GRASS GIS
Bringing advanced geospatial technologies to the world.

Introduction to GRASS

Geographic **R**esources **A**nalysis **S**upport **S**ystem

Dr. GIUSEPPE AMATULLI
Yale University, School of the Environmen (YSE)
Spatial Ecology (www.spatial-ecology.net)

Outline

1. Grass Features
2. GRASS Architecture
3. Command Structure
4. GUI or terminal

Open Source Concept

"Free software is a matter of liberty, not price. To understand the concept, you should think of free as in *free speech*, not as in free beer."

—Richard Stallman

Programmers can read, redistribute, and modify the source code

Access to source code increases transparency and reproducibility of science

GNU Operating System
open sources does not mean free !

The GNU Project was launched in 1984 to develop a complete Unix-like operating system which is free software: the GNU operating system.

The combination of GNU and Linux is the GNU/Linux operating system, now used by millions.

GRASS is Free Software/Open Source released under GNU General Public License

GRASS is an official project of the Open Source Geospatial Foundation

The Open Source Geospatial Foundation supports the highest-quality open source geospatial software. Our goal is to encourage the use and collaborative development of community-led projects.

Also Support:
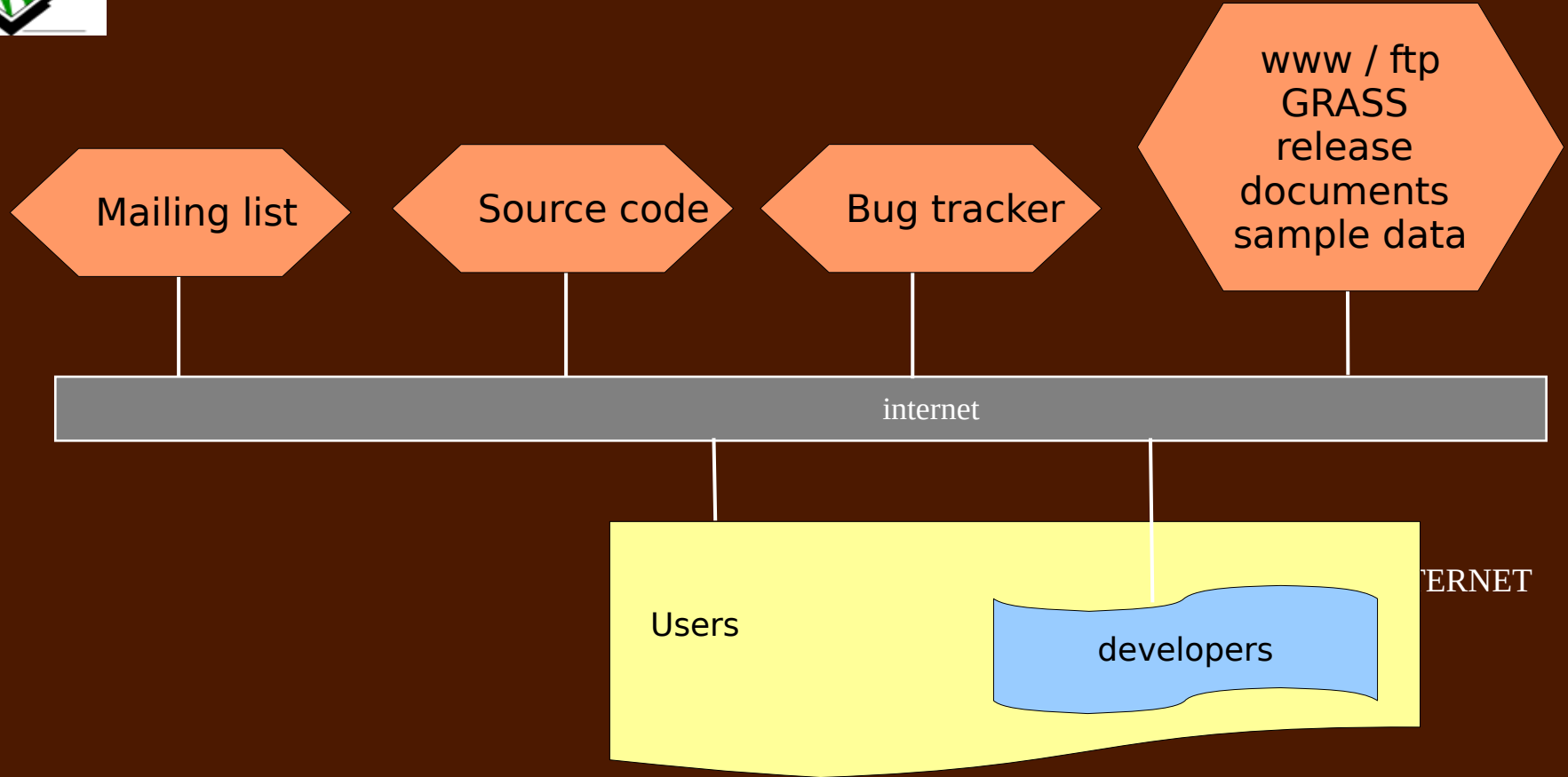GDAL/OGR, PostGIS, Quantum GIS, MapServer, OpenLayers

