

Free & Open Source Software

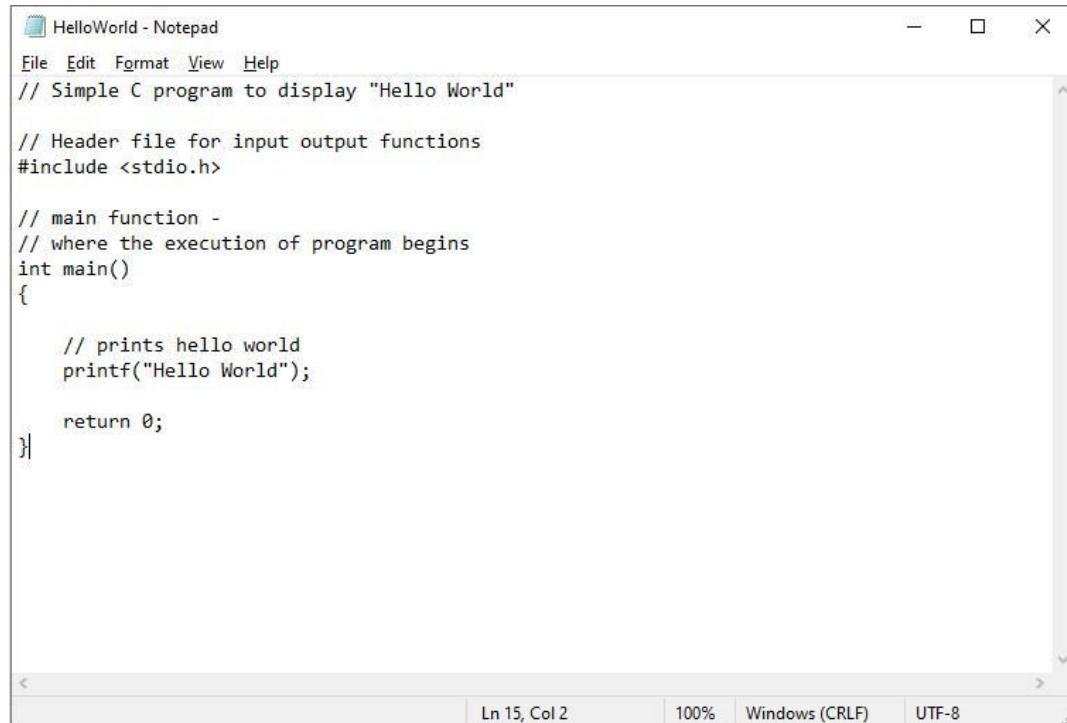
Ádám T. Kocsis (adam.kocsis@fau.de)



How are application software built?

The source code

- Human-readable
- A language of some sort



The image shows a Windows Notepad window titled "HelloWorld - Notepad". The window contains the following C program code:

```
File Edit Format View Help
// Simple C program to display "Hello World"

// Header file for input output functions
#include <stdio.h>

// main function -
// where the execution of program begins
int main()
{
    // prints hello world
    printf("Hello World");

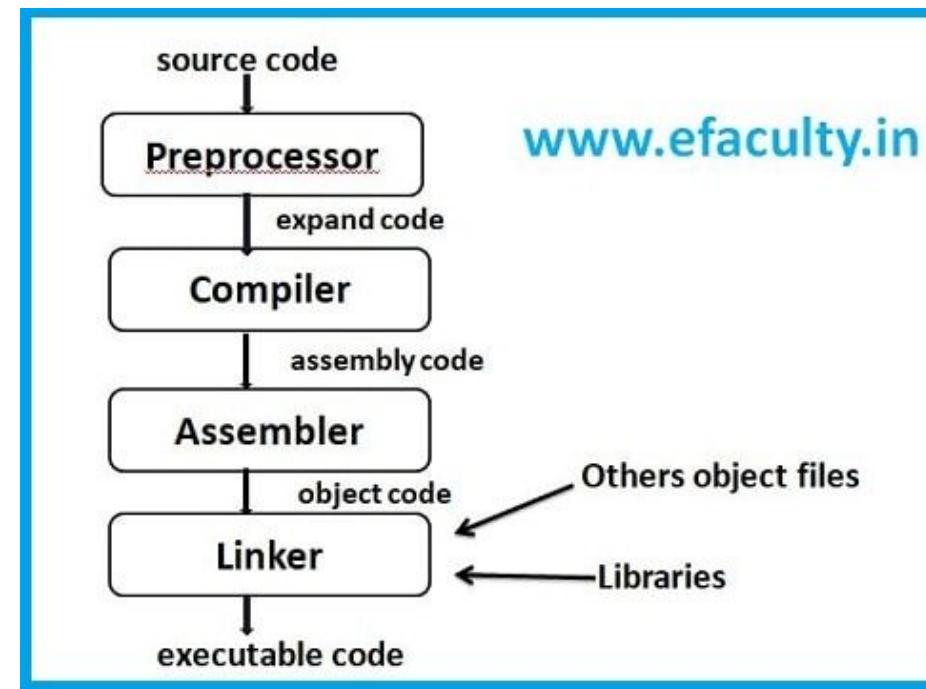
    return 0;
}
```

