

ADVANTAGES OF QGIS ENVIRONMENT POWERED BY NIX

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ABOUT ME





- Nix Geospatial Team
- <https://geospatial-nix.today>

MY TALK

Inovative ways of running a software on a computer.

GEOSPATIAL SOFTWARE ECOSYSTEM

- Core libraries (C, C++) + addons
- Python/R/Other libraries
- Databases + extensions
- Web services + plugins
- CLI tools

GEOSPATIAL SOFTWARE ECOSYSTEM

- Non-geospatial libraries (QT, SIP, ...)

GEOSPATIAL SOFTWARE ECOSYSTEM

- GRASS + addons
- QGIS + plugins
- Other ...

USER EXPECTATIONS

- Run **any** of software on **any** machine
- Run any software **without breaking** another one
- Freedom to decide **when to update** or **not to update** at all

USER EXPECTATIONS

- Be able to reproduce installation on any machine at any time

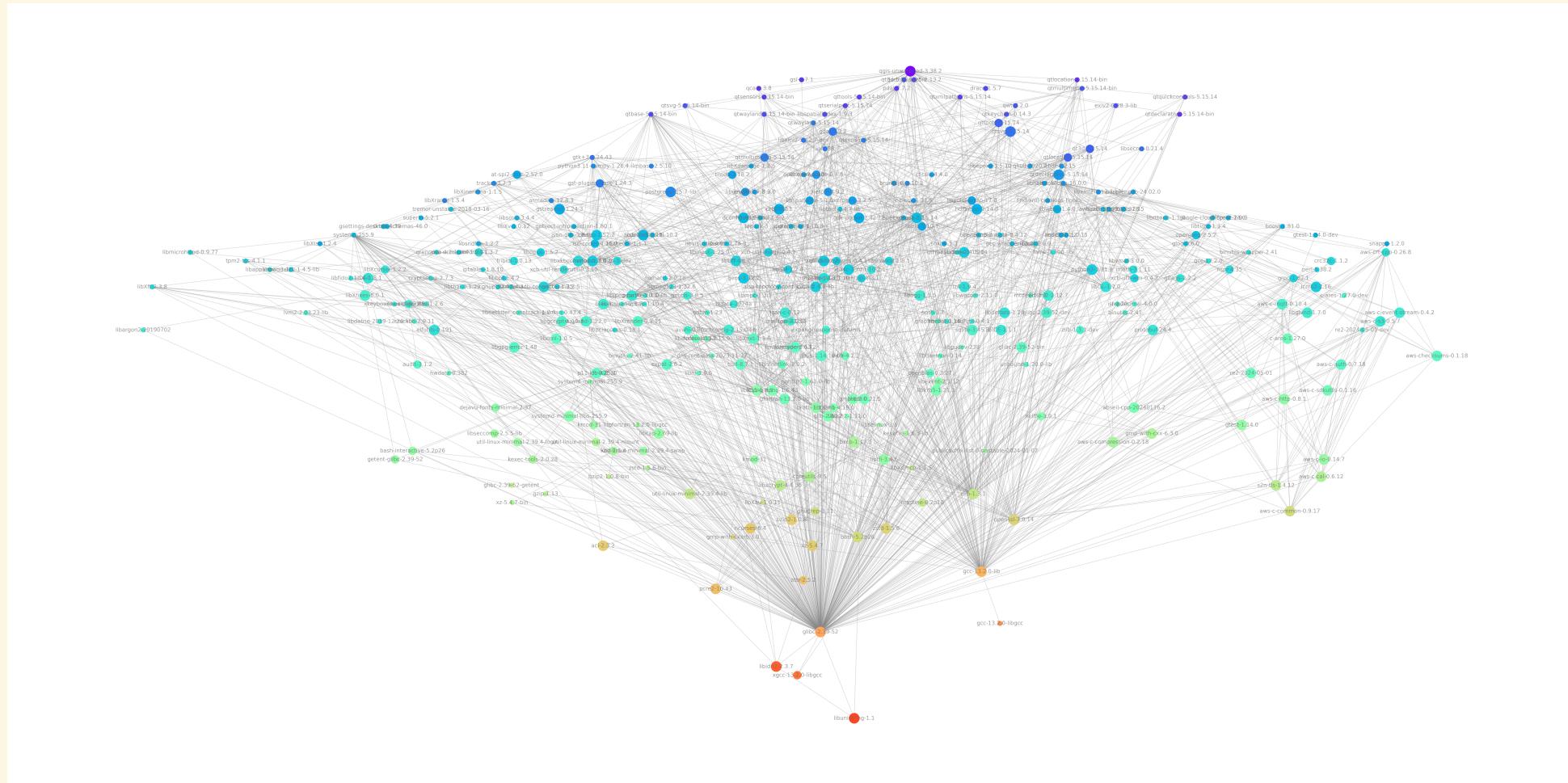
ADVANCED USER EXPECTATIONS

- Have a **full control** of whole dependency graph
- Be able to **customize** the software including **dependencies**

DEVELOPER EXPECTATIONS

- Be able to **start hacking** without too much effort
- Have a **quick and reliable feedback loop** with the users and other developers

THE PROBLEM



QGIS dependency graph.

NIX

Unique design, not building on already known broken patterns.

(E. Dolstra, PhD theses, 2006)

FEATURES OF NIX

- Reproducibility as a core feature:
 - between multiple builds
 - between multiple machines
 - over the time
- Full control over whole dependency graph
- No software conflicts
- Runs on all Linux, Mac, Win WSL 2

FEATURES OF NIX

- Per-project **isolated environments** for all types of software
- Software versions are **locked** and updated when requested
- Great **customization support**
- Dozens of other **very unique features**

