


Existing Open Source Tools and Possibilities for Cadastre Systems

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What is FLOSS? What is open source?

What open source software tools are available? Which ones are useful in Cadastre Systems?

Are they any good?

What is FLOSS

FLOSS stands for Free / Libre and Open Source Software. FLOSS is a combination of two movements:

Free Software Foundation

Software that can be used, copied, studied, modified and redistributed without restriction

Open Source Initiative

Software in which the source code is available for modification and redistribution by the general public

What is source code

```
for(int i=bitSet.nextSetBit(0); i>=0; i=bitSet.nextSetBit(i+1)) {
    statusMessage = "Procesando registro " + i;
    IGeometry g;
    g = inputLayer.getSource().getShape(i);
    Geometry jtsG = g.toJTSGeometry();
    Coordinate[] coords = jtsG.getCoordinates();
    if (jtsG.isEmpty())
        continue;
    Coordinate[] linePts =
        CoordinateArrays.removeRepeatedPoints(coords);
    Coordinate startPt = linePts[0];
    Coordinate endPt = linePts[linePts.length - 1];
    NodeError nStart = (NodeError) nodeMap.find(startPt);
    NodeError nEnd = (NodeError) nodeMap.find(endPt);
    if (nStart == null)
    {
        nStart = new NodeError(startPt);
        nodeMap.add(nStart);
    }
    else
        nStart.setOccurrences(nStart.getOccurrences()+1);
    if (nEnd == null)
    {
        nEnd = new NodeError(endPt);
        nodeMap.add(nEnd);
    }
    else
        nEnd.setOccurrences(nEnd.getOccurrences()+1);
}
```

Source code

COMPILE

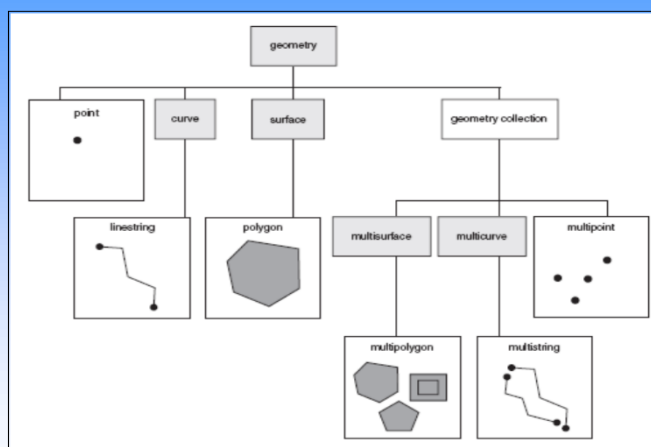
```
10011001 00011101 01001100
11000101 01001101 11100101
11010111 01100011 00011000
10010010 01110100 11011100
11101100 01110100 11011001
00010100 11011011 00101000
11011011 00100010 01000110
10101000 11011100 11011001
10011010 10001000 10001111
10101110 10001110 10111011
```

Binaries (machine code)

The FLOSS world

- OSS repositories: Sourceforge.net, Freshmeat, Savannah and many others
- 52° North Initiative hosts geospatial open source projects
- OSGEO supports and promotes the development of open source geospatial technology and organizes FOSS4G conferences
- OGC is setting standards for interoperability of geospatial information

OGC Simple Feature Specification



OGC interoperability standards

- Web Map Service (WMS)
- Web Feature Service (WFS)
- Transactional Web Feature Service (WFS-T)

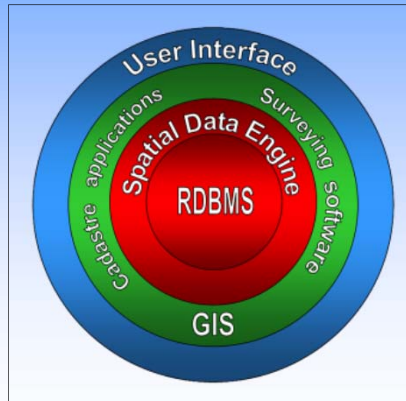
Digital Land Administration Systems

There are many variations resulting from different laws and practices in land administration

Most land administration systems use relational database software with spatial data engines to store the data; GIS software; and cadastral and surveying applications

All software components must be customized and adapted to fit legal requirements, there are no out of the box solutions

