

WMS Benchmarking

Cadcorp GeognoSIS, Constellation-SDI,
GeoServer, Mapnik, MapServer,
QGIS Server



Executive summary

- Compare the performance of WMS servers
 - 6 teams
- In a number of different workloads:
 - Vector: projected (Google Mercator – EPSG:3857) street level
 - Raster: EPSG:4326 DEMs projected (Google Mercator – EPSG:3857)
- Data backends:
 - Vector: PostGIS
 - Raster: BIL



Benchmarking History

- 5th FOSS4G benchmarking exercise. Past exercises included:
 - FOSS4G 2007: Refrations Research run - published the first comparison with the help of GeoServer and MapServer developers. Focus on big shapefiles, postgis, minimal styling (Brock Anderson & Justin Deoliveira)
 - FOSS4G 2008: OpenGeo run - published the second comparison with some review from the MapServer developers. Focus on simple thematic mapping, raster data access, WFS and tile caching (Justin Deoliveira & Andrea Aime)
 - FOSS4G 2009: MapServer and GeoServer teams in a cooperative benchmarking exercise (Andrea Aime & Jeff McKenna)
- Friendly competition: goal is to improve all software

Benchmarking 2010



8 Teams

Dedicated servers

Area specific data set (Spain)



Benchmarking 2011



6 Teams
Dedicated hardware
Area specific dataset – Colorado

Open Source Geospatial Foundation



Rules of engagement

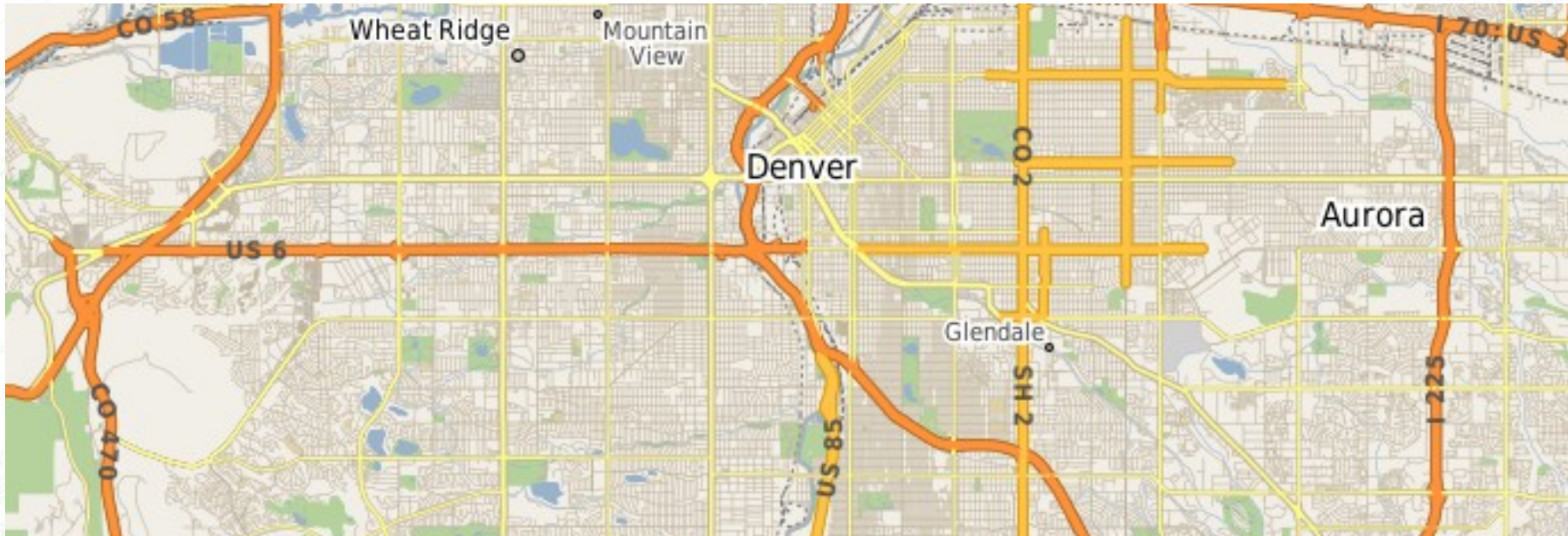
- Each server is tested in its latest version
- Each server performs exactly the same workload
 - Same set of WMS requests
 - Same data backends
 - Same image output format
- All modifications made to improve performance are to be included in a future release of the software
- Data used cannot be modified for display, other than indexing
- All testing to be done on the same benchmarking machines
 - Windows and Linux servers, 2 separate identical servers



