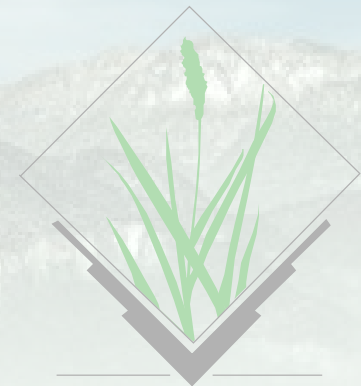


# Community based software development: The GRASS GIS project

*Seminar at  
Department of Information and  
Communication Technology  
University of Trento, 30 Nov 2006*

*M. Neteler  
neteler at itc it  
<http://mpa.itc.it>  
ITC-irst, Povo (Trento), Italy*



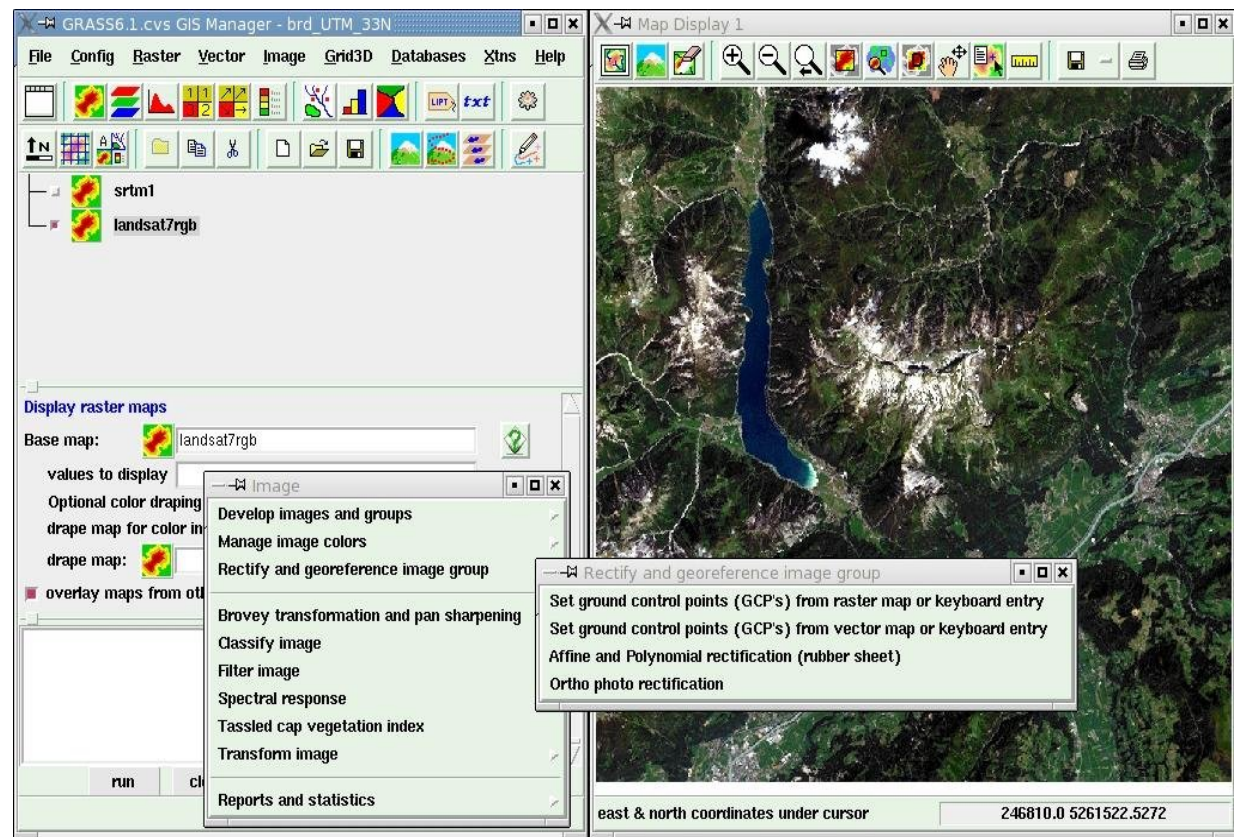
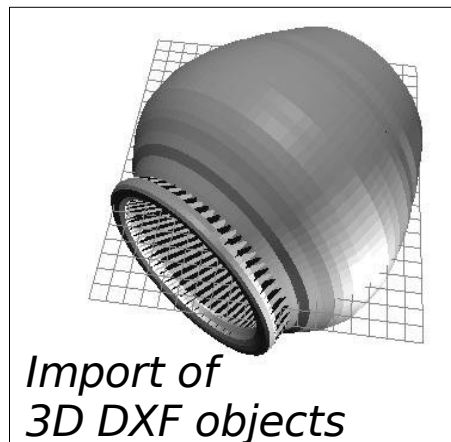
# Outline

## Seminar

- Introduction to the GRASS project
- Communication structure
- Code development
- Structure of the development team: be collaborative in the cyberspace
- Legal Issues

# Objectives of GRASS project

- Continue to develop free software GIS (since 1982)
- Deliver high quality algorithms (often academia based) for
  - spatial data analysis
  - innovative visualization
  - modeling and simulation

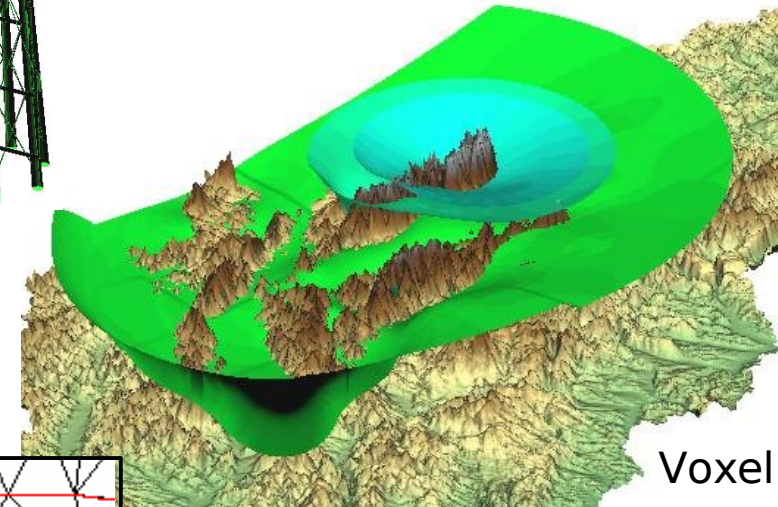


# Spatial Data Types

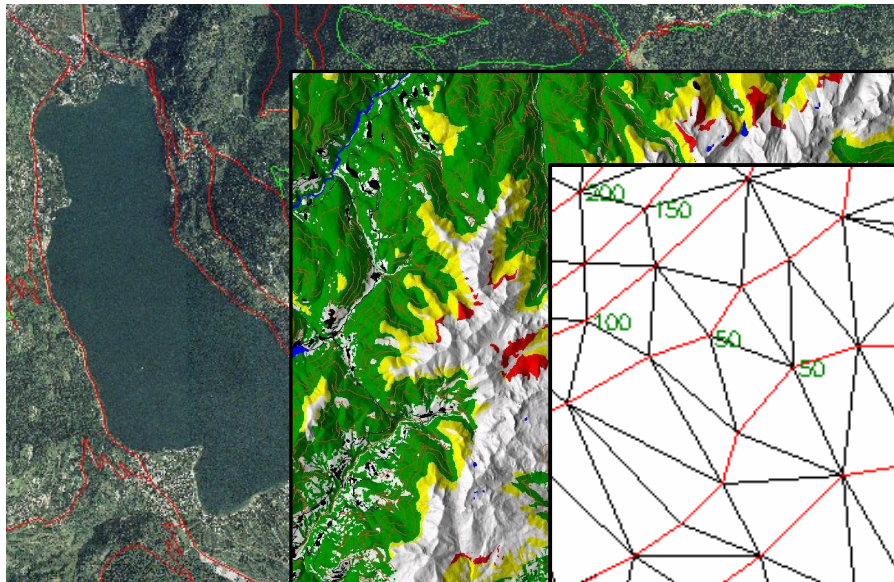
## Supported Spatial Data Types

- 2D Raster data incl. image processing
- 3D Voxel data for volumetric data
- 2D/3D Vector data with topology
- Multidimensional points data