Geographic Resources Analysis Support System

- Open Source GIS, developed since 1984 (U.S. Army), since 1999 GNU GPL

- Portable code (multi-OS, 32/64bit)

- 400+ modules for management, processing, analysis and visualization (raster/image/vector)

- GIS backbone – links to:

GRASS Development

Mailing list

Source code

Bug tracker

www / ftp
GRASS
release
documents
sample data

internet

TERNET

Users

developers

What GRASS can do?

- 2D raster analysis and 3D voxel (volumes) management

- 2D/3D vector engine with SQL based DBMS support

- Image processing modules

- Vector network analysis, Linear Referencing System

- Visualization of 2D, 3D maps and volumes

- Interoperable with standard raster and vector formats

- Works on GNU/Linux, Mac OS X, MS-Windows and other POSIX compliant platforms

- Modular architecture and scripting capabilities for batch processing

GRASS Architecture

/folder path

~/ost4sem/grassdb
GRASS DBASE

/europe
**LOCATION
PROJECT(>8.4)**

/PERMANENT
/Vmodel
/PCEM
MAPSET

GISDBASE

GRASS data are stored in a directory referred to as GISDBASE. This directory has to be created with mkdir or a file manager, before starting to work with GRASS. Within this DATABASE, the projects are organized by project areas stored in subdirectories called LOCATIONs.

LOCATION

Defined by its coordinate system, map projection and geographical boundaries. The subdirectories and files defining a LOCATION are created automatically when GRASS is started the first time with a new LOCATION. Every location has a PERMANENT MAPSET sub-directory which stores some basic information about the whole location.

MAPSET

Organize maps by theme/geography/projec/etc within MAPSETs. Every GRASS session runs in one MAPSET at a time. A LOCATION can have many MAPSETs.

GRASS DBASE

~/ost4sem/grassdb

LOCATION

/world

/asia

/spain

/europe

MAPSET

/PERMANENT

/Vmodel

/PCEM

Volume maps

/grid3

/soil3d

/range

/cellhd

/cell

/cats

/dbf

/Country.dbf

Vector maps

/vector

/Country

/coor

/dbln

/head

/hist

/topo

/sidx

Raster maps

/cats

/cell

/cellhd

/cell_misc

/colr

/fcell

/hist

Category values (e.g. color or temperature values) and   attributes (classes with caption) of the individual raster maps

cell/   Individual raster maps

cellhd/   Header rows of the individual raster maps

cell_misc/ Statistical data of the individual raster maps

colr/   Color information of the individual raster maps

dbf/   Contains the internal vector attributes in DBASE format

fcell/   Raster maps with floating point numbers

hist/   Developing history of the individual raster maps

vector/   Contains the individual vector data (geometry, topology, etc.)

WIND   Data of the current REGION and the MAPSET

Grass Commands

prefix	function class	type of command	example
g.*	general	general data management	g.rename: renames map
d.*	display	graphical output	d.rast: display raster map d.vect: display vector map
r.*	raster	raster processing	r.mapcalc: map algebra r.univar: univariate statistics
v.*	vector	vector processing	v.clean: topological cleaning
i.*	imagery	imagery processing	i.pca: Principal Components Analysis on imagery group
r3.*	voxel	3D raster processing	r3.stats: Voxel statistics
db.*	database	database management	db.select: select value(s) from table
ps.*	postscript	map creation in PostScript format	ps.map: PostScript map creation