Datasets Used: Vector

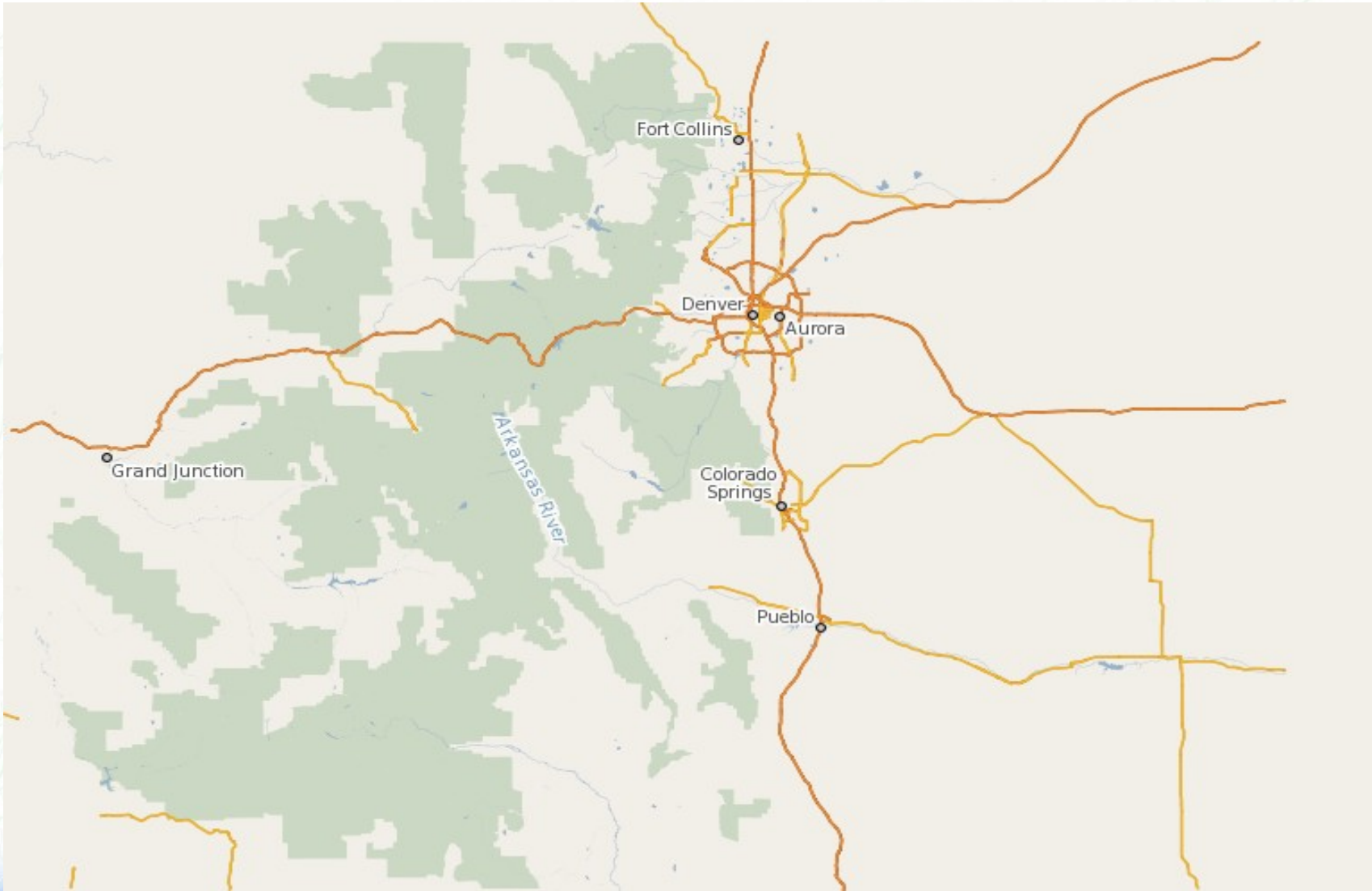
Open Street Map for Colorado

- IMPOSM to import data to PostGIS
 - Optimized for rendering
- Styling from MapServer Utils Imposm branch (Googly style)