WHAT IS NIX ?

Nix is the computation engine on file systems.

WHAT IS NIX ?

Nix is a pure, functional, lazy, declarative, and reproducible programming language.

WHAT IS NIX ?

- **Nixpkgs** - the largest packages repo
- **Nix modules system** - the declarative configuration management
- **NixOS** - the unique operating system
 - + *dozens of other community projects (Home Manager, ..)*

DEMO

(magic Nix commands)

NIX FOR USERS

RUN QGIS

- No QGIS installed

```
$ qgis  
The program 'qgis' is not in your PATH.
```

- Run QGIS from Internet repo (geospatial-nix)

```
$ nix run github:imincik/geospatial-nix#qgis -- --version  
QGIS 3.38.2-Grenoble 'Grenoble' (exported)
```

RUN QGIS (OTHER VERSION)

- Run QGIS in other version

```
$ nix run github:imincik/geospatial-nix/2b66624#qgis -- --version  
QGIS 3.38.1-Grenoble 'Grenoble' (exported)
```

INSTALL QGIS

- Install QGIS

```
$ nix profile install github:imincik/geospatial-nix#qgis
```

SHELL ENVIRONMENT

- No QGIS installed

```
$ qgis  
The program 'qgis' is not in your PATH.
```

- Create shell environment with GRASS and QGIS

```
$ nix shell github:imincik/geospatial-nix#{grass,qgis}  
  
$ grass --version  
GRASS GIS 8.4.0  
  
$ qgis --version  
QGIS 3.38.2-Grenoble 'Grenoble' (exported)
```

EXIT SHELL ENVIRONMENT

- Exit shell environment

```
$ exit # no grass and qgis anymore :(
```

NIX FOR ADVANCED USERS

QGIS CUSTOMIZATION (override dependencies)

- Build with development version of GDAL

```
$ nix run --impure --expr \
"let f = builtins.getFlake "github:imincik/geospatial-nix";
  p = f.packages.x86_64-linux; \

  in p.qgis.override { qgis-unwrapped = p.qgis-unwrapped.override { gdal = p.gdal-master; }; }"
```

QGIS CUSTOMIZATION (override dependencies)