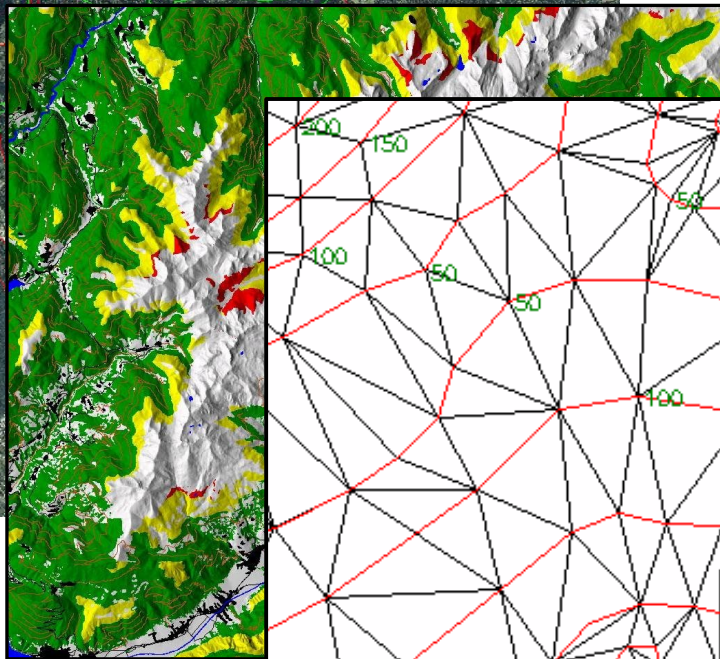
<http://grass.itc.it>



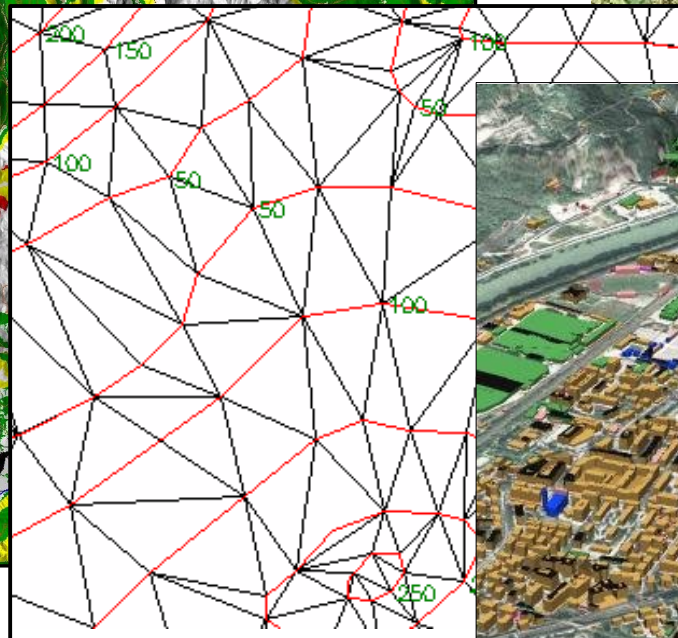
Voxel



Orthophoto



Distances



Vector TIN

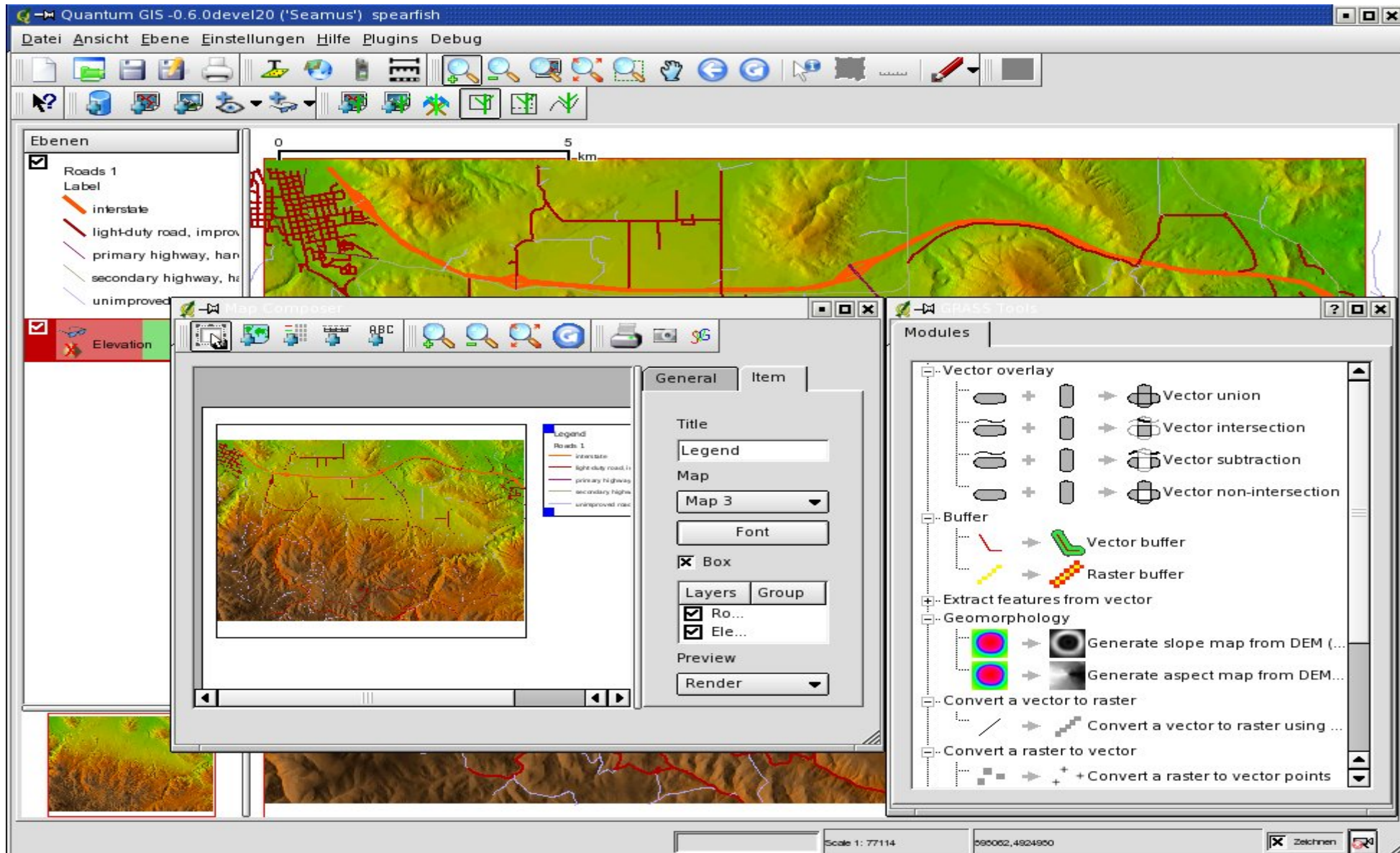


3D Vector buildings



## QGIS Printing Editor and GRASS toolbox

<http://qgis.org>





# Desktop GIS: GRASS GIS

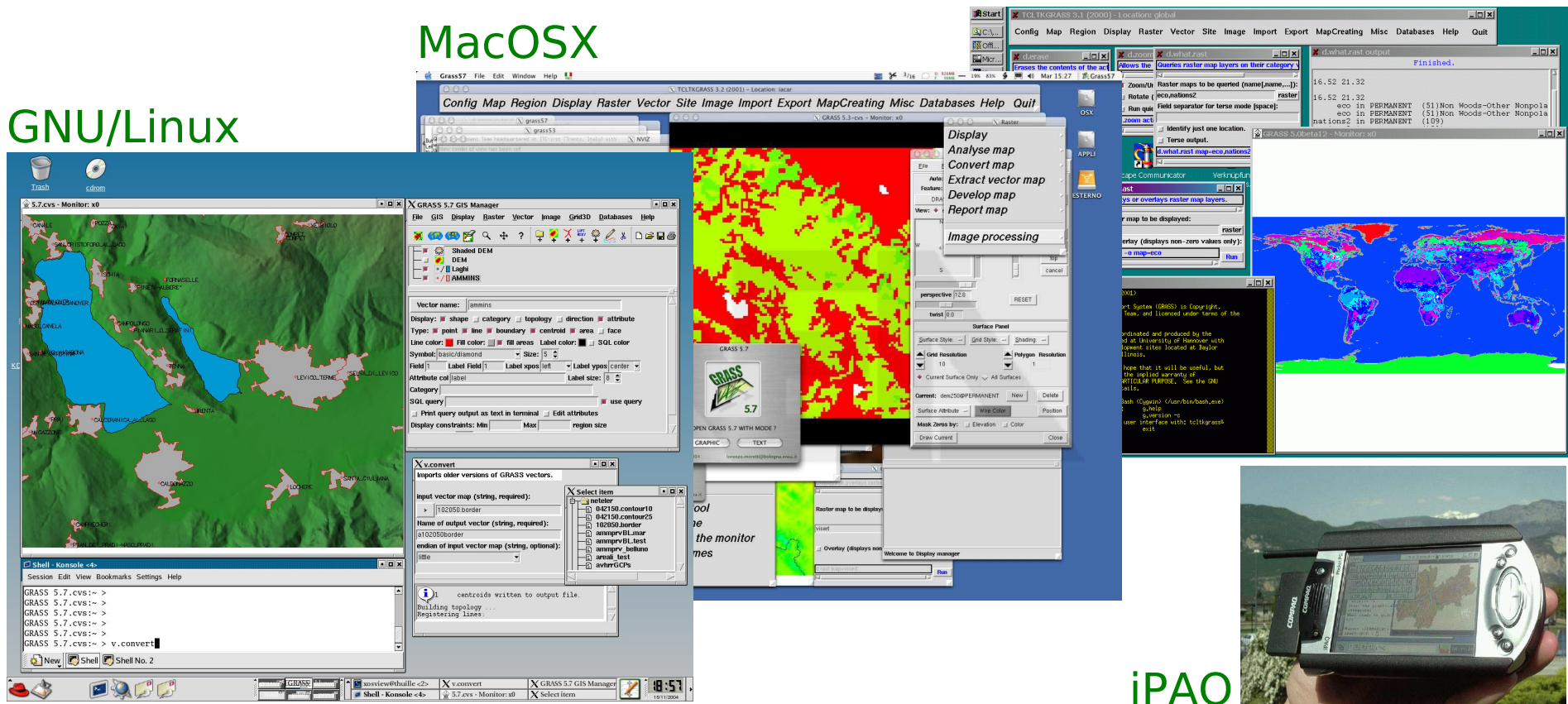
## Brief Introduction – Development and System Requirements

