Open Source Software Solutions

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Overview

• Introduction to open source software
• Geospatial software options
• Open Source Geospatial Foundation (OSGeo)
• Popular server and desktop GIS and RS platforms
Open source software

• Open source software is software that has the source code freely available and is licensed so that it can be freely distributed and modified as long as appropriate credit is provided to the developers.

• The strength of an open source project comes from a strong community of users.

• Community members participate by providing programming help, writing documentation, and by providing feedback with regard to what works and what could be modified to improve the program.

• The opposite of “open source” is “proprietary” – there are several examples of successful commercial open source projects.
Open Source Initiative
http://www.opensource.org/

• Dedicated to managing and promoting the open source definition for the good of the community

• Provides resources to help select an appropriate open source software license

• Provides resources to better understand the advantages of using and supporting open source software
Open source geospatial software

- Open source geospatial software includes image processing, GIS, spatial databases, geodata servers

- These tools are available for desktop and server environments

- Applications that are lagging are map layout and printing, and deployment on portable platforms (ArcPad-like applications)

- Focus is shifting from developing code libraries to developing user interfaces to provide easy access to the capabilities offered by the robust set of open source libraries.
## OSGIS Software Stacks... Desktop

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<th>Generic Stack</th>
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## OSGIS Software Stacks... Server

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<tr>
<td>Client Side Browser</td>
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<td>Mapserver, MapGuide,</td>
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Why use open source software?

• Software (source code and executable) is available at no charge

• No need for license management

• Can be freely distributed and modified

• Often available in multiple languages and more can be added

• Support from the user community is typically very strong

• Paid professional support options are increasingly available
More reasons...

• Variety of platforms (UNIX, Linux, Windows, Mac OS) and file formats

• You can pick the best tool for the job

• Development and bug fixes often happen quickly

• Most projects conform to the OGC standards for interoperability
Some considerations

• There are costs (financial, learning, and compatibility) associated with introducing and learning new software.

• Documentation often lags behind software development.

• Deciding which software project(s) to embrace can be difficult especially since the project(s) viability must be guessed and your future needs must be factored in.

• Lack of write support for proprietary formats.

• Linking with proprietary systems is limited.
Is it “Free” or “Open Source”?  

• In the open source community “Free” is usually used as freedom and free speech not as free beer  

• Use of “free” supported by the Free Software movement which preceded the open source movement  

• A philosophical issue that often causes confusion  

• The terms “open source” and “free” are more or less the same (although diehard “free” folks don’t agree)
Open Source Geospatial Foundation

- Provide resources for foundation projects to cover infrastructure, legal issues, funding activities, promotion and more
- Promote the use of open source software in the geospatial industry
- Promote freely available geodata through the Public Geospatial Data Project
- Encourage the implementation of open standards and standards-based interoperability in foundation projects
- Provide support for the use of OSGeo software in education via curriculum development, outreach, and support
- Support the formation of local and language based chapters – there is an Africa chapter (http://wiki.osgeo.org/wiki/Africa_Local_Chapter)
OSGeo Software Projects

Web mapping
- degree
- MapBender
- MapBuilder
- MapFish
- MapGuide Open Source
- MapServer
- OpenLayers
- GeoServer
- Geomajas

Desktop applications
- GRASS
- gvSIG
- Quantum GIS

Geospatial Libraries
- GDAL/OGR
- GeoTools
- GEOS
- OSSIM
- GeoTools
- MetaCRS
- PostGIS
- FDO

Metadata Catalog
- GeoNetwork
Open Layers

• Allows one to easily put a dynamic map into a web page using their 20-second tutorial

• Can display map tiles and markers from any source

• Actively being developed

• Example HTML to insert a map:
  
  <iframe src="http://openlayers.org/viewer/"
  width="400px" height="200px"
  scrolling="no"
  marginwidth="0" marginheight="0"
  frameborder="0">
  </iframe>
GRASS

• Around since 1982 and is currently undergoing changes to make it more user friendly and more usable on Windows computers

• Raster (including voxel) and vector GIS, image processing, graphics production, and spatial modeling system

• Includes sophisticated processing algorithms and the ability to link with other open source software such as QGIS, Python, and R

• Translated into several languages

• Very active users group
GRASS: Geographic Resources Analysis Support System

Free Software GIS (‘software libero’):

- GRASS master Web site is in Italy:
  http://grass.itc.it

- Portable: Versions for GNU/Linux, MS-Windows, Mac OSX, SUN, etc

- Programming: Programmer's Manual on Web site (PDF, HTML), generated weekly. Code is documented in source code files (doxygen)

- Sample data

- Mailing lists in various languages

- Commercial support
What's GRASS GIS?

