

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

## TileCache in Army Mapper

FOSS4G

September 9, 2010

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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

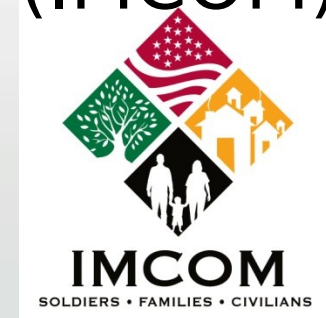
# Army Mapper

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

**WebMapViewer**  
U.S. Army Installation Geospatial Information & Services

Home Query Markup **ASIP** Map Publishing

Viewer Preferences Help  
Office of the Assistant Chief of Staff for Installation Management

My Bookmarks Quick Search Global Background

**Viewer Toolbox**

- Table of Contents
- Legend
- Army Stationing and Installation Plan

**Legend**

- COMPO 1 (Active) - Green
- COMPO 2 (ARNG) - Yellow
- COMPO 3 (USAR) - Blue

Line graphs and population data on base icons display Total Base Population.

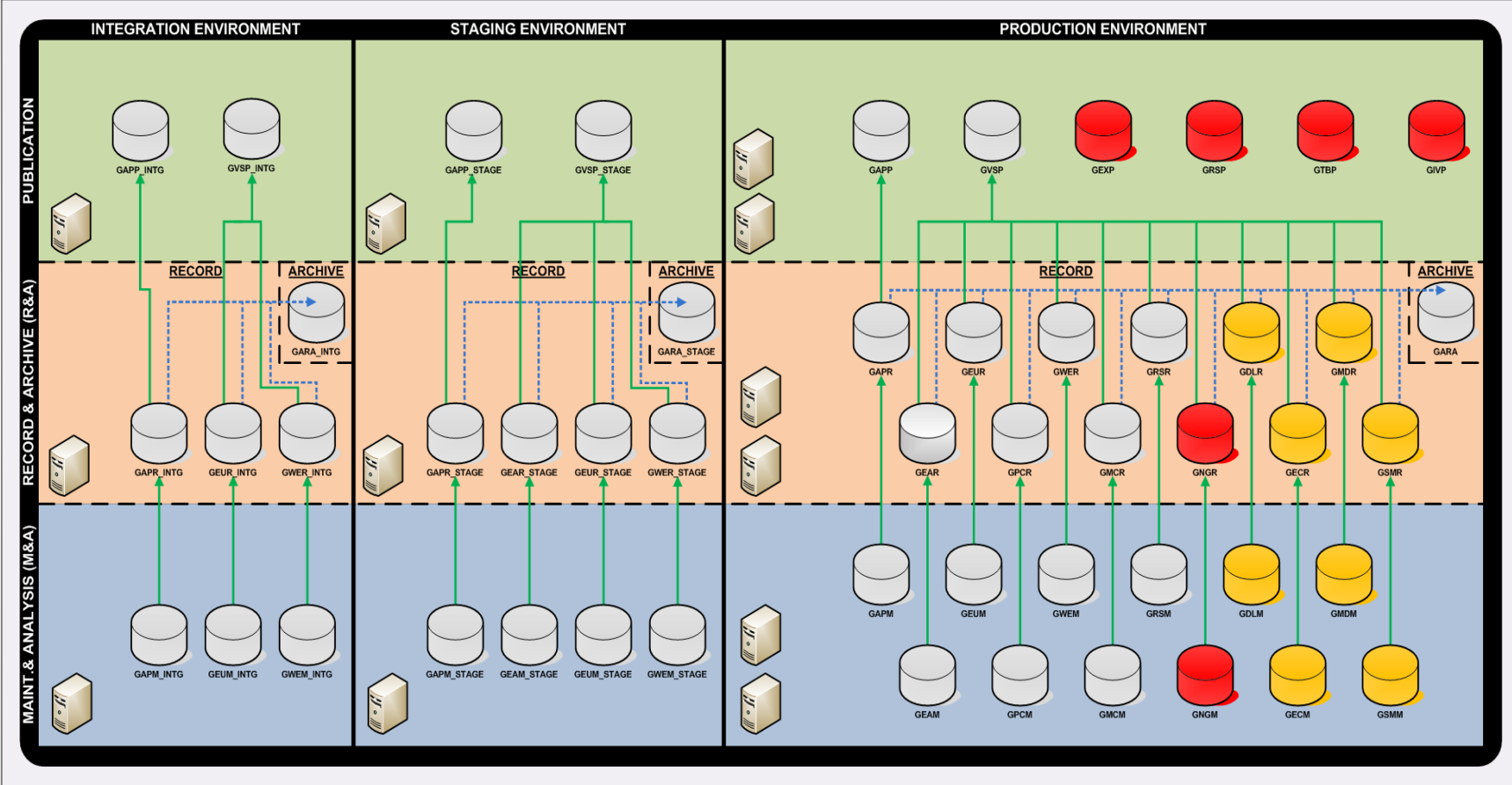
**2010 ASIP**  
SAMAS as of 8 JAN 2010  
ASIP DATA DATE: 16 APR 10