- Developed since 1984, **always Open Source**, since 1999 under GNU General Public License
- Written in C programming language, **portable code** (32/64bit)
- International development team**, since 2001 coordinated at ITC-irst
- Distributed as source code, precompiled binaries for various platforms, CDROM

MS-Windows

MacOSX

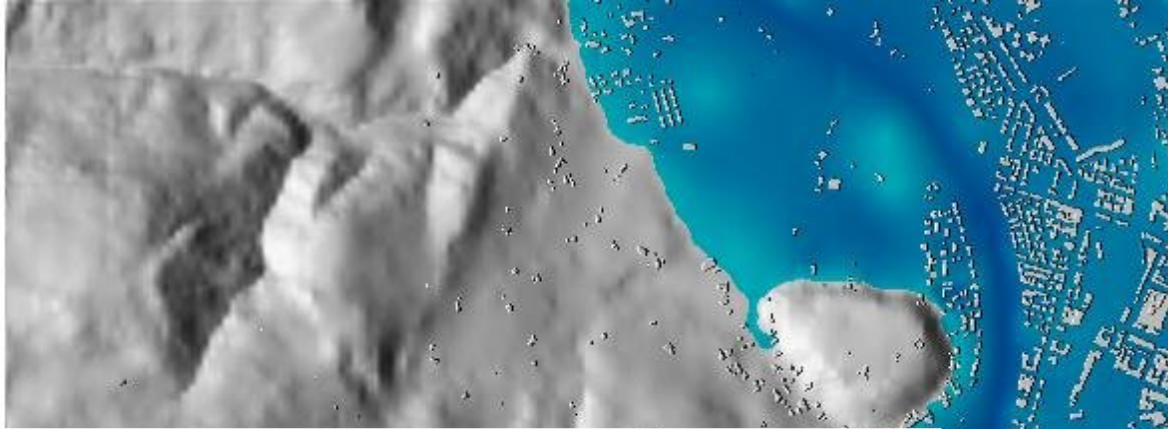
GNU/Linux



iPAQ

# GRASS new features

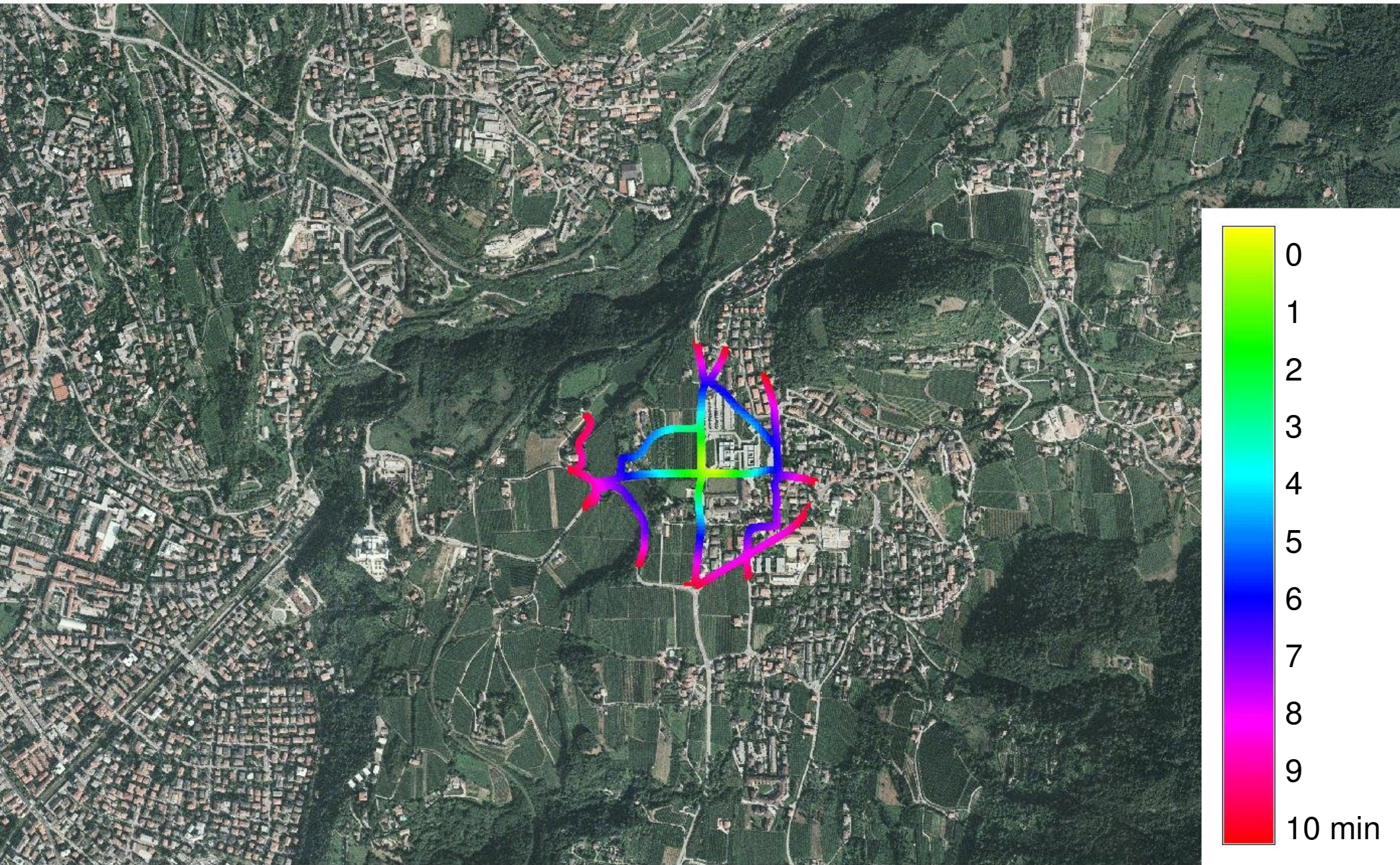
## Flood simulation Trento 1966



Courtesy:  
[www.questotrentino.it](http://www.questotrentino.it)