- Raster and 2D/3D topological vector GIS
- Voxel support (raster 3D volumes)
- Vector network analysis support
- Image processing system
- Visualization system
- DBMS integrated (SQL) with dbf, PostgreSQL, MySQL and sqlite drivers

- In GRASS 6.1 translations of the user interface to 16 languages ongoing
- Interoperability: supports all relevant raster and vector formats
Spatial Data Types

Supported Spatial Data Types

- 2D Raster data incl. image processing
- 3D Voxel data for volumetric data
- 2D/3D Vector data with topology
- Multidimensional points data

Orthophoto
Distances
Vector TIN
3D Vector buildings
Voxel

http://grass.itc.it
GRASS integration with QGIS

QGIS-GRASS plugin: Radim Blazek  http://qgis.org
Quantum GIS

• Run on Windows, Macintosh, and Linux/Unix

• Supports vector, raster, WMS, and database data

• Rapidly growing community of developers and users

• Initial focus on vector processing with raster overlay but GRASS functionality is being ported for raster processing

• Plug-in contributions are being developed to extend capabilities

• Developing an easy to use map layout features
gvSIG

• Developed using Java and runs on Windows, Mac OS X, and Linux

• Supports vector, raster, WMS, and database data

• Rapidly growing community of developers and users

• Developing a version for mobile devices

• Receiving support from the European Union

• Integrating advanced raster and vector functions
OSSIM

• High performance engine for remote sensing, image processing, GIS, and photogrammetry.

• Funded by several US Government agencies in intelligence and defense community

• Designed as a series of software libraries written in C++

• Includes a GUI called ImageLinker and virtual Earth called ossimPlanet

• Uses image processing chains that are effectively a series of processing steps that can be created, saved, and edited
GDAL / OGR

• Cross platform C++ translator library for raster and vector geospatial data formats

• Single geospatial data model for all formats

• The most widely used geospatial data access library - supports over 50 raster (GDAL) and over 20 vector (OGR) formats

• Plugin architecture and bindings for Python, Java, Perl, Ruby, R

• Utilities for:
  - Format translation
  - Spatial filtering
  - Attribute filtering
  - Reprojection/warping
  - Mosaicing
GeoTools

- Open source GIS toolkit using the latest Java tools and environments
- Modular architecture allows extra functionality to be easily incorporated
- Implements Open Geospatial Consortium (OGC) specifications as they are developed
- Uses the Java Topology Suite (JTS)
- Two rendering engines:
  - LiteRenderer – Stateless, low memory for server-side environments
  - J2D – Stateful renderer with optimization for update rate for client-side display
GeoNetwork opensource

- Catalog application to manage spatially referenced data and enable access to these data
- Provides metadata editing and search functions and the ability to publish these data via the Internet
- Developed to improve access to spatial by enhancing the exchange and sharing of data between organizations and their audience
- Supported by FAO, WFP, and UNEP
Search for Data and Information

Where
- Any -

Search box

What
Free Text

by Date
- Anytime
- Last month
- Last three
- Last six

Catalogue
- Any -

Map type
- Digital
- Hard copy

Hits per page
10

SHOW ADVANCED OPTIONS

SEARCH REMOTE (Z39.50)

Display maps (InterMap - interactive map viewer)

1. Choose a predefined map
- Landsat 7 Global Mosaic (pan sharpened)
- Landsat 7 Global Mosaic (not pan sharpened)
- Land Cover of the World in the Year 2000
- MODIS TERRA daily composite
- MODIS AQUA daily composite
- Soil Map of the World
- 1km elevation, seamless SRTM elevation

List of FAO's Web services

2. Create your own map composition
Base layers:
- Administrative boundaries
- Mayor Cities
- Roads of the World
- Rivers of the World
- Inland Water (perennial)
- Coastal Lines

Thematic layers:

Backdrop images:

CREATE
A few other open source geospatial desktop tools

- Moteverdi and Orfeo Toolbox (OTB)
- OpenEV
- uDig
- MapWindow
- Jump/OpenJUMP
- R
- ILWIS
OpenEV

- Image and vector viewer with a growing list of analysis and editing capabilities

- Runs on PC, Linux, and UNIX systems

- Reads and writes a wide variety of image format and data types including complex data

- Easily customized and extended using the Python programming language

- Most robust version is FWTools: http://fwtools.maptools.org/
uDig

- Based on Java so it runs on all computers that support Java
- Incorporates GeoTools
- Developed with a robust plug-in architecture
- Primarily aims to be a fully functional desktop GIS program but some image processing capabilities may be added in the future
MapWindow

- Windows only
- Professional support available
- Leverages ActiveX technology
- Recently released as open source and user base is growing rapidly
- Getting support from numerous US government grants
OpenJUMP

- Based on the JUMP program developed by Vivid Solutions
- Simple to use desktop GIS program for viewing and manipulating vector data sets
- Written in Java so it runs on Windows, MacOSX, Linux, and various UNIX systems
- Supports Open GIS standards
- Can access Web Map Server (WMS) data
R

• R is an integrated suite of software facilities for data manipulation, calculation and graphical display

• Recent development of packages that facilitate processing of image and vector data

• Provides sophisticated algorithms for working with spatial data

• Works on all major operating systems

• Convenient system for updating the core program and packages
R version 2.9.0 (2009-04-17)
Copyright (C) 2009 The R Foundation for Statistical Computing
ISBN 3-900051-07-0

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and 'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or 'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

>
How can you join in the fun?

• Go to the OSGeo website (http://osgeo.org) and find a project of interest

• Download some of the software packages and explore their capacities and limitations

• Join or browse on-line discussions (IRC chat, email list servers, forums) to see what people are talking about

• Get actively involved with a project – you can have a significant impact
Closing thoughts

• Open source software is an important component of the principals of the Creative Commons – improve access while guarding intellectual property rights

• There is a big difference between making data available and making it accessible – open source is all about access!

• Open source software is ideal for developing and sharing (with everyone) algorithms, models, and application tool-sets to consider the broad community