

From GDAL to SAGA: Tips & Tricks from the World of Open Source



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Purpose of this Presentation

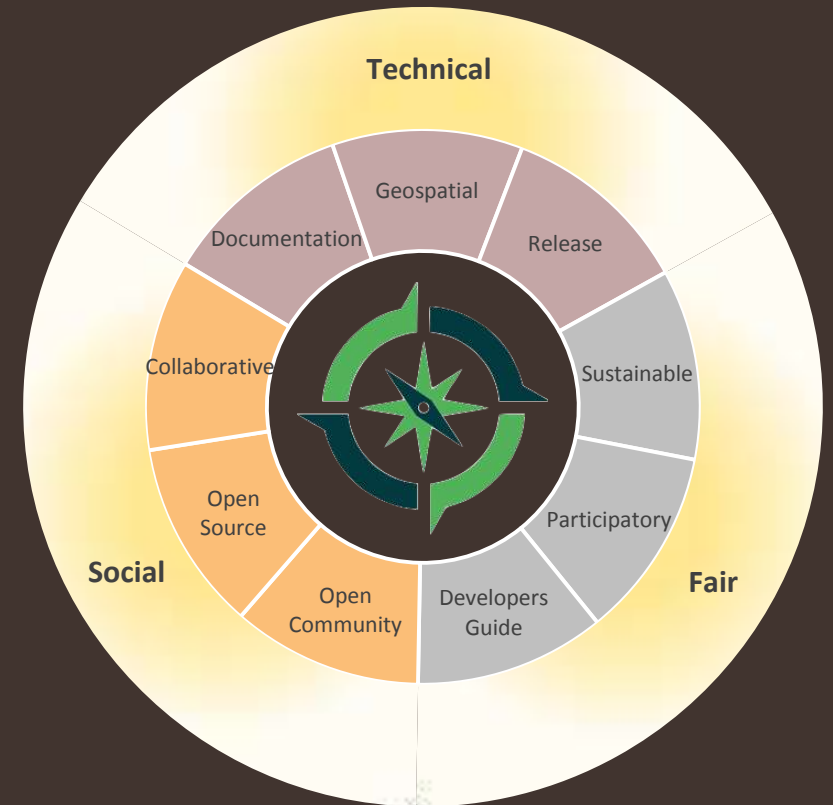
- Provide a brief introduction to a variety of open source GIS software
- Serve as a reference to links and documentation
- DEMO– LiDAR data processing using Open Source GIS
- Relate open source GIS workflows to ESRI workflows
- Promote greater awareness of open source GIS at IMAGIN

Application Soft Launch – Michigan Forest Viewer, LiDAR Derivative Products served as WMTS layers through Amazon Web Services

What is “Open Source” GIS?

From the Open Source Geospatial Foundation...

- **Open Source:** a collaborative approach to software development
- **Open Data:** freely available information to use as you wish
- **Open Standards:** avoid lock-in with interoperable software
- **Open Education:** Removing the barriers to learning and teaching



Open Source Geospatial Foundation
<https://www.osgeo.org/>

My Journey to Open Source...



- Think geo-centric solutions, not software-centric solutions
- International community of geospatial professionals from all backgrounds
- Transparency builds trust

Where do I get the Software? OSGeo Installation...

- Link to download... <https://qgis.org/en/site/forusers/download.html>
- OSGeo4W network installer or standalone QGIS
- What you get from OSGeo4W network installer...
 - QGIS
 - GRASS
 - SAGA
 - GDAL
 - OSGeo4w Python shell

Plus, a large number of optional packages using the “Advanced Install” option

QGIS



- QGIS is a comprehensive GIS GUI that “ports” many other Open Source GIS software
- Diverse community of worldwide developers contributing “plugins”
- Fast, efficient 2D and 3D rendering
- Integrates seamlessly with native file system or cloud relational database platforms
- Print composer designed for advanced cartographic production

Link to documentation... https://docs.qgis.org/3.4/en/docs/user_manual/

GRASS GIS



- “Geographic Resource Analysis Support System” is a comprehensive standalone GIS
- GRASS GIS contains over 350 modules to render maps and images on monitor and paper...
 - manipulate **raster**, and **vector** data including vector **networks**
 - process multispectral **image** data
 - create, manage, and store spatial data
- OSGeo download comes with a version of QGIS with GRASS modules embedded

