GeoServer
Past, Present and Future

Andrea Aime
TOPP

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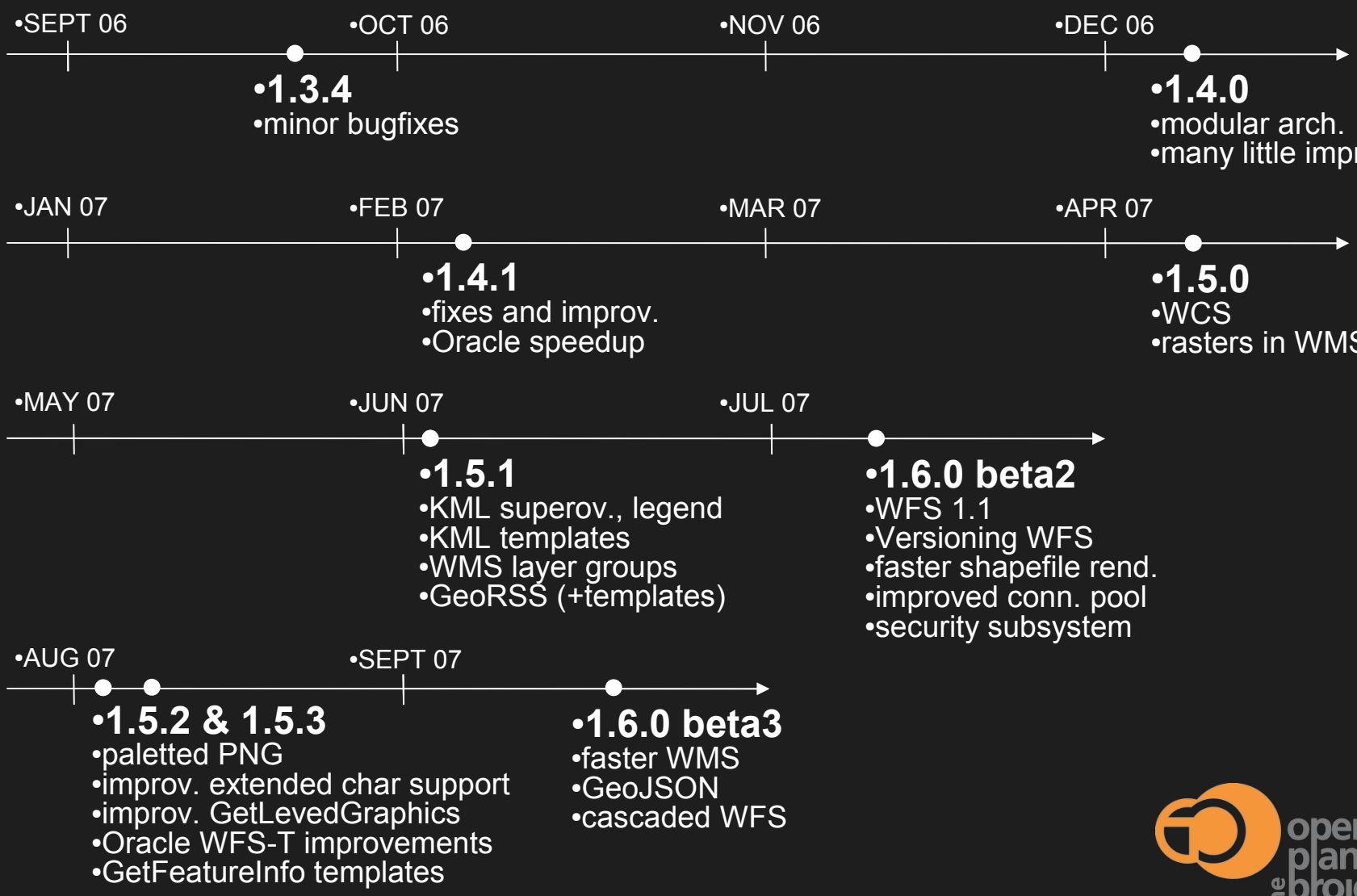
Outline

- Now and then... a lighting comparison
  - 9 releases
  - 1.3.4 vs 1.6.0 beta3 at a glance
- One year of progress
  - lots of new features
  - fixes and speed improvements all over the place
- The future
  - see what's cooking in developers minds