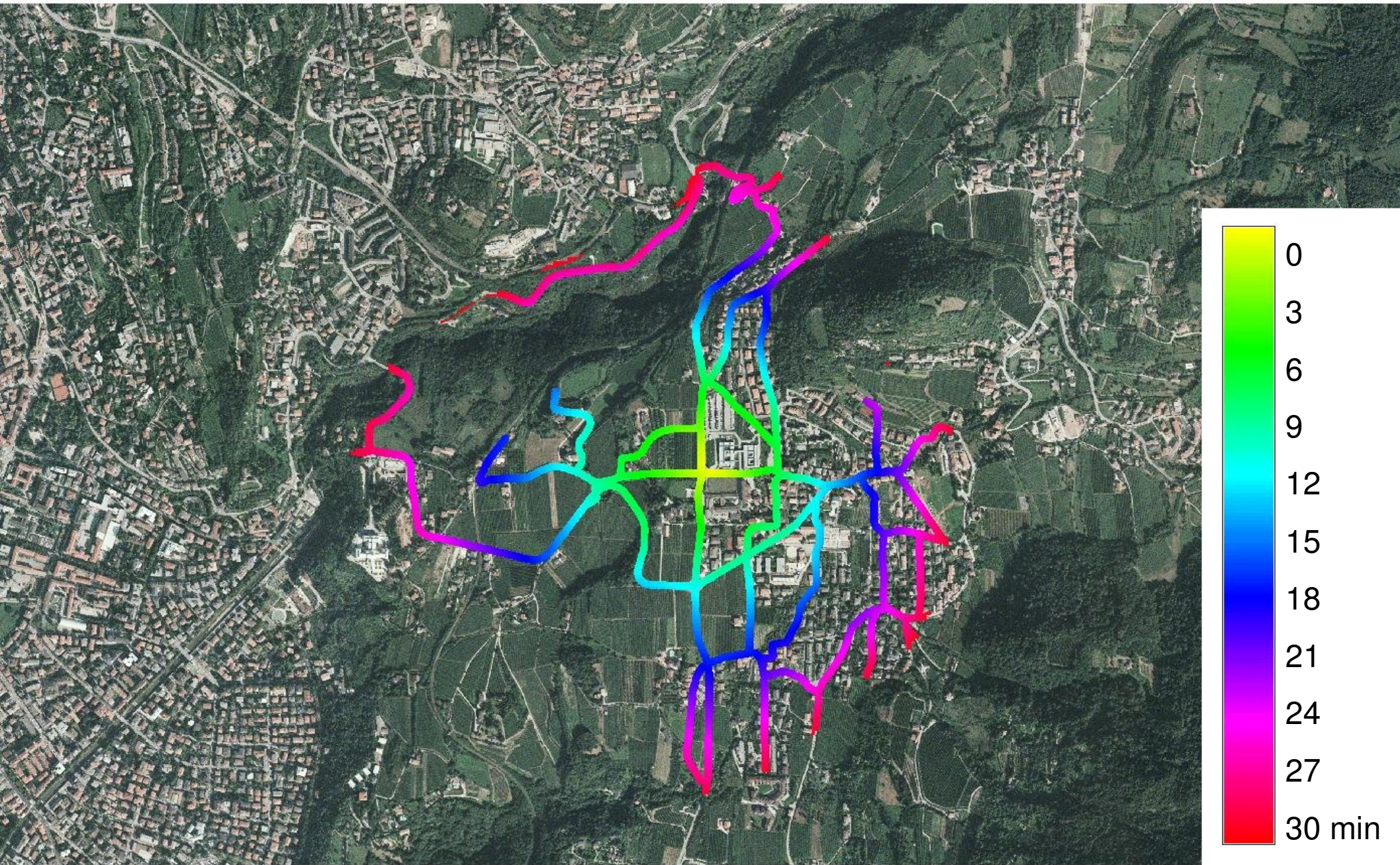


# GRASS: Person walking distance 10 minutes





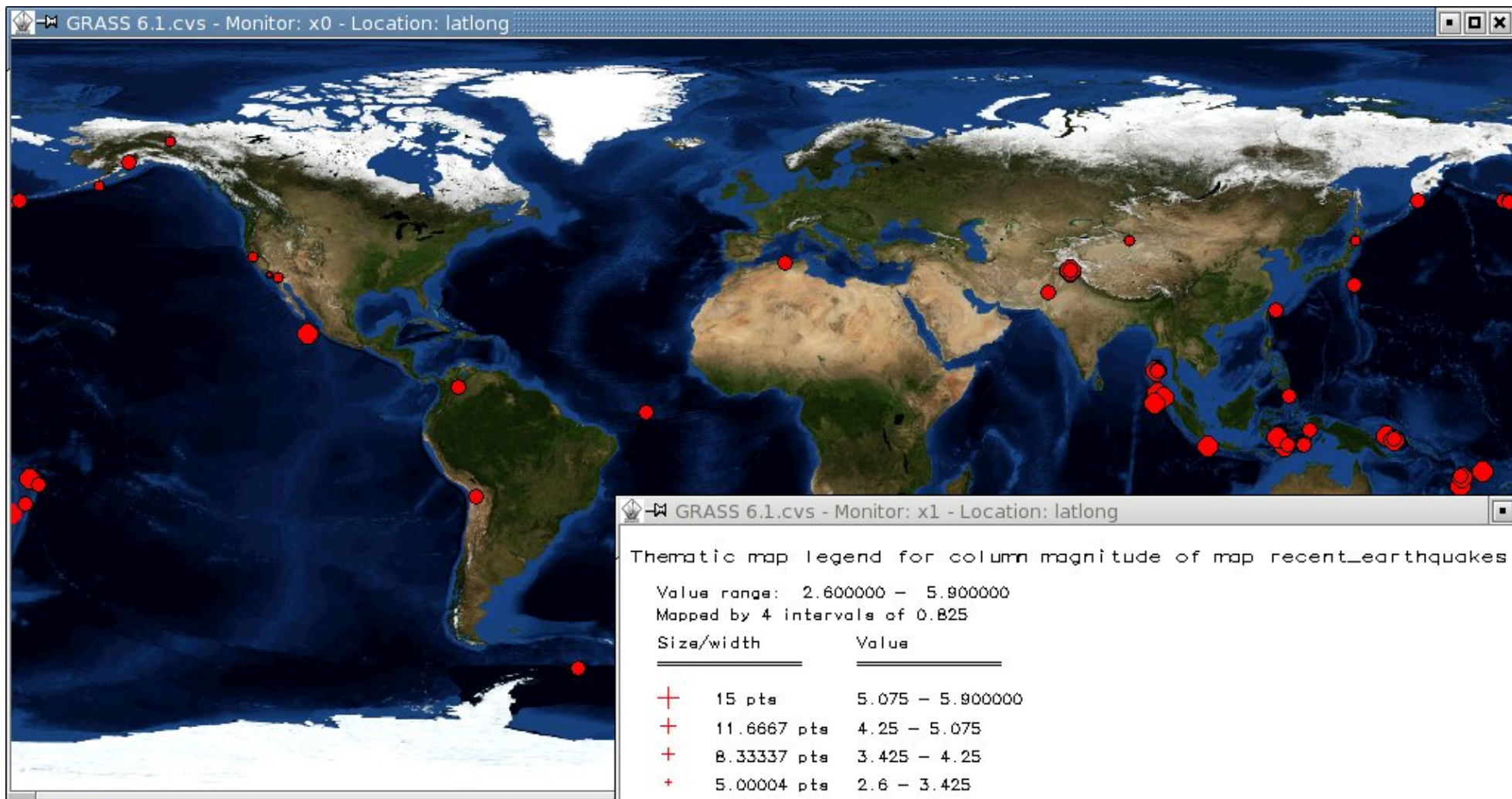
# GRASS: Person walking distance 30 minutes



# WebGIS: Integration of data sources

## GRASS in the Web

Real-time monitoring of Earthquakes (provided in Web by USGS)  
with GRASS/PHP: [http://grass.itc.it/spearfish/php\\_grass\\_earthquakes.php](http://grass.itc.it/spearfish/php_grass_earthquakes.php)