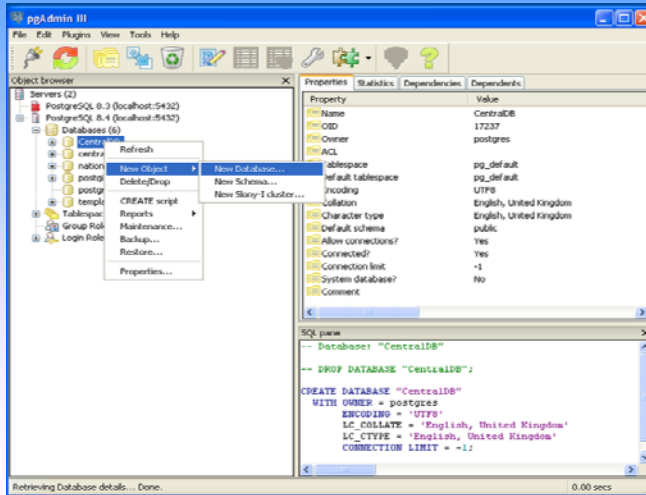
Software components in cadastre systems



FLOSS database alternatives

- Database technology is used to store, maintain and control access to large amounts of data
- Large differences in table design, queries, reporting functions and system architecture, but the underlying technology is the same
- Oracle with Oracle Spatial is the most common repository for digital cadastral systems
- FLOSS alternatives exist: PostgreSQL / PostGIS
MySQL, SQLite / SpatiaLite

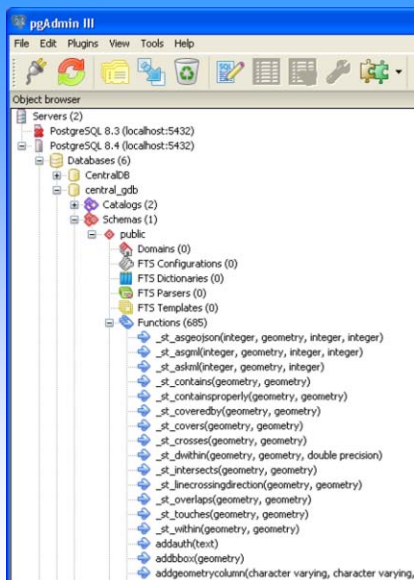
PostgreSQL



Mature and reliable open source database software

PostgreSQL has become the standard spatial database for open source GIS tools

PostgreSQL is not more difficult to install and use than proprietary database software



PostGIS

PostGIS adds spatial functions to PostgreSQL such as Intersects(), Overlaps(), Within()

With PostGIS, you can store and manage geographic datasets in PostgreSQL

Convert to Shapefile

Convert to PostGIS (gvSIG or Kosmo)

gid	parcel_no	entry_dt	shape_len	shape_area	the_geom
integer	text	text	double precision	double precision	geometry
1	08012201-0802	2004-05-17	28.756294	37.305616	010600002088790000010
2	08012201-0797	2004-05-17	111.135883	794.818257	010600002088790000010
3	08012201-0447	2004-05-17	245.716431	1647.056378	010600002088790000010
4	08012201-0799	2004-05-18	179.339591	1453.25135	010600002088790000010
5	08012201-0810	2004-05-18	76.672666	354.857153	010600002088790000010
6	08012201-0813	2004-05-18	83.799612	458.217331	010600002088790000010
7	08012201-0812	2004-05-18	93.569616	399.682088	010600002088790000010
8	08012201-0811	2004-05-18	91.618952	289.609403	010600002088790000010
9	08012201-0814	2004-05-18	110.42916	763.043069	010600002088790000010
10	08012201-0815	2004-05-18	212.6369	1575.384137	010600002088790000010
11	08012201-0809	2004-05-18	89.612558	441.81172	010600002088790000010
12	08012201-0818	2004-05-18	86.446653	931.960081	010600002088790000010
13	08012201-0816	2004-05-18	62.66657	190.056817	010600002088790000010
14	08012201-0564	2004-05-17	153.199806	640.309622	010600002088790000010
15	08012201-0443	2004-05-17	236.943704	326.998023	010600002088790000010
16	08012201-0442	2004-05-17	240.25891	796.48077	010600002088790000010
17	08012201-0440	2004-05-17	143.284703	1138.638636	010600002088790000010
18	08012201-0441	2004-05-17	179.100128	1517.887578	010600002088790000010
19	08012201-0439	2004-05-17	239.885798	381.416432	010600002088790000010
20	08012201-0429	2004-05-17	149.399922	521.943261	010600002088790000010