Evolution at a glance

One year of releases



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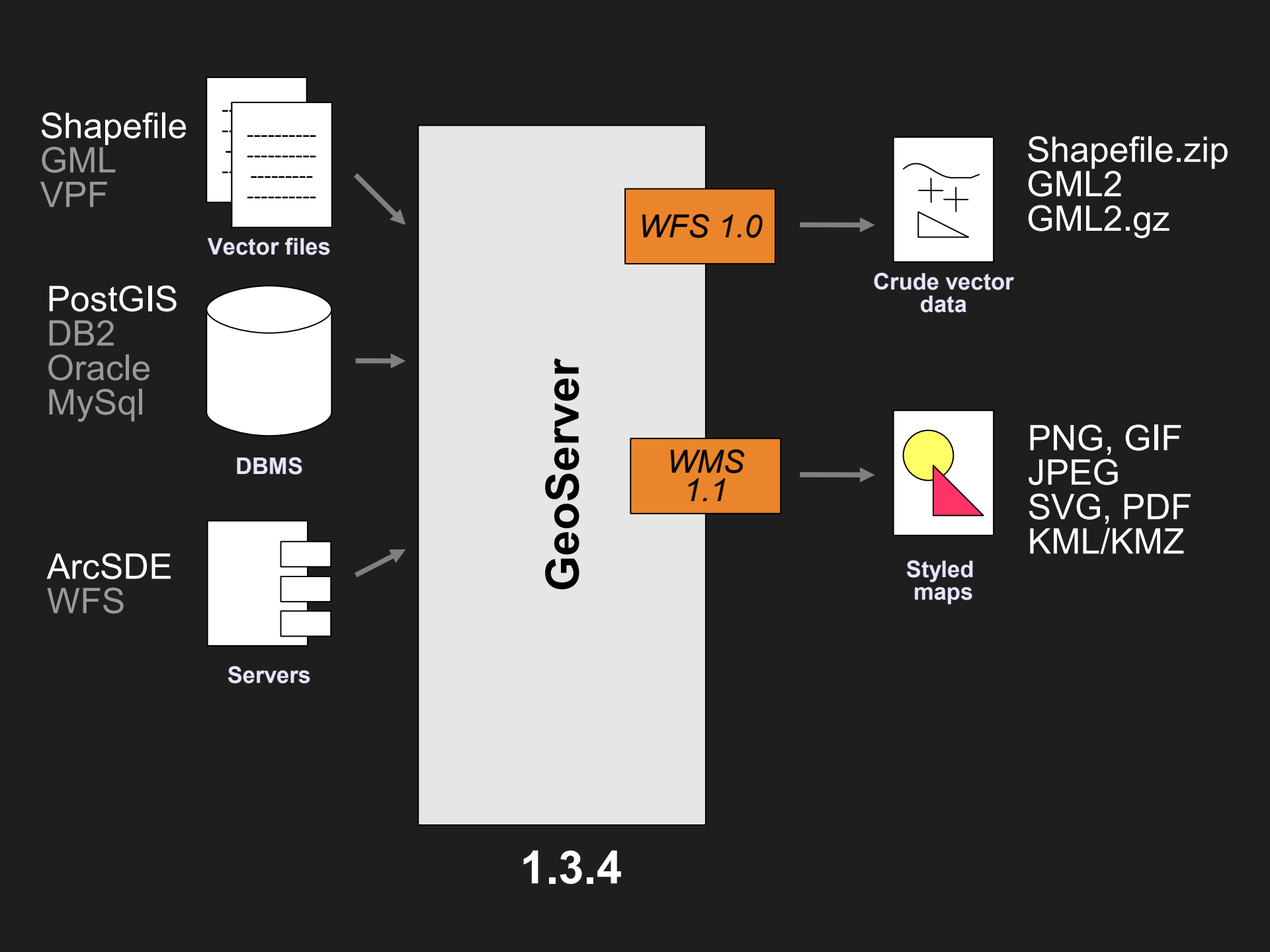
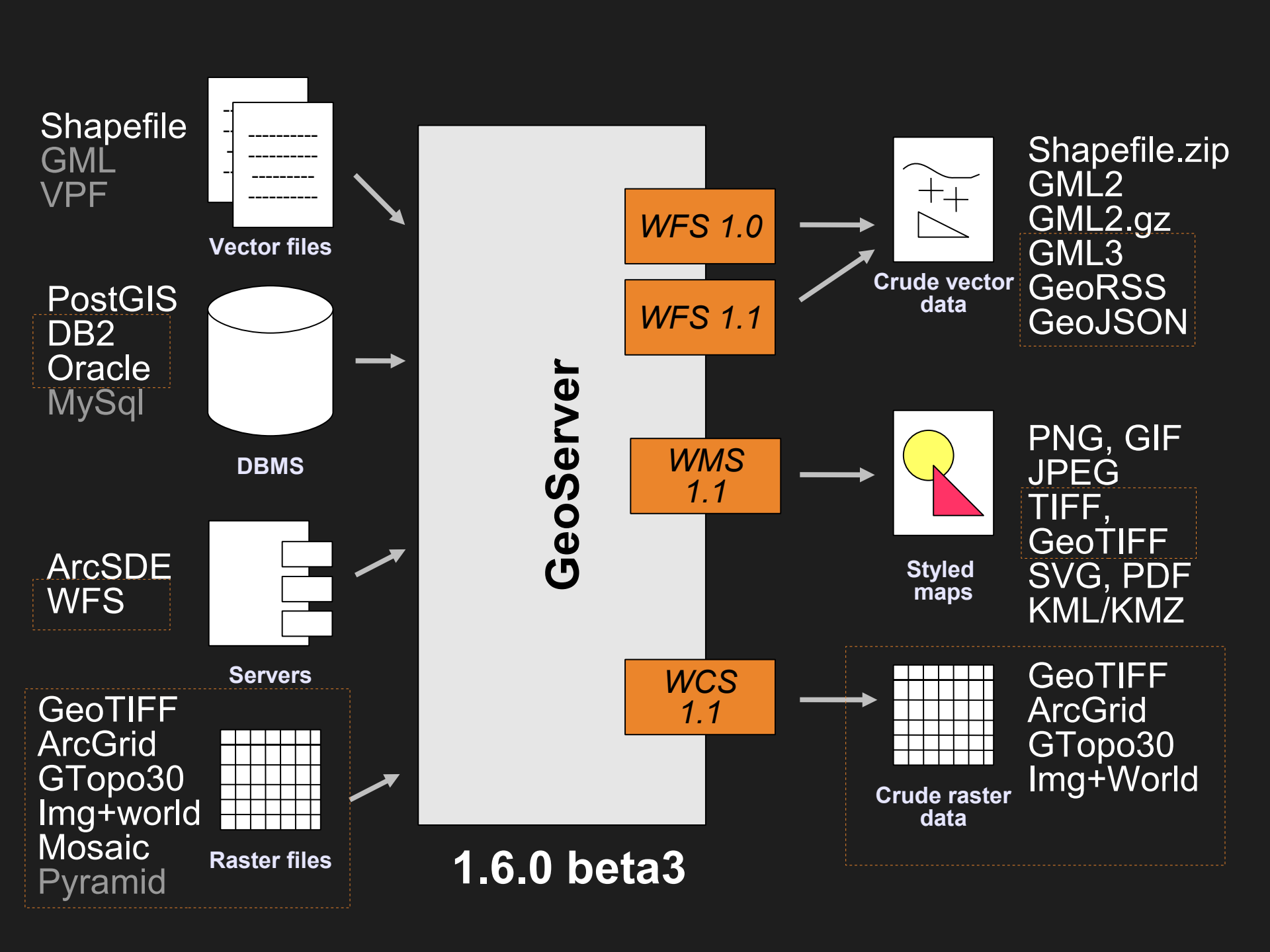
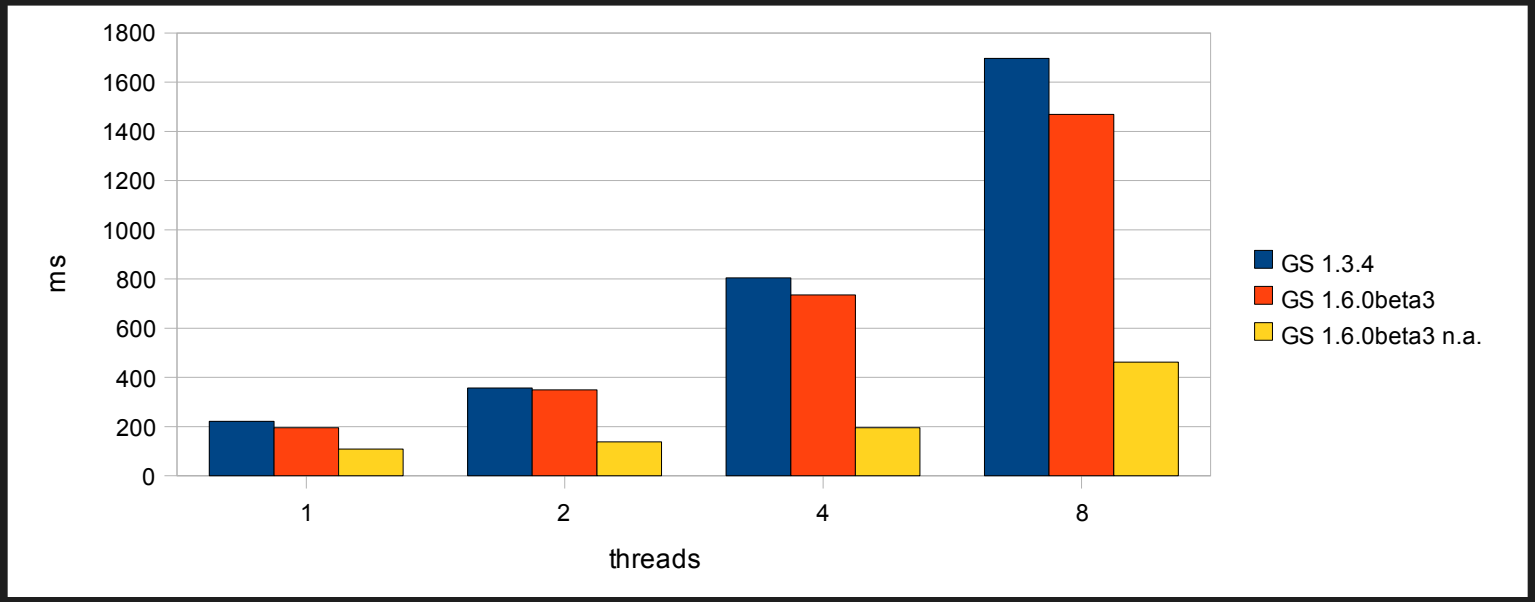
1.3.4 vs 1.6.0 beta3

- We'll compare:
  - **GeoServer 1.3.4,** which saw the light *right after FOSS4G 2006* (with minor fixes)
  - **GeoServer 1.6.0 beta3,** which saw the light *one week ago*
- Comparison as a data gateway
- Three benchmarks


