Analytical and Computer Cartography Winter 2017

Lecture 10:
Open Source Computer Cartography

Open Source Computer Cartography

- Why bother?
- OSF vs. FSF
- The Cathedral and the Bazaar
- Open Source GIS
- Some examples
- What the bazaar offers
- The future

Software vs. data

Mother of All Freeware

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(f) download any file posted by another that you know, or reasonably should know, cannot be legally distributed in such manner;

(g) impersonate another person or entity, or falsify or delete any author attributions or proprietary designations or labels of the origin or source of Content, software or other material;

(h) restrict or inhibit any other user from using and enjoying the Products or Google services;

(i) interfere with or disrupt Google services or servers or networks connected to Google services, or disobey any requirements, procedures, policies or regulations of networks connected to Google services;

(j) use any robot, spider, site search/retrieval application, or other device to retrieve or index any portion of the Google services or Content, or collect information about users for any unauthorized purpose;

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Software as a spectrum
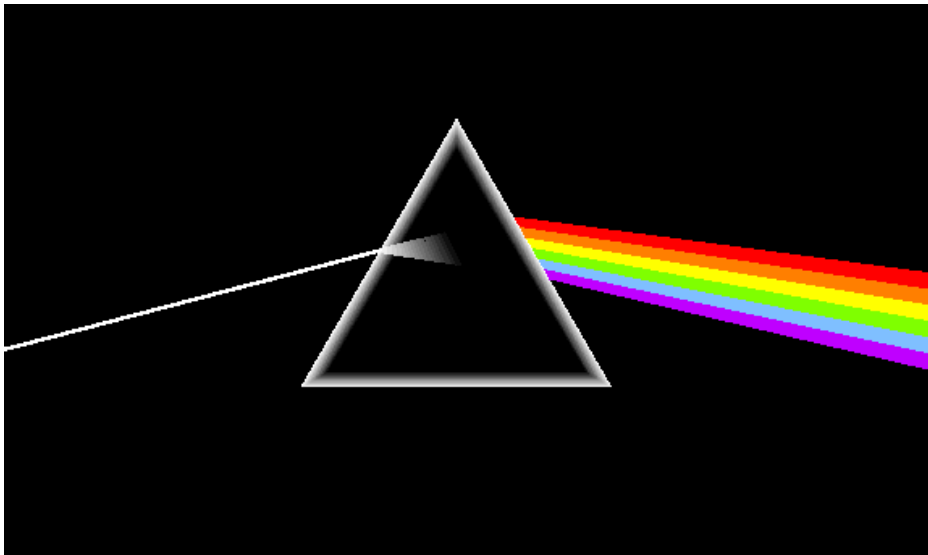
Proprietary

Freeware

Open source

What is Open Source?

Open Source Initiative

1. Free Redistribution

2. Source Code

3. Derived Works

4. Integrity of The Author's Source Code

5. No Discrimination Against Persons or Groups

6. No Discrimination Against Fields of Endeavor

7. Distribution of License

8. License Must Not Be Specific to a Product

9. License Must Not Restrict Other Software

10. License Must Be Technology-Neutral

OSI vs. FSF

The term "open source" software is used by some people to mean more or less the same category as free software. It is not exactly the same class of software: they accept some licenses that we consider too restrictive, and there are free software licenses they have not accepted. However, the differences in extension of the category are small: nearly all free software is open source, and nearly all open source software is free.