OK. Lnk: Ln 1 Col 66 Ch 66 911 rows 359 ms

An easy way to convert your GIS data to PostGIS format is by converting it first to Shapefile, and then to PostGIS

Add layer

File | GeoDB | WCS | WMS | ArcIMS | WFS | Annotation

Choose connection
[C:] gvSIGconnect (PostGIS JDBC Driver)

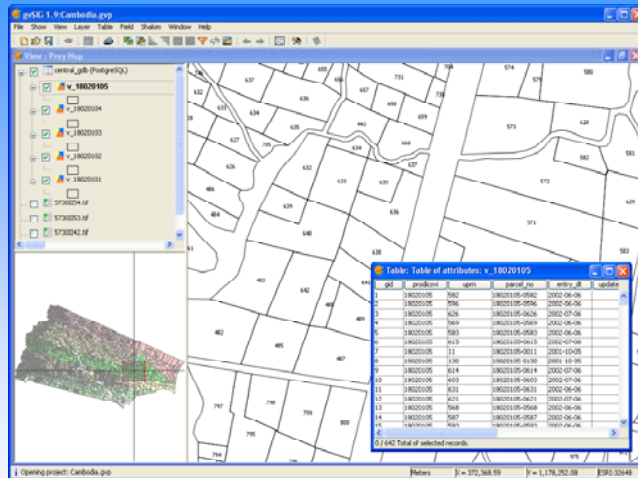
Choose table
public.mapsheetpoint
public.spatial_ref_sys
public.v_08012201
public.v_08012202
public.v_08012203
public.v_08012204
public.v_08012205
public.v_08012206
public.v_18020101
public.v_18020102

Table fields
gid [int4]
prodicovi [text]
uprn [int4]
parcel_no [text]
entry_dt [text]
update_dt [text]
history_dt [text]
status [int4]

Specify layer settings
Layer name: v_08012201 Current projection: ESRI:32648
ID field: gid Geometry field: the_geom
SQL restriction:
Working area:
Maximum Y: Minimum Y: Maximum X: Minimum X:
Get view

OK Cancel

Most open source desktop GIS can connect directly to PostGIS ...



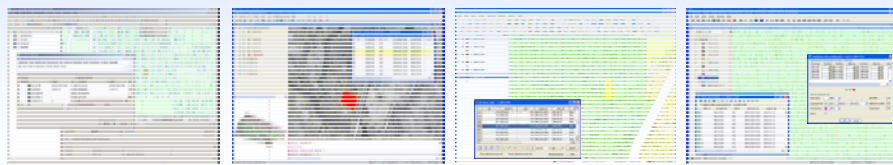
... and edit geographic data that is stored in PostgreSQL

Open source desktop GIS

Recent developments have lead to a number of free open source desktop GIS

All are user-friendly and easy to download and install, and come with raster and vector support, direct connection to PostgreSQL, topology validation tools.

Interface translations are available in a number of languages, and if your language isn't there, you can always start a new translation

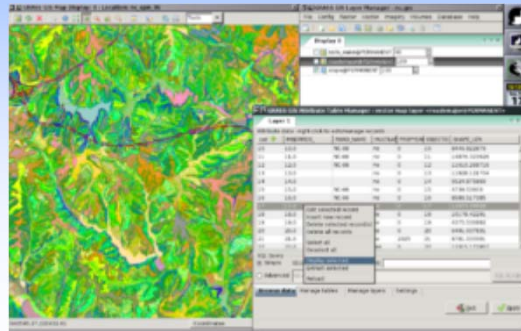


GRASS

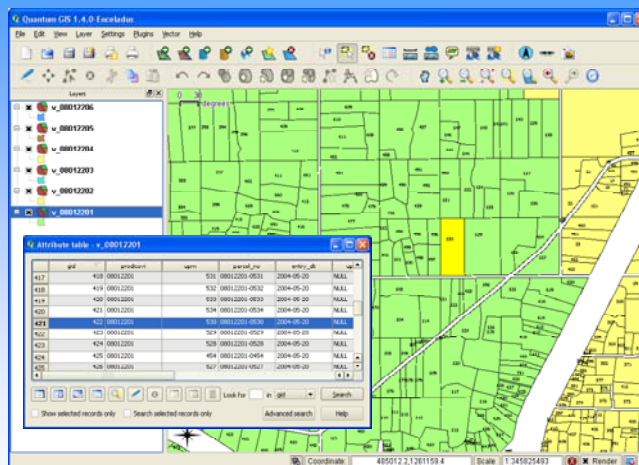
First open source GIS; development started in 1982