The status bar at the bottom of the Notepad window displays the following information: Ln 15, Col 2, 100%, Windows (CRLF), and UTF-8.

How are application software built?

The building process (*sensu lato* compilation)

- Translate the source code to executable
- One way deal, i.e. irreversible process – the exact source code cannot be recreated!



www.efaculty.in

Insert: compilation hello.exe

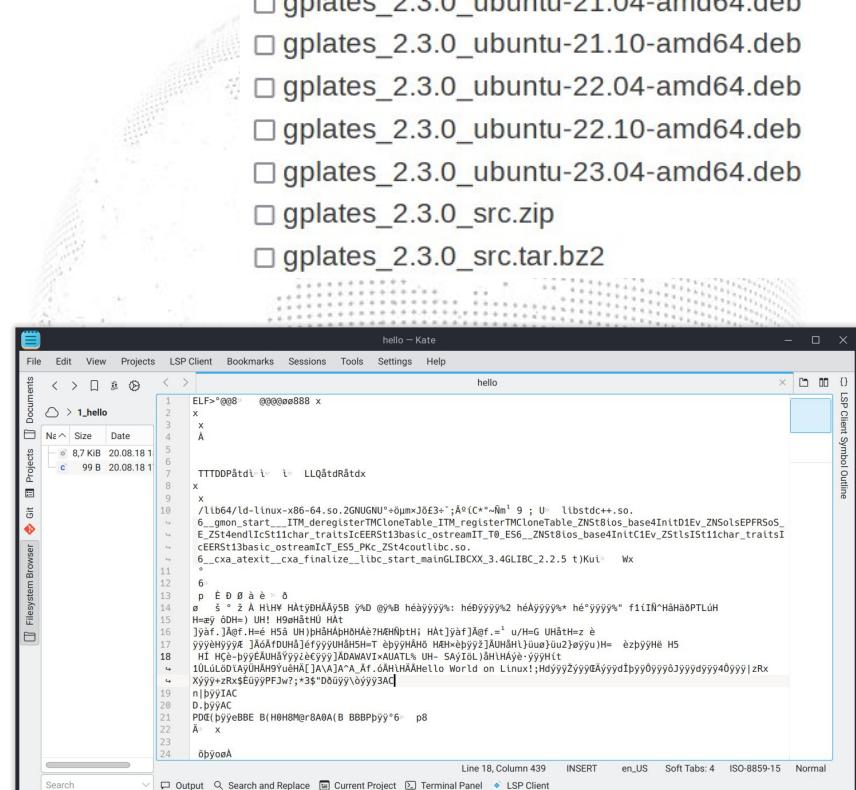
How are application software built?

Result: **binary executable**

- Modification is limited
- What the program does is cryptic (almost black box)
- Specific to Operating System and Architecture!

Download selection

- gplates_2.3.0_win64.exe
- gplates_2.3.0_win64.zip
- gplates_2.3.0_Darwin-x86_64.dmg
- gplates_2.3.0_ubuntu-18.04-amd64.deb
- gplates_2.3.0_ubuntu-20.04-amd64.deb
- gplates_2.3.0_ubuntu-20.10-amd64.deb
- gplates_2.3.0_ubuntu-21.04-amd64.deb
- gplates_2.3.0_ubuntu-21.10-amd64.deb
- gplates_2.3.0_ubuntu-22.04-amd64.deb
- gplates_2.3.0_ubuntu-22.10-amd64.deb
- gplates_2.3.0_ubuntu-23.04-amd64.deb
- gplates_2.3.0_src.zip
- gplates_2.3.0_src.tar.bz2