– Free Software Foundation, http://www.gnu.org/philosophy/categories.html

The nice thing about standards

39 Open Source License types

40 Types in Free Software Community

Examples: Academic Free License, Common Public License, GNU General Public License, Zope Public License

Other standards: e.g. Copyleft, Media Commons, Wiki, creative commons

WIKIMEDIA COMMONS

GNU Operating System
Sponsored by the *Free Software Foundation*
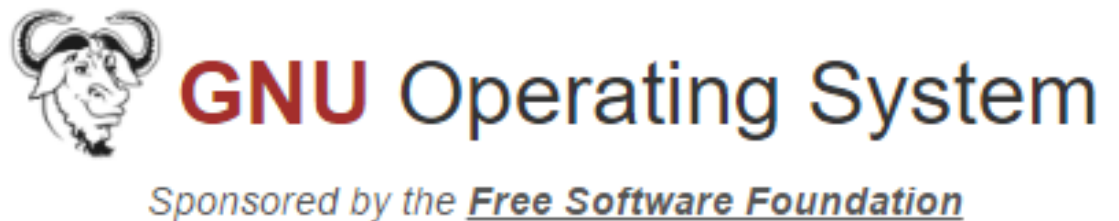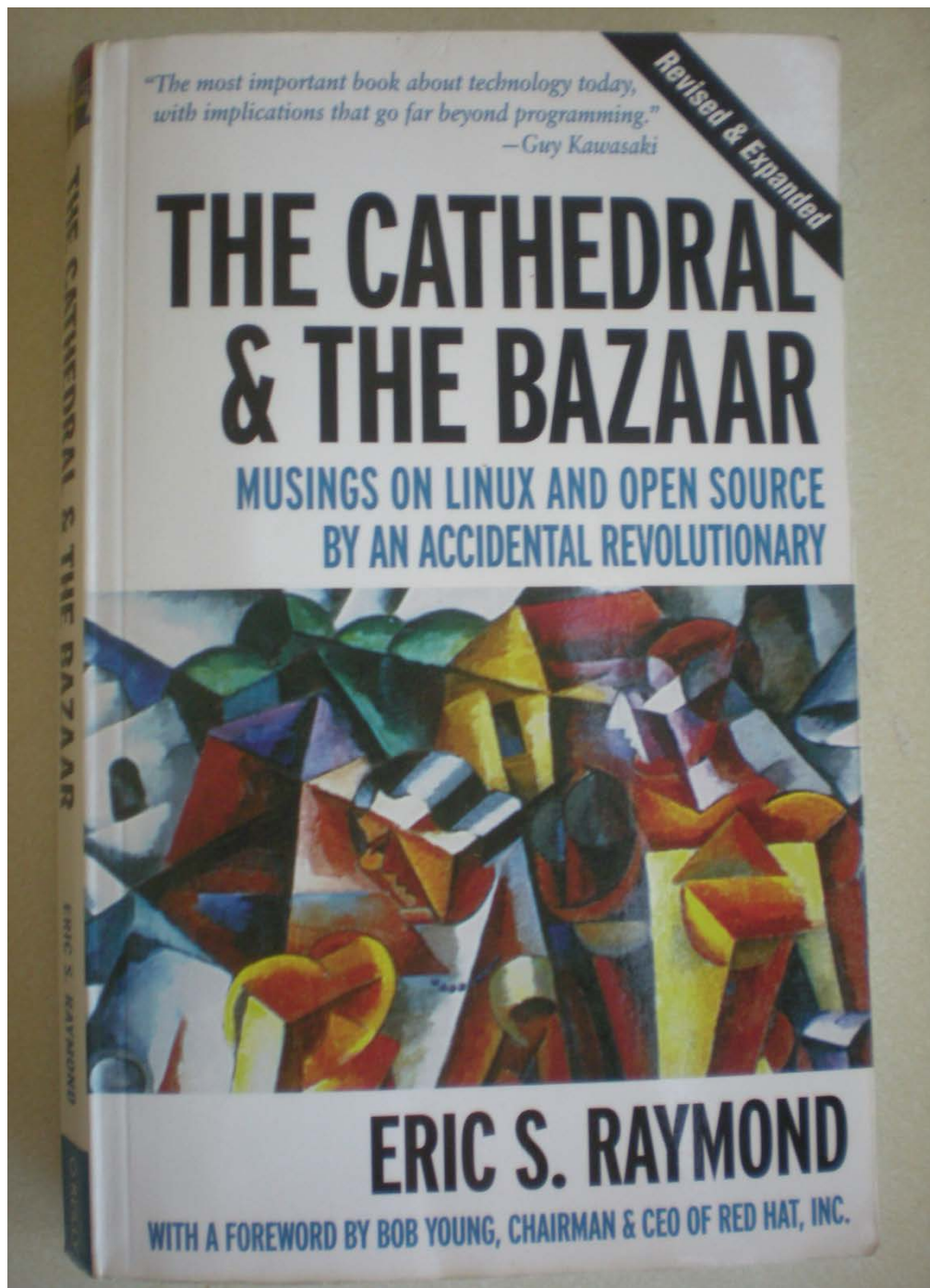
First edition 1999
Web essays included the "*Cathedral and the Bazaar*" and "*Revenge of the Hackers*" dating back to 80s
Compares 'cathedral' top-down model of software development to 'bazaar' model represented by Linux

