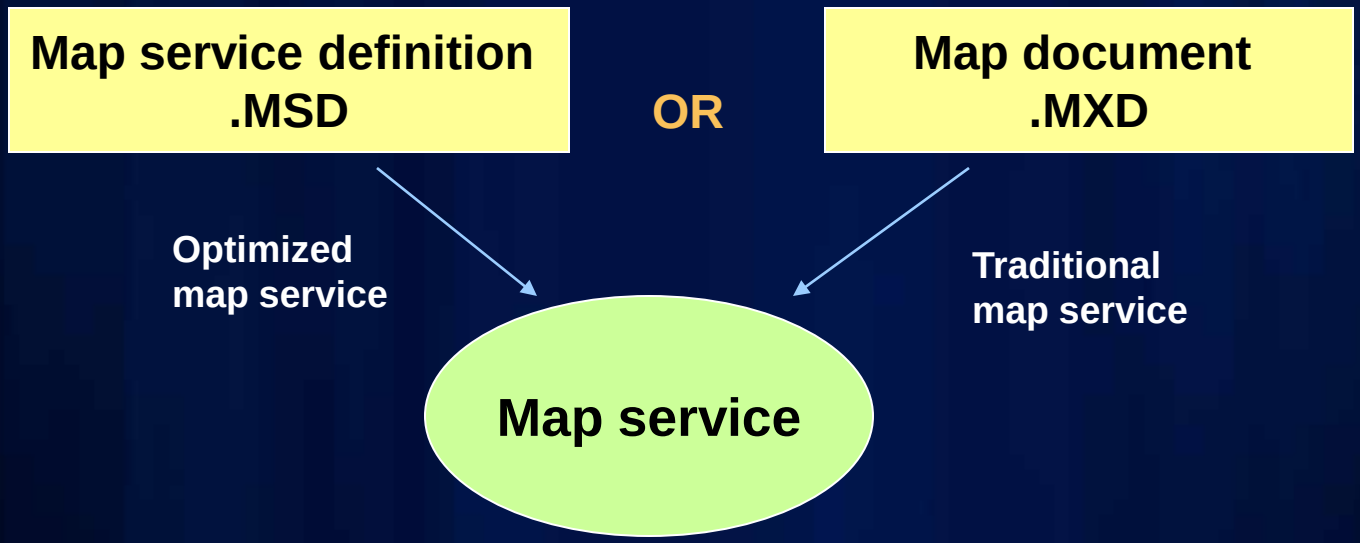
Dynamically drawn map services

- Server retrieves data, draws an image, sends image to client
- Slower than caching, but may be satisfactory using optimized map service

Data that’s OK to draw dynamically

- Real-time data
- Frequently-changing data with large scope
- Internal maps accessed by just a few people

Two types of files can support a map service



Optimized map services

- Obtained through Map Services Publishing toolbar in ArcMap
- Supports the most common layer and symbol types
- Faster dynamic drawing than ArcIMS

Demo

Publishing an optimized map service

Antialiasing with optimized map services

- **Improves visual quality**
- **Slight performance cost**
  - **Use Preview button to see effect on performance**

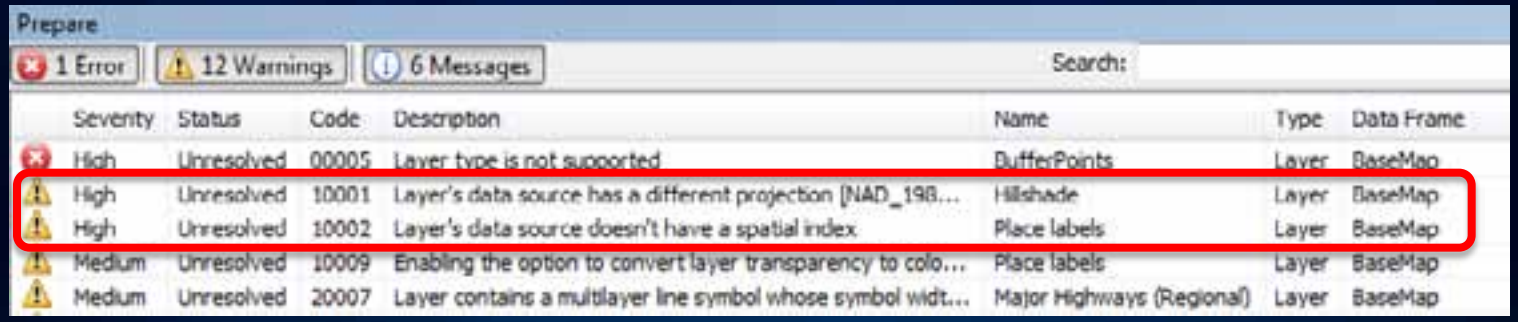
What's available through optimized services?