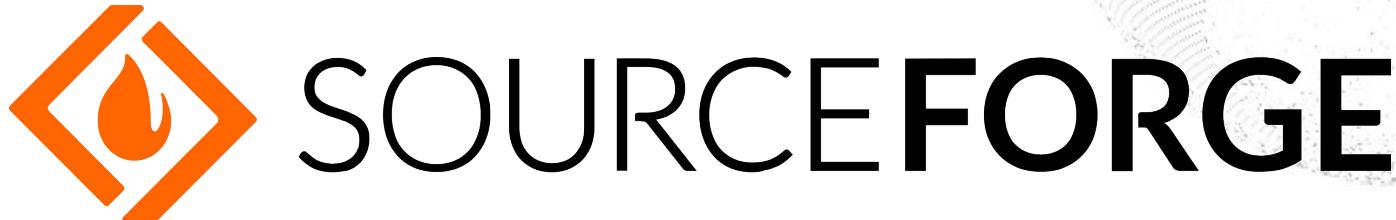


The screenshot shows the LSP Client interface. On the left, there's a file browser window titled "Documents" showing files like "1_hello" (elf), "1_hello.s" (S-Code), and "1_hello.o" (Object). On the right, the main window displays assembly code for a program named "hello". The assembly code includes instructions like "ELF->@08 @00000888 x", "6_gmon_start_ITM", and various system calls and library imports. Below the assembly code, there's a text area with some garbage characters. At the bottom, there's a status bar with information about the line, column, and file.

Free and Open Source Software?

Result

- You don't need to use binaries from the authors (no charge or restrictions)
- You can modify the program's behavior
- You can see what the program does



Original paradigm

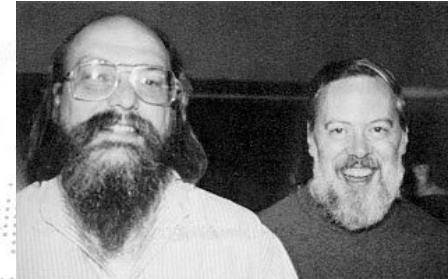
Software only for specific hardware!

- No transferability
- Apple still does this



Same Hardware → Different Software

- Proprietary operating systems
- Expensive, opaque
- **UNIX** (1969, AT&T Bell Labs)



Ken Thompson and
Dennis Ritchie

UNIX®

A Standard of The Open Group®

AIX

XENIX

solaris™

BSD

hp UX



A Free operating system?