Shapefile
GML
VPF
Vector files
PostGIS
DB2
Oracle
MySql
DBMS
ArcSDE
WFS
Servers
GeoServer
WFS 1.0
WMS 1.1
Crude vector data
Shapefile.zip
GML2
GML2.gz
Styled maps
PNG, GIF
JPEG
SVG, PDF
KML/KMZ
1.3.4


Shapefile
GML
VPF
Vector files
PostGIS
DB2
Oracle
MySql
DBMS
ArcSDE
WFS
Servers
GeoTIFF
ArcGrid
GTopo30
Img+world
Mosaic
Pyramid
Raster files
GeoServer
WFS 1.0
WFS 1.1
WMS 1.1
WCS 1.1
1.6.0 beta3
Crude vector data
Shapefile.zip
GML2
GML2.gz
GML3
GeoRSS
GeoJSON
Styled maps
PNG, GIF
JPEG
TIFF,
GeoTIFF
SVG, PDF
KML/KMZ
Crude raster data
GeoTIFF
ArcGrid
GTopo30
Img+World

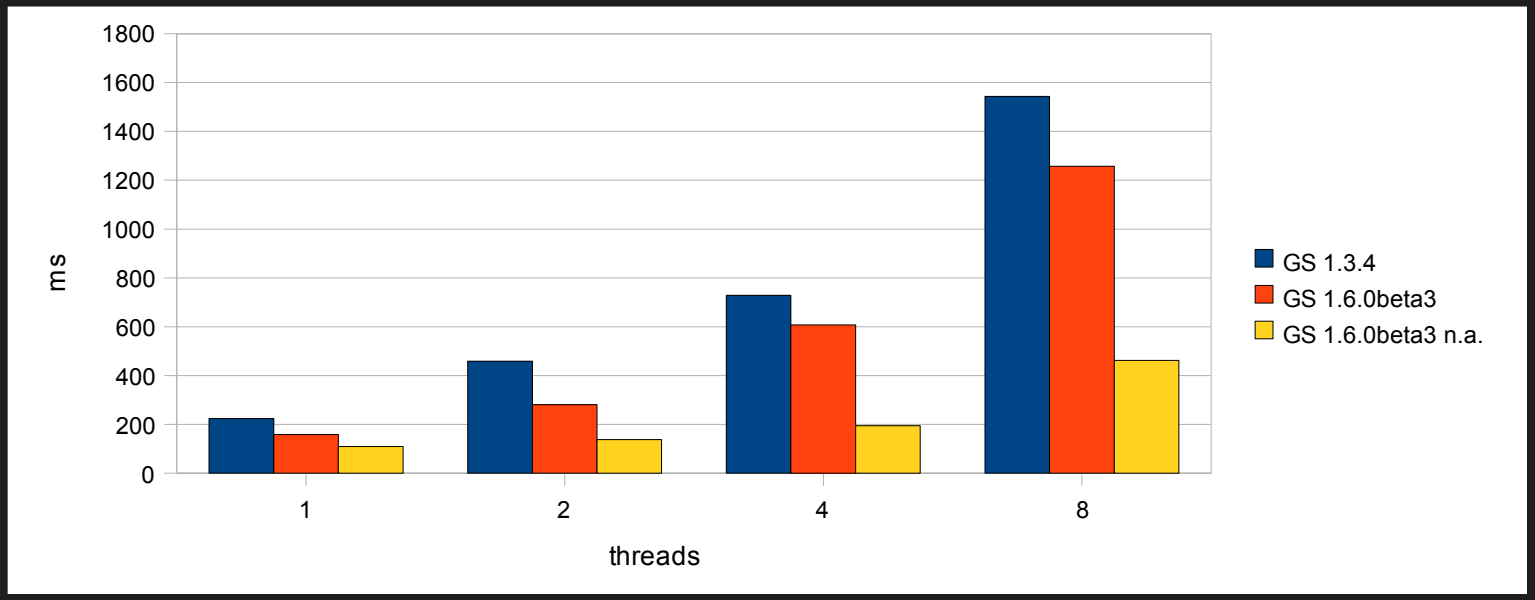
Postgis rendering



Threads	GS 1.3.4	GS 1.6.0beta3	GS 1.6.0beta3 n.a.
1	221	195	109
2	357	349	138
4	805	735	195
8	1697	1469	462

10 requests per thread
1000 out of 10.000 polygons rendered
n.a.: non antialiased

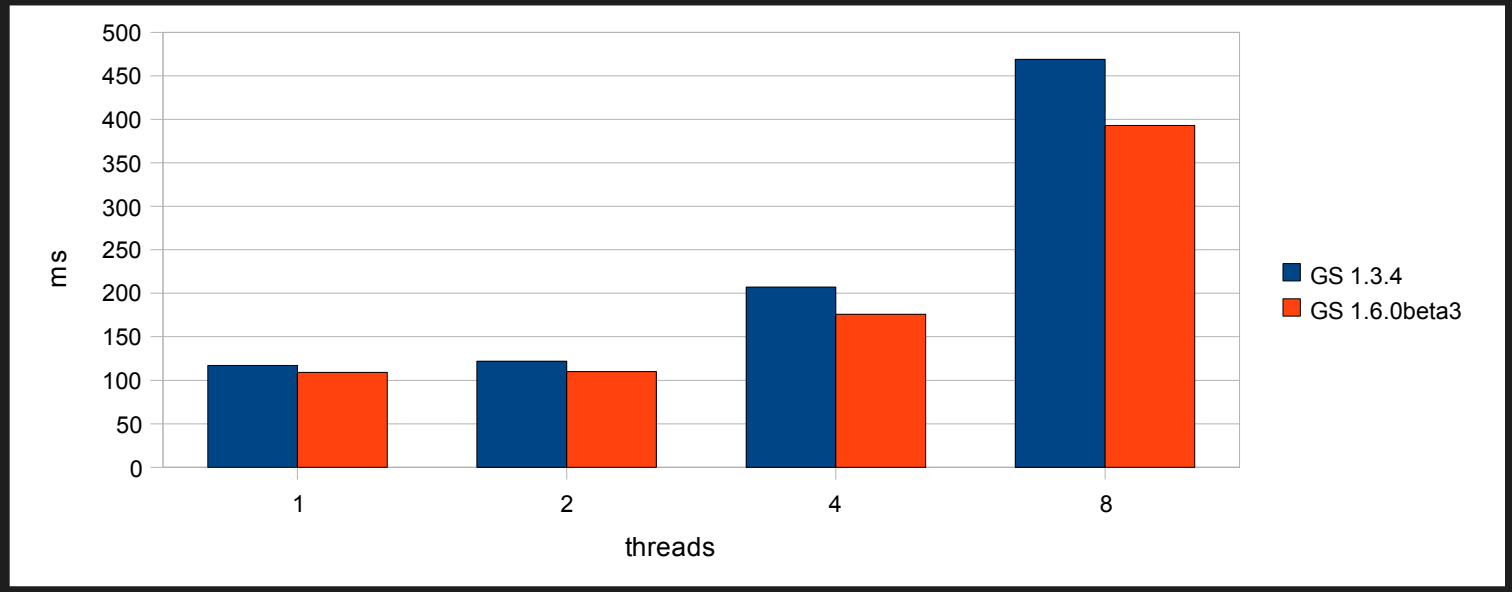
Shapefile rendering



Threads	GS 1.3.4	GS 1.6.0beta3	GS 1.6.0beta3 n.a.
1	224	159	73
2	459	281	101
4	729	608	123
8	1544	1258	294

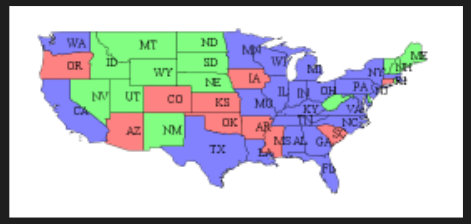
10 requests per thread
1000 out of 10.000 polygons rendered
n.a.: non antialiased

