Free & Open Source GIS

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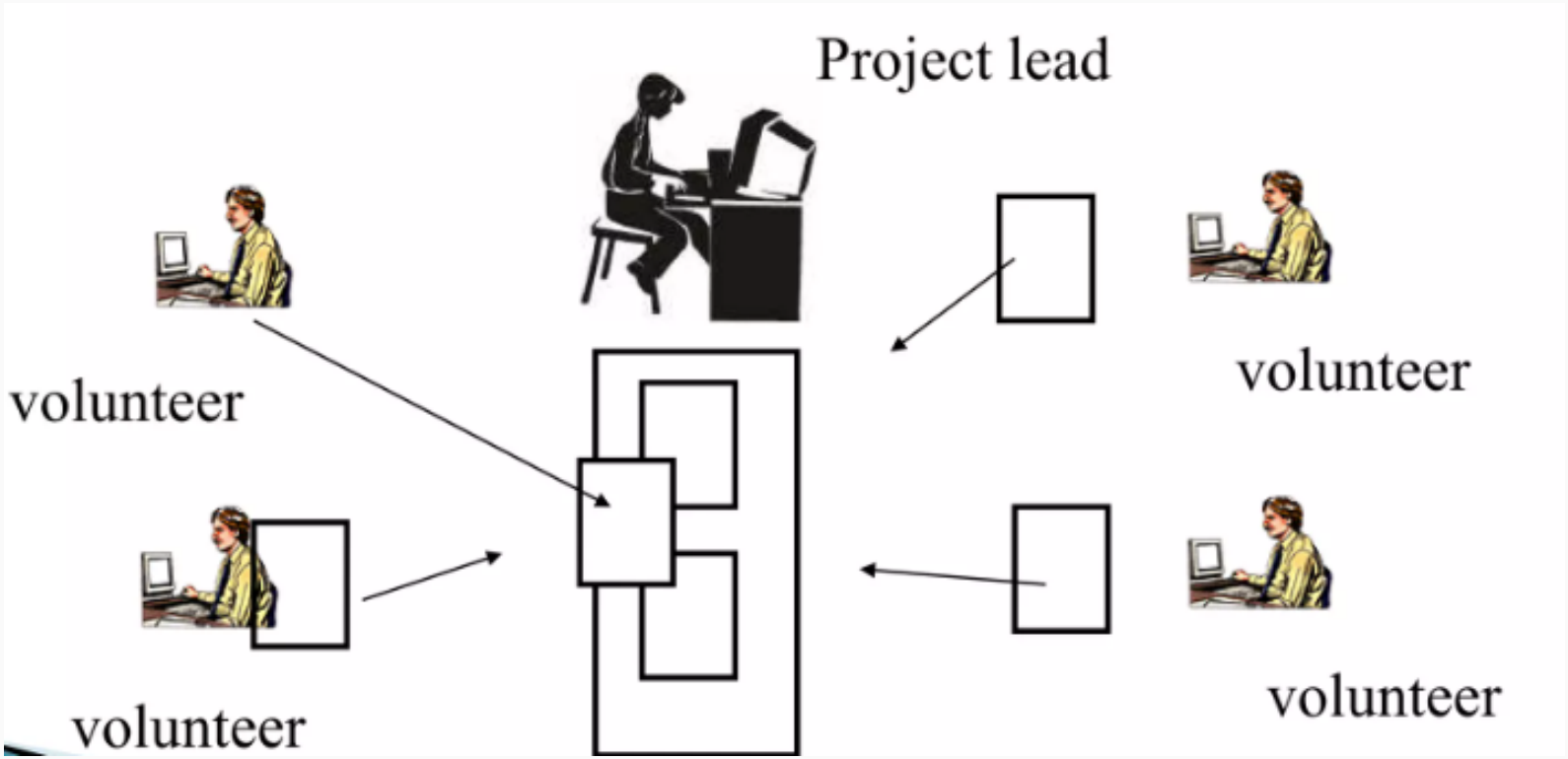
FOSS i

- FOSS = Free and Open Source Software
- "free" does not primarily point to price (freedom)
- openly available for anyone to use, modify and distribute (beware of the licence!)
- access to the source code for editing and sharing
- promotion of collaboration, transparency, community engagement
- one of the first FOSS were Unix (operating system) or TeX (typing)
- often supported by commercial companies (IBM, Red Hat, Microsoft)