Richard Stallman

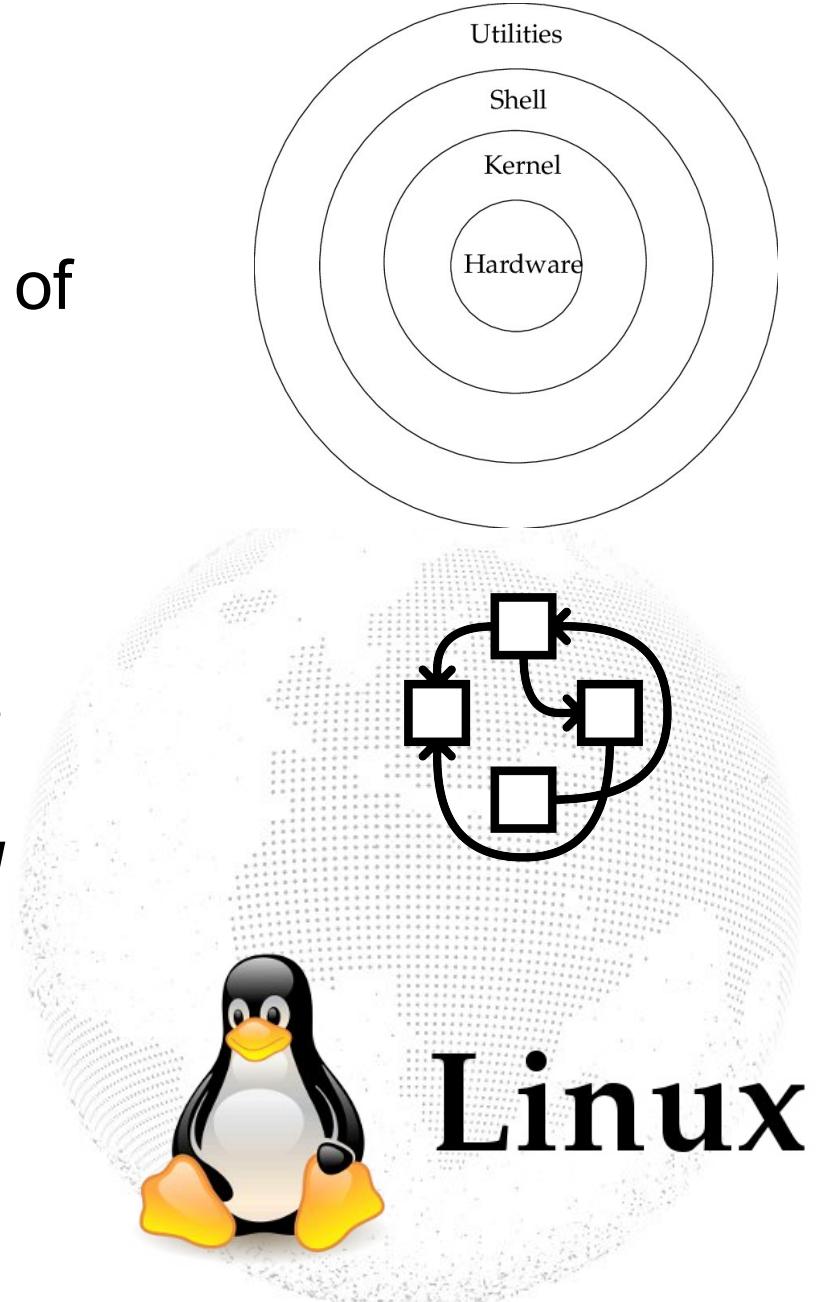


- **@MIT: GNU is Not UNIX (1983)**
- Unix-like OS: Modular design
- do one thing, but very good!
- Hundreds of software (including R!!)
- Works well with other open source software

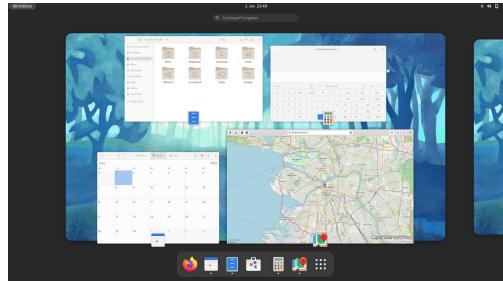


The Kernel

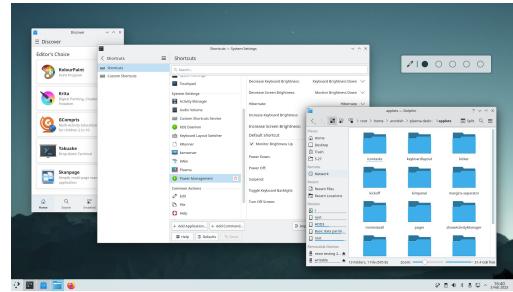
- The most important package of the OS, is built around this: Windows uses **NT**, MacOS: **Darwin**
- Handles hardware resources
- Original plans for GNU: *Hurd*
- 1991 UNIX-clone Minix was rebuilt by Linus Torvalds