Population Category Definitions

Download COP Spreadsheet

Map data ©2010 AND, Geocentre Consulting, MapData Sciences Pty Ltd, PSMA, MapLink, Tele Atlas - [Terms of Use](#)

Map Ready Area Units: Acres Dist Units: Miles Airport Runways -137.10937, 67.33986 Google Web Mercator



# 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!





**WebMapView**

U.S. Army Installation Geospatial Information & Services

Home
Query
Markup
ASIP
Map Publishing

Viewer Preferences
Help

Office of the Assistant Chief of Staff  
for Installation Management

**Viewer Toolbox**

Table of Contents

- Overlays
  - KML Feeds
  - Graticule
  - Precipitation (Info)
  - Army Service (Info)
    - Training & Range
    - Recreation
    - Natural Resource
    - Infrastructure
      - Parking Lot
      - Building
      - Roadway
      - Railroad
      - Installation Boundary
      - Airport Runway
      - Gate Line
      - Gate Point
- Backgrounds
  - No Background
  - USGS Topo
  - Google Satellite
  - Google Hybrid
  - Google Terrain
  - Google Streets

My Bookmarks

Street Background

Legend

Map Ready

Area Units: Acres

Dist Units: Miles

Airport Runways

-78.99436, 35.11921

Google Web Mercator

# 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/memcached/>
- 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