WFS encoding



Threads	GS 1.3.4	GS 1.6.0beta3
1	117	109
2	122	110
4	207	176
8	469	393

10 requests per thread
Encode in GML2 all features in the sample layer topp:states



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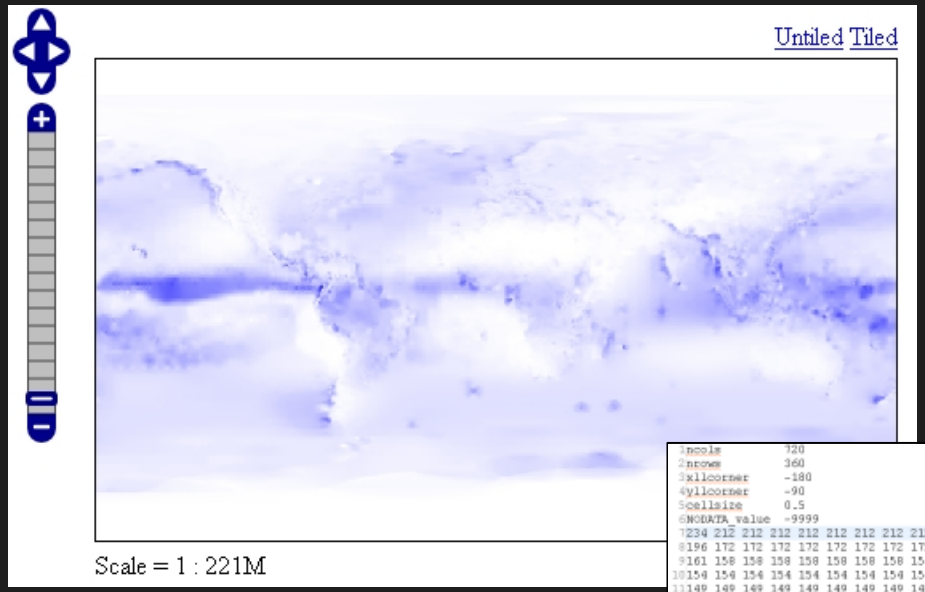
One year of new features

WCS, WMS and raster data

- 1.5.0 saw the introduction of raster support, both as WMS and as WCS
- Thanks GeoSolutions! (www.geosolutions.it)

- GeoTiff, Image + world file, ArcGrid, Gtopo30
- Large images support
  - inner tiled GeoTiffs with overviews
  - image mosaics
  - image pyramids

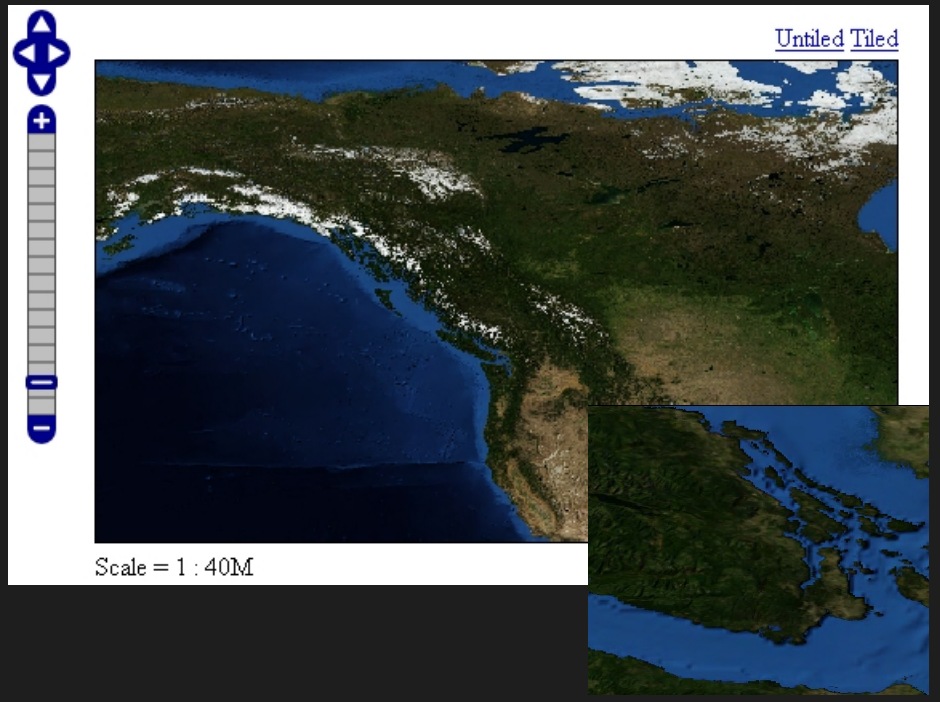
WMS raster integration




```
ncols         720
nrows         360
xllcorner     -180
yllcorner     -90
cellsize      0.5
NODATA_value  -9999
234 212 212 212 212 212 212 212 212 212
196 172 172 172 172 172 172 172 172 172
161 158 158 158 158 158 158 158 158 158
154 154 154 154 154 154 154 154 154 154
149 149 149 149 149 149 149 149 149 149
148 148 148 148 148 148 148 148 148 148
232 232 233 233 235 235 236 237 237 237
192 192 193 194 194 196 196 198 198 198
169 169 169 170 171 171 172 172 172 172
151 151 151 153 154 154 156 157 157 157
```

```
<Rule>
  <RasterSymbolizer>
      <Opacity>1.0</Opacity>
      <OverlapBehavior>
         <AVERAGE/>
      </OverlapBehavior>
      <ColorMap>
         <ColorMapEntry color="#ffffff" quantity="0" label="values"/>
         <ColorMapEntry color="#0000ff" quantity="3000" label="values"/>
      </ColorMap>
      <ShadedRelief/>
  </RasterSymbolizer>
```

ArcGrid precipitation raster + raster symbolizer



Bluemarble TNG portion, 2GB inner tiled GeoTiff

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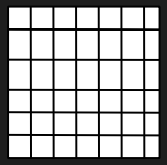
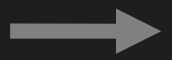
Web Coverage Service

- The WFS of raster world
- Extract raster data from available sources
- Certified OGC compliant (WCS 1.0)

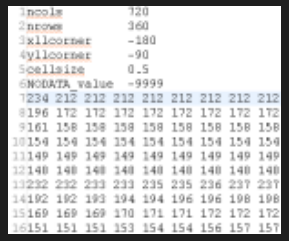


GeoTiff



```
<GetCoverage service="WCS" version="1.0.0"
  xmlns="http://www.opengis.net/wcs"
  xmlns:nurc="http://www.nurc.nato.int"
  xmlns:ogc="http://www.opengis.net/ogc"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.opengis.net/wcs http://schemas.
<sourceCoverage>nurc:Pk50095</sourceCoverage>
  <domainSubset>
    <spatialSubset>
      <gml:Envelope srsName="EPSG:32633">
        <gml:pos>347649.930868591 5176214.082539256</gml:pos>
        <gml:pos>370725.976428591 5196961.352859256</gml:pos>
      </gml:Envelope>
      <gml:Grid dimension="2" srsName="EPSG:4326">
        <gml:limits>
          <gml:GridEnvelope>
            <gml:low>0 0</gml:low>
            <gml:high>545 490</gml:high>
          </gml:GridEnvelope>
        </gml:limits>
      </gml:Grid>
    </spatialSubset>
  </domainSubset>
  <rangeSubset>
    <axisSubset name="Band">
      <singleValue>1</singleValue>
    </axisSubset>
  </rangeSubset>
  <output>
      <crs>EPSG:32633</crs>
      <responseCrs>EPSG:32633</responseCrs>
    <format>ArcGrid</format>
  </output>
</GetCoverage>
```

