

Importance of Linux for Open-Source Quantum Geographic Information Systems (QGIS) Software

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Abstract - The successful examples of systems software such as Linux has been substantial interest by policy makers and researchers on the dynamics of the production of open-source software. A topic of particular interest is the adoption of open-source software systems in developing nations, as a means of reducing licensing costs and of promoting indigenous technological development by having access to the source code of these systems. The importance of rapid development and research work of open-source software for QGIS software is taking essential for open source systems software like Linux. The excellent research work for software development for QGIS is a software for online working software for GIS. A Geographic Information System (GIS) represent a systematic integration of computer hardware, software, data and procedures designed to support the data capture, storage, management, updating, manipulation, analysis, and display of spatial data. More simply, a GIS is a system that provides the ability to work with information that is referenced to the surface of the earth. Quantum GIS (QGIS) is a user friendly Open Source Geographic Information System (GIS) that runs on Linux, Unix, Mac OSX, and Windows. GRASS stands for Geographic Resources Analysis Support System for QGIS. Commonly referred to as GRASS, this is a Geographic Information System (GIS) used for geospatial data management and analysis, image processing, graphics/maps production, spatial modeling, and visualization. GRASS is currently used in academic and commercial settings around the world, as well as by many governmental agencies and environmental consulting companies. It is the most complete free GIS application available. In this paper gives the importance open-source, license free software and the method & code of installations of QGIS working with the operating system Ubuntu 12.04 LTS is Linux flavor. This paper explain the QGIS installation and manage using Ubuntu is more features than that of Windows.

Keywords - *GIS, QGIS, GRASS, Ubuntu 12.04, Spatial Data, Open-Source, License Free.*

1. Introduction

A Geographic Information System (GIS) represent a systematic integration of computer hardware, software, data and procedures designed to support the data capture, storage, management, updating, manipulation, analysis, and display of spatial data. More simply, a GIS is a system that provides the ability to work with information that is referenced to the surface of the earth.

2. Geographic Information System (GIS)

This often involves the use of a geographic coordinate, like a latitude or longitude value. Spatial data is another commonly used term, as are: geographic data, GIS data, map data, location data, coordinate data and spatial geometry data. This geographic information we are working with in a GIS consists of two elements, namely spatial features and attribute data. Examples of spatial features might include streets, rivers or land cover. In other words, any feature you might find on a map. Meanwhile, attribute data describes the characteristics of the spatial features and is stored in a database within the GIS. For example, most of those streets have names and lengths; and the land-cover types have names and areas associated with them. In the land-use case, a GIS might store categories such as high-density urban, low-density urban, cropland, forest, etc., which one could then query easily.

2.1. GIS Data

GIS data can be described as either spatial or descriptive. Spatial data is defined as the data that relates to the geographic location or relationship of objects and

features. These can be displayed as points, lines, polygons, or surfaces and represent cities, rivers, forests, or elevation. In GIS, spatial data are generally in two formats; Vector and Raster. Vector data, in the context of GIS, refers to a series of points, lines and polygons that have associated descriptive information (called attributes).

- A point is defined as one coordinate pair. In other words, it has location that can be in X, Y coordinates, latitude/longitude. Points are used to represent features that are too small to be represented by line or polygon. These can be a village, location of springs, or nesting sites.

- A line is a series of points that are connected by an arc. Lines are commonly used to represent linear features that are too narrow to be represented by a polygon. These may include streams, roads, routes of travel, or line-transects.



Fig.1 Points an example of towns

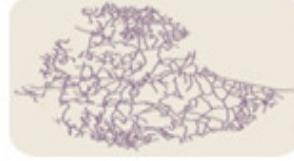


Fig.2 Lines an example of roads

- A polygon is a series of points and arcs that begin and end at the same location, and have a defined area. Polygons can be used to represent administrative boundaries, National Parks, lakes, or forests.

2.1.2. An Overview of Geodatabase Design

Geodatabase design is based on a common set of fundamental GIS design steps, so it's important to have a basic understanding of these GIS design goals and methods. This section provides an overview. GIS design involves organizing geographic information into a series of data themes—layers that can be integrated using geographic location. So it makes sense that geodatabase design begins by identifying the data themes to be used, then specifying the contents and representations of each thematic layer.

2.1.3. Data Themes

Geographic representations are organized in a series of data themes and sometimes referred to as thematic layers. A key concept in a GIS is one of data layers or themes. A data theme is a collection of common geographic elements such as a road network, a collection of parcel

boundaries, soil types, an elevation surface, satellite imagery for a certain date, well locations, and so on. The concept of a thematic layer was one of the early notions in GIS. Practitioners thought about how the geographic information in maps could be partitioned into logical information layers—as more than a random collection of individual objects (such as a road, a bridge, a hill, a house, a peninsula). These layers also provided a protocol for collecting the representations (as feature sets, raster layers, attribute tables, and so on). In GIS, thematic layers are one of the main organizing principles for GIS database design. Each GIS will contain multiple themes for a common geographic area. The collection of themes acts as layers in a stack. Each theme can be managed as an information set independent of other themes. Each theme has its own representations (points, lines, polygons, surfaces, rasters, and so on). Because the various independent themes are spatially referenced, they overlay one another and can be combined in a common map display. GIS analysis operations, such as overlay, can fuse information between themes.