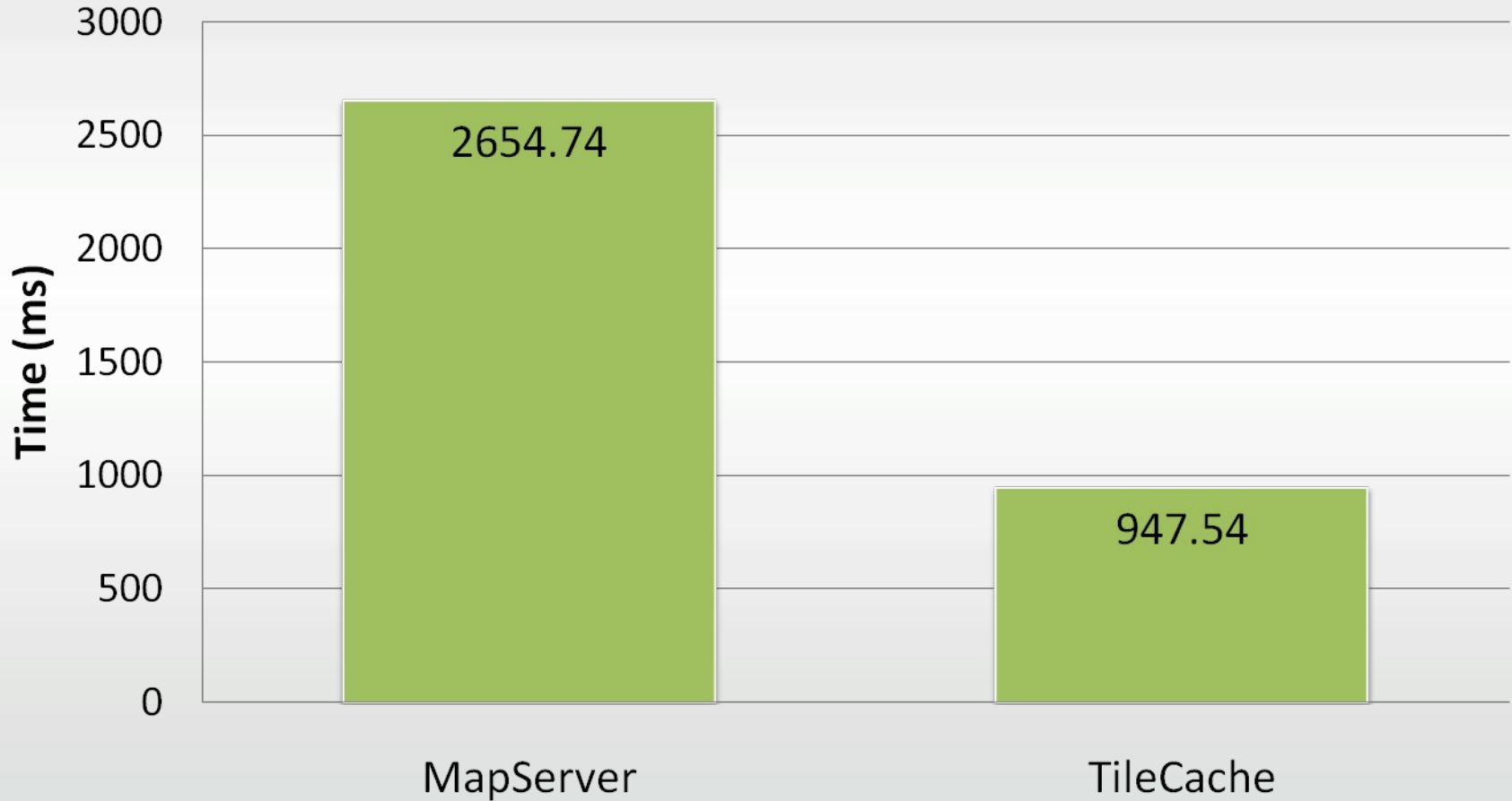
- Centralized or separate cache on each server?
  - Use a shared space on the SAN for disk cache
- Memcached
  - performance impact during seeding
  - have to rebuild when server is rebooted

# Performance Testing

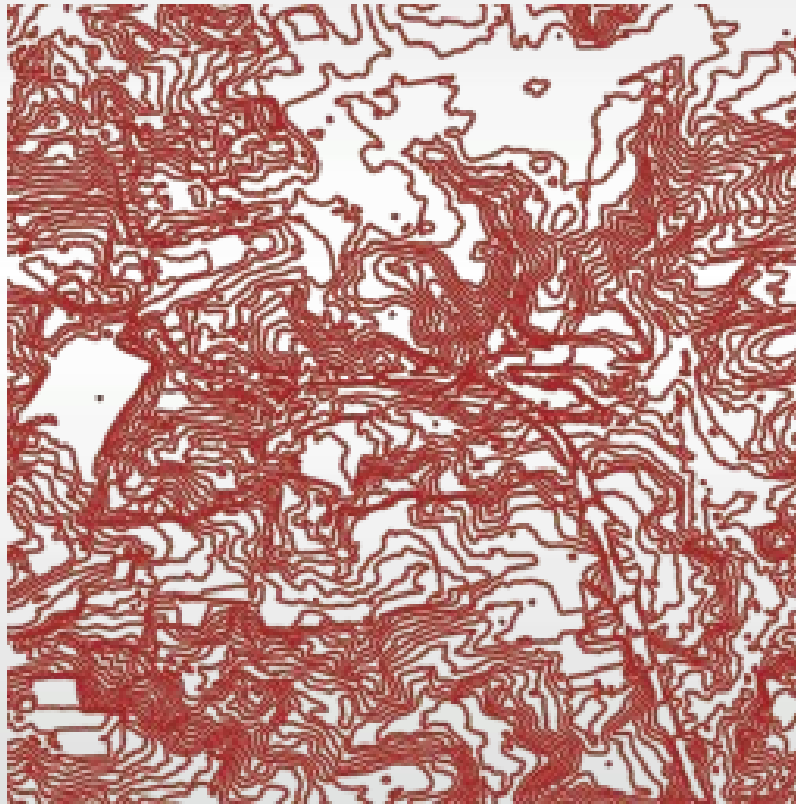
- Requesting a Single Tile Using Apache Jmeter
  - Roads & Buildings
  - Elevation Contour Lines
- OpenLayers
  - MapServer (tiled), MapServer (single image), TileCache
- Memcached