GetCoverage POST request

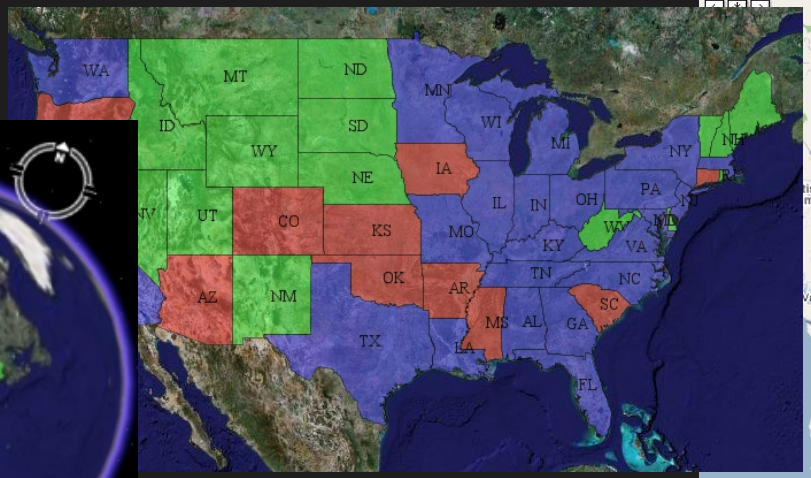


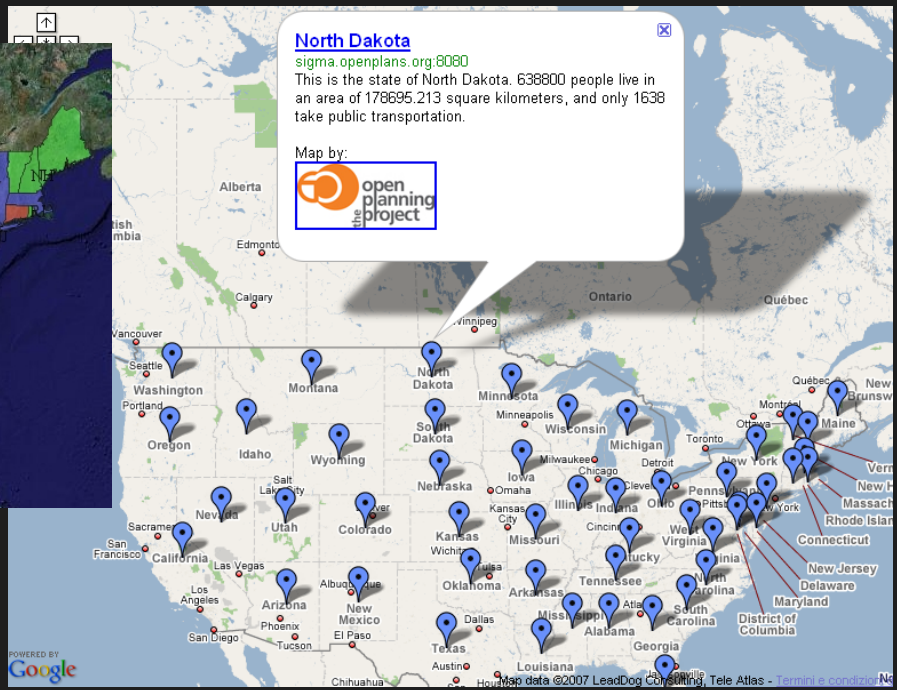
```
ncols         720
nrows         360
xllcorner     -180
yllcorner     -90
cellsize      0.5
NODATA_value  -9999
234 212 212 212 212 212 212 212 212
196 172 172 172 172 172 172 172 172
161 158 158 158 158 158 158 158 158
154 154 154 154 154 154 154 154 154
149 149 149 149 149 149 149 149 149
140 140 140 140 140 140 140 140 140
232 232 233 233 235 235 236 237 237
192 192 193 194 194 196 196 198 198
169 169 169 170 171 171 172 172 172
151 151 151 153 154 154 156 157 157
```

ArcGrid

Mashups everywhere

- New support for GeoRSS and GeoJSON, as well as Google Maps WMS integration.
- Improved Google Earth support
- Want more? Attend the next presentation





Color me ${templated}

- User customization of various outputs:
  - KML/KMZ (Google Earth & Maps)
  - GeoRSS (Yahoo! Maps, Virtual Earth)
  - WMS GetFeatureInfo (OGC clients)
- Template support courtesy of **Freemarker**, (www.freemarker.org)
- Want to see more? Attend the next presentation!

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Paletted images

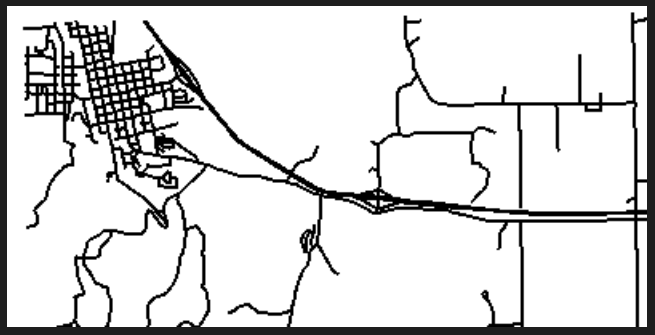
- The smaller the file, the faster the download
- Using 256 colors (or less) png's makes a world of difference
- Which palette?
  - compute one on the fly by image inspection -> *image/png8* and *image/gif*.
  - user provide one -> *palette=name* (“safe”, palette by example, .pal file)
  - derive it from the SLD style -> *format_options=antialias:none*

Road layer

png, 27ms, 25kb (TT 177ms)

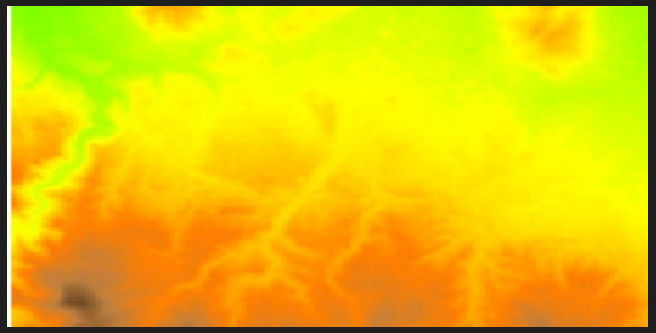
png8, 53ms, 10kb (TT 143ms)

safe pal., 27ms, 8kb (TT 109ms)

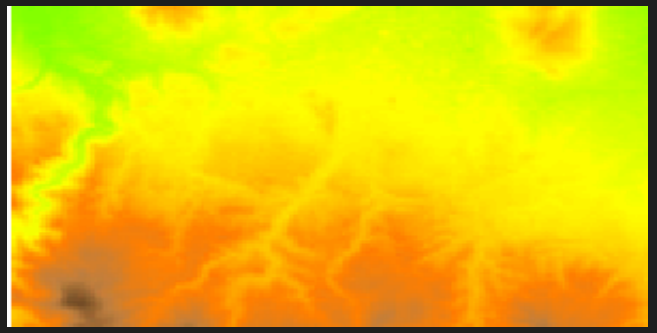


no ant., 17ms, 3kb (TT 79ms)