Datasets Used: Extents

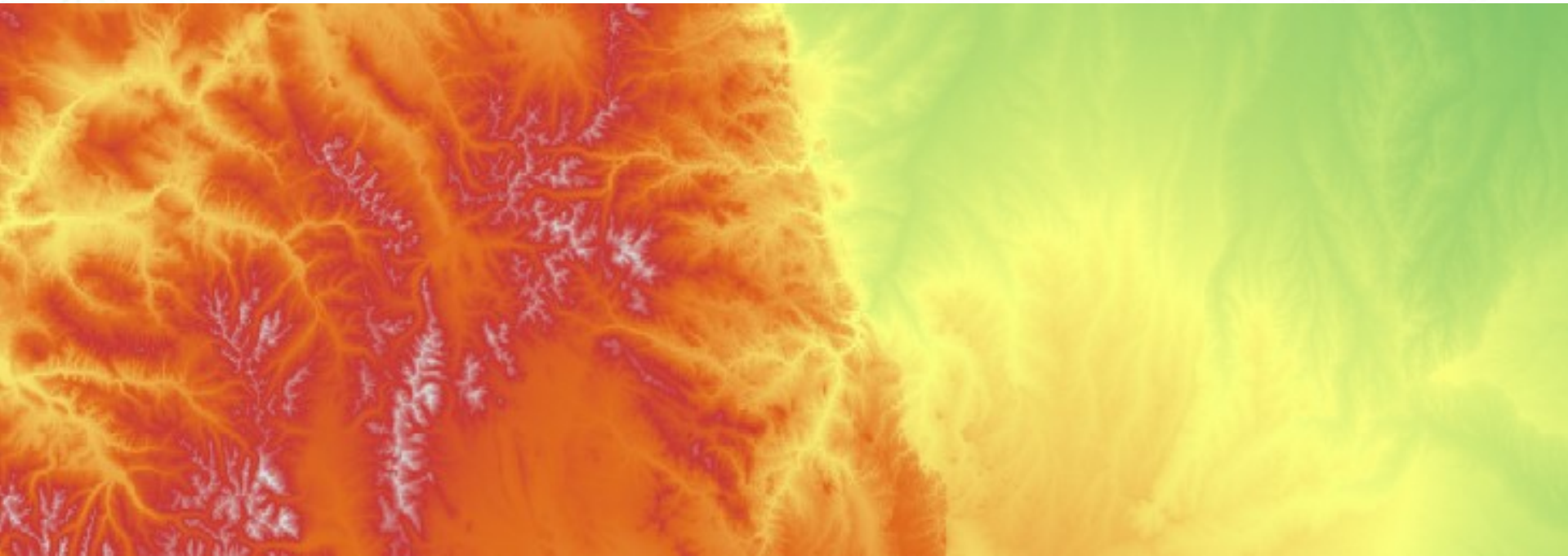




Datasets Used: Raster

USGS DEMs NED 1 arc second

- 30m (approx) Resolution
- 16bit Band Interleaved Line (BIL)
- Color range dynamically applied based on elevation





Hardware specs

- JMeter:

- Dell Precision Workstation 390 from 9/7/2006

- Processor, 6300, 1.86, 2M, Core Duo-conroe, Burn 2
 - 2Gb RAM 160 Gb Hard drive 7200 rpm OS: Centos 5.5 i386

- WMS(2):

- Dell PowerEdge R410 - Ship Date: 7/7/2010

- Processor: Intel® Xeon® E5630 2.53Ghz, 12M Cache, Turbo, HT, 1066MHz Max Mem

- 8GB Memory (4x2GB)

- 2TB 7.2K RPM SATA

- OS: Windows Server 64bit, Centos 5.5 x86-64

- Database:

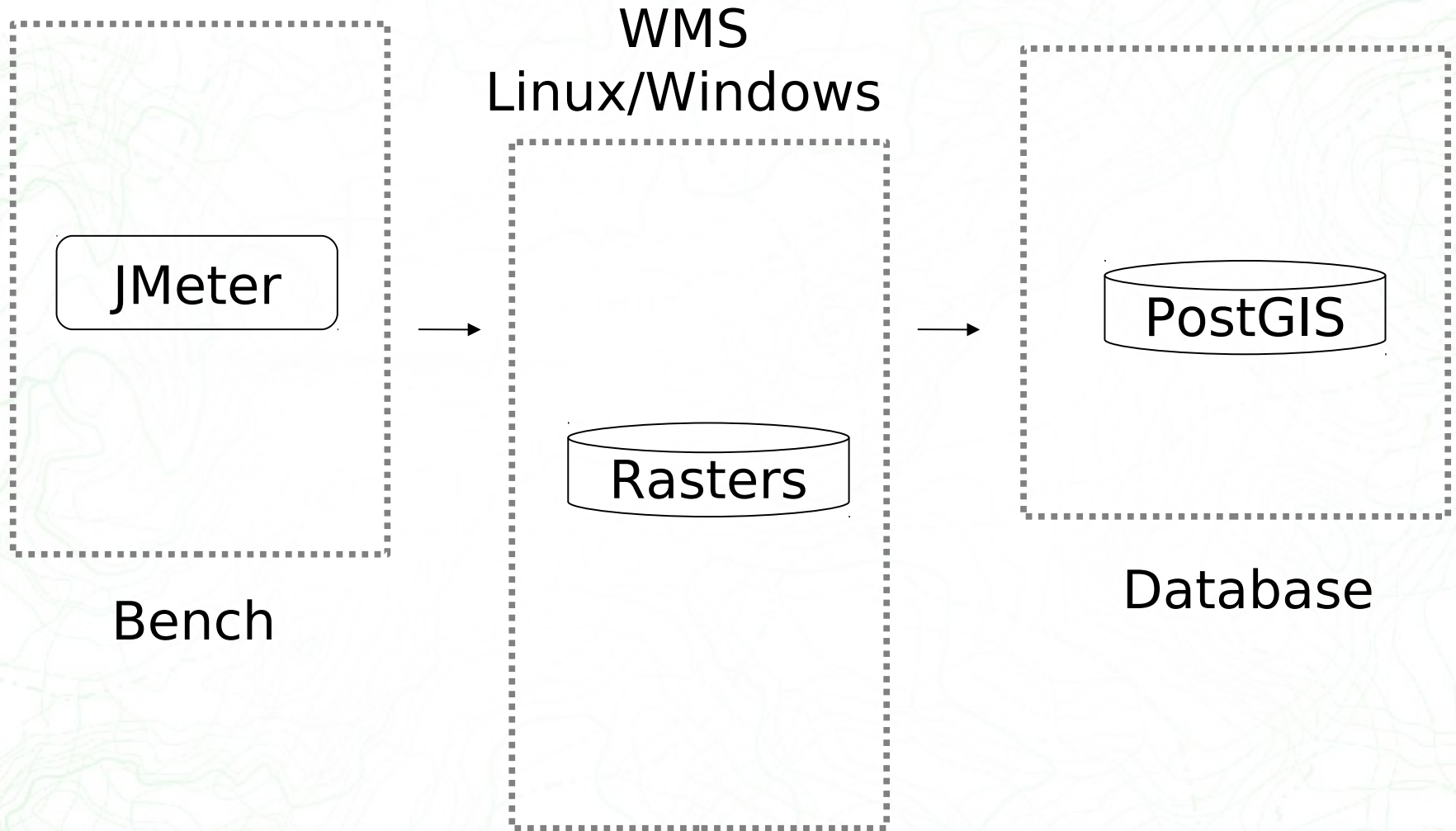
- Gateway E6610D Intel Core2 Duo - E6750 2.66 Ghz

- 250Gb Hard Drive 7200 rpm, 4Gb Ram

- OS: Centos 5.5 x86-64



Hardware Configuration





Methodology

- Each test run performs requests with 1, 2, 4, 8, 16, 32, 64, 128 and 256 parallel clients (for a total of 3688 requests)
- Each test uses a random set of requests stored in a CSV file: no two requests in the same run are equal, but all servers perform the same workload
- Two separate tests
 - Normal request
 - The image size (between 64x64 and 1024x768)
 - The geographic envelope (extent)
 - Seed type request
 - Image size fixed (2248x2248)
- Each test is run three times in a row, the results of the third run are used for the comparison: this benchmark assumes full file system caches (“hot” benchmark)