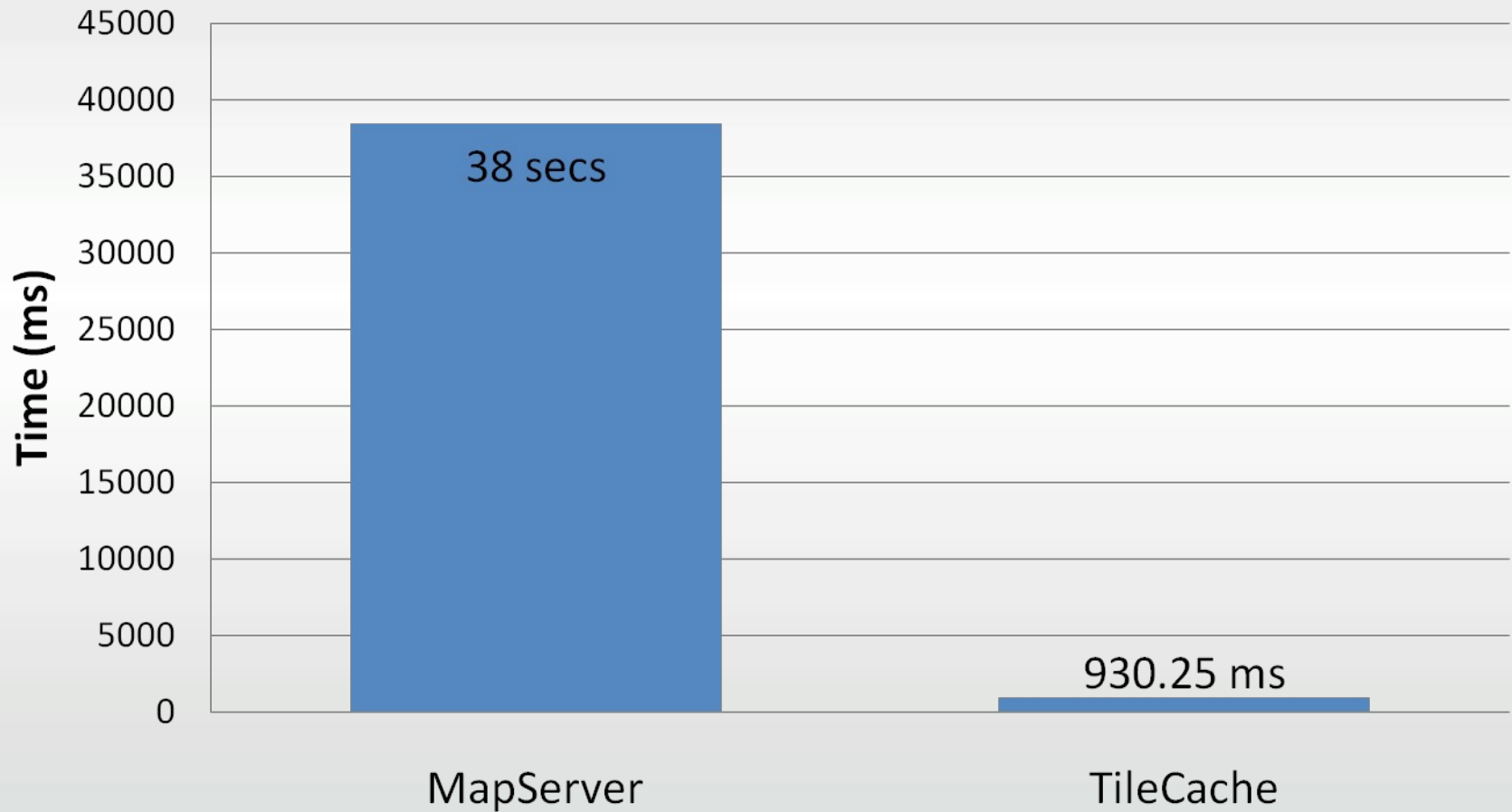
## Single Tile - Roads & Buildings



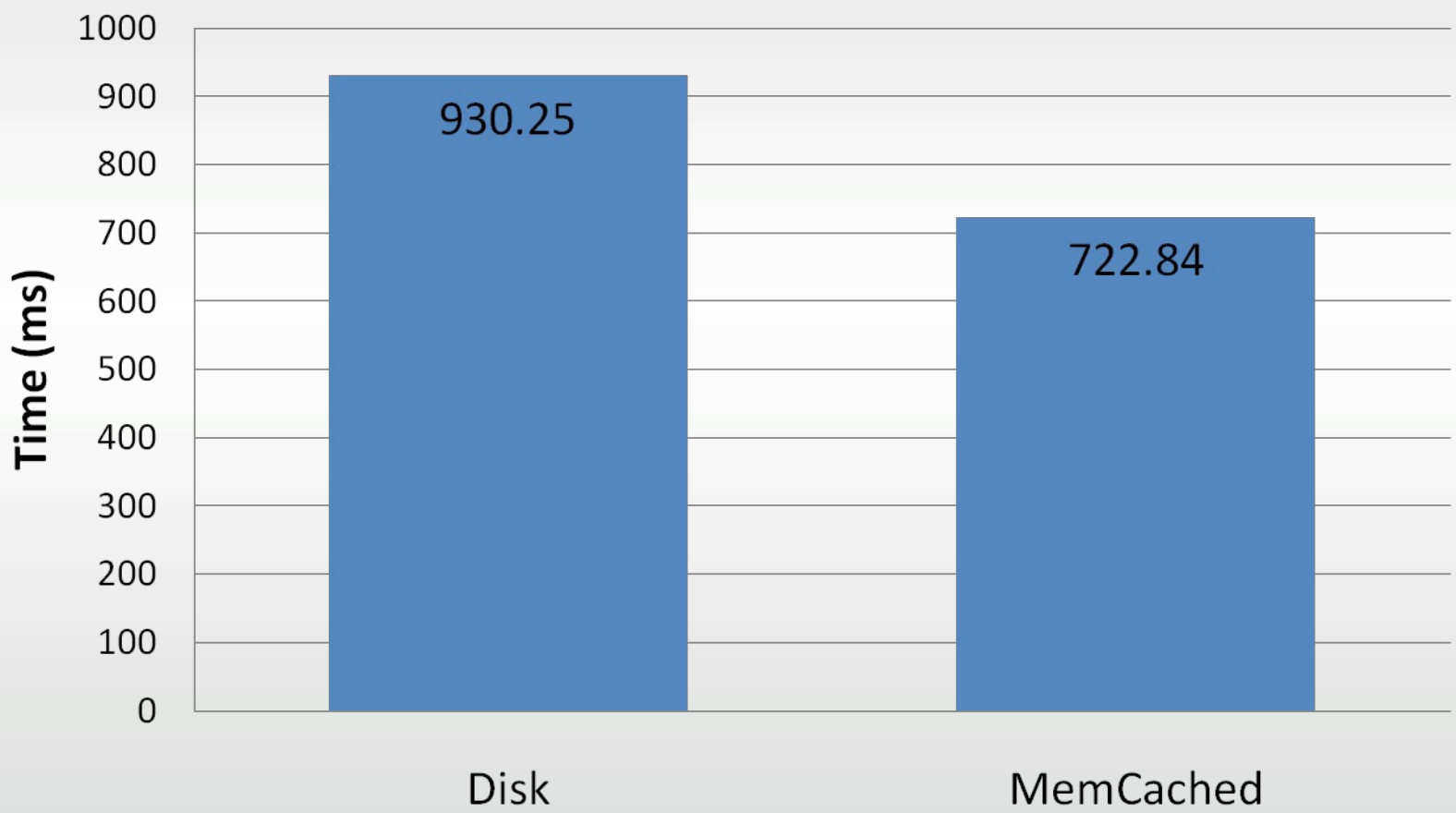
