Open Web Mapping for Local Units of Government

Developing a Sustainable Framework for Small Townships and Villages

Howard Yamaguchi – Geog 596A – Spring 2010
Project Proposal for Peer Review
Advisor – Dr. Ian Turton
Project Goals

• Assist small, resource-strapped Local Units of Government (LUGs) establish a basic in-house GIS capability to create local spatial information products;

• Determine how such LUGs can *easily* and *sustainably* create and maintain web mapping applications created using such products (maps, databases, etc.)
Overview

- Overview of Michigan LUGs
- What’s in a LUG Web Map?
- Open Source Strategy
- Sustainability
- Deliverables, Tasks, and Timeline
Local Units of Government

- 83 counties in Michigan, containing:
  - 1,242 townships
  - 274 cities
  - 259 villages

- Township, cities, & villages: LUGs
- Population: < 100 to 910,000 (Detroit)
LUGs can provide ...

- Planning, zoning, and (property) tax assessment, property tax collection
- Police and emergency mgmt services
- Utilities and other services
- Elections and political representation at LUG level
Local Units of Government

- Often assume onus of local land-use planning
- Depend on citizen groups to advise elected officials in planning, park and asset management, etc.
- Often do not have access to planning resources such as GIS and web-based mapping

A form of “Public Participation GIS” at local township halls as part of regional transportation planning exercise, Antrim and Grand Traverse Counties, 2007-2008

Photo Source: The Grand Vision
Helping with GIS and Web-based Information Dissemination

• Basis for informed decision making by LUGs and their constituent citizenry

• Help establish in-house desktop GIS capabilities to create spatial data products (maps, DBs)

• Disseminate such info to general public via LUG website:
  • Static maps and info documents (PDF files)
  • Interactive web mapping applications
Selecting LUGs for My Project

- LUGs with populations ≥ 1,000 and < 5,000 usually have permanent office and staff, but not full-time professional planners and technical staff.
- LUGs with populations ≥ 5,000 tend to have professional planners and technical specialists among full-time staff, with probability being much higher for larger populations.
- Target LUGs for this project will have populations around 5,000: permanent office and staff, but probably no full-time technical specialists.
Capstone Project LUGs
(Start with two, later add some more [Whitewater, Blair and Clearwater Twps?])

**Acme Township**
Grand Traverse County, MI

**Village of Elk Rapids**
Antrim County, MI

--- U.S. Census Bureau, June 2010

**Est. 2009 Populations:**
- Acme Township: 4,579
- Village of Elk Rapids: 1,650
- Whitewater Township: 2,899
- Blair Township: 6,952
- Clearwater Township: 2,382
Waterford Township

- Sophisticated system maintained by professional GIS Department
- Rec facilities, political boundaries (voting and school), parcel data, aerial DOQs, educational facilities, etc.

Population 73,500
34 lakes and numerous hi-valued properties
(http://maps.twp.waterford.mi.us)
What interactive layers are in the LUG Web Maps?

- **Parcel data** (tax info, assessment and sales info, ownership)
- Base layers of aerial photo DOQs, USGS topos, historical maps
- USDA Soil Survey use suitability layers;
- FEMA flood insurance layers;
- EMS, 9-1-1 street addresses, and utility lines, and zoning;
- Ag land preservation and nat’l resource conservation;
- Local POIs
- Just about any layer!!
Web Map Implementation

Two-step Strategy

• Create a GIS map/web app prototype at LUG using open source software (QGIS) --- also create static PDF for download

• Create web map from QGIS project using:
  - Google or Bing Map Mashups, and/or
  - Thin web client (OpenLayers) using GIS layers served from a dedicated map server
Outfitting LUGs with QGIS software (open source)

- Huge variation degree of in PC- and GIS-savviness in LUGs, may need much (or very little) tutoring
- QGIS is readily available from www.qgis.org, reasonable amount of support in forums, frequent updates

QGIS screen showing Acme Twp parcel data from attribute table (shape file obtained from Grand Traverse County)
Two Kinds of Web Maps

QGIS “projects” can be transformed into:

- **Google/Bing-type Map Mashups**
- **OpenLayers thin client with GeoServer/QGIS-Mapserver**

Note the different Acme Twp shapes in the two maps! Google Maps uses Mercator Projection (WGS 84 datum) while the thin client in this case (using layers served by GeoServer and by a USGS map server) uses GCS (WGS 84).
Open Source Web Map Strategy

Web Map Workflow

- Set up Webserver (Tomcat, Apache)
- Set up Mapserver (GeoServer, QGIS Mapserver)

- QGIS Project File and Shapefiles
  - Convert shapefiles to KML
  - Prepare other text-based datasets as needed (XML, GeoJSON, csv)
  - Use QGIS plug-in to upload map to QGIS Mapserver, automatic generation of single project-wide SLD file
  - Use uDig desktop client to create many SLD files that style shapefiles, or use GeoServer to create CSS
  - Create HTML map page
    - Invoke OpenLayers
    - Serve uploaded map/SLD files from QGIS Mapserver
  - Create HTML map page
    - Invoke OpenLayers
    - Serve uploaded map/SLD files from GeoServer
  - Create HTML map page
    - Upload datasets/DBs to map server
    - Upload and publish web map page

- QGIS Mapserver
  - Set up Mapserver (GeoServer, QGIS Mapserver)
  - Map Servers
  - Mashups (Google or Bing)
  - Set up Webserver (Tomcat, Apache)

- Sustainable Updating/Maintenance by LUGs ???
Sustainable Web Map Ideas

QGIS projects – Data Files and Datastores- HTMLs

• Strive for simplicity, not computational efficiency or elegance --- e.g., if updating a text file is easier than updating a powerful geodatabase, go for text file

• Use tools familiar to LUG staff --- word processors and spreadsheets rather than desktop databases:
  – VBA macros for Excel and Word
  – Excel concatenation functions in spreadsheet cells
  – available web-based tools (“Mr. Data Converter,” etc.)

• Ultimately depends on computer skill level of LUG staff.

• Bing API rather than Google: Michigan’s contract with MS for Bing Enterprise
Project Deliverables

• Web map applications for participating LUGs
• Documentation of various methods used to effectively and simply update web map components
• A “lessons learnt” document/paper at end of project for use as guidance document by LUGs --- continually update document
• Present paper at FOSS4G conference
### Key Tasks and Timetable

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<thead>
<tr>
<th>Task</th>
<th>Timetable</th>
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<tr>
<td>Creation of QGIS Projects by LUG (at least two from each LUG – one mashup, one thin client)</td>
<td>Ongoing, through January/February 2011</td>
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<td>Set up, operate web servers, map servers, and datastores on PC and on Linux-based Map Server machine</td>
<td>Setup in October 2010, operate through project life (and possibly beyond)</td>
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<tr>
<td>Conversion of LUG QGIS Projects to Web Maps (mashup and thin client)</td>
<td>Oct/Nov 2010 – March 2011 (possibly beyond)</td>
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<td>Design and operate trial “sustainable” web map update/maintenance procedures</td>
<td>Nov 2010 – April 2011</td>
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<tr>
<td>Compile “Lessons Learnt” guidelines for web map creation from QGIS and for map update/maintenance</td>
<td>April 2011</td>
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<tr>
<td>Submit conference abstract</td>
<td>April 2011</td>
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<tr>
<td>Complete/submit conference paper</td>
<td>July 2011</td>
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<tr>
<td>Present at FOSS4G Conference, Denver CO</td>
<td>Sept 2011</td>
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We’re done! Questions?