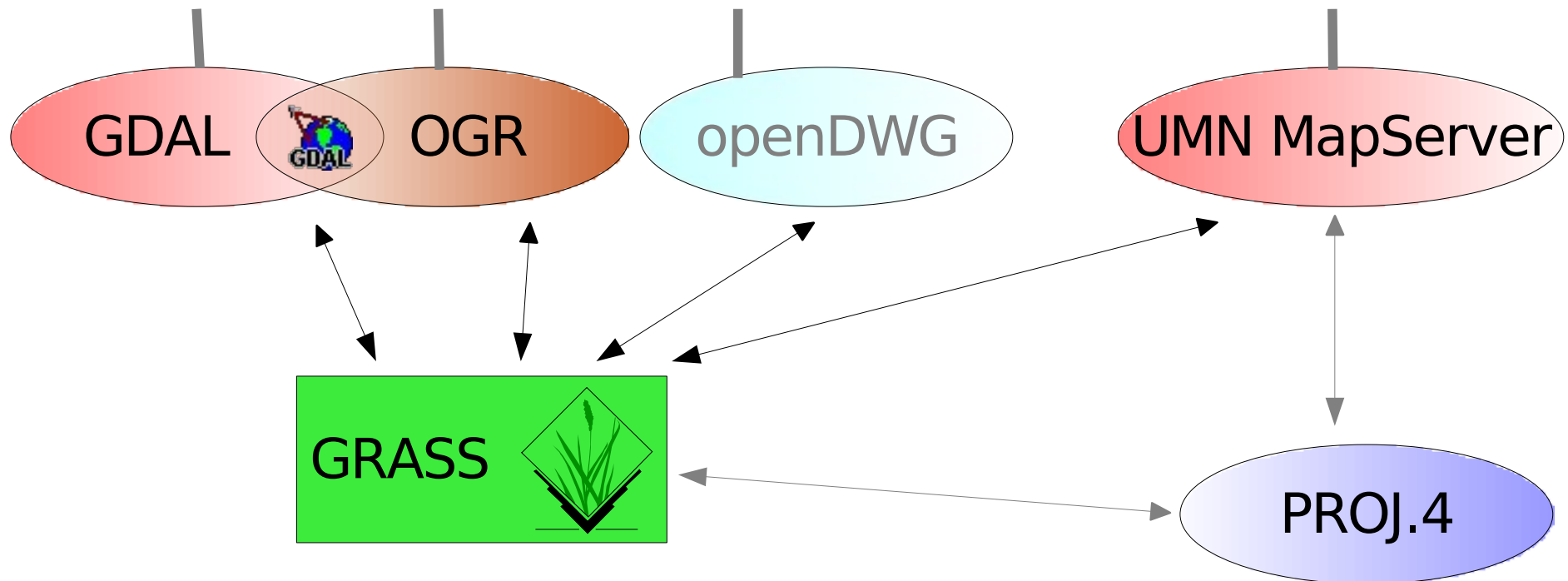




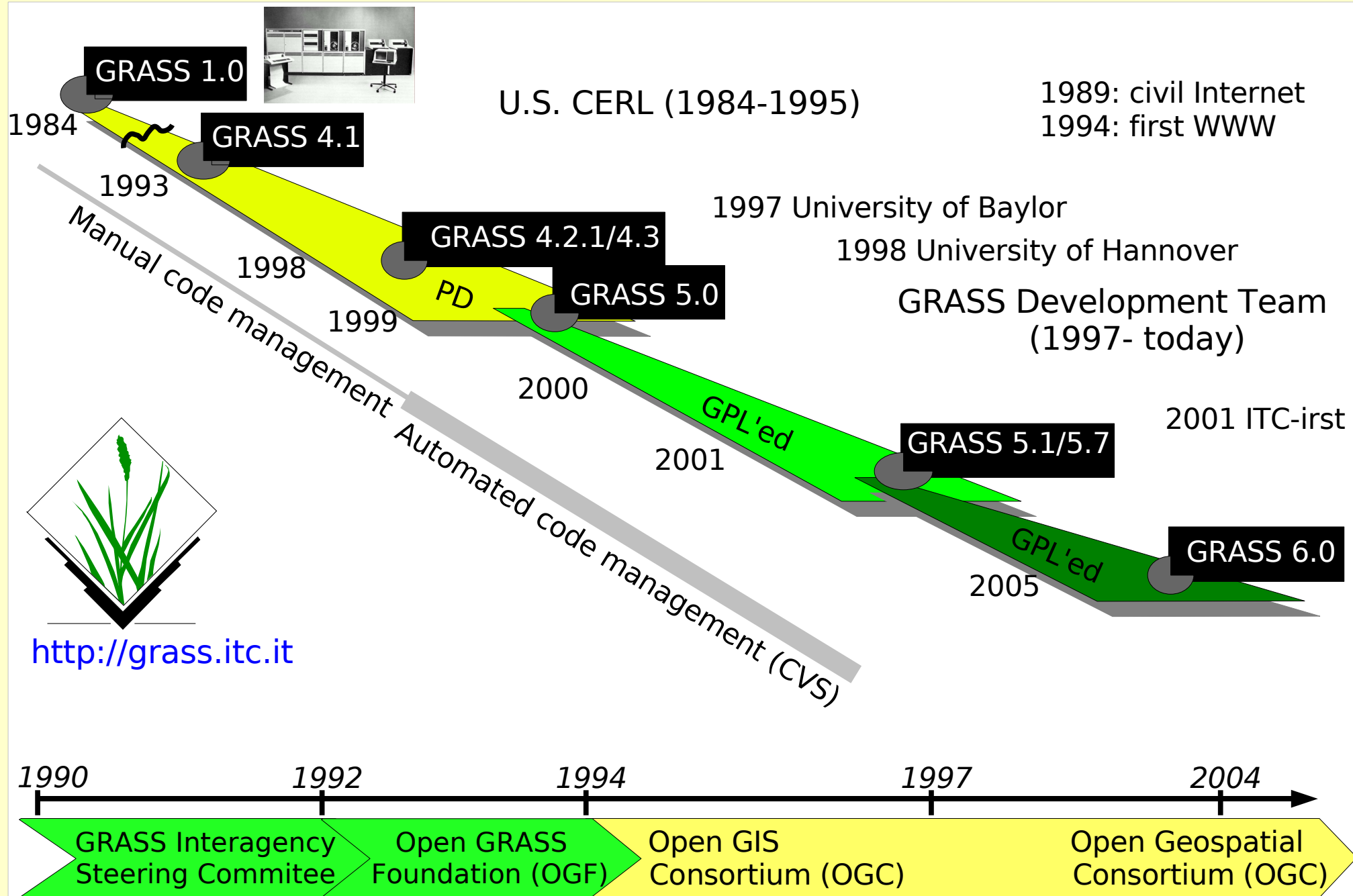
# GRASS GIS Interoperability

## Data models and sources

Raster	Vector	CAD	WebGIS
GeoTIFF	DGN	DXF	Web Map Service (WMS)
Erdas IMG	ESRI-SHAPE	DWG	Web Coverage Service (WCS)
MrSID	GML	...	Web Feature Service (WFS)
ECW	Spatial SQL		Web Map Context Documents (WMC)
JPEG2000	...		



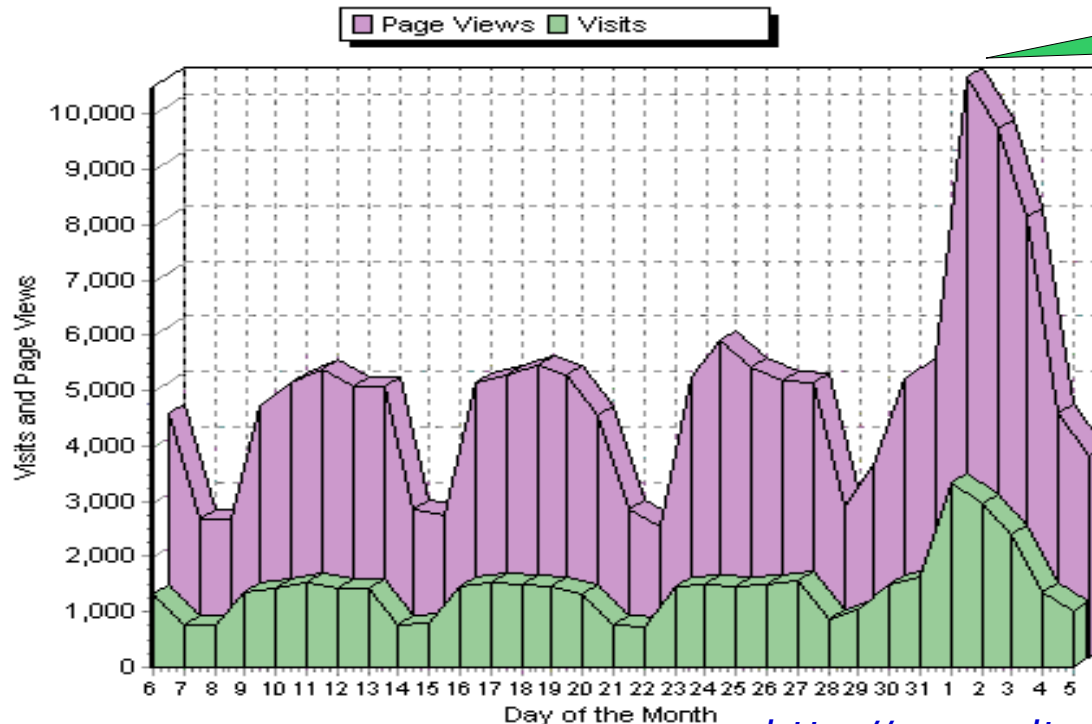
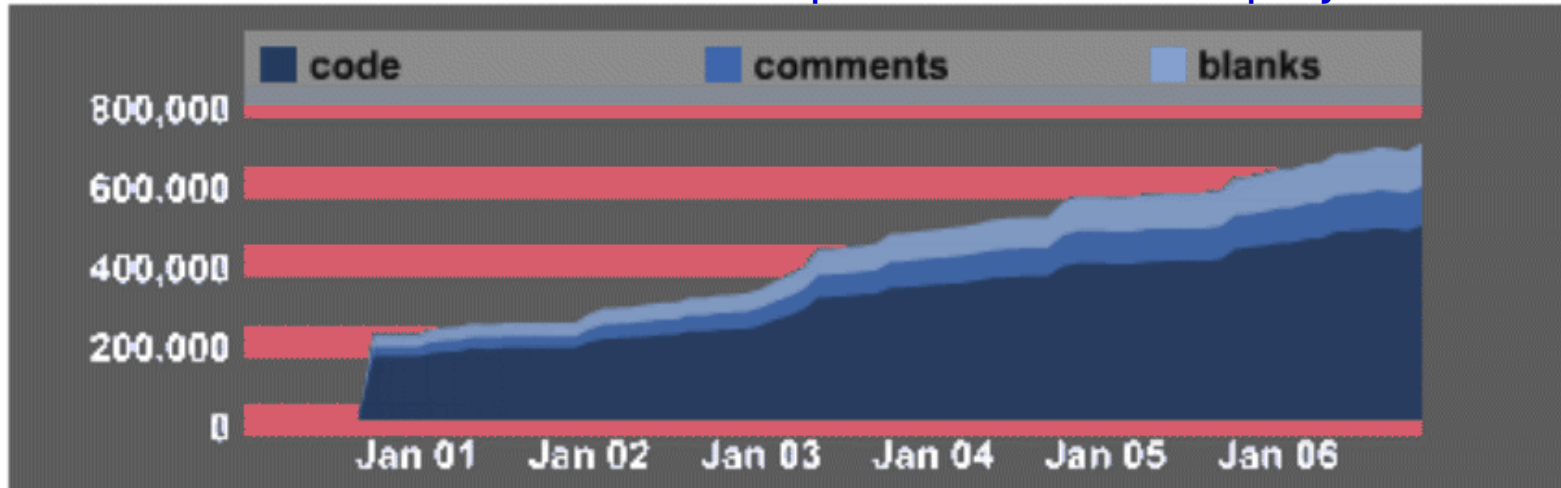
# GRASS: more than 20 years of free GIS