Link to documentation... <https://grass.osgeo.org/documentation/>

SAGA



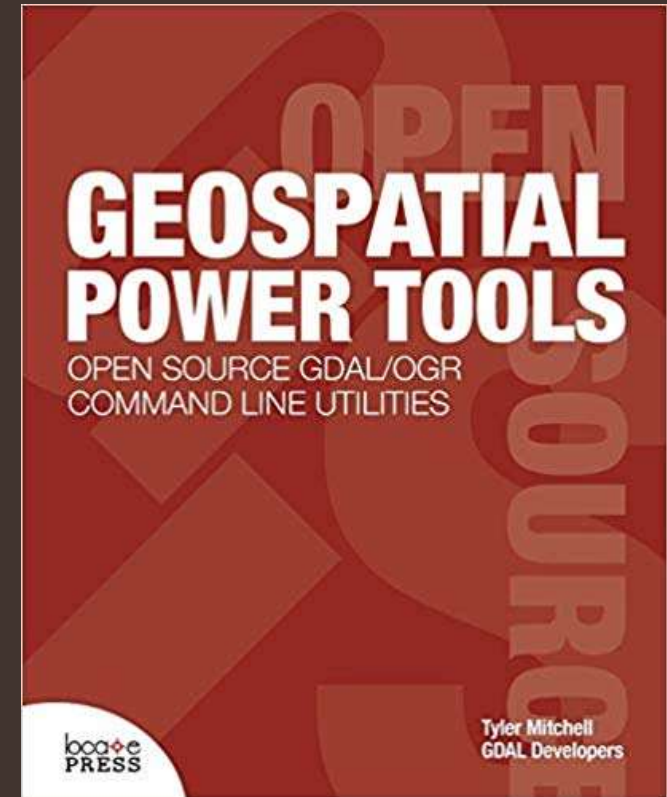
- “System for Automated Geoscientific Analyses”
- Ideal for statistically driven analyses for earth science applications...
 - Terrain analysis
 - Geostatistics
 - Hydrologic modeling
 - Image analysis and segmentation

Link to documentation... <http://www.saga-gis.org/en/index.html>

GDAL



- “Geographic Data Abstraction Library”
- Script-based interface – Tools and “flags” structure
- **OSGeo4W** – Python environment that functions like Windows CMD
- Ideal for large processing jobs, iterations, or batch scripting



Link to documentation... <https://gdal.org/programs/index.html>

What can you do with this Software?

Examples...

- Launch QGIS – Quick orientation
- DEMO – Process LiDAR data using Open Source GIS, and make available as tiled basemap imagery via the web

DEMO steps...

1. Build a “virtual raster” from a directory of images and generate terrain derivatives (GDAL)

ArcMap equivalent...

Mosaic to New Raster

DEMO steps...

1. Build a “virtual raster” from a directory of images and generate terrain derivatives (GDAL)
2. “Sieve” a raster to generalize noise (GDAL from within QGIS)

ArcMap equivalent...

No direct equivalent, but can be achieved similarly with a combo of...
Locate Regions + Region Grow Tools (Overlay toolset)

DEMO steps...

1. Build a “virtual raster” from a directory of images and generate terrain derivatives (GDAL)
2. “Sieve” a raster to generalize noise (GDAL from within QGIS)
3. “Flatten” a stack of imagery and vector data into a single tiff with QGIS Atlas Composer (QGIS)

ArcMap equivalent...

No direct equivalent, but can be achieved similarly with *Pansharpening* and *Data Drive Pages*

DEMO steps...

1. Build a “virtual raster” from a directory of images and generate terrain derivatives (GDAL)
2. “Sieve” a raster to generalize noise (GDAL from within QGIS)
3. “Flatten” a stack of imagery and vector data into a single tiff with QGIS Atlas Composer (QGIS)
4. Generate a tiled web map with GDAL2Tiles and Leaflet

ArcPro equivalent...

Generate Map Tile Package → AGOL

Leaflet



- Open source web mapping platform
- Based on Javascript
- Community of developers providing “plugins”

ESRI Leaflet API available...