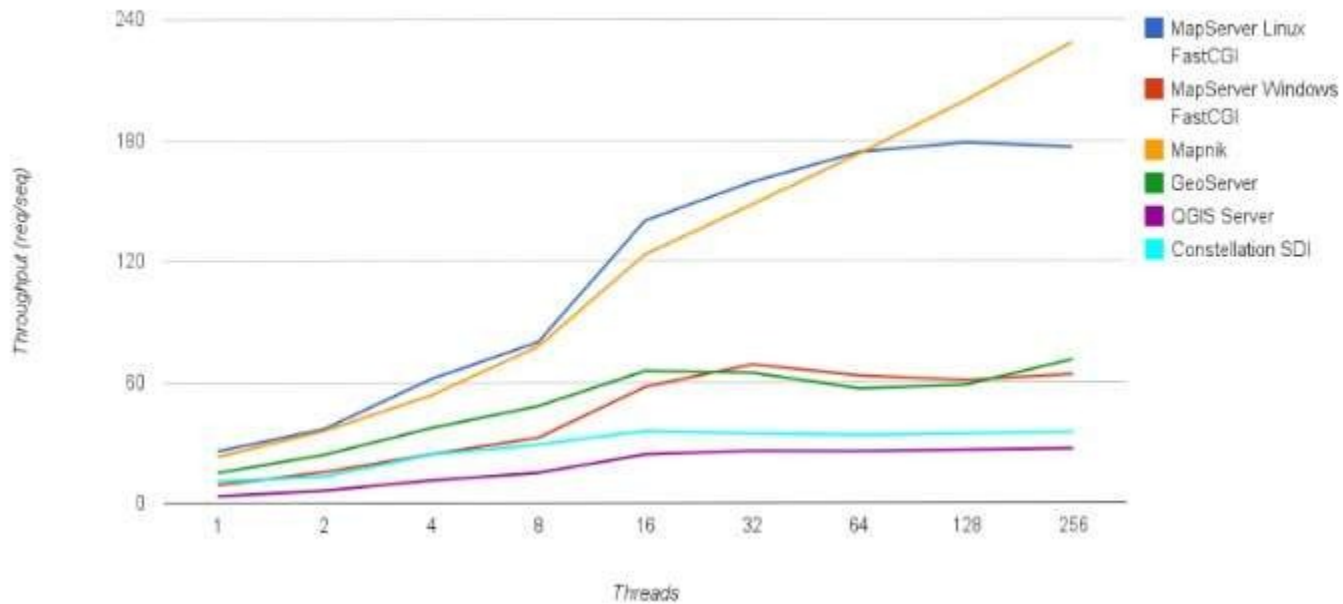
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Results



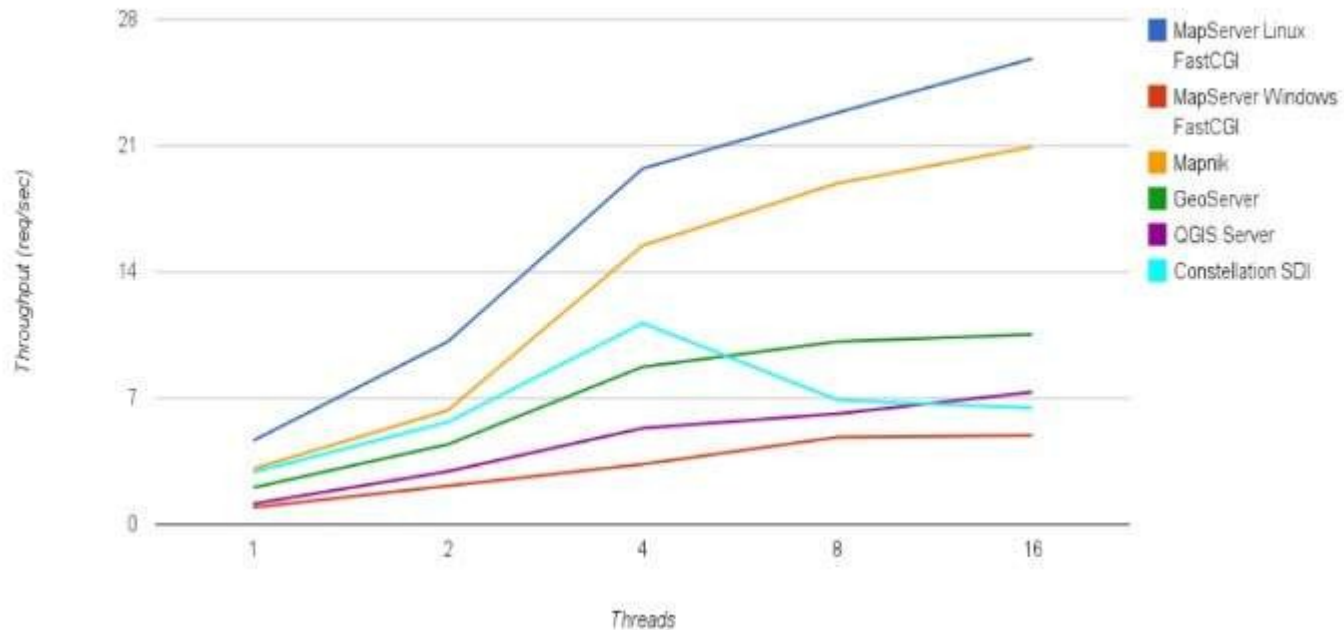
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Vector Results – OSM/PostGIS