About	
What's New	
Providers	
Developers	
Contributors	
Developers Map	
Translators	
Donors	
License	
QGIS version	3.38.2-Grenoble
Qt version	5.15.14
Python version	3.11.9
GDAL/OGR version	3.10.0dev
PROJ version	9.4.1
EPSG Registry database version	v11.006 (2024-03-13)
GEOS version	3.12.2-CAPI-1.18.2
SQLite version	3.45.3
PDAL version	2.7.2
PostgreSQL client version	unknown
SpatiaLite version	5.1.0
QWT version	6.2.0
QScintilla2 version	2.13.2
OS version	NixOS 23.11 (Tapir)
Active Python plugins	
db_manager	0.1.20

QGIS CUSTOMIZATION (MODIFY BUILD CONFIGURATION)

- Build without 3D support

```
$ nix run --impure --expr \
"let f = builtins.getFlake "github:imincik/geospatial-nix";
  p = f.packages.x86_64-linux; \

in p.qgis.override {
  qgis-unwrapped = p.qgis-unwrapped.overrideAttrs (
    old: { cmakeFlags = old.cmakeFlags ++ [ "-DWITH_3D=False" ]; }
  );}"
```

QGIS CUSTOMIZATION (ADD PATCH)

- Build with patch from PR

```
p.qgis-unwrapped.overrideAttrs (_: { patches = [
    n.fetchpatch {
        url = "https://github.com/<OWNER>/<REPO>/commit/<GIT-REVISION>.patch";
        hash = "";
    }
]})
```

GRASS IN CONTAINER

- Nix is a better Docker image builder than Docker

```
$ nix build --impure --expr \
  "let \
    f = builtins.getFlake "github:imincik/geospatial-nix"; \
    p = f.packages.x86_64-linux; \
    n = f.inputs.nixpkgs.legacyPackages.x86_64-linux; \
    in n.dockerTools.buildImage \
    { name = \"grass\"; config.Cmd = [ \"${p.grass}/bin/grass\" \"--version\" ]; }"
```

```
$ docker load < ./result

$ docker run grass:<TAG>

GRASS GIS 8.4.0
```

NIX FOR DEVELOPERS

PR: ADD NIX FILES TO THE PROJECT

<https://github.com/qgis/QGIS/pull/58510>

- flake.nix
- flake.lock
- package.nix
- unwrapped.nix

QGIS DEVELOPMENT ENVIRONMENT

- Get QGIS source code

```
$ git clone https://github.com/qgis/QGIS.git
```

- Build QGIS from source

```
$ nix develop

Welcome to a QGIS development environment !
Build QGIS using following commands:

1. cmake -G Ninja -D CMAKE_BUILD_TYPE=Debug -D CMAKE_INSTALL_PREFIX=$(pwd)/app ...
2. ninja
3. ninja install

...
```

RUN QGIS DIRECTLY FROM SOURCE CODE

- Run latest development version

```
$ nix run github:qgis/QGIS/#qgis-- --version
```

- Run specific git revision

```
$ nix run github:qgis/QGIS/<GIT-REVISION>#qgis -- --version
```

- Run from PR

```
$ nix run github:qgis/QGIS/<PR-BRANCH>#qgis -- --version
```

INSTALL QGIS DIRECTLY FROM SOURCE CODE

- Install latest development version

```
$ nix profile install github:qgis/qgis/#qgis -- --version
```

- Install specific git revision

```
$ nix profile install github:qgis/QGIS/<GIT-REVISION>#qgis -- --version
```

- Install from PR

```
$ nix profile install github:qgis/QGIS/<PR-BRANCH>#qgis -- --version
```

ISSUES WITH QGIS

- Doesn't work on Darwin (yet)
- Failing test suite
- GPU drivers not available out-of-box

GEOSPATIAL NIX.TODAY

<https://geospatial-nix.today/>

INTERESTED ?

- <https://nixos.org/community/teams/geospatial/>
- Matrix: #geospatial:nixos.org
- Email: ivan.mincik@gmail.com

NIX DOCUMENTATION

<https://nix.dev/>