The Desktop Environment



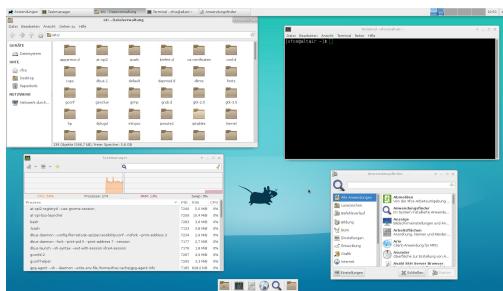
Gnome



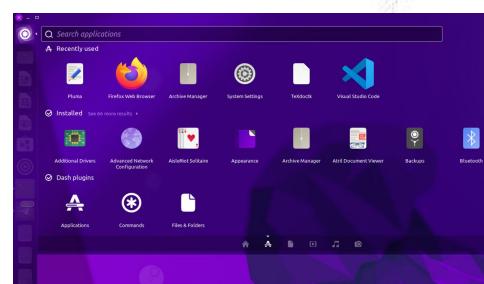
KDE



Pantheon



XFCE



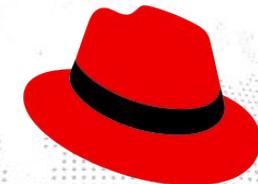
Unity



Budgie

Package management

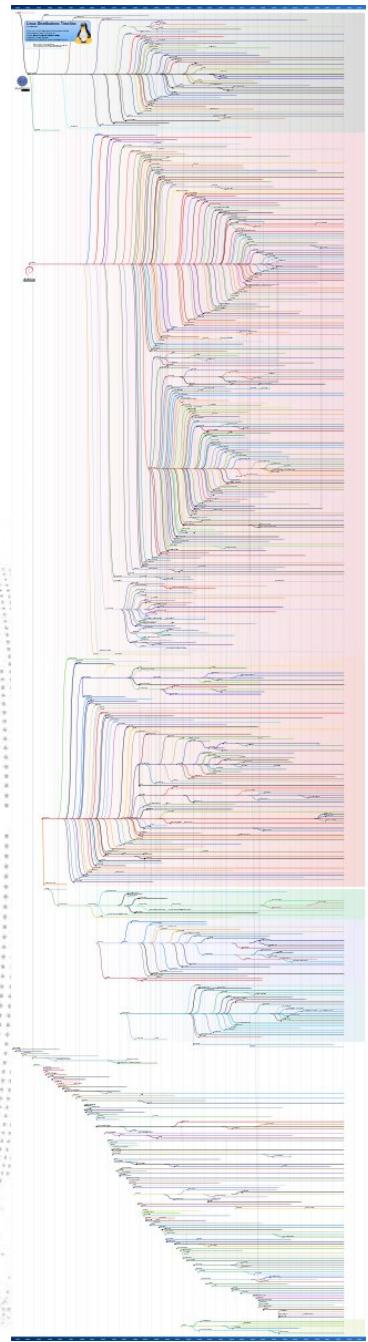
- You can build programs yourself, but it is easier to use pre-built ones
- Most important/prevalent ones



Primary Distribution	Debian	Arch	Red Hat
Manager Program	dpkg/apt	pacman	Re
Package extension	.deb	(AUR)	.rpm

The Phylogeny

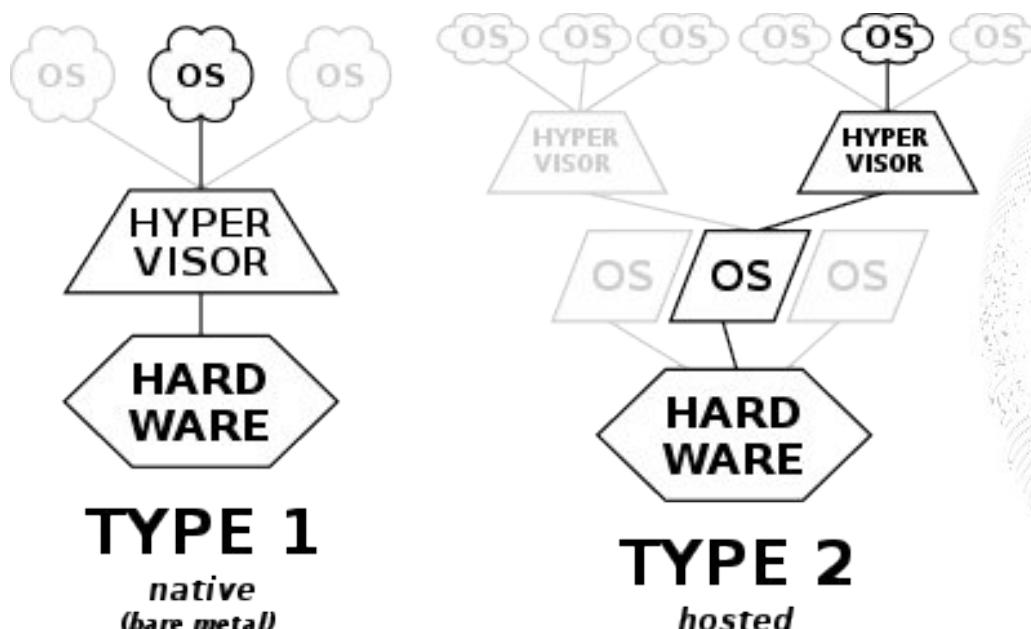
https://en.wikipedia.org/wiki/Linux_distribution#/media/File:2023_Linux_Distributions_Timeline.svg



Try them!

In virtual computers...