# Single Tile - Elevation Contour Lines



## Single Tile - Elevation Contour Lines

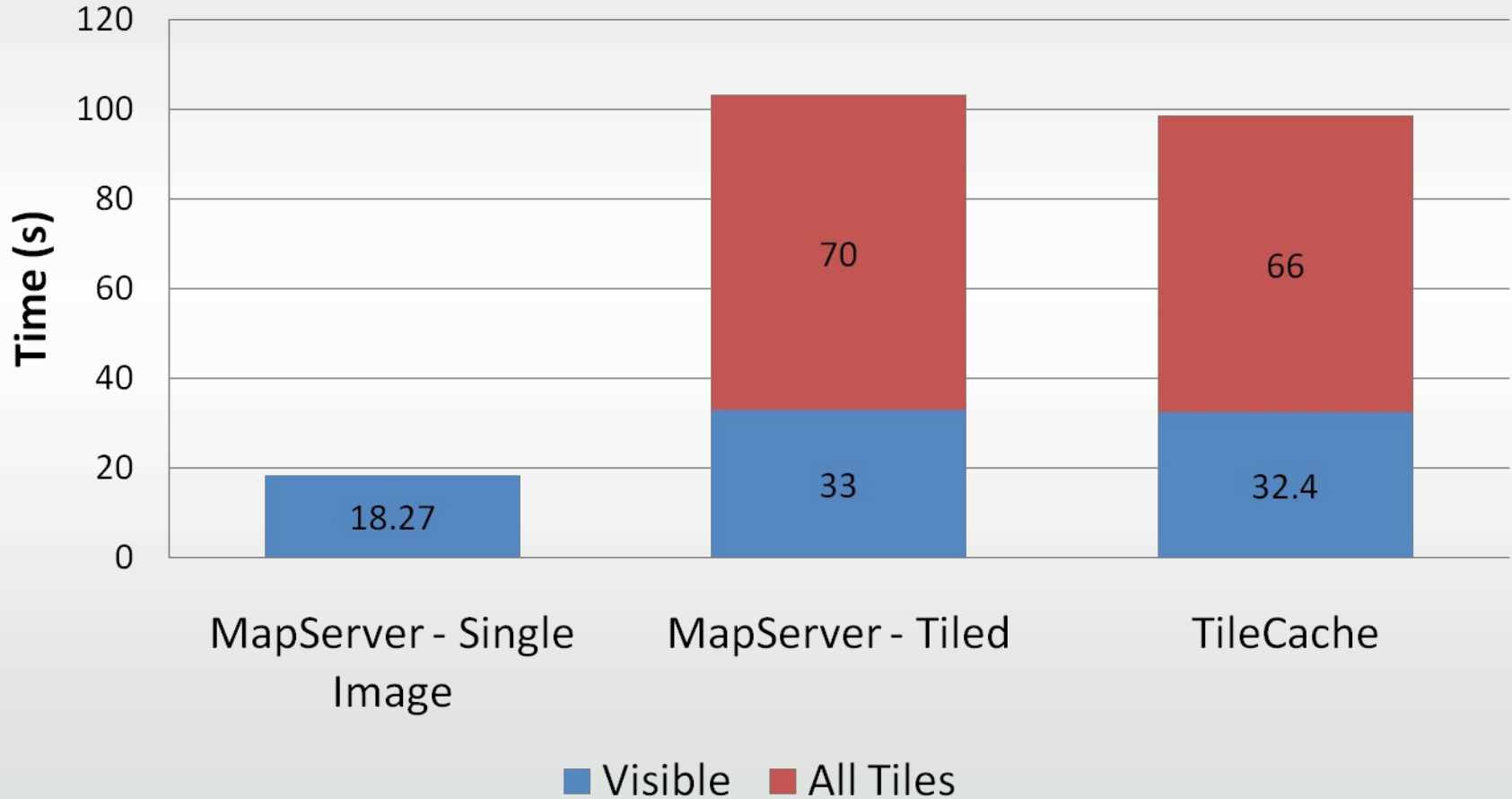


## Disk vs. Memcached





## OpenLayers Test



## 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?