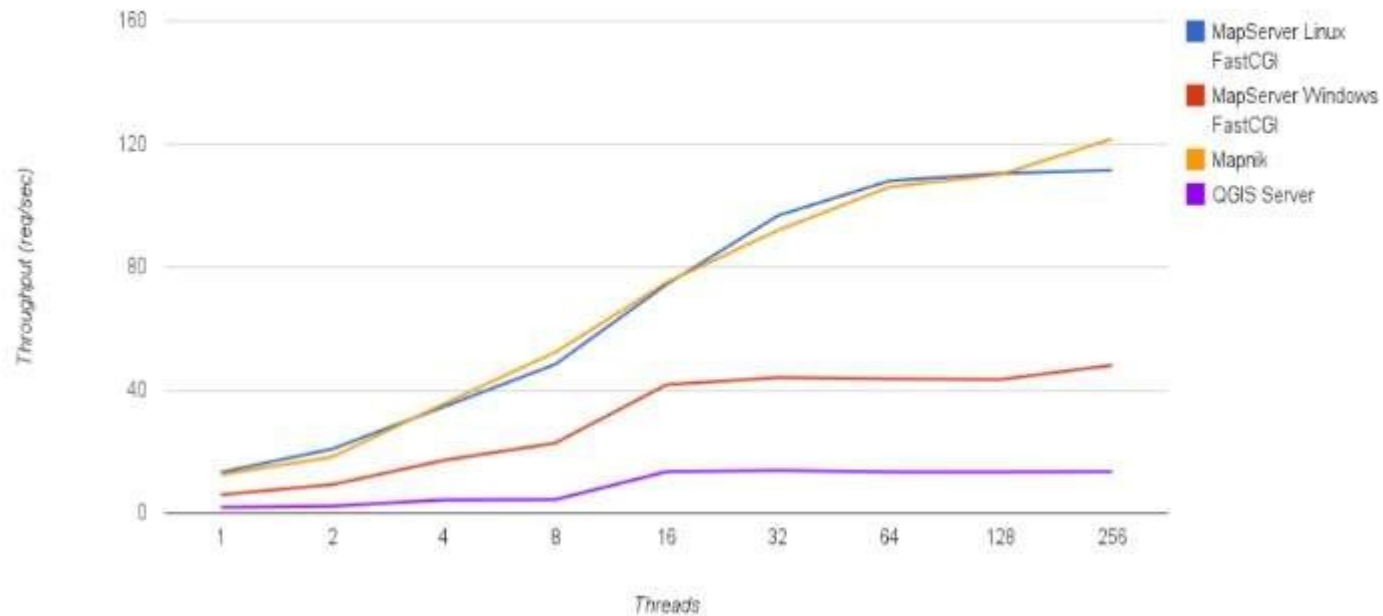


Vector Seeding Results – OSM/PostGIS





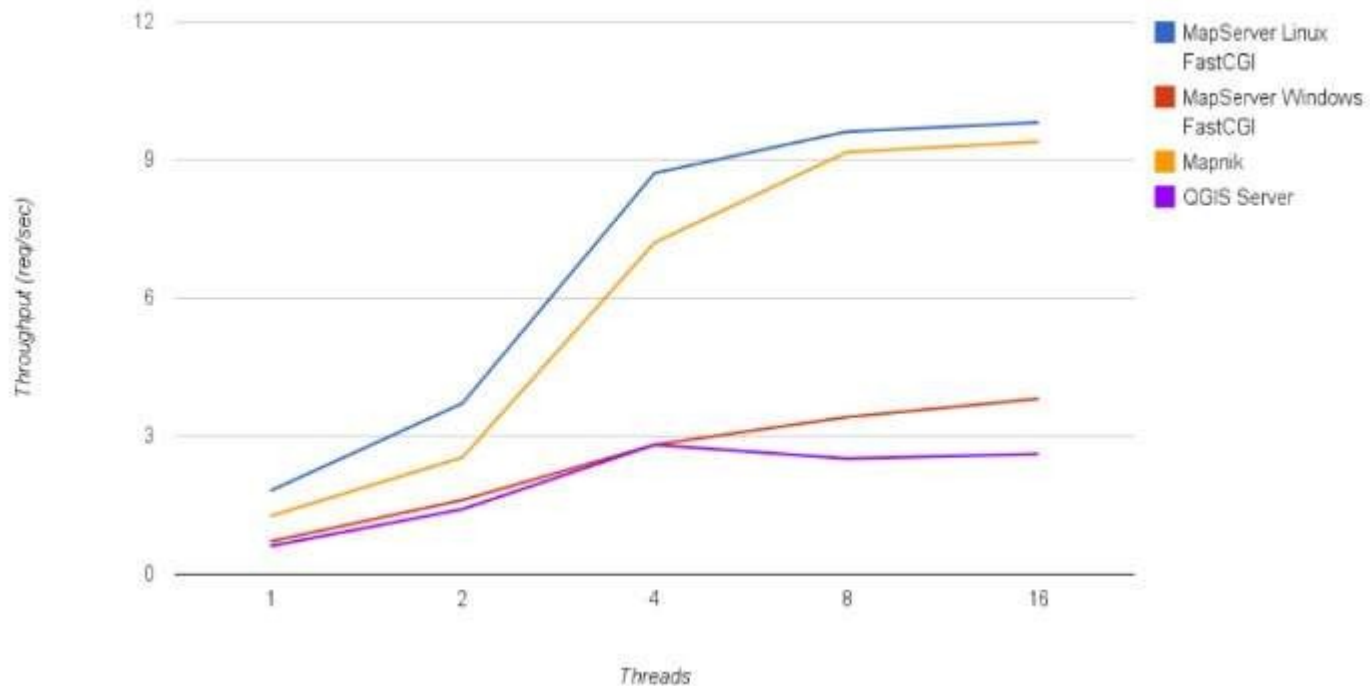
Vector+Raster Results - DEM+OSM





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Vector+Raster Seeding Results - DEM+OSM





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Team Reports



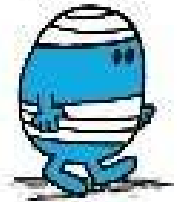
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- The Cadcorp GeognoSIS team had to withdraw at the last minute due to a serious family medical emergency
- They will resume the tests if at all possible, and publish their results in due course
- So watch this space
- Not that any of *you* care about the results

MR. BUMP

By Roger Hargreaves



MR. UPPITY

By Roger Hargreaves





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- Had to write a MapFile to SLD converter
- Had to write a BIL reader for rasters
 - Work was not completed in time
- Profiling observations
 - CPU usage between 50 and 80%
 - 2/3 of time is spent reading the result of SQL
 - Byte arrays are sent as text (base 64 encoding)
 - Known PostgreSQL-JDBC issue
(<http://postgresql.1045698.n5.nabble.com/bytea-performance-tweak-td4510843.html>)



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GeoServer

- Due to lack of time decided to participate only on the vector tests
- No shoot-out specific improvements this year, although didn't want to drop
- Borrowed SLD 1.1 styles from Constellation team (thanks!)
- Hopefully GeoServer keeps doing well
- Same bottleneck: Java2D antialiasing rasterizer. Workaround: load balance an instance each with two cores