A lightweight set of tools for ArcGIS Services with Leaflet

Link to Leaflet documentation... <https://leafletjs.com/reference-1.5.0.html>

Link to ESRI/Leaflet API documentation... <https://esri.github.io/esri-leaflet/>

Tile Server PHP



- Open source tile server for serving pre-rendered map tiles
- Uses Apache web server and PHP script language
- OGC WMTS compliant

Link to documentation... <https://github.com/klokantech/tileserver-php>

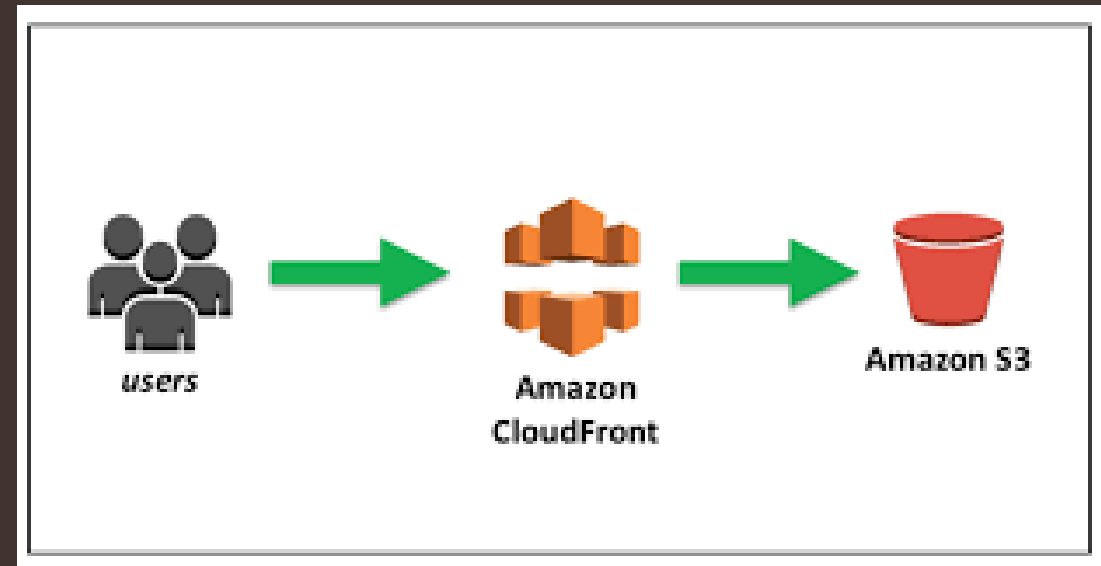
Application Soft Launch – Michigan LiDAR and Forest Viewer

- OGC Compliant (WMTS) Tiled County-wide LiDAR data (Hillshade and Canopy Height Layers) available for free!
- Add to ArcMap, ArcPRO, QGIS, whatever GIS you use.
- Include WMTS layers in your web maps.

Link to Individual WMTS datasets... <http://maptiles.cgwebmaps.com/>

Application Soft Launch – Michigan LiDAR and Forest Viewer

- Built with TileServer PHP, and hosted on Amazon Web Services...
- Location enabled for use in the field (Secure SSL/HTTPS)
- Ability to print maps to PDF



Michigan Forest Viewer AWS Configuration

Link to Michigan Forest Viewer... <https://forestviewer.cgwebmaps.com/>

Application Soft Launch – Michigan LiDAR and Forest Viewer

Future Goals...

- To expand data coverage to the entire state of Michigan (or beyond?)
- Cooperatively manage and develop as a **Free and Open Source Data** project (volunteers?)
- Need to secure minimal funding to sustain the server architecture (if interested in participating, let's talk!)

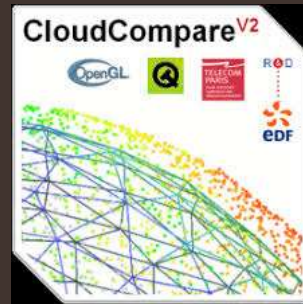
Link to Michigan Forest Viewer... <https://forestviewer.cgwebmaps.com/>

Questions?

Thank you

Extra Items

Cloud Compare



- Point cloud visualization and analysis software – Link to download and documentation... <https://www.danielgm.net/cc/>
- Useful for LiDAR and Photogrammetry applications - not just aerial, but ground-based, oblique, and large scale (small footprint) scenes.

Link to documentation... https://docs.qgis.org/3.4/en/docs/user_manual/

Red Relief Image Mapping with SAGA

- [Red Relief for a Japanese Volcano – ESRI's Maps We Love Gallery](#)

Positive Openness (O_p) vs. Negative Openness, (O_n)