Grass syntax

SYNOPSIS
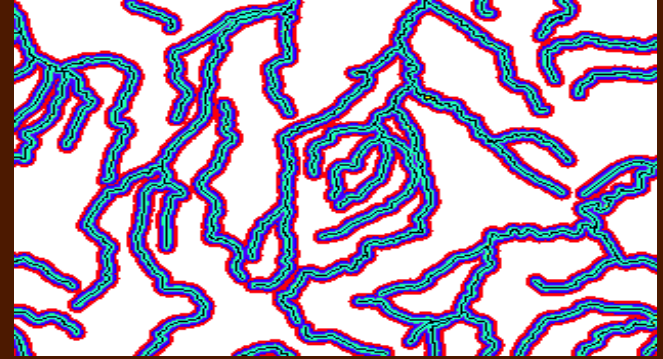Command [flags or options] parameter [flags]

Grass syntax

Command [flags or options] parameter [flags]

Example:

r.buffer - Creates a raster map layer showing buffer zones
surrounding cells that contain non-NULL category values.

r.buffer [-zq] input=name output=name distances=float[,float,...] [units=string]
[--overwrite] [--verbose] [--quiet]

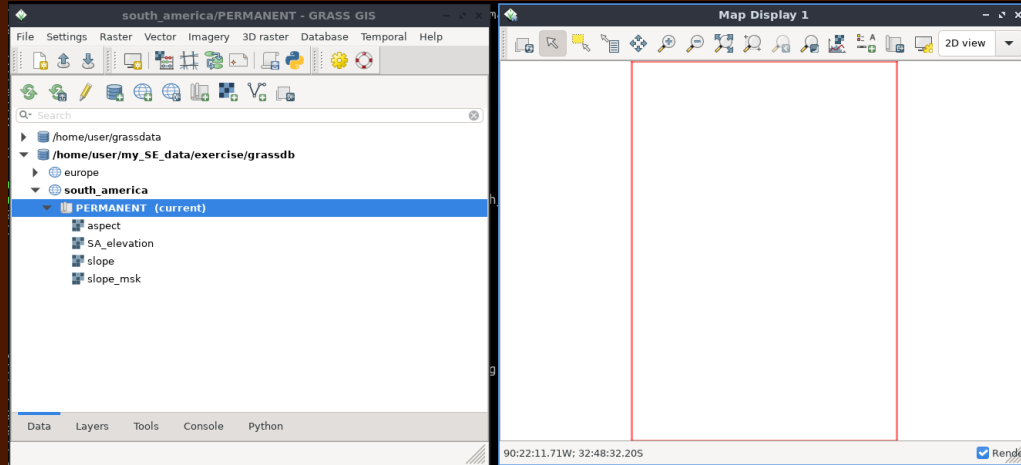-z: Ignore zero (0) data cells instead of NULL cells

r.buffer -z input=roads output=roads.buf distances=100,200,300,400,500 units=kilometers --overwrite
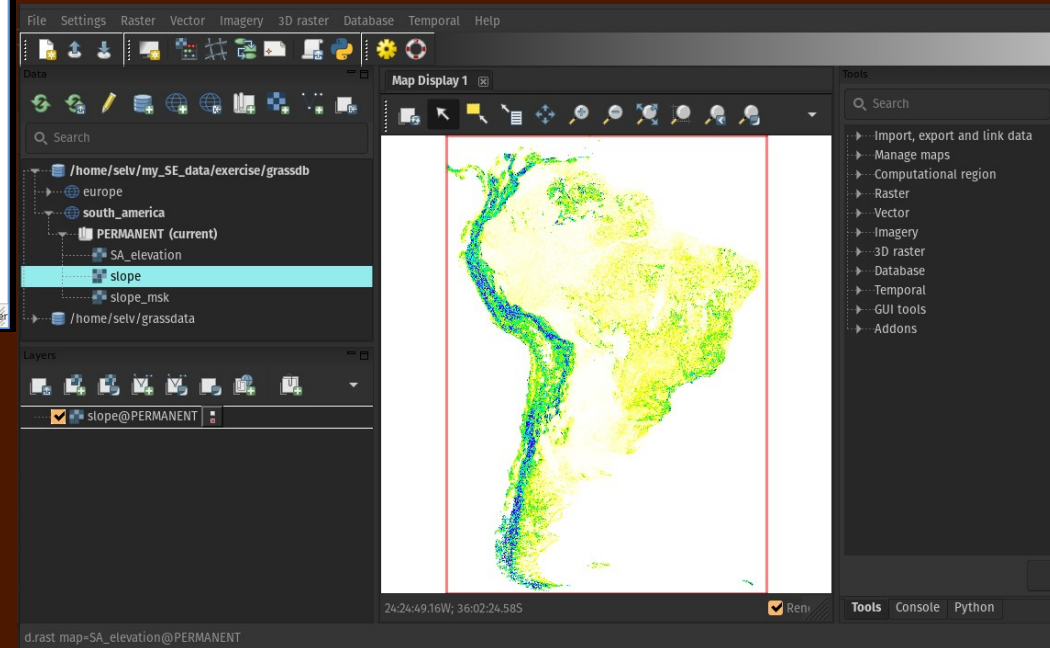
GRASS Graphical User Interface