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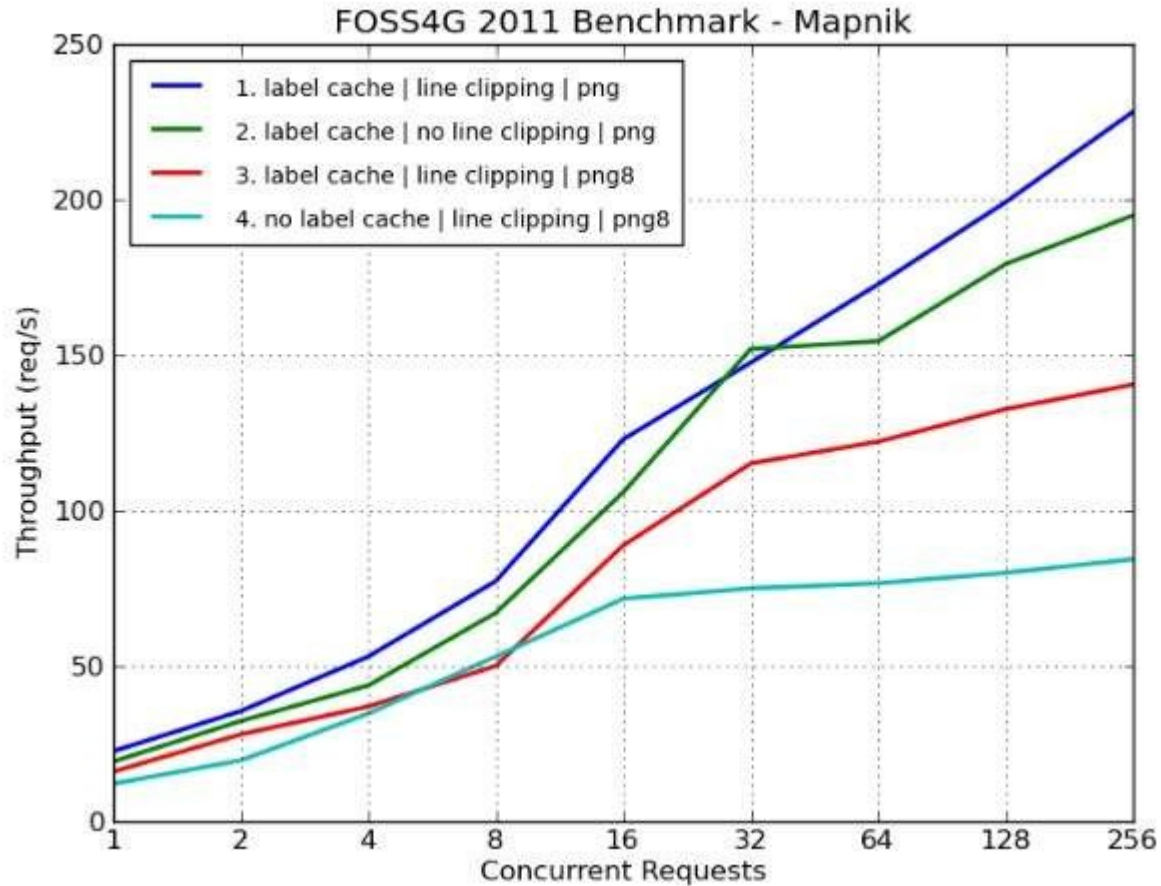


- **Node.js:** New async javascript server: [landspeed.js](#)
 - 8 processes (nginx), threadpool of 16 (libeio)
 - >10 r/s than c++ (paleoserver)
- **Labels:**
 - Deferred rendering (avoid extra db queries)
 - Faster placement and halo rendering
- **Raster:** new raster reprojection (using AGG)
- **Encoding:** ability to pass options for zlib/png perf
- **Line drawing:** option for faster rasterization
- **Clipping:** first attempt at polyline clipping
- **Future:** parallel db queries, intelligent feature caching

Thank you: Thomas Bonfort, Konstantin Kaefer, AJ Ashton, Artem Pavlenko, Alberto Valverde, Hermann Kraus, Rob Coup, Simon Tokumine



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QGIS Server

- QGS project with 349 layers (200 for labelling)
- Might be the reason for overhead with small tiles
- Improvements of rule-based renderer
- New raster provider with reprojection support performed well
- Data preparation needed, because QGIS requires a unique primary key
- mod_fcgid configuration:
 - Best results with `FcgidMaxProcesses = 32`
- QGIS uses benchmark server for performance regression testing



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MapServer
open source web mapping

Tweaks & Enhancements

- Png compression parameters
 - Tradeoff between performance and image size
- Apache / mod_fcgid configuration:
 - Run on worker mpm instead of prefork
 - Set FcgidMaxProcessesPerClass to a reasonable value (32) to avoid overwhelming the server with too many processes
 - Default value will eat up postgres connections and lead to failed requests
- Patch to mapserv to not re-parse the (huge!) mapfile at each request
- Patch to MapServer to not apply run-time substitutions (cgi)
- Further optimizations (not done): minimize classification cost
 - Order classes by order of occurrence
 - Stop using regexes



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Awards



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Last Run Award



GeoServer

**Benchmark run at
12:23pm today**



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- **Wiki home:** http://wiki.osgeo.org/wiki/Benchmarking_2011
- **Mailing list: join at**
<http://lists.osgeo.org/mailman/listinfo/benchmarking>
- **SVN:**
<http://svn.osgeo.org/osgeo/foss4g/benchmarking/wms/2011/>

Thank you to all 6 teams!