From command-driven, UNIX based raster GIS to a comprehensive, flexible and user-friendly GIS

Latest version (6.4) runs also on Windows

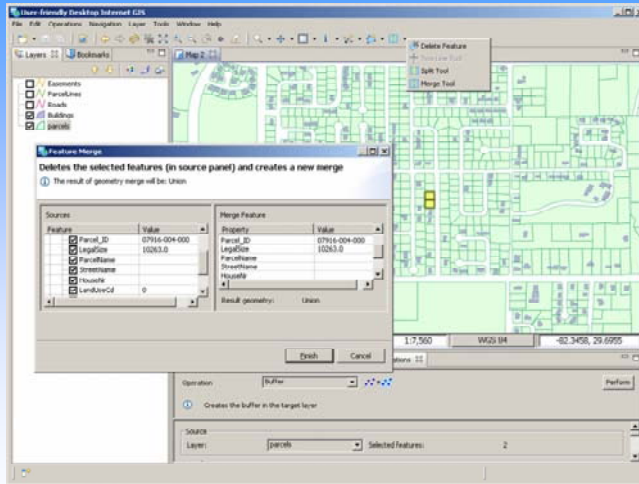


Quantum GIS



Quantum GIS was initially developed as a light-weight front end to GRASS, but is now a very functional desktop GIS on its own with connections to PostGIS, MySQL and SpatialLite. The latest version 1.4 (Enceladus) has 30 (!) new functionalities

uDIG

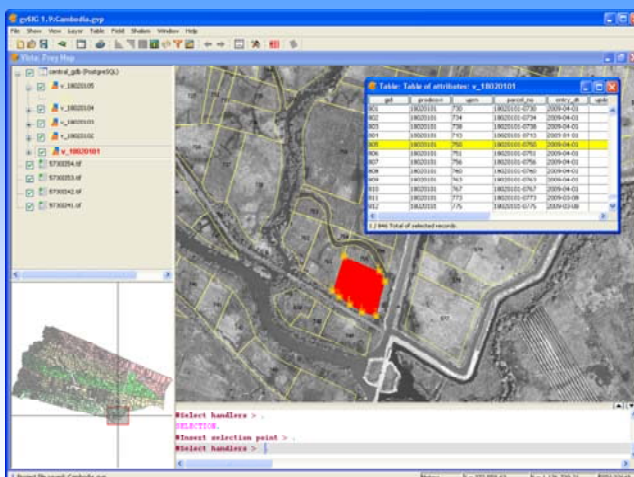


Development started by Refrations Research in 2004

Advanced editing and spatial analysis tools through the Axios plugin

Complete integration with OGC Web services; supports editing of WFS layers from GeoServer through WFS-T

gvSIG



Comprehensive raster and vector support

Easy to configure "locator map" to see where you are in your dataset

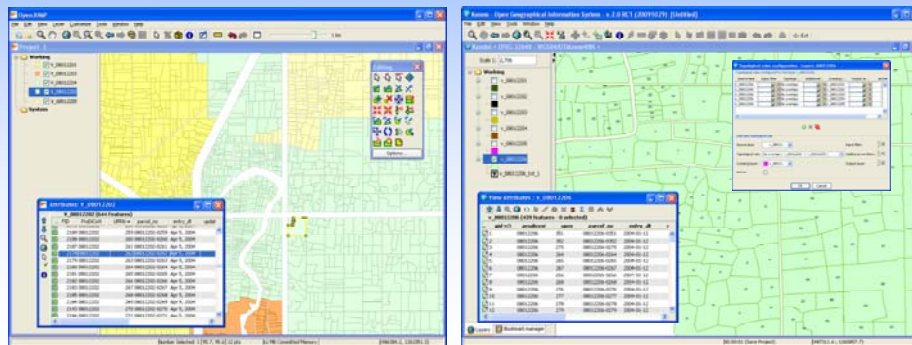
Very active user and developer community

Mobile version available: gvSIG Mobile

OpenJUMP and Kosmo

Same code base: Kosmo was forked from OpenJUMP in 2005

Both have many editing functions; good topology tools



Mobile GIS – gvSIG Mobile

gvSIG Mobile is a smaller version of gvSIG that can be installed on mobile devices.