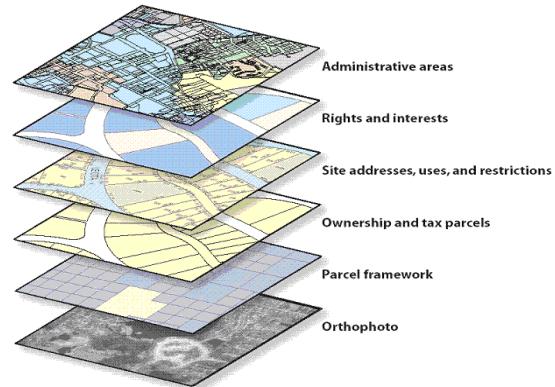


Fig.3 An overview of geodatabase design

3. Quantum Geographic Information System (QGIS)

Quantum GIS (QGIS) is a user friendly Open Source Geographic Information System (GIS) that runs on Linux, Unix, Mac OSX, and Windows. QGIS supports vector, raster, and database formats. QGIS is licensed under the GNU General Public License. QGIS lets you browse and create map data on your computer. It supports many common spatial data formats (e.g. ESRI ShapeFile, geotiff). QGIS is Open Source software and its free of cost. Quantum GIS can also be used as a graphical user interface to GRASS. Quantum GIS has a small file size compared to commercial GISs and requires less RAM and processing power; hence it can be used on older hardware.

or running simultaneously with other applications where CPU power may be limited.

3.1. Advantages

- It's free, as in lunch. Installing and using the QGIS program costs you a grand total of zero money. No initial fee, no recurring fee, nothing.
- It's constantly developing. Because anyone can add new features and improve on existing ones, QGIS never stagnates. The development of a new tool can happen as quickly as you need it to. Extensive help and documentation is available. If you're stuck with anything, you can turn to the extensive documentation, your fellow QGIS users, or even the developers. Cross-platform. QGIS can be installed on MacOS, Windows and Linux.

4. Geographic Resources Analysis Support System (GRASS) To Implement QGIS

GRASS stands for Geographic Resources Analysis Support System. Commonly referred to as GRASS, this is a Geographic Information System (GIS) used for geospatial data management and analysis, image processing, graphics/maps production, spatial modelling, and visualization. GRASS is currently used in academic and commercial settings around the world, as well as by many governmental agencies and environmental consulting companies. It is the most complete free GIS application available. It can be used both in command line and GUI mode. Integration with Quantum GIS provides further user-friendliness. Its ability to work in conjunction with the free statistical application R (by means of the package "spgrass6") is particularly interesting for research applications. GRASS versions exist for Windows, Linux and Mac, but as it is mainly developed for Linux, it is recommended to use it on a Linux system or through a virtual machine. GRASS GIS 7.0 is the current development (unstable) version in the GRASS GIS family. In this paper, the importance gives importance and installation steps of GRASS with libblas support Ubuntu 12.04 LTS.

4.1 Installation of GRASS on Ubuntu 12.04

Steps involved in building libLAS as follows.

- Untar the file
- Run cmake
- Install

```
$tar -xzvf libLAS-1.7.0.tar.gz  
$cd libLAS
```

```
$sudo apt-get install libboost-system-dev  
$libboost-program-options-dev libboost-thread-dev  
$cmake .  
$make  
$sudo make install
```

4.2 Configuring GRASS GIS with all options

```
./configure --with-freetype-includes=/usr/include/freetype2 \  
--with-postgres-includes=/usr/include/postgresql \  
--with-postgres --with-readline --with-nls --with-blas \  
--with-lapack --with-wxwidgets --with-sqlite --with-geos \  
--with-mysql-includes=/usr/include/mysql \  
--with-mysql --with-netcdf --with-libblas --with-freetype
```

4.3 Building

Check your configuration settings and if you are satisfied you can build GRASS now.

```
$make
```

4.4 Installing GRASS GIS

```
$sudo make install
```

This will build and install GRASS under /usr/local/grass7.0svn. To install in a different location specify prefix=/path/to/install dir along with other configuration options.

5. Ubuntu 12.04 LTS Using QGIS

Its ability to work in conjunction with the free statistical application R is particularly interesting for research applications. GRASS versions exist for developed for Ubuntu 12.04 LTS flavor of Linux, it is recommended to use it on a Linux system or through a virtual machine. GRASS, is available for free on Linux.