<https://www.youtube.com/watch?v=v1JVqd8M3Yc>



Inkscape

Vector graphics



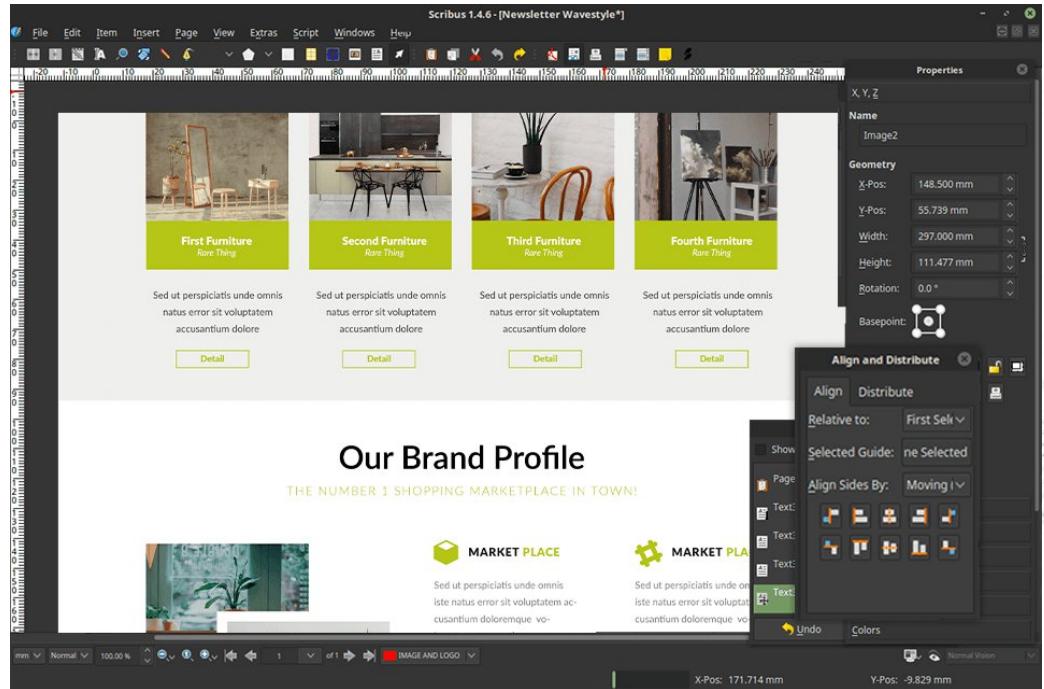
GIMP

Raster graphics editor



Scribus

Publishing (InDesign)