- **Most data and layer types**
  - **You'll get an Error in analyzer if not supported**

- **New at 10.0: Maplex and cartographic representations**
  - **Recommended for caching only**

If you have to use an MXD-based service…

- Move whatever layers you can into a separate optimized map service
- Use ESRI_Optimized style for drawing
- Still use the Analyze button to catch performance warnings



Client-side graphics

- **“Data on demand” pattern treats map service as a feature server**
  - **Queries from map services**
  - **Feature services**
- **Server sends geometries and attributes to client**
- **Features drawn in browser**

What should you draw with client-side graphics?

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

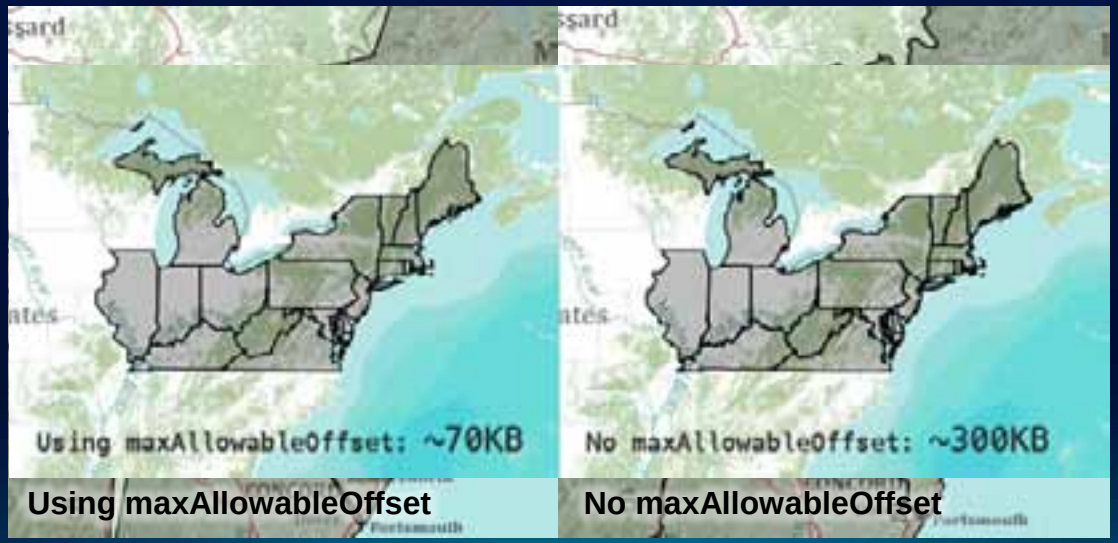
ArcGIS Server Blog Posts

- Determining Limits for Map Graphics
- High Performance Web Map with Large Dataset as FeatureLayer
- Out of Box Vector Tiling using FeatureLayer
- FeatureLayer can Generalize Geometries on the fly

maxAllowa… what?