# GRASS Source Code Statistics

## Codebase History GRASS 6

<http://next.ohloh.net/projects/3666>

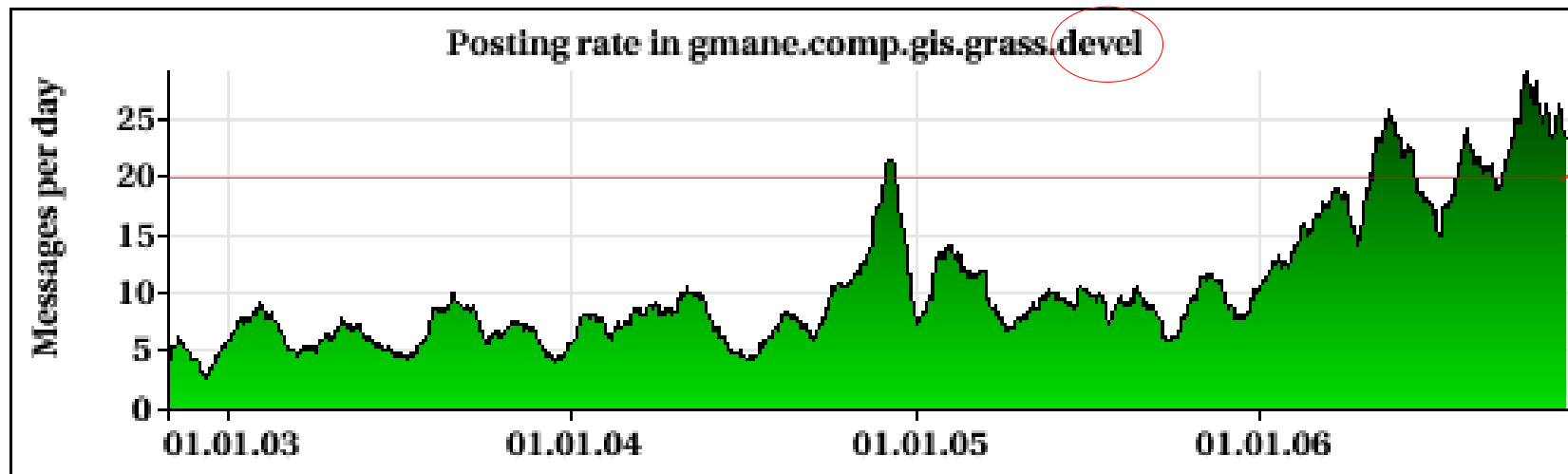
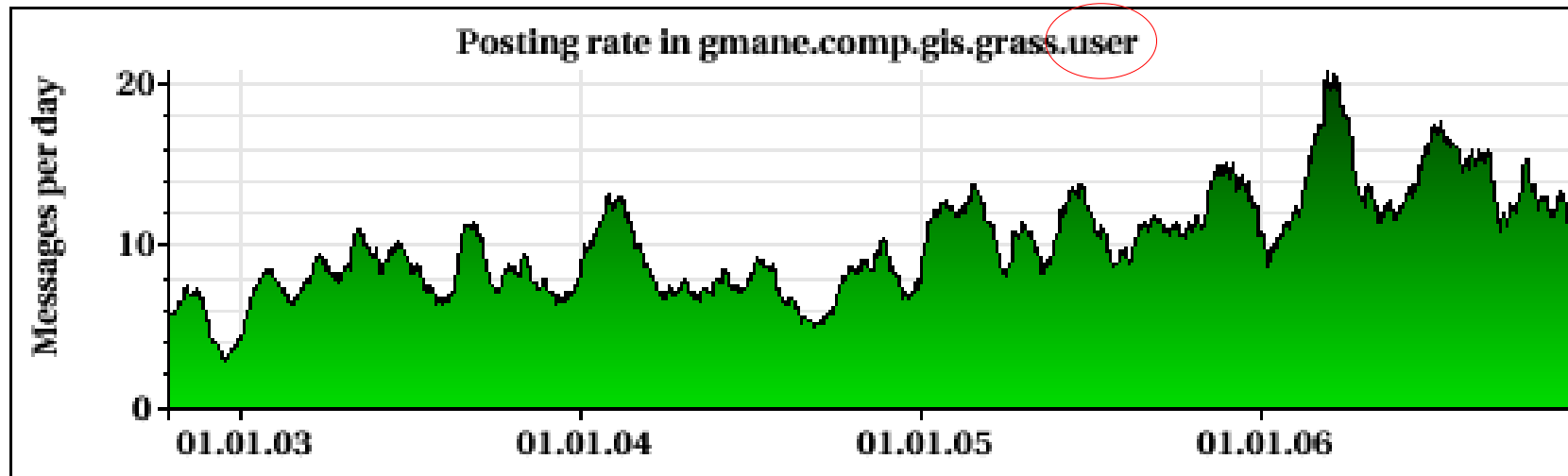


GRASS 6.2.0 release  
31 Oct 2006

Visitors at  
<http://grass.itc.it>

<http://www.sitemeter.com/?a=stats&s=s24grassgis>

# GRASS Mailing List Statistics: messages per day



*(gmane.org is a mailing list mirror)*

# GRASS SLOC Analysis

## Project Cost ?

This calculator estimates how much it would cost to hire a team to write this project from scratch.

Include:  ▼

Codebase	490,387 LOC
Effort (est.)	132 Person Years
Avg. Salary	\$ <input type="text" value="55000"/> /year
<b>Total</b>	<b>\$7,257,406</b>

<http://next.ohloh.net/projects/3666>

Basic COCOMO model,  
but slightly different  
parameters

Or do this analysis yourself - Download and run:  
<http://www.dwheeler.com/sloccount/>

## GRASS 6.3.CVS, 27 nov 2006:

SLOC Totals grouped by language:

ansic:	459197 (83.79%)
tcl:	44671 (8.15%)
sh:	18290 (3.34%)
python:	10463 (1.91%)
cpp:	10142 (1.85%)

...

Total Physical Source

Lines of Code (SLOC) = 548,024

Person-Years = 150.23

...

Total Estimated Cost to Develop = \$ 20,294,632  
(average salary = \$56,286/year,  
overhead = 2.40)

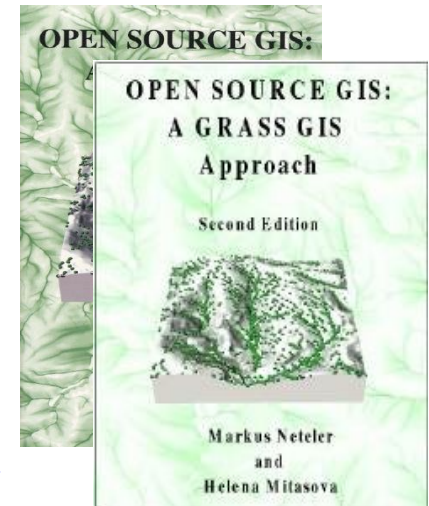
*Generated using David A. Wheeler's 'SLOCCount'*

# GRASS Documentation



GDF Hannover bR (2005)  
free document, GNU FDL  
[www.gdf-hannover.de](http://www.gdf-hannover.de)

Neteler/Mitasova  
(2002/2004)  
Kluwer/Springer  
Boston, 420 S.  
[mpa.itc.it/grassbook2/](http://mpa.itc.it/grassbook2/)



Adresse: <http://mpa.itc.it/markus/grass63progman/>

**GRASS**

- GRASS\_Programmers\_Manual
- File List
- Data Structures
- Data Fields
- Directories
- Globals
- Related Pages
- GRASS D display Library
- GRASS DBMI DataBase
- GRASS Grid3D raster v
- GRASS GIS Library
- GRASS Raster File Pro
- GRASS Vector File Pro
- GRASS Numerical math
- GRASS Imagery Library
- GRASS OpenGL gsurf C
- GRASS Raster Graphic
- GRASS Segment Librar
- Directed Graph Library
- GRASS 6 Vector Archit

[Main Page](#) | [Data Structures](#) | [Directories](#) | [File List](#) | [Data Fields](#) | [Globals](#) | [Related Pages](#)

## GRASS\_Programmers\_Manual

### GRASS 6 Programmer's Manual: GIS Library

6

#### GRASS 6 Programmer's Manual

GRASS GIS (Geographic Resources Analysis Support System) is an open source, Free Software Geographical Information System (GIS) with raster, topological vector, image processing, and graphics production functionality that operates on various platforms through a graphical user interface and shell in X-Window. It is released under GNU General Public License (GPL).

This manual introduces the reader to the *Geographic Resources Analysis Support System* from the programming perspective. Design theory, system support libraries, system maintenance, and system enhancement are all presented. Standard GRASS 4.x

The Programmer's Manual is 'doxygen' based, i.e. it is auto-generated from the source code.