5.1. Installation Steps of QGIS on Ubtunu 12.04 LTS

QGIS strongly depends on the grass libraries so as a first step we will install them:

```
$ sudo apt-get install grass
```

As QGIS 2.0 is not part of the official Ubuntu repositories (aka software provider) we need to enhance the list of

software providers. Open up the terminal and edit the sources.list which holds this list:

```
$sudoedit /etc/apt/sources.list
```

Now the standard editor of Ubuntu open up and you should add the following lines at the end of the file:

```
$deb http://qgis.org/debian precise main
deb-src http://qgis.org/debian precise main
```

The official support has only precise pangolin aka 12.04 as the latest release. Save and close the file. Add the keys via the terminal. Open up terminal and type

```
$gpg --keyserver keyserver.ubuntu.com --recv 47765B75
gpg --export --armor 47765B75 | sudo apt-key add -
```

Next of it we need to install one more software provider:

```
$sudo add-apt-repository
ppa:ubuntugis/ubuntugis-unstable
```

To update your local catalog of available software use the heavy line

```
$sudo apt-get update
```

And in the end we are ready to go to install QGIS 2.0 Dufour

```
$sudo apt-get install qgis python-qgisqgis-plugin-grass
```

6. QGIS Features

6.1. QGIS Desktop and Browser

Create, edit, visualize, analyze and publish geospatial information. Browse and preview your data and metadata. Drag and drop your data from one data store into the other one.

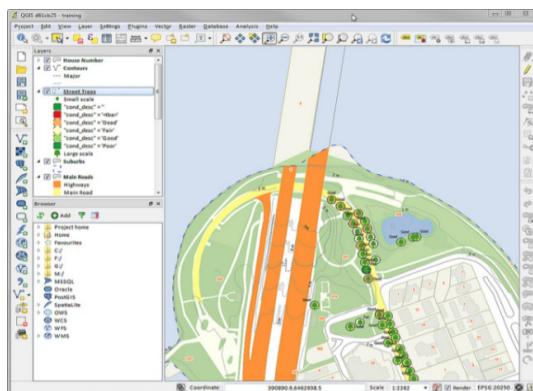


Fig. 4 QGIS working desktop

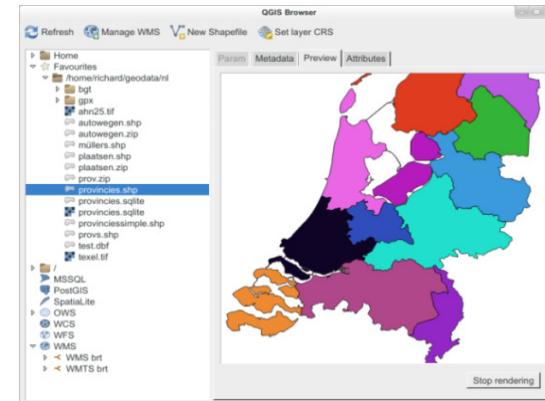


Fig. 5 QGIS working browser

6.2. The use of QGIS in the Geodata Infrastructure

QGIS is used for the following GIS projects:

- Viewing of waste-water data, integration of additional databases and direct access to canal videos and inspection protocols
- Viewing and editing for monitoring and the environmental and urban planning of the waste water and hydrology systems (german: Genereller Entwässerungsplan)
- Viewing of underground cadastral data (waste water, water, gas and electricity networks, later also telecommunication) (german: Leitungskataster). Viewing and editing of urban and regional planning data.

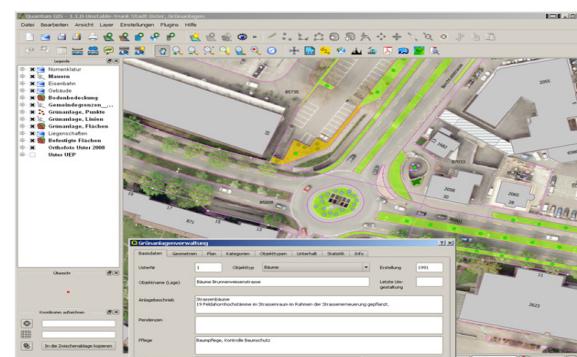


Fig.6 Vector data sets of Roads in the city of Uster

7. Conclusion

In conclusion focusing the importance of Open source software like Linux is an emerging type of software. The open-source and license free is fundamentally affect the business and economic features and conditions of the IT industry. Linux, an open-source operating system, has

been the prominent example of the potential of the open source movement, challenging and competing against Microsoft Windows, the incumbent operating system. A topic of particular interest is the adoption of open-source software systems in developing nations, as a means of reducing licensing costs and of promoting indigenous technological development by having access to the source code of these systems. In open-source system software UBUNTU 12.04 LTS flavor of Linux operating system for the open source software QGIS. This work examines the nature of open-source software development, by looking in detail at the application area of geo-information technology. In surveying about open-source GIS software projects and concluded that the Linux paradigm is the exception rather than the rule, and that corporations are the main developers of successful open-source products. As established by extensive research, good software design and development are the products of qualified teams that operate at a high level of interaction. The direct participation of universities in open-source software is limited due to the conflict between the generation of new research ideas and the need for long-term software maintenance and upgrades. These results have important consequences for public policy guidance. First, good open-source software is the product of corporations, which will build them based on their strategic intents. Therefore, governments worldwide that try to benefit from the open-source software model by simply establishing legislation that mandates its use could be frustrated in their objectives, because of the lack of suitable public-sector applications. In order to create the software they need governments need to enhance and establish public-funded projects for open-source development and adaptation to local needs on focusing open-source technology, virus-free and free-license software development.

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