

GEOSPATIAL FACT SHEET: OPEN SOURCE GIS

WHAT TO KNOW ABOUT OPEN SOURCE GIS: Open source software has a license that includes user rights: the software may be freely used, modified, and shared. The [Open Source Initiative](#) (OSI) reviews and approves open source licenses. OSI maintains the [canonical definition of open source](#) and a comprehensive catalog of approved licenses. Software is not open source because it is available online without payment. The open source designation is determined exclusively by the license.

In addition to the Open Source Initiative, it is important to note the work of the [Free Software Foundation \(FSF\)](#), the originators of the first [free software](#) licenses. [Started in 1985](#) by [Richard Stallman](#), the FSF both creates and reviews licenses and publishes software.

Open source licenses differ from proprietary licenses not only in the balance of rights and responsibilities they convey, but also in that they are not product-specific. The various approved licenses have names, and are seen across any number of projects and products.

Frequently Asked Questions

- Page 2: Who makes open source software, and why?
- Page 2: Is open source limited to software? What about data, documentation, etc.?
- Page 2: Is there support for open source software?
- Page 3: What is different about open source software?
- Page 3: Are there certifications for open source GIS?
- Page 4: What open source GIS software is available?
- Page 5: Is there training for open source software?
- Page 5: Are there conferences and user groups for open source GIS?
- Page 5: Are there security issues specific to open source software?
- Page 6: Can I mix open source and proprietary GIS?
- Page 6: Are data interoperable between open source and proprietary GIS?
- Page 6: Who uses open source GIS?
- Page 7: Where can I find more information about user groups for open source GIS?
- Page 7: Resources

HOW DO I GET STARTED WITH OPEN SOURCE SOFTWARE?

Try a tutorial for a single package.
QGIS is a reasonable place to start, and maintains a list of [free training materials](#).

Who makes open source software, and why?

Open source software development is distributed, and not controlled exclusively by the organization that publishes the software. The metaphor that is often used is [The Cathedral and the Bazaar](#), also the title of a [book](#) by Eric S. Raymond. Proprietary software development is centrally controlled, like the construction of a cathedral. In a bazaar, however, there are a variety of products offered by whoever chooses to participate. The character and content of the bazaar vary according to what sells, what works for the marketplace. Similarly, open source software serves the needs of the marketplace quite directly.

Most people who write open source software do it as part of their jobs. IBM, for example is a [major supporter of open source development](#). InfoWorld [lists more contributors to open source projects](#), notably Microsoft, Google, Amazon, Intel, Oracle, and Esri.

It's important to note that many open source projects are supported by organizations that assist with legal issues, provide frameworks for development roadmaps, etc. These organizations include:

- [Open Source Geospatial Foundation \(OSGeo\)](#)
- [Apache Software Foundation \(ASF\)](#)
- [Free Software Foundation \(FSF\)](#)
- [Eclipse Foundation](#)

Is there support for open source software?

Yes. Each well-established open source package lists support resources: mailing lists, IRC chat lines, developer and user group meetings, MeetUp groups, etc. There are also a variety of paid commercial support resources. Some are for established suites (e.g., [Boundless](#)), or for individual packages. The websites for individual packages feature support information for both community and commercial support. The [Open Source Geospatial Foundation](#) (OSGeo) maintains a list of service providers, among them providers for commercial support.

Is open source limited to software? What about data, documentation, etc.?

No, the concept of licensing that recognizes rights and responsibilities for both creators and users is not limited to software.

[OpenStreetMap](#) is a standout example, providing spatial data worldwide under an [open license](#).

Both [Creative Commons](#) and the [Free Software Foundation](#) maintain licenses appropriate to data, documentation, videos, etc.

What is different about open source software?

Interoperability

Each project is conceived separately to fill a particular niche, in the expectation that other software packages will work with it to provide a complete experience for the user. For example, the PostGIS spatial database was released without any graphical user interface (GUI) whatsoever. The assumption was made, correctly, that someone would create one. PostGIS is now the most common back-end database for open source desktop and web publication packages, and can be used as a back end for ArcGIS.

