State of GRASS GIS Project: 35 years is nothing!

Markus Neteler, Veronica Andreo, Anna Petrasova, Moritz Lennert, Martin Landa, Luca Delucchi, Markus Metz & GRASS Development Team

glass.osgeo.org

FOSS4G 2019 – Bucharest, Romania
35+ years of GRASS GIS: from mainframe to desktop and cloud

GRASS GIS 101

- GRASS = Geographic Resources Analysis Support System
- modular and flexible GIS and image processing software
- freedom: GNU General Public License 2+
  - 2D raster and 3D raster voxel processing
  - topological vector data functionality
  - image processing, time series analysis
  - visualization options
- portable software ("all" operating systems)
- graphical user interface and command line
- cloud ready: docker images available
GRASS GIS and the scientific community

GRASS GIS scientific reputation:

• 34528 citations
• H-index: 88
• i10-index: 444

https://scholar.google.com/citations?user=gJ0ZB0cAAAAJ
GRASS GIS is Big Data ready

Virtual raster tiles (VRT)

`r.buildvrt` - creates VRT layer from a list of input raster maps

Useful for tile based (cloud) computing or better management of mosaics

Screenshot source:
https://wenzeslaus.github.io/grass-gis-talks/ncgis2019_whats_new.html#26
GRASS GIS is Big Data ready

New raster compression

**ZSTD** - an improvement over ZLIB (Deflate) method, providing both faster and higher rate of compression

GRASS GIS is Big Data ready

Flexible memory handling:
- **all-in-memory** mode
- **disk cache** mode

The new all-in-memory cache offers faster cost path, point cloud binning, stream and flow computation, image segmentation, b-spline interpolation

GRASS GIS is Big Data ready

Up-to-date docker images are available from https://grass.osgeo.org/download/software/docker-images/

→ https://hub.docker.com/
GRASS GIS is Copernicus-ready

New toolset for processing Sentinel-2 data

https://grass.osgeo.org/grass7/manuals/addons/i.sentinel.html

S-2 download, import, atmospheric and topographic correction, cloud detection, and masking
Remote sensing in GRASS GIS: object-based image analysis (OBIA)

- Complete toolchain from segmentation to classification
- including
  - SLIC superpixel creation
  - image segmentation and parameter optimization
  - Machine Learning (r.learn.ml, v.class.mlR)
  - Deep learning (i.ann.*)
GRASS GIS and Python: a long-lasting love story

Python 3 support is available!

- started in 2018 as a Google Summer of Code project
- a notable amount of code needed to be revisited:

First release candidate (7.8.0 RC1) in August 2019
https://github.com/OSGeo/grass/releases/tag/7.8.0RC1
Try GRASS GIS online!

Try GRASS GIS in Jupyter Notebook with Python

![launch binder]

https://github.com/wenzeslaus/try-grass-in-jupyter

Jupyter Notebook for trying GRASS GIS in *Binder.*

Try GRASS GIS in Jupyter Notebook with Bash

![launch binder]


Jupyter Notebook for trying GRASS GIS in *Binder.*
Try GRASS GIS online!

Watersheds

Set computational region and create...

```
In [4]: gs.parse_command('g.region', raster="elevation", flags='pg')
gs.parse_command('r.relief', input="elevation", output="shade")

gs.run_command('d.erase')
gs.run_command('d.rast', maps="elevation")
gs.run_command('d.legend', raster="lakes_buff", range=(2, 5), at=(88, 100, 2, 16))
Image(filename="map.png")

gs.run_command('r.watershed', elevation="elevation", basins="watersheds", threshold=80000)
#gs.run_command("r.colors", map="watersheds", color="haxby")
gs.run_command('d.erase')
gs.run_command('d.shade', color="watersheds", shade="shade")
Image(filename="map.png")
```

Out[4]:
**actinia**: GRASS GIS with REST API

**Actinia** is an open source REST API for scalable, distributed, high performance processing of geographical data that uses GRASS GIS for computational tasks. Users can process satellite images, time series of satellite images, and also arbitrary raster and vector data with geographical relations.

https://github.com/mundialis/actinia_core/
actinia: GRASS GIS with REST API

GRASS 7.8.dev (nc_spm_08)::~ >
v.buffer input=mypoint output=mybuffer distance=42 --json
{
  "module": "v.buffer",
  "id": "v.buffer_1804289383",
  "inputs": [
    {"param": "input", "value": "mypoint"},
    {"param": "layer", "value": "-1"},
    {"param": "type", "value": "point,line,area"},
    {"param": "distance", "value": "42"},
    {"param": "angle", "value": "0"},
    {"param": "scale", "value": "1.0"}
  ],
  "outputs": [
    {"param": "output", "value": "mybuffer"}
  ]
}
actinia: GRASS GIS with REST API

“ace” tool – actinia command execution

ace allows to work with actinia REST services:

- execution of **single** or **lists** of GRASS GIS commands (i.e., process chains)
- ... the actinia job management will distribute the requests to multiple compute nodes in the cloud

Tutorial incl. download of “ace” tool:
https://github.com/mundialis/actinia_core/tree/master/scripts
SVN to git migration: GRASS GIS 7.x

https://github.com/OSGeo/grass
SVN to git migration: 1987 – 2016
v3.2 ... v6.x

https://github.com/OSGeo/grass-legacy

GRASS GIS Addons were also moved to GH:
https://github.com/OSGeo/grass-addons/
A true software archive: back to GRASS GIS v 3.2 from 1987

https://github.com/OSGeo/grass-legacy

Legacy code repository of GRASS GIS versions 3.2, 4.x, 5.x, 6.x (1987-2016)  https://grass.osgeo.org

This branch is 7978 commits ahead, 24035 commits behind develbranch_6.

... i.e. the old v6.5!
Community activities: Code Sprint 2019 in Berlin

- Focus on SVN to GitHub migration
- Discussions on “image collections” (now available as pull request for discussion)
- WIP: support for PROJ 6

May 2019
New Web site upcoming!
Thanks for your attention – and join us!

grass.osgeo.org

https://github.com/OSGeo/grass