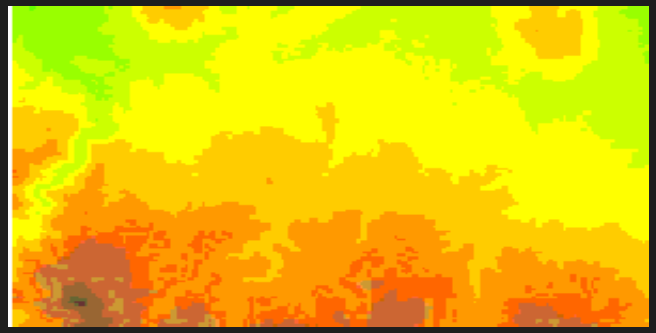
Raster data



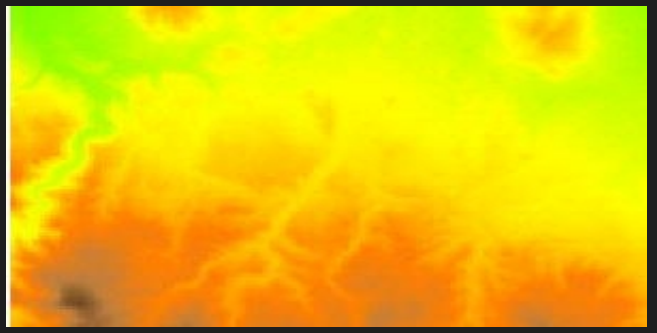
png, 40ms, 28kb (202ms)



png8, 49ms, 20kb (179ms)



safe pal., 28s, 5kb (98ms)



jpeg, 23ms, 6kb (TT 97ms)

Web Feature Service 1.1

- The new WFS spec:
  - GML3
  - reprojection
- Soon to become an ISO standard (with a few amendments that will make it WFS 1.2)
- GeoServer is the reference implementation for WFS 1.1 too

Versioning WFS

- Think WFS + a version control system (CVS, SVN):
  - access to a specific revision
  - rollback
  - diff
  - user identification, commit log, log access
- Yet, backwards compatible with standard WFS: transparent versioning
- Not a spec, but an experiment and a proposal

Security subsystem

- Multi-user, multi role
- Remember login cookies
- HTTP basic authentication on OGC services
- At the moment, a promising prototype configured with two clear text files:

users.properties

```
#user=password,role1,...,roleN
admin=geoserver,ROLE_ADMINISTRATOR
wfst=wfst,ROLE_WFS_READ,ROLE_WFS_WRITE
wfs=wfs,ROLE_WFS_READ
```

services.properties

```
#service.request=role1,...,roleN
wfs.GetFeature=ROLE_WFS_READ
wfs.Transaction=ROLE_WFS_WRITE
```

The future

KML / Google Earth

- 'Extrudes' - 3d look from your GIS data in Google Earth from attributes.
- More efficient streaming of large datasets to Google Earth
  - Raster super-overlays with Java tile caching
  - Investigation of Vector region streaming
- Participating in OWS-5 testbed on Agile Geography to help define what the next version of KML will be.

Raster data

- GeoServer is going ot become the WCS 1.1 reference implementation
- Native multi dimensional raster handling (NetCDF, HDF)
- GDAL integration, so access to ECW, MrSid, JPEG 2000 and other formats

Other exciting stuff

- REST interfaces:
  - Remote administration
  - Atom publishing protocol (FeatureServer like)
- Visual SLD editor
- Integrated tile cache
  - Ease of configuration
  - WFS-T integration, expired tiles for modified data
- Much, much more, see the Bonus Tracks

Question time!

(aaime@openplans.org)

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Bonus tracks

Good stuff... that did not fit the 25 minutes time limit

Template extras

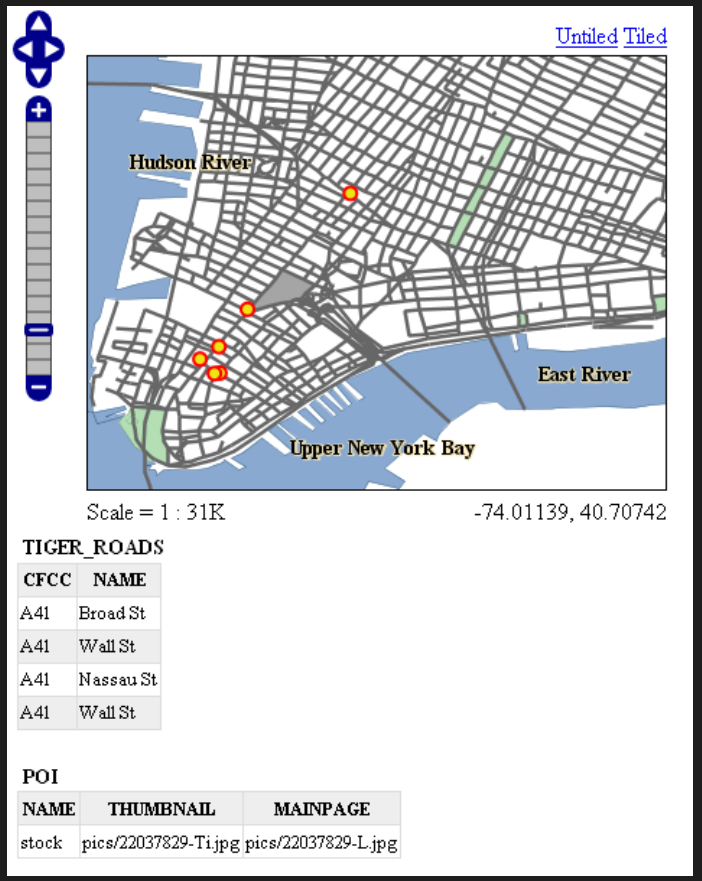
Standard template

```
<table class="featureInfo">
  <caption class="featureInfo">
      ${type.name}
  </caption>
  <tr>
<#list type.attributes as attribute>
  <#if !attribute.isGeometry>
    <th>${attribute.name}</th>
  </#if>
</#list>
  </tr>



<#assign odd = false>
<#list features as feature>
  <#if odd>
    <tr class="odd">
  <#else>
    <tr>
  </#if>
  <#assign odd = !odd>



  <#list feature.attributes as att>
    <#if !attribute.isGeometry>
      <td>${att.value}</td>
    </#if>
  </#list>
  </tr>
</#list>
</table>
<br/>
```

Table header

Alternate row background control

Attribute list



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Custom templates

```
<ul>
<#list features as feature>
  <li><b>Type: ${type.name}</b>
  (id: <em>${feature.fid}</em>):
  <ul>
  <#list feature.attributes as attribute>
    <#if !attribute.isGeometry>
      <li>${attribute.name}:
          ${attribute.value}</li>
    </#if>
  </#list>
  </ul>
  </li>
</#list>
</ul>
```

List oriented, but can still be applied to every feature type

```
<ul>
<#list features as feature>
  <li><b>Point of interest,
  "${feature.NAME.value}"</b>: <br/>
  <img
    src="http://localhost:
        8080/geoserver/popup_map/
${feature.THUMBNAIL.value}"/>
  </li>
</#list>
</ul>
```

Feature type specific, knows about attribute name and meaning

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Paletted images extra

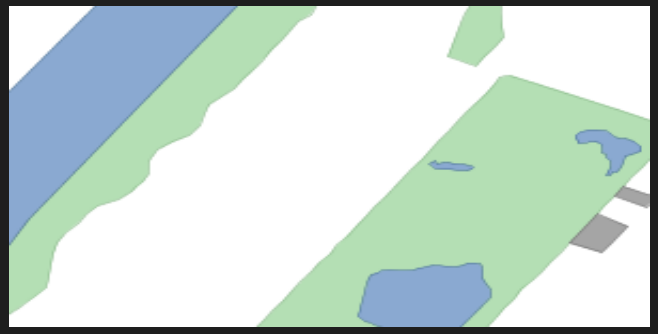
Some benchmarks

- 300x200 images
- Parameters
  - **image/png**: full color, 24bits per pixel png
  - **image/png8**: 256colors, 8bits png, rendered in full color and reduced to 256 in post processing
  - **image/png&palette=safe**: 256colors, 8bit png, rendered in full color and reduced to a known palette in post processing
  - i**mage/png&format_options=antialias:none**: palette computed from SLD, rendering in 256 colors directly, no antialiasing

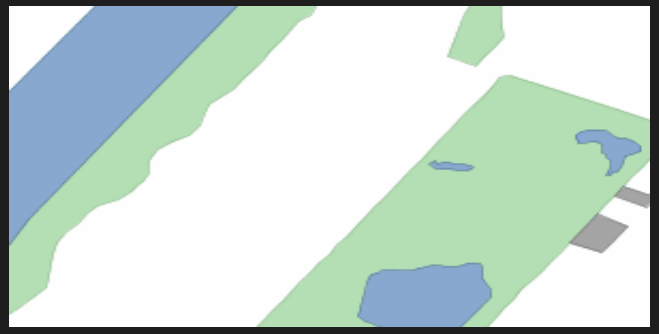
Some benchmarks (cont.)