GRASS 8.3

GRASS 8.4

Command line

```
user@osgeolive:~$ grass --text  my_SE_data/exercise/grassdb/south_america/PERMANENT/
Starting GRASS GIS...
Cleaning up temporary files...


            _____  ____   ___ _____   _____
           / ____/ __ \/ __ | / __//_____/ / ____/  _/ ___/
          / / __/ /_/ / /_/ |/ /_/_____/  / / __ / //  \__ \
         / /_/ / _, _/ __  |/____/_____/  / /_/ // /_____/ /
         \____/_/ |_/_/  |_/____/_____/  \____/___/_____/


Welcome to GRASS GIS 8.2.1
GRASS GIS homepage:                    https://grass.osgeo.org
This version running through:           Bash Shell (/bin/bash)
Help is available with the command:     g.manual -i
See the licence terms with:             g.version -c
See citation options with:              g.version -x
Start the GUI with:                     g.gui wxpython
When ready to quit enter:               exit

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

GRASS south_america/PERMANENT:~ >
GRASS south_america/PERMANENT:~ >
```
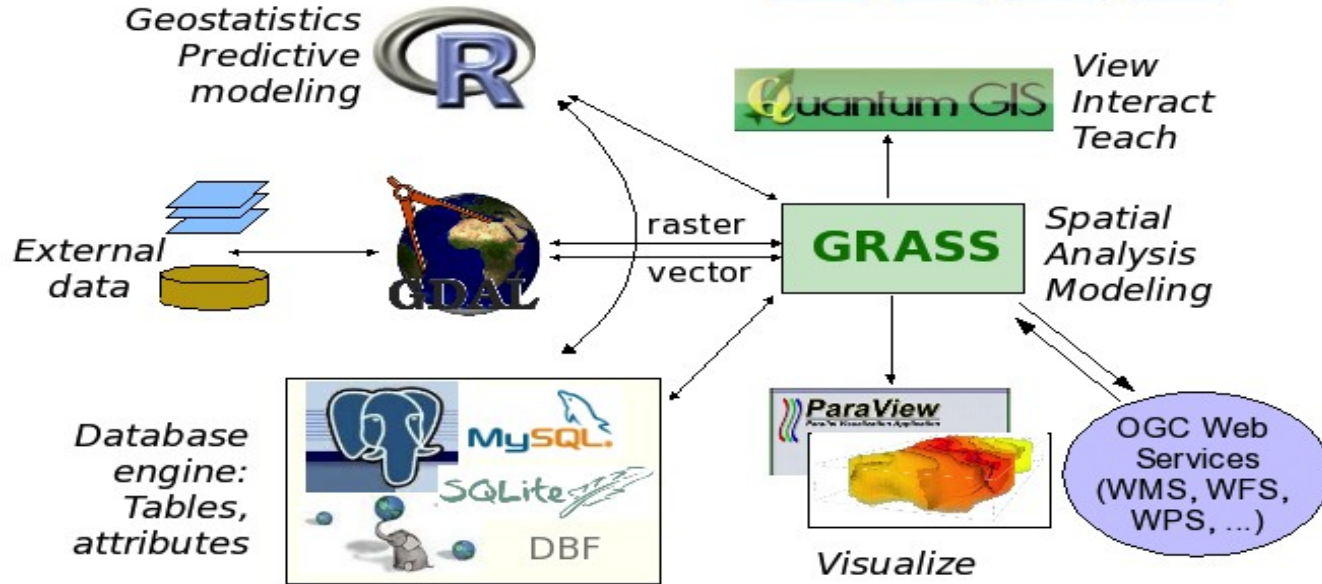
Portability, Interoperability

http://spatial-ecology.net/
GRASS – GIS section