The Cathedral

- Central planning and design
- Takes years to build
- Divide and conquer approach
- Code for wages
- "Customer driven"
- Feature and version approach
- Teams and internal competition

The Bazaar

- Little planning at all
- Change is instantaneous
- Competition and cooperation
- Code for bragging rights
- Customers and shopkeepers
- Whatever works best

"Given enough eyeballs, all bugs are shallow."
Linus' Law

Open Source GIS

- Basis in standards: OGC critical, but others e.g. GeoVRML, X11

- Includes code level tools, scripts, libraries, and utilities

- Clearinghouses for information: e.g. opensource.org

- Support fora, wikis, lists, etc

- Whole GIS systems e.g. GRASS, QGIS

- Whole web-based support systems e.g. MapServer

Have an Idea?   INSPIRE   You Tube What is the OGC?

OGC®

Making location count.

| Home | Standards ▼ | Programs ▼ | Participate ▼ | News & Events ▼ | About OGC ▼ | Member Login | Search |

Geospatial and location standards for:

Aviation

Built Environment & 3D

Business Intelligence

Defense & Intelligence

Emergency Response &
Disaster Management

Geosciences & Environment

Government &
Spatial Data Infrastructure

Earth Observation

Analysis   BIM   Proximity
Navigation   Open Source   Global

Crowdsourcing   CAD   GIS

Spatial Policy   Open   Points of Interest
Place

Where   Sensor Web   Linked Data

Monitoring   Location   hydrology
Geoweb

Map   Interoperability

Share   Open Data   Geosemantics

Information Integration   Time   Planning   Shared Understanding

Geosynchronization   SDI   Indoor/Outdoor

Climate   GPS   Metadata

Data Quality   Situational Awareness

Windows Start | 8:58 AM 2/14/2013

Sample code libraries

cgal.org: CGAL Open Source Project to provide easy access to efficient and reliable geometric algorithms in the form of a C++ library

OGR: Simple features library, C++ open source library (and commandline tools) providing R/W access to vector file formats

GEOS: Geometry Engine - Open Source, C++ port of the Java Topology Suite (JTS)

GTK: graphics Toolkit, with UI, libraries etc

OpenGL, OpenCV: C and C++ libraries

CGAL

Shapelib: C library

Shapefile C Library

Purpose

The Shapefile C Library provides the ability to write simple C programs for reading, writing and updating (to a limited extent) ESRI Shapefiles, and the associated attribute file (.dbf).

Supporting Information

- Shapefile API Docs
- DBF/xBase API Docs
- Shapefile Tools Docs
- Release Notes
- Shapelib File Manifest
- Shapelib Licensing Terms

What is a Shapefile?

If you don't know, you probably don't need this library. The Shapefile format is a working and interchange format promulagated by ESRI for simple vector data with attributes.

An excellent white paper on the shapefile format is available from ESRI, but it is .pdf format, so you will need Adobe Acrobat to browse it.