Regardless of the open source spatial database (PostGIS, Spatialite, etc.), it is common to use a variety of open source tools to access, edit, or publish the same database without translation. There is no economic incentive to make data processed by a given package inaccessible to other software, and many incentives to keep it open.

Openness

Many Open Source projects from the very beginning publish their code as open source which enables open peer review, project extension through code contributions and project continuation either by forking the development or replacing the original developers who have moved on. However, some of the more important projects started out as “abandonware” and were rescued by user and developer communities. They include the [Apache web server](#), [GRASS GIS](#), the [Firefox browser](#) and more. If the code had been closed on these packages there simply wouldn't have been a way to continue them. With access to the source code, users have the ability to create new functionalities themselves, hire someone else to do it, or even continue entire packages after the original development team has moved on.

Transparency

It's normal to have a development roadmap available for a given package so you know what to expect in coming releases, unencumbered by marketing considerations. [Here](#), for example, is development information for PostgreSQL. It is normal to be able to know who is making decisions about development of a given package, and even have direct input. Users can [report bugs directly](#) and observe their progress.

Community Support

Finally, when you acquire open source software you become a member of a community rather than a customer. You will be expected to read available information before going for help, but once you have exhausted your own resources the entire community is available to support you regardless of time of day or day of the week.

Are there certifications for open source GIS?

Not specifically.

[EnterpriseDB has a certification program for PostgreSQL](#). Although the latter doesn't include the spatial functions, it covers the system that houses it.

[gvSIG has two levels of certification available, but they don't require exams.](#)

[There are discussions underway concerning QGIS certification](#)

What open source GIS software is available?

The open source world offers a full set of capabilities available for geographic information systems. There are several open source suites supported by companies or organizations, either conceived of as a whole or consisting of software from a variety of projects. These include:

- OpenGeo Suite by [Boundless](#)
- [gvSIG](#) originally a [public sector project](#), now supported by the [gvSIG Association](#)
- [GeoHelm](#) by [AcuGIS](#)

Additionally, it is common to acquire software packages separately as the need arises. Some of the common packages and their categories are listed below. Each of these projects is well-established and has associated projects found on their respective websites. The list is meant to be a starting point, not a comprehensive catalog.

Project Name	Project Type	Comments
GDAL (Geospatial Data Abstraction Library)	Translation library	Provides translation capabilities for both raster and vector data. May be used embedded in various packages, QGIS for example, or via command-line utilities.
GeoServer	Web map server	Provides data publication through a GUI interface.
OpenJump	Desktop application	Provides tools to view, analyze, edit and publish data from PostGIS databases and a variety of other sources. Has particularly well-designed editing capabilities.
pgAdmin	Administration and development platform for PostgreSQL	Handy tool, especially for users that lack SQL experience.
PostGIS	Spatial database	Spatial extension for PostgreSQL . Provides comprehensive data-handling capabilities, either at the command line or via a variety of graphical “front ends,” for example: pgAdmin , QGIS , OpenJump
PostgreSQL	Relational database	ACID-compliant object-relational server-based database that PostGIS extends. Runs on all major operating systems.
QGIS	Desktop application	Provides tools to view, analyze, edit and publish data from PostGIS databases and a variety of other sources.
Spatialite	Spatial database	File-based spatial database.

Is there training for open source software?

Yes. As with commercial support, the [Open Source Geospatial Foundation](#) maintains a list of training resources: multi-unit courses, tutorials, conferences featuring workshops and other training venues, etc. And like most things, [YouTube](#) has videos of all kinds, from broad overviews of the topic to short videos describing specific tasks. The [FOSS4G](#) (Free and Open Source Software for Geospatial) and [FOSS4G-NA](#) (North America) conferences have extensive training offerings, and training materials from past conferences are either posted or available from the authors.