- Times measured with **ab** (ApacheBench) and 30 requests
- Total Time considers a 2Mbit/s connection and a 50ms latency

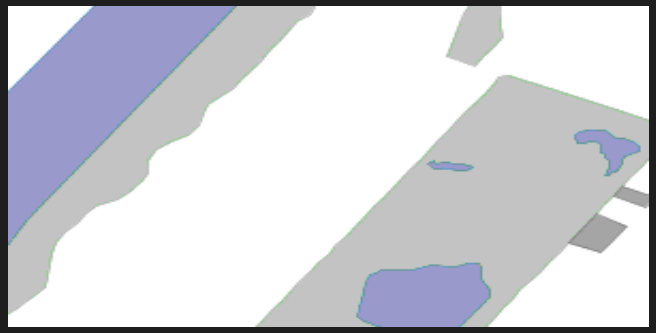
Beware the safe palette



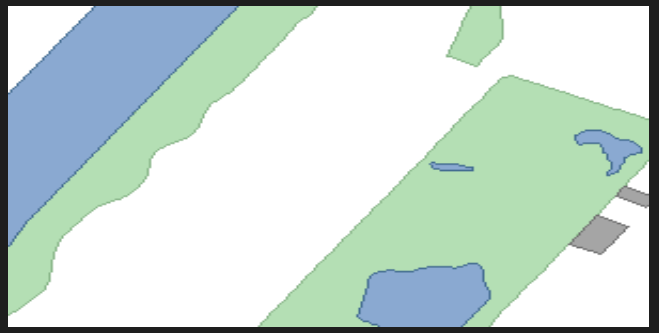
png, 25ms, 11kb (TT 119ms)



png8, 38ms, 6kb (TT 112ms)



safe pal., 20ms, 4kb (TT 86ms)

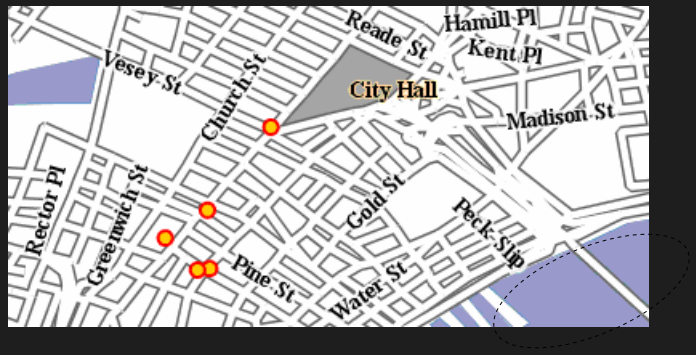


no ant., 12ms, 3kb (TT 74ms)

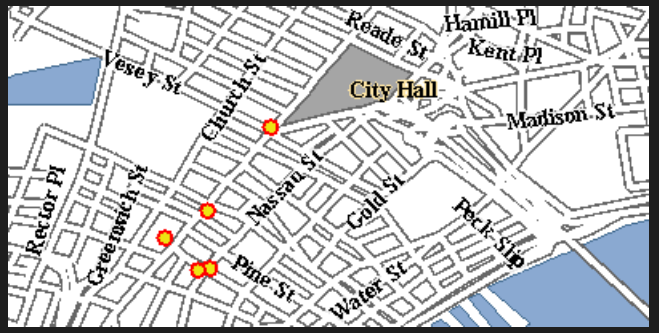
Multilayer, labelled map

png, 139ms, 95kb (516ms)

png8, 143ms, 24kb (289ms)



safe pal., 127s, 22kb (TT 265ms)



no ant., 108ms, 15kb (TT 258ms)

Image sampler conclusions

- On a real internet connection, png8 is always faster than png
- Using a fixed palette is even better, but better provide a custom one, specific for the custom map
- Non antialiased images are real fast for simple overlay layers, but quality is low
- In raster background serving nothing beats JPEG.

WFS-V sample

Step 1, doing a transaction

INSERT

UPDATE

DELETE

```
<wfs:Transaction service="WFSV" version="1.0.0"
  ...
  handle="Updating Signature rock label">
  <wfs:Insert>
    <topp:archsites>
      <topp:cat>2</topp:cat>
      <topp:str1>Alien crash site</topp:str1>
      <topp:the_geom>
        <gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#26713">
          <gml:coordinates decimal="." cs="," ts=" ">
             604000,4930000
          </gml:coordinates>
        </gml:Point>
      </topp:the_geom>
    </topp:archsites>
  </wfs:Insert>

  <wfs:Update typeName="topp:archsites">
    <wfs:Property>
      <wfs:Name>str1</wfs:Name>
      <wfs:Value>Signature Rock, updated</wfs:Value>
    </wfs:Property>
    <ogc:Filter>
      <ogc:FeatureId fid="archsites.1" />
    </ogc:Filter>
  </wfs:Update>

  <wfs:Delete typeName="topp:archsites">
    <ogc:Filter>
      <ogc:FeatureId fid="archsites.2" />
    </ogc:Filter>
  </wfs:Delete>
</wfs:Transaction>
```