Supports raster (TIFF, JPEG, PNG etc.) and vector (Shapefile) formats

Access remote WMS layers

Connect to GPS, measure areas and distances

Create points, lines and polygons





Mobile GIS - BeeGIS

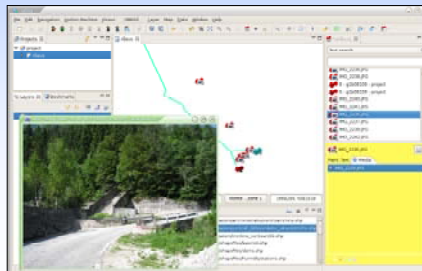
BeeGIS is developed as an extension to uDIG

Designed for tablet PCs and mobile PCs

Connect to GPS; data logging

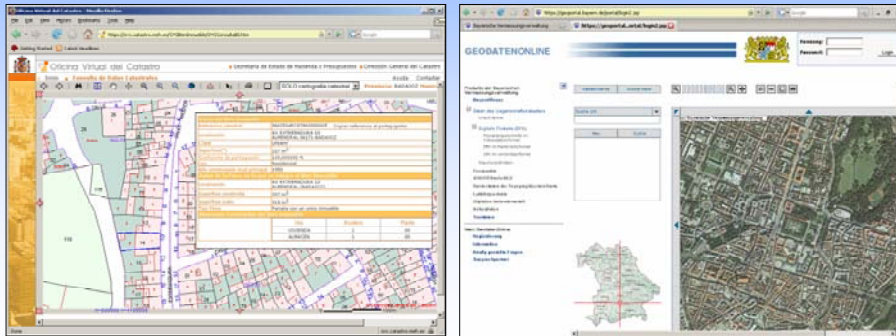
Create points, lines and polygons

Store Geonotes and pictures

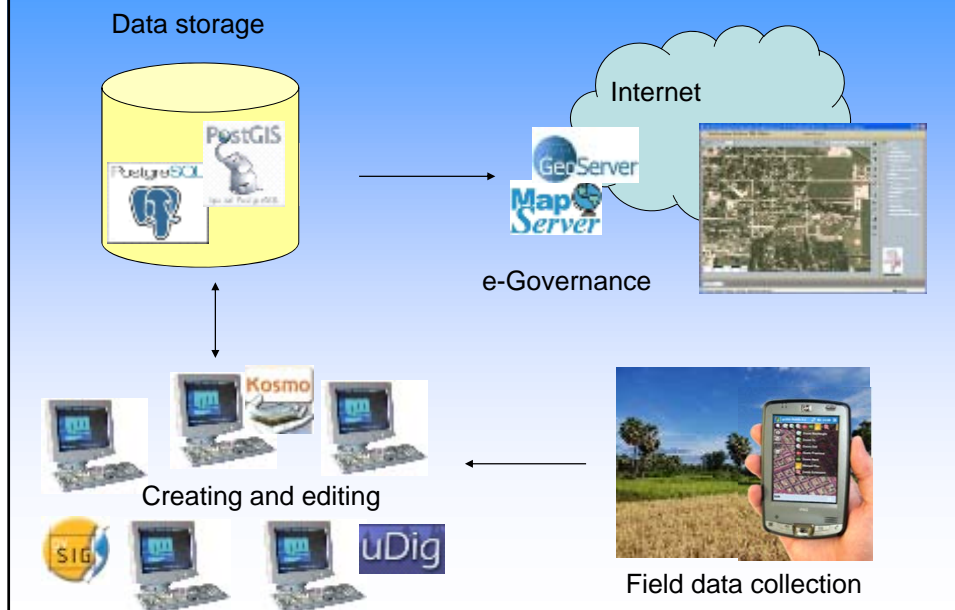


Internet mapping tools

GeoServer, MapServer and Deegree are open source map server products focusing on internet mapping applications using OGC webGIS standards.



The role that FLOSS can play



But...

- Introduction of IT systems must be carefully planned and budgeted
- IT expertise is needed to set up and maintain systems
- Cost of maintenance must be taken into account

The use of FLOSS can be successful in places where:

- The government adopts a pro-FLOSS policy and include FLOSS as part of the national IT strategy
- The use of FLOSS in schools and universities is supported by the government
- Local IT companies are using FLOSS to implement IT systems