# Outline

## Seminar

- Introduction to the GRASS project
- **Communication structure**
- Code development
- Structure of the development team: be collaborative in the cyberspace
- Legal Issues

# The actors

## Free Open Source Software (FOSS) Community

### Universities and Research Institutes

*(e.g. NASA, Minnesota, ITC-irst, Uni TN)*

### Companies

*(e.g. D.M. Solutions Refractions, MRCC)*

### Freelancers

*(e.g. F. Warmerdam)*

### INTERNET

- Web Servers
- Mailing lists
- CVS centralized source code servers
- WIKIs and bulletin boards

### Individuals

*(often major part of developers and users)*

### Governments

*(e.g. Canada, Japan, Germany, ...)*

# Communication tools: Project Portal

The screenshot shows the GRASS GIS website interface. The browser address bar displays 'http://grass.itc.it/'. The main heading is 'Welcome to GRASS GIS' with a sub-message: 'You are at the official GRASS site in Italy (of a mirror site)' and 'This site is updated daily: 27 Nov 2006'. A navigation menu includes 'Home', 'Intro', 'Docs', 'Download', 'Community', 'Applications', and 'Development'. A left sidebar contains a search bar and links for 'About GRASS', 'Download', 'Wiki - help site | FAQ', 'Mirror sites', 'Mailing lists | IRC', 'Translating', 'Newsletter', 'Get involved!', 'GRASS in the Press', and 'Bug/Wish reports'. A central banner reads 'Public Geo Data is public property'. Below it, a world map is captioned 'New GRASS User map (without pop-up)'. The main content area features the title 'Geographic Resources Analysis Support System' and a paragraph describing GRASS as a GIS used for geospatial data management and analysis. A 'Latest News!' section with 'XML' and 'RSS FEED' buttons lists several releases: 'GRASS 6.2.0 released' (31 Oct 2006), 'GRASS 6.2.0RC3 released' (24 Oct 2006), 'GRASS 6.2.0RC2 released' (06 Oct 2006), and 'GRASS 6.2.0RC1 released' (26 Sep 2006). A 'Bug/Wish reports' link is also visible in the sidebar.

# Job automatization: Let the computer do it!

## **Cronjobs are a life saver!**

- Web pages are maintained in CVS and updated via cron hourly
- Mirrors sites sync through 'rsync'
- Weekly software snapshots are generated from CVS
  - source code tarballs
  - binary builds
  - HTML and PDF manual pages
  - local search engine


# Communication tools: Wiki and Bugtracker

Adresse: <http://grass.gdf-hannover.de/wiki/GRASS-Wiki>

Log in / create account

article discussion edit history

## GRASS-Wiki



navigation

- Main Page
- Community
- Development
- Documents
- GRASS Help
- Recent changes
- Donations

search

Go Search

toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link

Welcome to the GRASS-Wiki [\[edit\]](#)

*A Wiki is a collaborative help system*

The [Geographic Resources Analysis Support System](#), commonly referred to as **GRASS**, is a Geographic Information System (GIS) used for geospatial data management and analysis, image processing, graphics/maps production, spatial modeling, and visualization. GRASS is currently used in academic and commercial settings around the world, as well as by many governmental agencies and environmental conservation organizations. [GRASS Wiki](#) is the official community help system of the GRASS GIS project.

On this Wiki, you can find information about GRASS GIS and its development programs.

**Getting started**

- GRASS Help and Documentation
- Full GRASS Documentation
- Installation Guide
- FAQ

**Community**

- GRASS Community

## Wish- and Bugtracker

Adresse: [http://intevation.de/rt/webtr?\\_q\\_sort=age&q\\_reverse=1&q\\_status=open&q\\_queue=grass&q\\_area=grass6](http://intevation.de/rt/webtr?_q_sort=age&q_reverse=1&q_status=open&q_queue=grass&q_area=grass6)

Req.#	Pri.	Status	Due	Subject	Owner	Queue	Area	Requestor	Age	Last
#5341	99	open		<a href="#">v.db.select: segfault</a>		grass	grass6	<a href="mailto:tutty@o2.pl">tutty@o2.pl</a>	13 hr	72 min
#5328	70	open		<a href="#">Create new mapset fails</a>		grass	grass6	<a href="mailto:mjospa01@ezplanet.net">mjospa01@ezplanet.net</a>	2 day	31 hr
#5300	30	open		<a href="#">./configure treats X11 as an atomic package</a>		grass	grass6	<a href="mailto:maris.gis@gmail.com">maris.gis@gmail.com</a>	10 day	9 day
#5291	30	open		<a href="#">broken rpm for fc5?</a>		grass	grass6	<a href="mailto:ew(remove brackets and contents)@waterwatch.com">ew(remove brackets and contents)@waterwatch.com</a>	11 day	10 day
#5264	30	open		<a href="#">v.digit - G malloc out of memory error</a>		grass	grass6	<a href="mailto:glcenz2000@yahoo.com">glcenz2000@yahoo.com</a>	2 wk	2 wk
#5263	30	open		<a href="#">r.to.vect: -v flag doesn't transfer cat values</a>		grass	grass6	<a href="mailto:hanish_nospam@yahoo.com">hanish_nospam@yahoo.com</a>	2 wk	2 wk
#5258	30	open		<a href="#">v.patch: crash or ERROR, if tables missing in input</a>		grass	grass6	<a href="mailto:glcenz2000@yahoo.com">glcenz2000@yahoo.com</a>	3 wk	3 wk
#5257	30	open		<a href="#">Tcl install copy fails</a>		grass	grass6	<a href="mailto:johnq@telascience.org">johnq@telascience.org</a>	3 wk	10 day
#5253	70	open		<a href="#">grass-fc4.rpm dependency breaks fontserver (xfs)</a>		grass	grass6	<a href="mailto:ew@waterwatch.com">ew@waterwatch.com</a>	3 wk	3 wk
#5220	30	open		<a href="#">wingrass: v.in.oqr (tcltk version) creates wrong directory path</a>		grass	grass6	<a href="mailto:mlennert@club.worldonline.be">mlennert@club.worldonline.be</a>	5 wk	5 wk
#5219	30	open		<a href="#">d.vect display=cat works only for layer 1</a>		grass	grass6	<a href="mailto:tutty@o2.pl">tutty@o2.pl</a>	5 wk	5 wk
#5218	30	open		<a href="#">wingrass: creating new location from startup screen with projection values fails</a>		grass	grass6	<a href="mailto:mlennert@club.worldonline.be">mlennert@club.worldonline.be</a>	5 wk	4 wk

# Outline

## Seminar

- Introduction to the GRASS project
- Communication structure
- **Code development**
- Structure of the development team: be collaborative in the cyberspace
- Legal Issues

# Changing source code: what happens? (1/2)

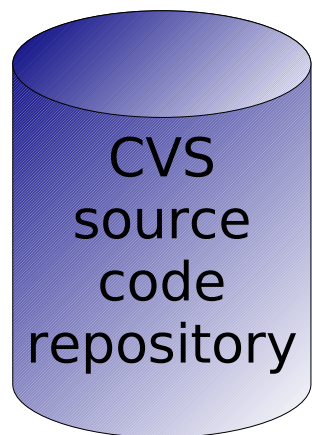
```
tflag->description      = _("Print topology information only");

if (G_parser(argc,argv))
    exit(EXIT_FAILURE);

/* open input vector */
if ((mapset = G_find_vector2 (in_opt->answer, "")) == NULL) {
    G_fatal_error (_("Could not find input map <%s>"), in_opt->answer);
}
```

*Developer changes and enters:*

`cvs ci -m "i18N macro added" main.c`



*Germany*

Code differences email is  
auto-generated and sent to  
"grass-commit" mailing list

*Italy*

Email notification triggers  
updated of GRASS Quality  
Assessment System

*Canada*

# Changing source code: what happens? (2/2)

Email notification triggers updated of GRASS Quality Assessment System

Clone detection is run as well as other quality measures, results sent out

*Canada*

Code quality email is sent to "grass-qa" mailing list

*Italy*

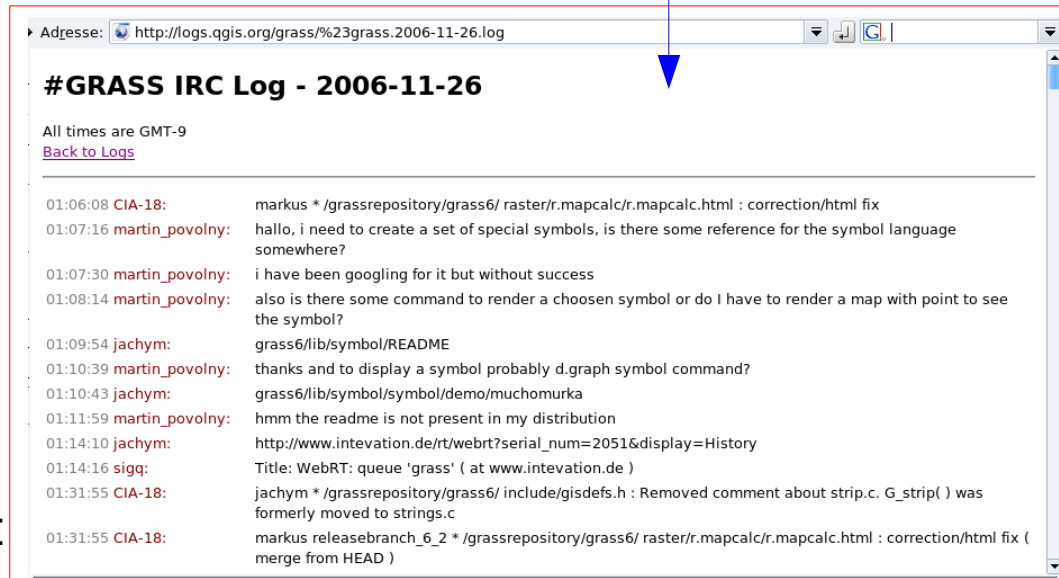
CIA-IRC robot feeds #grass IRC channel on freenode.net

CIA open source monitor receives simplified QA message USA?