COMMIT MESSAGE

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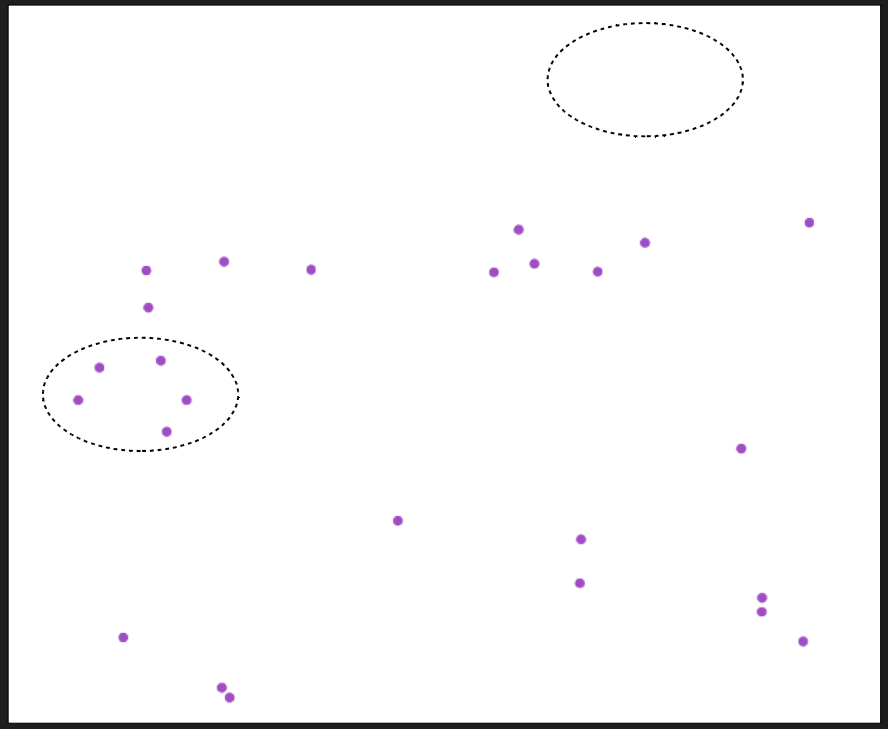
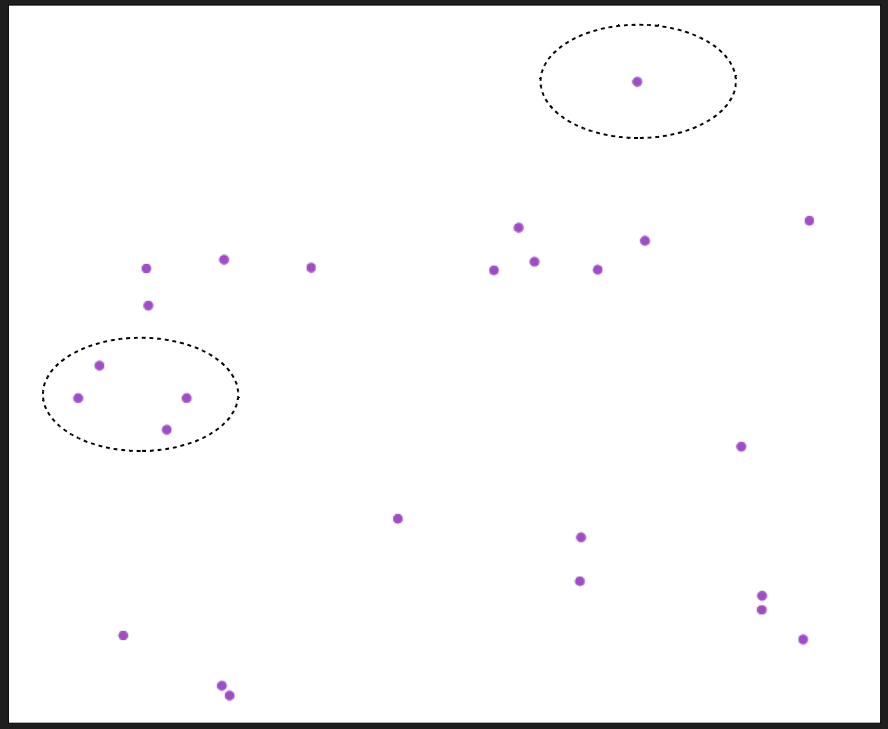
Step 2, visual compare

http://.../geoserver/wms?request=**GetMap**
&HEIGHT=400&WIDTH=600
&LAYERS=topp:archsites&...
&featureVersion=1

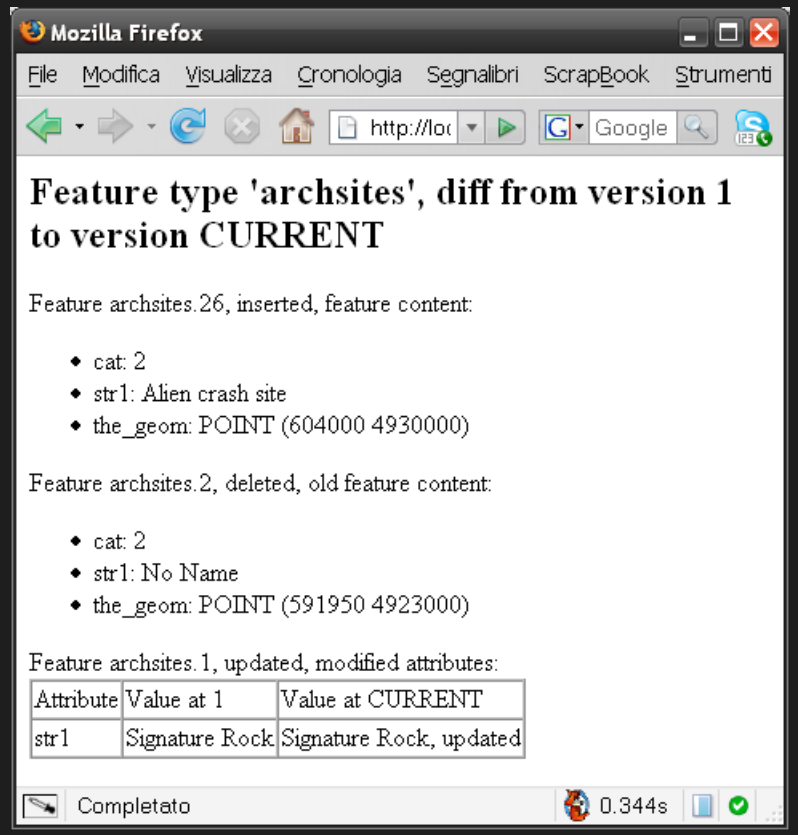


http://localhost:8080/geoserver/wms?
request=**GetMap**
&HEIGHT=400&WIDTH=600
&LAYERS=topp:archsites&...



Step 3, get a diff

```
<wfsv:GetDiff
 service="WFSV" version="1.1.0"
 outputFormat="HTML"
 ...>
 <wfsv:DifferenceQuery
  typeName="topp:archsites"
  fromFeatureVersion="1"/>
</wfsv:GetDiff>
```



Step 4, roll back and log

```
<wfs:Transaction
  service="WFSV"
  ...
  handle="Rolling back
          previous changes">
  <wfsv:Rollback
        safeToIgnore="false"
        vendorId="TOPP"
        typeName="archsites"
        toFeatureVersion="1"/>
</wfs:Transaction>
```

```
<?xml version="1.0" encoding="UTF-8"?>
<wfs:TransactionResponse version="1.1.0"
  ...
  <wfs:TransactionSummary>
    <wfs:totalInserted>1</wfs:totalInserted>
    <wfs:totalUpdated>1</wfs:totalUpdated>
    <wfs:totalDeleted>1</wfs:totalDeleted>
  </wfs:TransactionSummary>
  <wfs:TransactionResults />
  <wfs:InsertResults>
    <wfs:Feature>
      <ogc:FeatureId fid="archsites.2" />
    </wfs:Feature>
  </wfs:InsertResults>
</wfs:TransactionResponse>
```

```
<wfsv:GetLog service="WFSV"
  outputFormat="HTML"
  ...
  <wfsv:DifferenceQuery
   typeName="topp:archsites"
   fromFeatureVersion="1"
   toFeatureVersion="3"/>
</wfsv:GetLog>
```

Revision	Author	Date	Message
3	anonymous	20/09/07 9.39	Rolling back previous changes
2	anonymous	19/09/07 17.06	Updating Signature rock label

the open planning project

Future extras

GML Complex features

- Support for complex features, that is feature with:
  - nested subfeatures
  - collection attributes
  - associations
- This will open the road for sensor observations and other non flat GML data
- Mapping from database schema to well known GML schema

REST interfaces

- Remote configuration of GeoServer Layers
- User and permission management

- Atom Publishing Protocol implementation for editing geodata
- WFS alternative
- Hook up to versioning backend

Integrated tile cache

- Integrated Java TileCache
- Summer of Code Project built JTileCache
- Ship with GeoServer with seamless integration and configuration
- Hook up to transactions, with conditional HTTP, for live edits with cached data (invalidate only affected tiles)
- Investigate caching vector outputs

Visual SLD editor

- Visual SLD editor
- Ajax based environment to style maps
- Thematic mapping (prototype is complete)
- Graphical User Interface to make maps look good
- Scale centered UI for web maps.

New and improved subsystems

- New configuration subsystem, more amenable to cluster, and quicker to develop with for developers
- Remote access to configuration (read/write)

- New modular user interface, more options, quicker setup
- Improved security subsystem (from prototype to production grade)