MDOT’s Approach to Building Interactive Maps

Mike Cresap, P.E.
Where we started

- No Buy-In from IT Department
  - Lack of experience with maps and Spatial data
  - Hard to explain anticipated outcome
Maps Built with Deprecated Technology

- Contributes to Browser Incompatibility
- Discourages Use
Example of a typical Google Map

- Uses Google API
- Our data on top of Google’s Base Map
- What County am I in?
What users want:

- Google experience
- OpenStreetMap look and feel
- Slippy Map
- Quick Map Refresh
- Use of our data
- User Defined symbology for features
- Software Interoperability
- Flexibility for data formats
Other Considerations

- Low-Cost Solution
- Supports Oracle database
- “Stand-alone” API approach
- Compatible with Mobile devices
- WORA (Write Once Run Anywhere)
What are the limitations?

- Google Maps
  - Data is copyrighted
  - Data owned by multiple organizations
    - NAVTEQ
    - Tele Atlas
    - Google
  - No guarantee of accuracy

“The Google Maps API can be incorporated into open source projects. But this only governs how you use the software - it doesn't have any implications whatsoever for the data displayed by this API, which is still under copyright.”

(wiki.openstreetmap.org)
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Base Map data is not your data
MDOT’s Data Publishing Solution

- GeoServer
  - Free and Open Source Software
  - Reads Oracle Spatial
  - Can Publish/Serve
    - WFS - supports feature query and retrieval
    - WMTS - Tile service
    - WFS-T - Transactional WFS service for insert / delete / modify actions
    - ...and others
- WMS output formats
  - KML
  - GeoTiff
  - JPEG
  - PDF
  - PNG
  - ...and many others
GeoServer - Data Management

- Data Sources
  - Vector Data
  - Raster Data
- Extensions
GeoServer - Challenges

- Data Organization
  - Workspace
  - Store

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Workspace</th>
<th>Store Name</th>
<th>Type</th>
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Challenges (Cont’d)

Styling
OpenGIS Styled Layer Descriptor (SLD) vs. Cascading Style Sheets (CSS)

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<th>SLD formatting</th>
<th>Equivalent CSS formatting</th>
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<td><a href="">ogc:PropertyIsLessThan</a></td>
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<tr>
<td>&lt;Fill&gt;</td>
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<tr>
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Challenges (Cont’d)

- Styling
  - Z Ordering

<table>
<thead>
<tr>
<th>Without Z Ordering</th>
<th>With Z Ordering</th>
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<td><img src="image2.png" alt="With Z Ordering" /></td>
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MDOT’s Map Solution

- Leaflet
  - Open-Source JavaScript Library
  - Mobile-Friendly
  - Provider Agnostic
  - Extensible
  - Well-Documented API
What’s Next?

- **Vector Tiles**
  - Rendering is done by the Client
    - Allows applications to style maps differently without reconfiguring GeoServer
  - File smaller than an image tile
    - Faster data transfer and lower bandwidth usage
  - Will require a move to OpenLayers

- **Load Balancing**
  - Distribution of workloads across multiple computing resources
  - Allows GeoServer Clustering
  - NGINX