Implementing Open Source
Tile Caching in a Large Scale
US Army Project
TileCache in Army Mapper

FOSS4G
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Outline

• Introduction to Army Mapper
• Web Map Viewer
  • user generated map files
  • SLDs
  • dynamic data
• Challenges with TileCache Implementation
• Performance Testing
Army Mapper

Army Mapper is the U.S. Army’s enterprise GIS supporting the overall management and resourcing of Army installations worldwide.

Installation Geospatial Information and Services (IGI&S)

Installation Management Command (IMCOM)
Army Mapper O&M

- SYNCADD Systems is a US Army contractor
- Army Mapper Operations & Maintenance Team
  - Manage and administer environments, servers and data.
  - Coordinate with development teams to deploy new releases.
  - Develop and implement updates to maintain system availability and performance.
  - Provide tier 2-3 help desk support
What is Army Mapper?

- Geospatial Data Warehouse for Army Installations
- Web Map Viewer – powerful suite of web-base GIS tools on top of MapFish and MapServer
- Desktop Tools – ArcGIS, Bentley Map, ERDAS Imagine published over web via Citrix XenApp
Numbers

- 200+ US Army Installations
- Thousands of data layers for each installation
- Terabytes of data
- 60+ servers, multiple environments
- Thousands of users
- Integrations with other Army data sets

All of these are increasing!
User Generated Map Files

- pick from up to 1,345 layers
  - add custom symbology and labeling
  - share the map with other users

- new feature in Army Mapper
  - increased demand on MapServer and database
  - now need to support rendering of large complex data sets like detailed elevation contour lines
Other Web Map Viewer Features

• Customizable Symbology
  – color, line type, line weight, fill type, transparency, label field, label font, and more

• Query Tools
  – spatial selection, query builder, buffer, identify

• Markup tools – points, lines, polys, text, and icons
  – Exportable to KML, GeoRSS

• Integration with Army business data for planning/analysis
TileCache vs. GeoWebCache

- Dynamic layer requests
  - Layers=roads, buildings, airports, golf course, etc.
- User generated custom MapServer map files including up to 1,345 layers
- TileCache can build composites
TileCache Configuration

- MS4W with MapServer v5.6.1
  - http://www.maptools.org/ms4w/
- TileCache v2.10
  - http://tilecache.org
- Memcached v1.4.5 binaries for Windows
  - http://labs.northscale.com/memcached-packages/
- Memcached Python client
  - http://code.sixapart.com/svn/memcached/trunk/api/python/memcache.py
- Oracle 10g (Oracle Spatial)
Challenges with TileCache

• Dynamic Data
• User Generated Map Files
• Custom Symbology SLDs
• Cloud & Clustering
Challenges - SLDs

• Session vs. Saved in User Preferences
• Saved SLDs added as special layers in TileCache config

[roads-kristofor_carle]
type=MapServer
layers=roads
mapfile=C:\ms4w\mapfiles\cip_AM20.map?sld=http://localhost/slds/roads-kristofor_carle.xml

• Route requests using URLRewriteFilter or mod_rewrite
Challenges - User Map Files

- Need to automatically add maps and their layers to the TileCache.cfg
- Also need to seed scripts that know how to rebuild the cache
- Performance significance depends on map popularity
  - can be private, public, or shared with specific users
Dynamic Data

- Army Mapper has an automated data publishing migration process
- For each updated layer
  - `tilecache_seed.py --force layer_name`
- To update only a single installation use
  - `tilecache_seed.py --force layer_name --bbox [installation’s extent]`
- This might have to run overnight for some layers!
Challenges - Cloud & Clustering

• Centralized or separate cache on each server?
  – Use a shared space on the SAN for disk cache

• Memcached
  – performance impact during seeding
  – have to rebuild when server is rebooted
Performance Testing

- Requesting a Single Tile Using Apache Jmeter
  - Roads & Buildings
  - Elevation Contour Lines
- OpenLayers
  - MapServer (tiled), MapServer (single image), TileCache
- Memcached
Single Tile – Roads & Buildings
Single Tile - Roads & Buildings

- MapServer: 2654.74 ms
- TileCache: 947.54 ms
Single Tile – Elevation Contour Lines
Disk vs. Memcached

Time (ms)

Disk

930.25

MemCached

722.84
Conclusion

• Tile Caching is a must for Army Mapper to overcome long render times on some layers
• Possible to overcome challenges related to dynamic content and large datasets
• Need further testing on production level multi-CPU machines for better comparison with OpenLayers single tile mode
Hear more about Open Source GIS policy in the US Government

Open Government, Open Data, Open Architecture and Open Source Software
GIS Policy For U.S. Army Installation Management: 2010
by Jaymes Cloninger

Immediately following this presentation.
Questions?