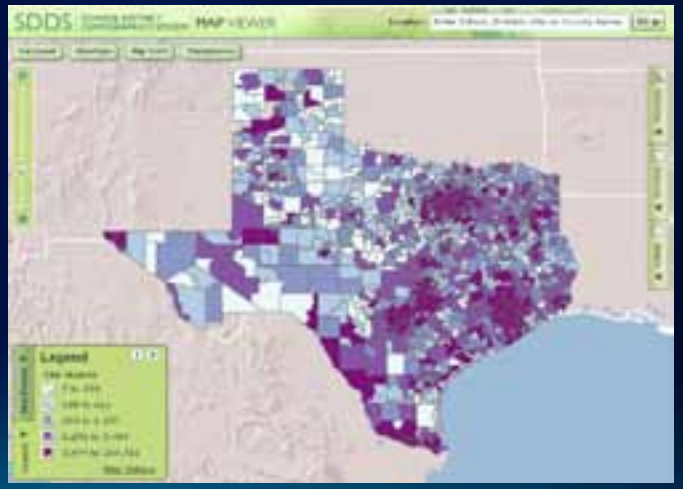
maxAllowableOffset:

- a way of reducing the number of points in a curve
- Suggestion: a feature's geometry should not display more than one vertex per pixel



Graphics performance considerations

- Generalize geometries
  - Do not generalize geometries in Editing scenario
- Be careful not to request too many features
  - Scale dependencies with Feature Services
- Beware of server limits on number of features that can be returned
  - Default 1000
- Beware “1=1” firewall filters



Where can I learn more about these techniques?

- Implementation differs depending on the web API being used
- See the Web API Sessions (Javascript, Flex, Silverlight) in the agenda.
- Online examples at the ArcGIS Resource Center

Performance tips for map services

Pre-compute when possible

- Cache
- Annotation
- Projection
  - Tip: You can re-project geodatabase features during replication
- Spatial indexes
  - Keep up to date
  - Correct size relative to map extent

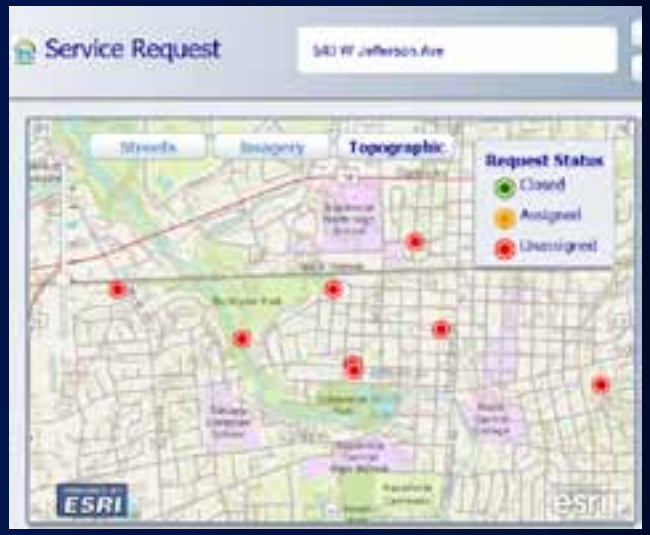
Data access tips

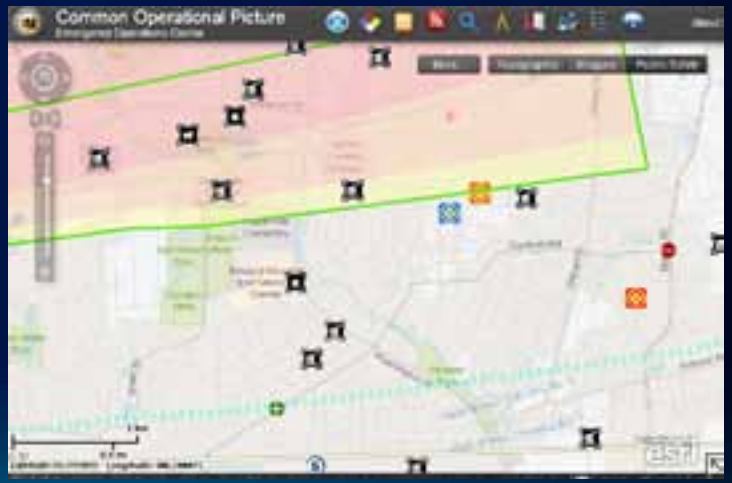
- ArcSDE geodatabase tips
  - Tune ArcSDE
  - Use direct connect
- Avoid UNC paths for file-based data
- Cached query or tool results
  - Example: Solar Boston
- Avoid downloading all attributes unless you have to
- Attribute indexes
  - Use for joins and common queries

Authoring a good web map

Start with a template

- Fully functional apps, maps and data
  - Esri: Resources.arcgis.com
    - User Communities
  - Community: www.arcgis.com > Gallery
    - Look for “Configurable”
  - Download and point at your own data



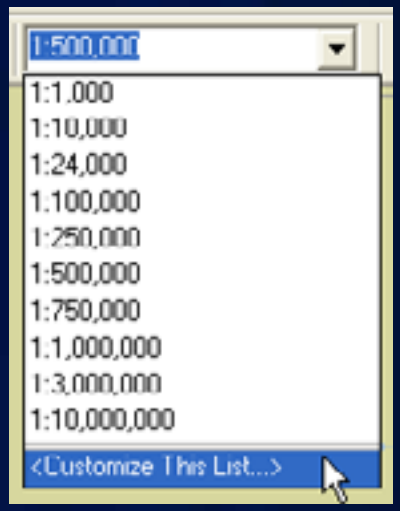


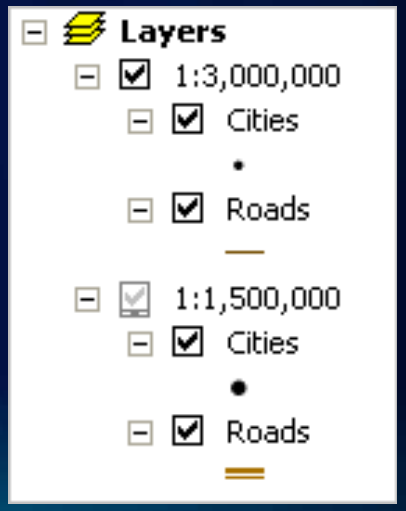
Demo

Building a basemap from a template

Authoring a basemap from scratch

- Only a good option if there are no templates
- Design map for cache scales
  - Add your tiling scheme scales to the ArcMap dropdown list
- Group layers by scale level
  - Only have to set the scale range at the group layer level
  - Copy layers between groups





Authoring for feature service: symbology

- Rendered in the client
- Symbols can be Simple (Marker, Line, Fill) or Picture (Marker, Fill)
  - Complex symbols are converted to picture (PNG)
    - Most point symbols reproduced well – test
  - Avoid gradient fills

ArcMap

WebMap

Authoring mobile maps

Specific cartography for mobility

- Design for purpose
  - Remove unnecessary layers of information
  - Set scale dependency (walk, drive, etc)
  - Render editable layers to define feature types

Sunlight washes out Colors

- Design for the environment
  - Establish contrast, choose meaningful symbology

Authoring mobile maps continued

Specific cartography for mobility

- **Design for device form factor**
  - **Set scale dependency based on device resolution**
  - **Set symbol width based upon device resolution**
- **Architect and Deploy Map Data**
  - **Build Compressed Base Map Datasets**
  - **Build Operational Mobile Caches**

1280x1024
BIG

320x240
Small

Sneak peek: server side thematic mapping at 10.1

- New at ArcGIS Server 10.1
- Allows to modify renderer without downloading geometries on the client side
  - Specially helps with too many features
- Maps are drawn at the server side
  - Only image is returned to the client
- Helper function available on the server side to compute class breaks based on different classification methods.

Demo

Server side thematic mapping at 10.1

Review

- Organize map services in logical groups
  - Base maps
  - Operational layers
- Use a high-performance blend of display techniques
  - Cached tiles
  - Dynamically drawn services
  - Client-side graphics
- Follow performance tips, pre-computing when possible

Additional Resources

- ESRI Showcase
  - Meet ESRI Development staff
- Other sessions
  - Advanced Map Caching Topics
  - Javascript, Flex, Silverlight web API sessions
  - Many other ArcGIS Server sessions
- Resource centers: resources.esri.com

Questions

Please fill out the survey for this session
www.esri.com/sessionevals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