FOSS ii



FOSS iii


Open Source
openSUSE
CakePHP
git
php
openmoko
mongoDB
MySQL

Brief History of FOSS i

- 1980s
  - limitations until 1970s
  - start of the first FOSS projects
  - 1984 - GNU by Richard Stallman (core of Unix-based operating systems)
  - 1985 - Free Software Foundation (FSF) - supporting visions and goals of all FOSS projects
  - 1991 - Linus Torvalds starts Linux projects
- 1990s
  - connected to widespread innovations in IT
  - Geographical Resources Analysis Support System (GRASS) - originally for US Army
  - one of the most known GIS systems, command-line based

Brief History of FOSS ii

  - over 300 moduls, OSGeo supported
  - 1994 - MapServer
- 21st century
  - massive interest in FOSS
  - IBM investing in Linux
  - 2001 - Python foundation (Python - one of the most used programming language in FOSS)
  - 2001 - GeoServer - sharing and hosting geospatial data
  - 2002 - QGIS - multiplatofrm GIS
  - 2008 - GitHub - one of the largest platforms for community code contributing
  - 2017 - Microsoft becomes the largest contributor in FOSS

Licencing Politics i

- as much openness as possible to everyone
- basic principles of FOSS regardless of license:
  - widespread (and free) possibility of redistribution
  - the source code is always shared and possible to modify
  - the license must allow the distribution of modified code
  - the possibility of dissemination must not discriminate against any person/group
  - the license must not restrict use in a specific area
  - the rights associated with the program apply to all derivatives
  - the rights of the program do not depend on whether the program is part of the distribution of the superior software
  - the license must not prevent the use of other programs
  - the license must be technologically neutral
- BSD, MIT, Apache, GNU GPL etc.

Why is it important? i

- source of innovation, broad ideas
- community collaboration
- developing of standards
- flexibility and quick reparations

Organizations in FOSS i

- Free Software Foundation (FSF)
  - non-profit organization
  - support of rights of FOSS users
  - financed by patrons and gifts
  - handling legal issues

- OSGeo
  - `https://www.osgeo.org`
  - Open Source Geospatial Foundation
  - founded 2006
  - framework for creating and maintaining geospatial tools and libraries
  - fostering global community of users

Organizations in FOSS ii

- QGIS - popular desktop GIS
- GDAL/OGR - library for maintaining raster and vector geodata
- PostGIS - spatial database extension for PostgreSQL - spatial geodata handling and archiving
- PROJ - library for handling spatial reference systems
- FOSS4G - annual global conference for users and developers
- issuing data standards and accessibility
- educational resources

- Open Geospatial Consortium (OGC)
  - established in 1994
  - developing and producing open standards
  - establish interoperation and seamless data sharing

Organizations in FOSS iii

- developed standards: WMS (Web Map Service), WFS (Web Feature Service), GML (Geography Markup Language), GPKG (GeoPackage)
- sponsoring pilot projects with industry collaboration global membership community

Notable FOSS GIS Projects

- **QGIS (Quantum GIS)**
  - Desktop GIS with user-friendly interface and extensive plugin support
  - Features: vector and raster analysis, geoprocessing, and map composition
  - Commonly used in urban planning, environmental monitoring, and non-profit projects
- **GRASS GIS**
  - Powerful tool for geospatial data management and spatial modeling
  - Strengths in environmental, ecological, and landscape analysis
  - Used for land cover analysis, hydrological modeling, and more
- **PostGIS**
  - Spatial extension for PostgreSQL, a popular open-source relational database
  - Provides advanced spatial functions and supports spatial SQL standards

Web-Based GIS Tools

- **MapServer**
  - Platform for publishing spatial data and creating web-based GIS applications
  - Supports OGC standards like WMS and WFS
  - Used for government portals, environmental monitoring, and community projects
- **GeoServer**
  - Java-based server for sharing and editing geospatial data on the web
  - Integrates with data sources like PostGIS and shapefiles
  - Popular for complex web mapping and real-time spatial data services

JavaScript Libraries for Web Mapping

- **OpenLayers**
  - JavaScript library for building interactive maps from various sources
  - Customizable and mobile-friendly
  - Used in web mapping apps and visualizing geographic data in web apps
- **Leaflet**
  - Lightweight, easy-to-use JavaScript library for web maps
  - Features include interactive maps with layers, markers, and popups
  - Often used in lightweight applications, like tourism and local government sites

Specialized Analysis Tools

- **PySAL (Python Spatial Analysis Library)**
  - Python library for spatial data analysis, geostatistics, and econometrics
  - Provides clustering, regression, and spatial pattern analysis tools
  - Used in academic research, urban studies, and spatial econometrics
- **GDAL/OGR (Geospatial Data Abstraction Library)**
  - Core library for reading and writing raster and vector geospatial data formats
  - Supports data conversion, warping, and reprojection
  - Serves as the backbone of many other GIS tools like QGIS and GRASS

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