For general reference there are books available from a number of publishers:

- [QGIS booklist](#)
- [PostGIS booklist](#)
- [PostgreSQL booklist](#)
- [Open source GIS books from O'Reilly](#)
- [Manning books](#), which include a number of notable selections on open source GIS

Are there conferences and user groups for open source GIS?

Yes, some of the larger conferences are:

- [FOSS4G](#) (Free and Open Source Software for Geospatial) and [FOSS4G-NA](#) (North America) conferences
- The [State of the Map](#) (SotM) conference, organized by the [OpenStreetMap Foundation](#)

User groups include:

- [OSGeo Chapters](#)
- [PostgreSQL User Groups](#)
- [QGIS U.S. User Group](#)
- [QGIS International User Groups](#)

Are there security issues specific to open source software?

Security is a concern with all software. Unlike some proprietary software, however, security issues in open source software have a history of getting found and fixed promptly due to the number of people inspecting the code. Notably, the Defense Information Systems Agency has published a security technical implementation guide (STIG) for PostgreSQL, giving it a security status equal to well-known proprietary database products.

Can I mix open source and proprietary GIS?

Yes. Your mileage may vary, but at least the most common circumstances can be accommodated. Here are some examples:

- QGIS can open and edit Esri file-based geodatabases and shapefiles among the [60+ formats it supports](#)
- PostgreSQL/PostGIS has a facility called [“foreign data wrappers”](#) that allows queries across a wide variety of data sources: Esri SDE, file-based geodatabases, Oracle, Microsoft SQL Server, point clouds, even spreadsheets and .csv files
- Esri lists PostgreSQL as a [supported back end for ArcGIS Pro](#)

Are data interoperable between open source and proprietary GIS?

Yes. The [OGC GeoPackage](#) format is designed to be platform independent and inherently interoperable. Built on [Spatialite](#), the format is readable and writable using Esri software, as well as QGIS, PostgreSQL/PostGIS and a [variety of other software](#). The capabilities of open source and proprietary software to read and edit a variety of data sources - file-based geodatabases, shapefiles and others described above make a great many data sets interoperable.

Who uses open source GIS?

It can be difficult to gauge how many people are using open source, or even who they might be. There is rarely even a requirement to register to use software. You can get a sense of who's using a particular package by scanning mailing list archives, and it's a useful exercise. It can help you know if people are using a given software package for the purpose you're considering, and how successful they are.

Some organizations collect case studies that can be helpful. These include:

- [EnterpriseDB](#) (PostgreSQL case studies)
- [PostGIS](#)
- [OSGeo](#) (Case studies for a variety of open source packages)
- [QGIS](#)

Resources

Software

- [Linux FAQ](#)
 - This is an example of a really, really extensive FAQ involving open source
- [OSGeo Foundation FAQ](#)
 - The OSGeo Foundation supports many open source GIS projects
- [52 North](#)
 - Development group known for working with sensor webs
- [OpenSource.com FAQ](#)
 - Open source resources: news, projects, etc.
- [GeoServer](#)
 - A brief FAQ about the most commonly used open source GIS web server
- [Eclipse LocationTech Projects](#)
 - Geospatial projects built on Eclipse, each with its own overview

Conferences

- [FOSS4G](#): The premier open source developers' conference; publishes an astonishing amount of educational material
- [FOSS4G NA](#): North American edition of the FOSS4G
- [State of the Map](#)

Organizational Support

- [Open Source Geospatial Foundation \(OSGeo\)](#)
- [Apache Software Foundation](#)
- [OpenStreetMap Foundation](#)

Field Collection Software

- [QField](#) (software site)
- [OpenGIS.ch](#) (developer site)
- [Open Fieldtrip](#)
- [GeoShape](#)

Licensing

- [Open Source Initiative](#)
- [Creative Commons](#)
- [Free Software Foundation](#)

Data

- [OpenStreetMap](#)