Blender

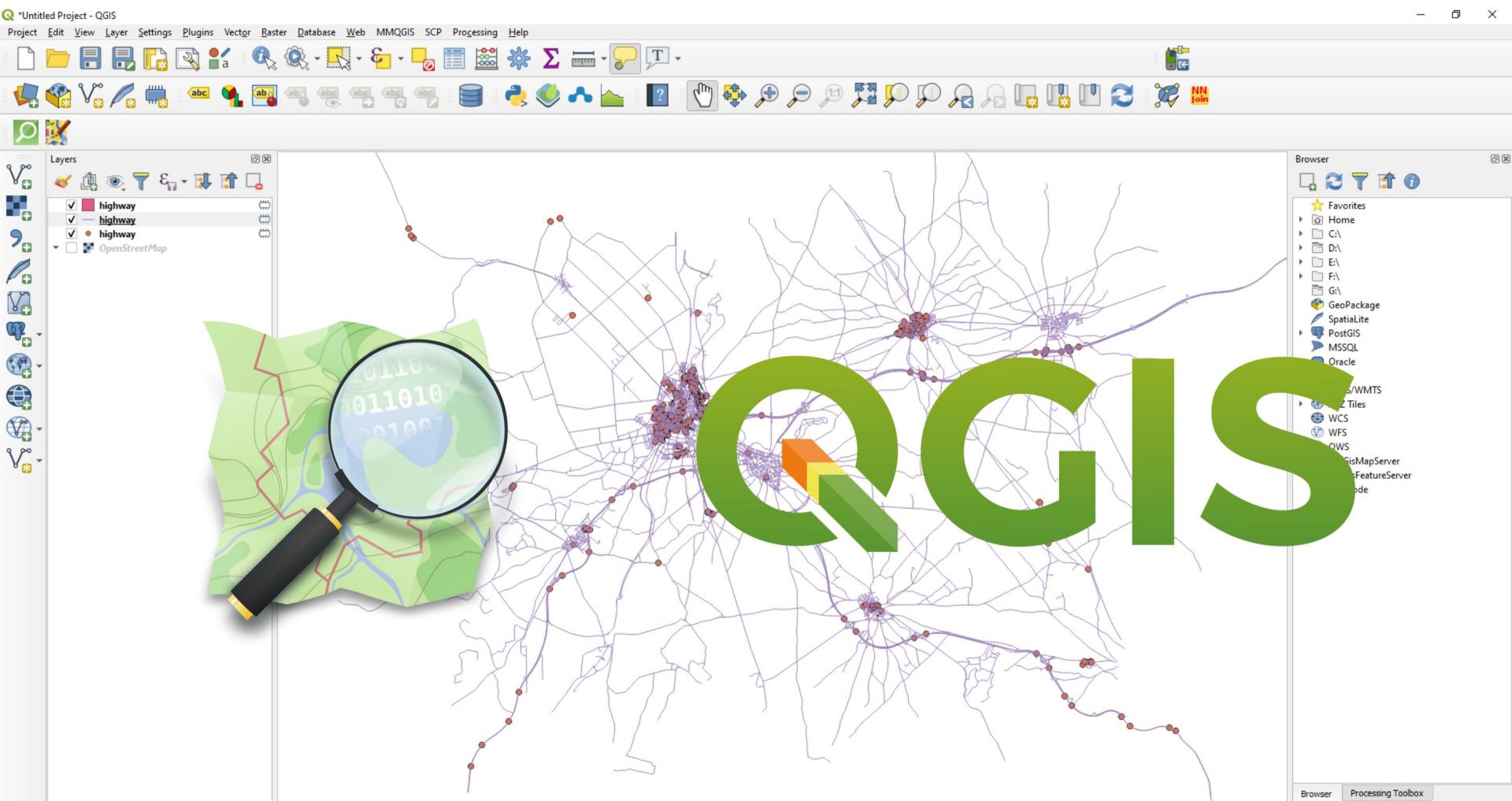
blender

*3D Graphics, Modelling, Shading,
Animation, Rendering*



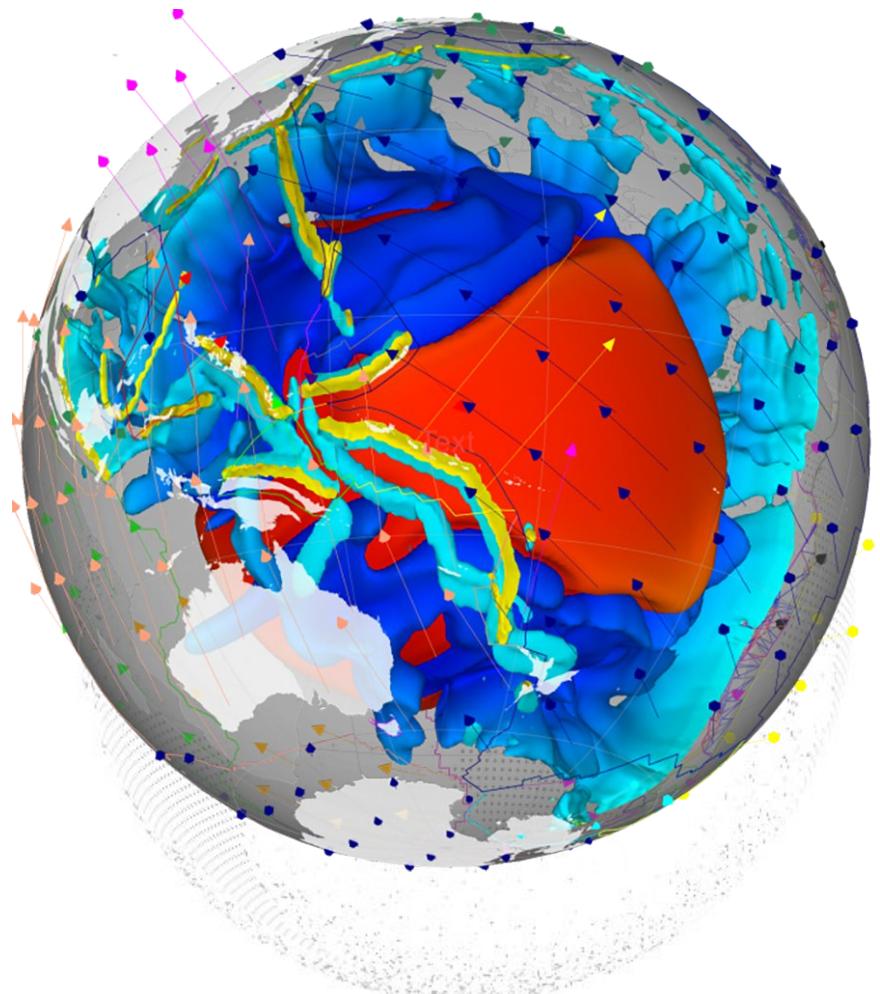
QGIS

Open source GIS



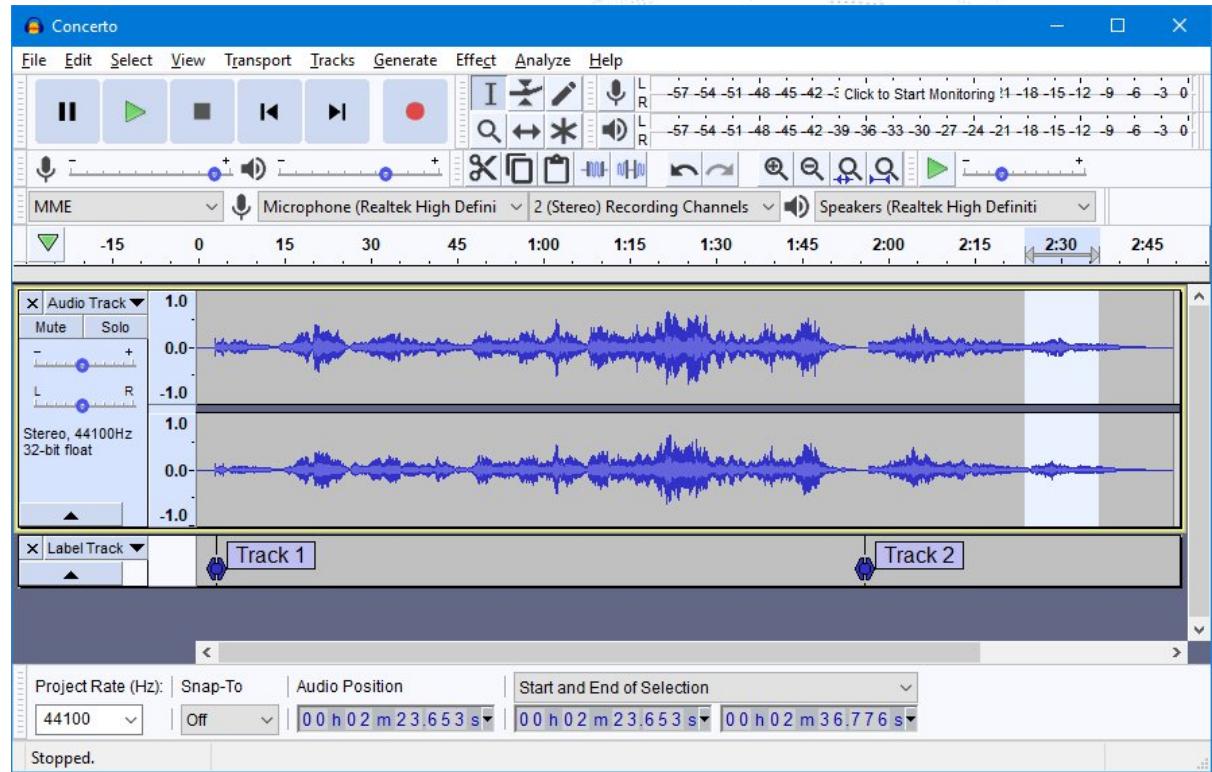
GPlates

Plate tectonic reconstructions



Audacity

Sound and music editor



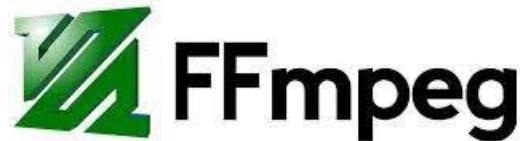
Office

Open source



Hundreds of command line tools, e.g.

Multimedia:



Images:



Compiler:



Document conversion:

