

About QGIS testing

QGIS Project

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CHAPTER

ONE

PREAMBLE

Welcome to the documentation of the geographical information system (GIS) software QGIS. QGIS is subject to the GNU General Public License version 2, or any later version. More information is available on the QGIS website.

The contents of this document have been written and verified to the best of the knowledge of the authors and editors. Nevertheless, mistakes are possible.

Therefore, the authors, editors and publishers do not take any responsibility or liability for errors in this document and their possible consequences. We encourage you to report possible mistakes.

This document has been typeset with reStructuredText. It is available as reST source code on github, and online as HTML and PDF via https://www.qgis.org/resources/hub/#documentation. Translated versions of this document can be browsed and downloaded via the documentation area of the QGIS project as well.

For more information about contributing to this document and about translation, please read QGIS-documentation-guidelines.

Links in this Document

This document contains internal and external links. Clicking on an internal link moves within the document, while clicking on an external link opens an internet address.

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The list of the persons who have contributed with writing, reviewing and translating the following documentation is available at *Contributors*.

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1.1 What is new in QGIS testing

This release of QGIS includes hundreds of bug fixes and many new features and enhancements, compared to QGIS 3.40. For a list of new features, visit the visual changelogs.

CHAPTER

TWO

FOREWORD

Welcome to the wonderful world of Geographical Information Systems (GIS)!

QGIS is an Open Source Geographic Information System. The project was born in May 2002 and was established as a project on SourceForge in June the same year. We have worked hard to make GIS software (which is traditionally expensive proprietary software) available to anyone with access to a personal computer.

QGIS currently runs on most Unix platforms, Windows, and macOS. QGIS is developed using the Qt toolkit (https://www.qt.io) and C++. This means that QGIS feels snappy and has a pleasing, easy-to-use graphical user interface (GUI). There are also independently created applications that allow you to take QGIS into the field. These applications can run on Android and iOS.

QGIS aims to be a user-friendly GIS, providing common functions and features. The initial goal of the project was to provide a GIS data viewer. QGIS has reached the point in its evolution where it is being used for daily GIS data-viewing needs, for data capture, for advanced GIS analysis, and for presentations in the form of sophisticated maps, atlases and reports. QGIS supports a wealth of raster and vector data formats, with new format support easily added using the plugin architecture.

QGIS is released under the GNU General Public License (GPL). Developing QGIS under this license means that you can inspect and modify the source code, and guarantees that you, our happy user, will always have access to a GIS program that is free of cost and can be freely modified. You should have received a full copy of the license with your copy of QGIS, and you can also find it in Appendix *Appendix A: GNU General Public License*.

Tip: Up-to-date Documentation

The latest version of this document can always be found in the documentation area of the QGIS website at https://www.qgis.org/resources/hub/#documentation.

CONVENTIONS

This section describes the uniform styles that will be used throughout this manual.

3.1 GUI Conventions

The GUI convention styles are intended to mimic the appearance of the GUI. In general, a style will reflect the non-hover appearance, so a user can visually scan the GUI to find something that looks like the instruction in the manual.

Menu Options: Layer ➤ Add a Raster Layer or Settings ➤ Toolbars ➤ Digitizing
Tool: Add a Raster Layer
Button: Save as Default
Dialog Box Title: Layer Properties
Tab: General
Checkbox: Render
Radio Button: Postgis SRID EPSG ID
Select a number: 1,00 ♀
Select a string:
Browse for a file: ...
Select a color:
Slider:

A shadow indicates a clickable GUI component.

• Input Text: Display name lakes.shp

3.2 Text or Keyboard Conventions

This manual also includes styles related to text, keyboard commands and coding to indicate different entities, such as classes or methods. These styles do not correspond to the actual appearance of any text or coding within QGIS.

- Hyperlinks: https://qgis.org
- Keystroke Combinations: Press Ctrl+B, meaning press and hold the Ctrl key and then press the B key.
- Name of a File: lakes.shp
- Name of a Class: NewLayer

About QGIS testing

• Method: classFactory

• Server: myhost.de

• User Text: qgis --help

Lines of code are indicated by a fixed-width font:

```
PROJCS["NAD_1927_Albers",
GEOGCS["GCS_North_American_1927",
```

3.3 Platform-specific instructions

GUI sequences and small amounts of text may be formatted inline: Click $\bigcirc P$ File $\bigcirc Q$ GIS $\triangleright Q$ Quit to close QGIS. This indicates that on Linux, Unix and Windows platforms, you should click the File menu first, then Quit, while on macOS platforms, you should click the QGIS menu first, then Quit.

Larger amounts of text may be formatted as a list:

- \triangle Do this
- 🔊 Do that
- X Or do that

or as paragraphs:

 Δ X Do this and this and this. Then do this and this.

Do that. Then do that and that and that, and that and that and that, and that and that and that, and that and that.

Screenshots that appear throughout the user guide have been created on different platforms.

FOUR

FEATURES

QGIS offers a wealth of GIS functions, provided by core features and plugins. The locator bar makes it easy to search for functions, datasets and more.

A short summary of six general categories of features and plugins is presented below, followed by first insights into the integrated Python console.

4.1 View data

You can view combinations of vector and raster data (in 2D or 3D) in different formats and projections without conversion to an internal or common format. Supported formats include:

- Spatially-enabled tables and views using PostGIS, SpatiaLite and MS SQL Spatial, Oracle Spatial, vector formats supported by the installed OGR library, including GeoPackage, ESRI Shapefile, MapInfo, SDTS, GML and many more. See section label_workingvector.
- Raster and imagery formats supported by the installed GDAL (Geospatial Data Abstraction Library) library, such as GeoTIFF, ERDAS IMG, ArcInfo ASCII GRID, JPEG, PNG and many more. See section working_with_raster.
- Mesh data (TINs and regular grids are supported). See label_meshdata.
- Vector tiles
- GRASS raster and vector data from GRASS databases (location/mapset). See section sec_grass.
- Online spatial data served as OGC Web Services, including WMS, WMTS, WCS, WFS, and WFS-T. See section working_with_ogc.

The QGIS authentication infrastructure helps you manage user/password, certificates and keys for web services and other resources.

Spreadsheets (ODS / XLSX)

Temporal data are supported.

4.2 Explore data and compose maps

You can compose maps and interactively explore spatial data with a friendly GUI. The many helpful tools available in the GUI include:

- · QGIS browser
- On-the-fly reprojection
- 2D and 3D map rendering
- DB Manager
- Print layout

- Report
- · Overview panel
- · Spatial bookmarks
- Annotation tools
- Identify/select features
- Edit/view/search attributes
- Data-defined feature labeling
- Data-defined vector and raster symbology tools
- Atlas map composition with graticule layers
- North arrow, scale bar and copyright label for maps
- Support for saving and restoring projects

4.3 Create, edit, manage and export data

You can create, edit, manage and export vector and raster layers in several formats. QGIS offers the following:

- · Vector digitizing tools
- Ability to create and edit multiple file formats and GRASS vector layers
- Georeferencer tool to geocode vectors and images
- GPS tools to import and export GPX format, and convert other GPS formats to GPX or down/upload directly to a GPS unit (on Linux, usb: has been added to list of GPS devices)
- Support for visualizing and editing OpenStreetMap data
- Ability to create spatial database tables from files with the DB Manager plugin
- Improved handling of spatial database tables
- Tools for managing vector attribute tables
- · Option to save screenshots as georeferenced images
- DXF-Export tool with enhanced capabilities to export styles and plugins to perform CAD-like functions

4.4 Analyze data

You can perform spatial data analysis on spatial databases and other OGR-supported formats. QGIS currently offers vector analysis, raster analysis, sampling, geoprocessing, geometry and database management tools. You can also use the integrated GRASS tools, which include the complete GRASS functionality of more than 400 modules (see section sec_grass). Or, you can work with the Processing plugin, which provides a powerful geospatial analysis framework to call native and third-party algorithms from QGIS, such as GDAL, SAGA, GRASS, OTB, R, and more (see section sec_processing_intro). All analysis functions are run in the background, allowing you to continue your work before the processing has finished.

The graphical modeller allows you to combine / chain functions into a complete workflow in an intuitive graphical environment.

4.5 Publish maps on the Internet

QGIS can be used as a WMS, WMTS, WMS-C, WFS, OAPIF and WFS-T client (see section working_with_ogc), and QGIS Server (see QGIS-Server-manual) allows you to publish your data through the WMS, WCS, WFS and OAPIF protocols on the Internet using a webserver.

4.6 Extend QGIS functionality through plugins

QGIS can be adapted to your special needs with the extensible plugin architecture and libraries that can be used to create plugins. You can even create new applications with C++ or Python!

4.6.1 Core Plugins

Core plugins include:

- 1. DB Manager (exchange, edit and view layers and tables from/to databases; execute SQL queries)
- 2. Geometry Checker (check geometries for errors)
- 3. Georeferencer GDAL (add projection information to rasters using GDAL)
- 4. GPS Tools (load and import GPS data)
- 5. GRASS (integrate GRASS GIS)
- 6. MetaSearch Catalogue Client (interacting with metadata catalog services supporting the OGC Catalog Service for the Web (CSW) standard)
- 7. Offline Editing (allow offline editing and synchronizing with databases)
- 8. Processing (the spatial data processing framework for QGIS)
- 9. Topology Checker (find topological errors in vector layers)

4.6.2 External Python Plugins

QGIS offers a growing number of external Python plugins that are provided by the community. These plugins reside in the official Plugins Repository and can be easily installed using the Python Plugin Installer. See Section managing_plugins.

4.7 Python Console

For scripting, it is possible to take advantage of an integrated Python console, which can be opened with: *Plugins* Python Console. The console opens as a non-modal utility window. For interaction with the QGIS environment, there is the qgis.utils.iface variable, which is an instance of QgisInterface. This interface provides access to the map canvas, menus, toolbars and other parts of the QGIS application. You can create a script, then drag and drop it into the QGIS window and it will be executed automatically.

For further information about working with the Python console and programming QGIS plugins and applications, please refer to console and PyQGIS-Developer-Cookbook.

4.8 Known Issues

4.8.1 Number of open files limitation

If you are opening a large QGIS project and you are sure that all layers are valid, but some layers are flagged as bad, you are probably faced with this issue. Linux (and other OSs, likewise) has a limit of opened files by process. Resource limits are per-process and inherited. The ulimit command, which is a shell built-in, changes the limits only for the current shell process; the new limit will be inherited by any child processes.

You can see all current ulimit info by typing:

```
$ ulimit -aS
```

You can see the current allowed number of opened files per process with the following command on a console:

```
$ ulimit -Sn
```

To change the limits for an **existing session**, you may be able to use something like:

```
$ ulimit -Sn #number_of_allowed_open_files
$ ulimit -Sn
$ qgis
```

Alternatively, you can use the newer prlimit utility. More info: https://manpages.ubuntu.com/manpages/latest/man1/prlimit.1.html

To fix it forever

On most Linux systems, resource limits are set on login by the pam_limits module according to the settings contained in /etc/security/limits.conf or /etc/security/limits.d/*.conf. You should be able to edit those files if you have root privilege (also via sudo), but you will need to log in again before any changes take effect.

More info:

https://www.cyberciti.biz/faq/linux-increase-the-maximum-number-of-open-files/ https://linuxaria.com/article/open-files-in-linux

CHAPTER

FIVE

HELP AND SUPPORT

5.1 Mailing lists

QGIS is under active development and as such it won't always work like you expect it to. The preferred way to get help is by joining the qgis-users mailing list. Your questions will reach a broader audience and answers will benefit others.

5.1.1 QGIS Users

This mailing list is used for discussion about QGIS in general, as well as specific questions regarding its installation and use. You can subscribe to the qgis-users mailing list by visiting the following URL: https://lists.osgeo.org/mailman/listinfo/qgis-user

5.1.2 QGIS Developers

If you are a developer facing problems of a more technical nature, you may want to join the qgis-developer mailing list. This list is also a place where people can chime in and collect and discuss QGIS related UX (User Experience) / usability issues. It's here: https://lists.osgeo.org/mailman/listinfo/qgis-developer

5.1.3 QGIS Community Team

This list deals with topics like documentation, context help, user guide, web sites, blog, mailing lists, forums, and translation efforts. If you would like to work on the user guide as well, this list is a good starting point to ask your questions. You can subscribe to this list at: https://lists.osgeo.org/mailman/listinfo/qgis-community-team

5.1.4 QGIS Translations

This list deals with the translation efforts. If you like to work on the translation of the website, manuals or the graphical user interface (GUI), this list is a good starting point to ask your questions. You can subscribe to this list at: https://lists.osgeo.org/mailman/listinfo/qgis-tr

5.1.5 QGIS Project Steering Committee (PSC)

This list is used to discuss Steering Committee issues related to overall management and direction of QGIS. You can subscribe to this list at: https://lists.osgeo.org/mailman/listinfo/qgis-psc

5.1.6 QGIS User groups

In order to locally promote QGIS and contribute to its development, some QGIS communities are organized into QGIS User Groups. These groups are places to discuss local topics, organize regional or national user meetings, organize sponsoring of features... The list of current user groups is available at https://qgis.org/community/groups/

You are welcome to subscribe to any of the lists. Please remember to contribute to the list by answering questions and sharing your experiences.

5.2 Matrix / IRC

Matrix (https://matrix.org) is a project for decentralised chat. QGIS has a room accessible by the #qgis:osgeo.org alias (among others) which bridges to the libera.chat #qgis IRC channel.

To use Matrix:

- 1. Create an account (at matrix.org is easiest, but if you have an OSGeo account you can also use your OSGeo id as matrix id)
- 2. Install a client (Elements is easiest, but see Matrix clients for more), OR point your browser to https://matrix. to/#/#qgis:osgeo.org

To use IRC:

- 1. Install an IRC client
- 2. Connect to irc://irc.libera.chat/#qgis or point your browser to https://web.libera.chat/?channels=#qgis

5.3 Commercial support

Commercial support for QGIS is also available. Check the website https://qgis.org/resources/support/commercial-support/ for more information.

5.4 BugTracker

While the qgis-users mailing list is useful for general 'How do I do XYZ in QGIS?'-type questions, you may wish to notify us about bugs in QGIS. You can submit bug reports using the QGIS bug tracker.

Please bear in mind that your bug may not always enjoy the priority you might hope for (depending on its severity). Some bugs may require significant developer effort to remedy, and the manpower is not always available for this.

Feature requests can be submitted as well using the same ticket system as for bugs. Please make sure to select the type Feature request.

If you have found a bug and fixed it yourself, you can submit a Pull Request on the Github QGIS Project.

Read Bugs, Features and Issues and submit patch for more details.

5.5 Blog

The QGIS community also runs a weblog at https://planet.qgis.org/, which has some interesting articles for users and developers. Many other QGIS blogs exist, and you are invited to contribute with your own QGIS blog!

5.6 Plugins

The website https://plugins.qgis.org is the official QGIS plugins web portal. Here, you find a list of all stable and experimental QGIS plugins available via the 'Official QGIS Plugin Repository'.

5.7 Wiki

Lastly, we maintain a WIKI web site at https://github.com/qgis/QGIS/wiki where you can find a variety of useful information relating to QGIS development, release plans, links to download sites, message-translation hints and more. Check it out, there are some goodies inside!

5.5. Blog 15

CONTRIBUTORS

QGIS is an open source project developed by a team of dedicated volunteers and organisations. We strive to be a welcoming community for people of all race, creed, gender and walks of life. At any moment, you can get involved.

6.1 Authors

Below are listed people who dedicate their time and energy to write, review, and update the whole QGIS documentation.

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6.2 Translators

QGIS is a multi-language application and as is, also publishes a documentation translated into several languages. Many other languages are being translated and would be released as soon as they reach a reasonable percentage of translation. If you wish to help improving a language or request a new one, please see translation_guidelines.

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COMPLYING WITH LICENSES

7.1 Appendix A: GNU General Public License

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