The file format actually consists of three files.

```
XXX.shp - holds the actual vertices.
XXX.shx - hold index data pointing to the structures in the .shp file.
XXX.dbf - holds the attributes in xBase (dBase) format.
```

Download

Source code, and some other odds and ends can be downloaded from http://download.osgeo.org/shapelib.

Shapelib is available for anonymous CVS access:

```
cvs -d :pserver:cvsanon@cvs.maptools.org:/cvs/maptools/cvsroot login
Password: (hit enter)
cvs -d :pserver:cvsanon@cvs.maptools.org:/cvs/maptools/cvsroot co shapelib
```
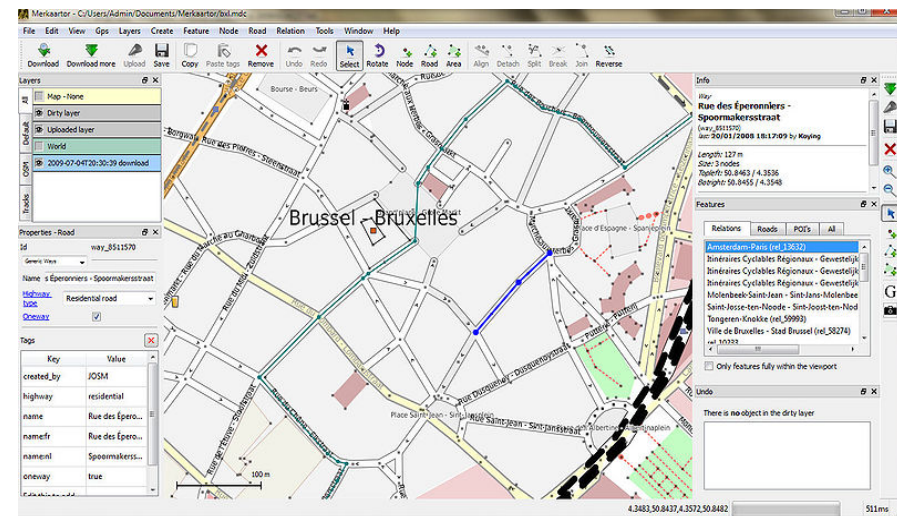
Sample software tools

TARDEM, A suite of programs for the Analysis of Digital Elevation Data

Merkaartor is an OpenStreetMap editor distributed under the GNU General Public License

Worldwind: browser tool for geospatial data

Sample freeware

FlexProjector: Java

MapShaper:Java tools using shapelib

LandSerf: Java

MicroCAM

MicroDEM

Many open versions of common packages, e.g. ArcGISOnline, LAStools, etc: Payment unlocks parts of code unavailable to simple download

Often make student version free

Open Source Tools Clearinghouses

http://opensourcegis.org/

http://freegis.org/

http://en.wikipedia.org/wiki/List_of_geographic_information_systems_software

http://www.geotools.org/ (Java libraries)

http://mapnik.org/

http://mapguide.osgeo.org/

www.mapserver.org

Open Source GIS

QGIS	Quantum GIS–QGIS is a user friendly Open Source GIS that runs on Linux, Unix, Mac OS X, and Windows.	http://www.qgis.org/
MapWindow GIS	Free, open source GIS desktop application and programming component.	http://www.mapwindow.org/
ILWIS	Integrated Land and Water Information System. Integrates image, vector and thematic data.	http://www.itc.nl/ilwis/
uDig	uDig is an open source desktop application framework, built with Eclipse Rich Client technology.	http://udig.refractions.net/
JUMP GIS / OpenJUMP–(O	Java Unified Mapping Platform. OpenJUMP, SkyJUMP, deeJUMP, and Kosmo emerged from JUMP.	http://www.jump-project.org/
Capaware rc1 0.1	General purpose virtual worlds 3D viewer. A free software project started in 2007 to promote the development of free so	http://www.capaware.org/
Kalypso	An Open Source GIS (Java, GML3) that focuses on water management. Supports modeling and simulation.	http://www.ohloh.net/p/kalypso
TerraView	Desktop GIS that handles vector and raster data stored in a relational or geo-relational database, a frontend for TerraLib.	http://www.dpi.inpe.br/terraview/index.php
GeoServer	GeoServer is an open source software server written in Java that allows users to share and edit geospatial data. Desig	http://geoserver.org/display/GEOS/Welcome
WebMap Server	Open source protocol and tools for serving GIS data over the Internet.	http://terraserver-usa.com/ogcwms.aspx
MapGuide Open Source	Web-based platform that enables users to quickly develop and deploy web mapping applications and geospatial web se	http://mapguide.osgeo.org/
MapServer	Web-based mapping server, developed by the University of Minnesota.	http://mapserver.org/
PostGIS	Spatial extensions for the open source PostgreSQL database, allowing geospatial queries.	http://postgis.refractions.net/
H2Spatial for	Spatial extension for an open source DBMS H2_(DBMS).	http://geosysin.iict.ch/irstv-trac/wiki/H2spatial/Download
SpatialLite for SQLite	SpatiaLite extension enables SQLite to support spatial data in a way conformant to OpenGis specifications.	http://www.gaia-gis.it/spatialite-2.0/index.html
MySQL Spatial	MySQL spatial extensions following the specification of the Open Geospatial Consortium.	http://dev.mysql.com/doc/refman/5.0/en/spatial-extensions.html

For example: uDig

For example: Quantum GIS

Graphics editors

GIMP2.0: Raster editor, filters etc. Versatile read/write capability

InkScape: vectors tools with support for SVG

SVG: Scalable Vector Graphics
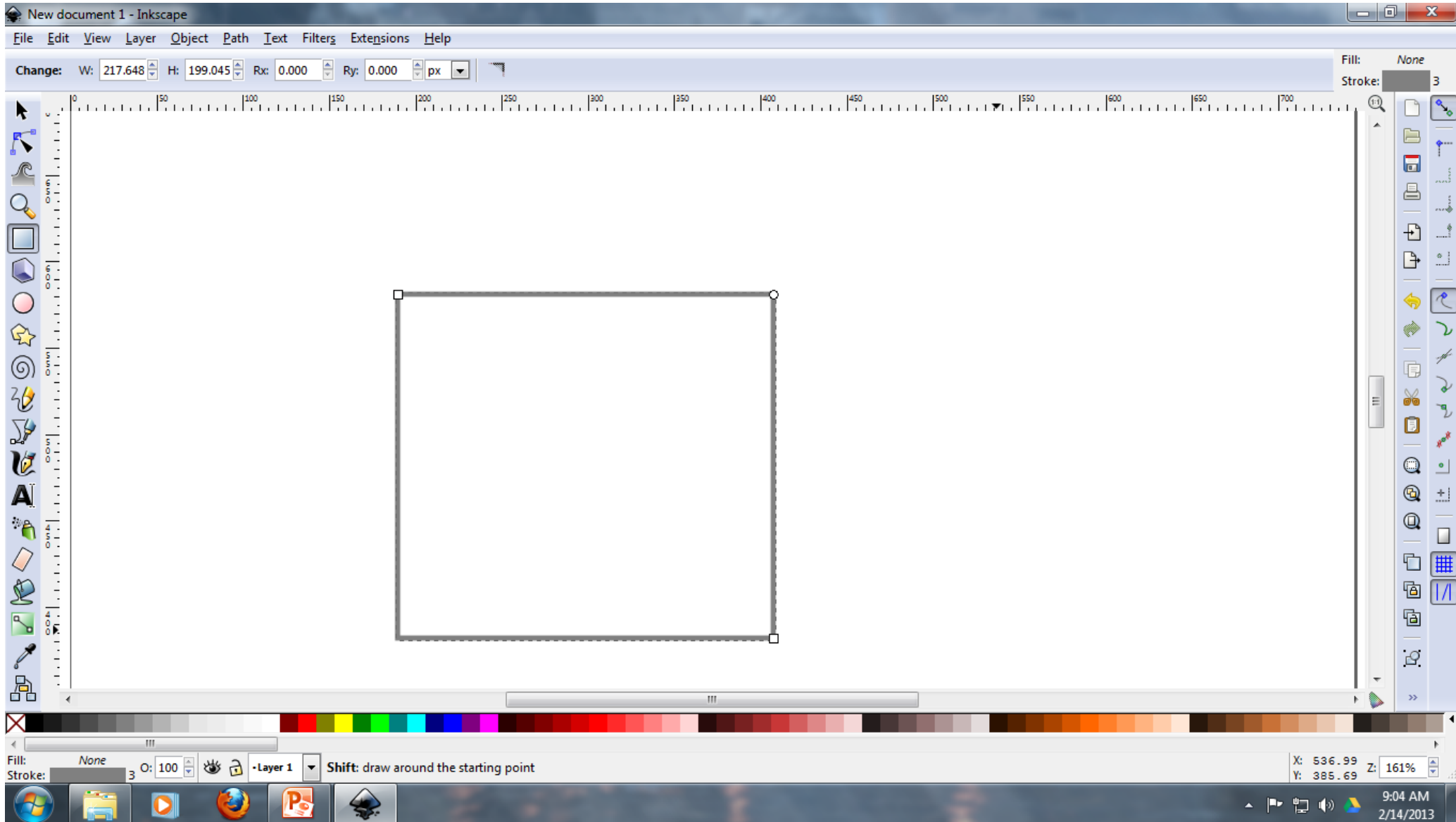
XML standard to allow multiscale feature redraw

Simple specification, but large files

A square in Inkscape

square.svg: Open file in Firefox
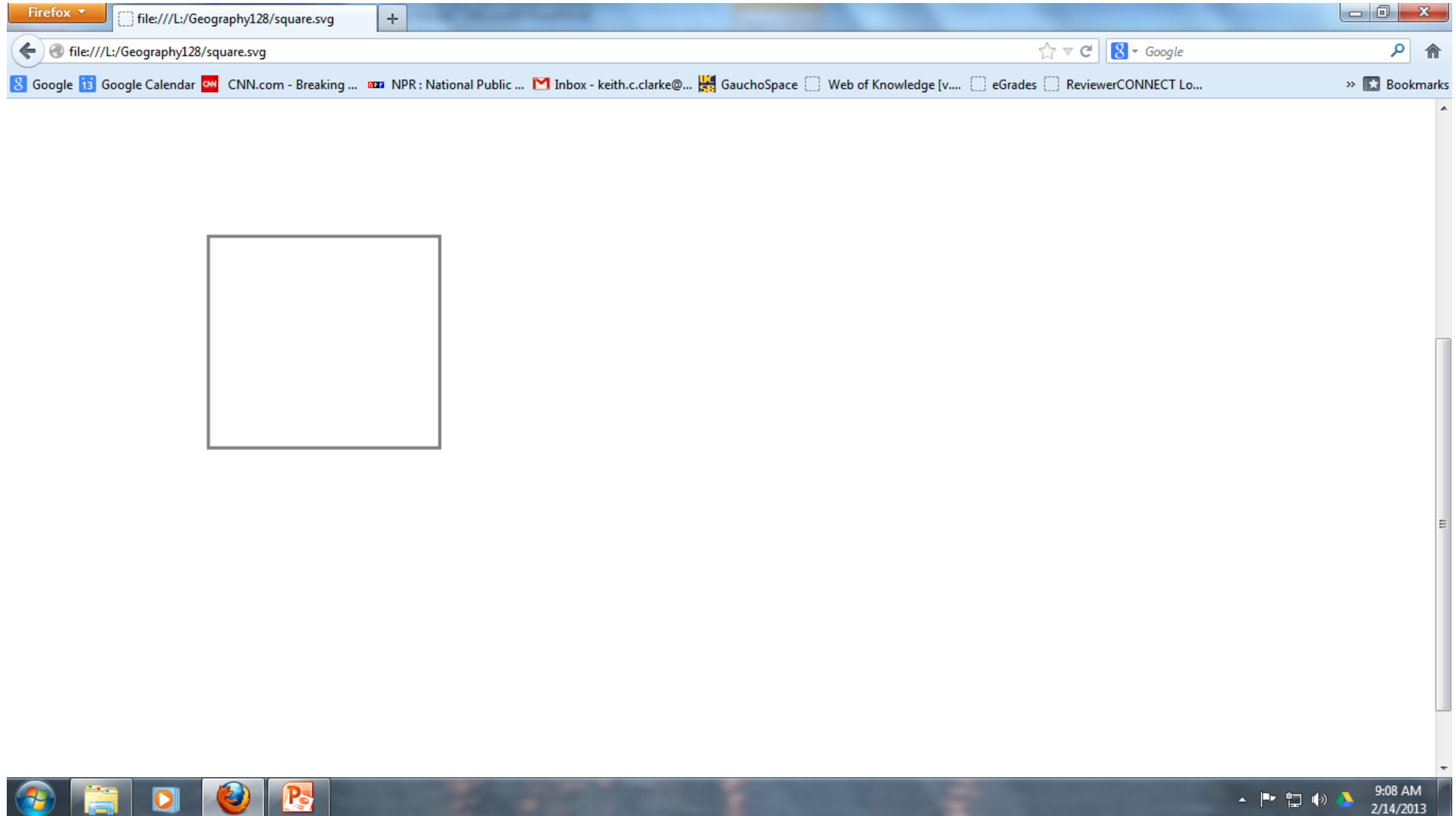
File header metadata

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!-- Created with Inkscape (http://www.inkscape.org/) -->
<svg
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:cc="http://creativecommons.org/ns#"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:svg="http://www.w3.org/2000/svg"
    xmlns="http://www.w3.org/2000/svg"
```

Page and document description

xmlns:sodipodi="http://sodipodi.sourceforge.net/DTD/sodipodi-0.dtd"

xmlns:inkscape="http://www.inkscape.org/namespaces/inkscape"

width="744.09448819"

height="1052.3622047"

id="svg2"

version="1.1"

inkscape:version="0.48.4 r9939"

sodipodi:docname="New document 1">

Draw description

```
<rect

    style="fill:none;stroke:#808080;stroke-width:3;stroke-
    miterlimit:4;stroke-dasharray:none;stroke-dashoffset:0"

    id="rect2985"

    width="217.64763"

    height="199.04527"

    x="189.74409"

    y="471.34842" />
 </g>
</svg>
```

Cathedral & the Bazaar: Why?

- Release early and often vs. Versioning

- Delegate everything vs. Control everything

- Restrict nothing vs. License everything

- Copy and reuse vs. Stovepipe

- Interest rises and falls vs. Discontinued products

- Open algorithms vs. Proprietary solutions

- Toolboxes, libraries, code vs. Object modules and documentation

- Bug-free vs. Buggy

The Future

- Large software companies relying more on Open Source, microprojects abound!

- Price will converge on zero, Quality/Quantity should increase

- No more dongles or license servers

- Cyberinfrastructure, geoservices, mashups

- New social infrastructure and reward model

- Client server model to cloud and web model

- Geography can move on to spatial knowledge and learning

- Programming (and scripting) will be much more central

Summary

- Defined open source, freeware, etc

- Software as a spectrum

- The cathedral and the bazaar

- GIS, mapping software

- GIS, mapping toolkits and resources

- Advantages of OS

- Examples of Inkscape, GIMP, SVG

- The future of OS