The screenshot shows a web interface for monitoring the GRASS project. The URL is <http://cia.navi.cx/stats/project/GRASS>. The page title is "GRASS Real-time open source activity stats". It features a navigation bar with "Stats", "Documentation", "IRC Bots", and "Rulesets". The main content area is divided into several sections: "information" with a logo and a link to <http://grass.itc.it/>; "event counters" showing message statistics (e.g., "The last message was received 22.87 minutes ago at 00:30 on Nov 28, 2006"); and "recent messages" with a table of activity.

date	project	content	link
22 min ago	GRASS	Commit by michael : /grassrepository/grass6/ visualization/nviz/scripts/tclIndex : Removed old scale panel; added entries for new arrow, legend, and fringe panels; updated entries for label panel.	#
22 min ago	GRASS	Commit by michael : /grassrepository/grass6/ visualization/nviz/scripts/widgets.tcl : Fixed autodraw function so that it actually works (can be toggled on and off) in most NVIZ modules. Did a bit of code reformatting and cleanup too.	#



The screenshot shows an IRC log for the #GRASS channel on 2006-11-26. The URL is <http://logs.qgis.org/grass/%23grass.2006-11-26.log>. The log contains a series of messages with timestamps and usernames, including discussions about symbol rendering and code corrections.

```
01:06:08 CIA-18: markus * /grassrepository/grass6/ raster/r.mapcalc/r.mapcalc.html : correction/html fix
01:07:16 martin_povolny: hallo, i need to create a set of special symbols, is there some reference for the symbol language somewhere?
01:07:30 martin_povolny: i have been googling for it but without success
01:08:14 martin_povolny: also is there some command to render a choosen symbol or do I have to render a map with point to see the symbol?
01:09:54 jachym: grass6/lib/symbol/README
01:10:39 martin_povolny: thanks and to display a symbol probably d.graph symbol command?
01:10:43 jachym: grass6/lib/symbol/symbol/demo/muchomurka
01:11:59 martin_povolny: hmm the readme is not present in my distribution
01:14:10 jachym: http://www.intevation.de/rt/webrt?serial_num=2051&display=History
01:14:16 sigq: Title: WebRT: queue 'grass' ( at www.intevation.de )
01:31:55 CIA-18: jachym * /grassrepository/grass6/ include/gisdefs.h : Removed comment about strip.c. G_strip( ) was formerly moved to strings.c
01:31:55 CIA-18: markus releasebranch_6_2 * /grassrepository/grass6/ raster/r.mapcalc/r.mapcalc.html : correction/html fix ( merge from HEAD )
```



# GRASS Quality Assessment I

## GRASS Test Suite Project: Automated usage tests on Linux and MS-Windows



### GRASS Test Suite 0.2.0.2

Output generated at: Di Mai 2 21:36:57 CEST 2006

#### GRASS Test Environment

```
GRASS_GNUPLOT='gnuplot -persist'
GRASS_GUI=text
GRASS_HTML_BROWSER=htmlview
GRASS_INT_ZLIB=1
GRASS_PAGER=more
GRASS_PERL=/usr/bin/perl
GRASS_TCLSH=tclsh
GRASS_VERSION=6.1.cvs
GRASS_WISH=wish
TESTSUITE_INSTALLDIR=/tmp/GRASS_Te
```

**Build information:** GRASS 6.1.cvs (2006) # ./configu  
 --with-jpeg --without-odbc --with-fft --with-glw --wit  
 --with-gdal=/usr/local/bin/gdal-config --with-cxx --with

**Machine:** Linux AMD64bIT 2.6.12-1.1381\_FC3 #1 Fr

#### Test suite settings

Done

Test	Module	Status	Output validation	command line argument
6 of 6 <a href="#">log-&gt;</a>	v.drape	success	Output valid	input=elevation@PERMANENT rast=elevation@PERMANE
<a href="#">memlog-&gt;</a>		memory-errors-detected		output=lines_cubic_27370

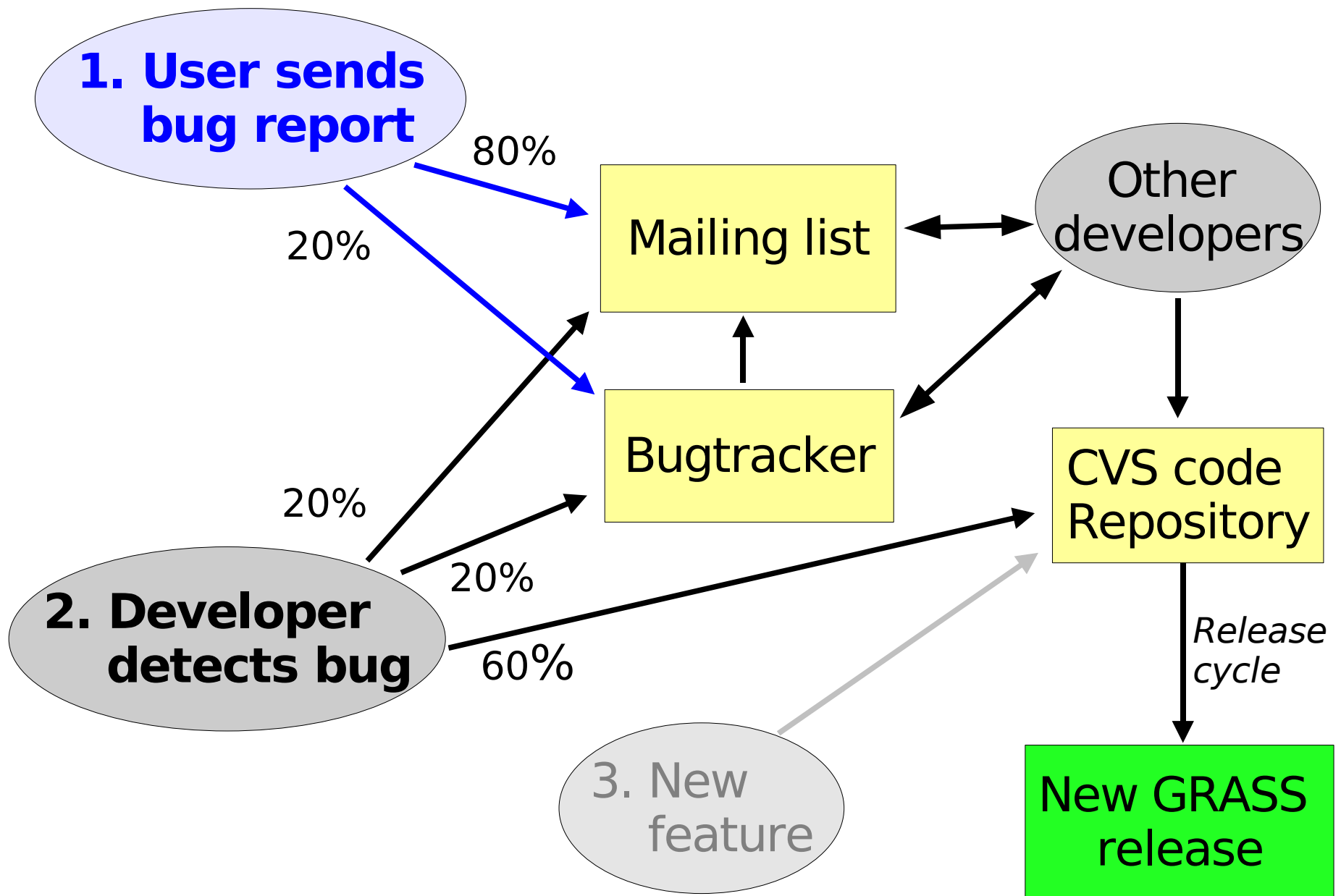
  

v.hull test (unit)		Full function test of v.hull.		
<a href="#">(source)</a>				
Test	Module	Status	Output validation	command line argument
1 of 1 <a href="#">log-&gt;</a>	v.hull	success	Output valid	input=points output=hull_27574
<a href="#">memlog-&gt;</a>		memory-errors-detected		

v.patch test (unit)		Full function test of v.patch.		
<a href="#">(source)</a>				
Test	Module	Status	Output validation	command line argument
1 of 1 <a href="#">log-&gt;</a>	v.patch	success	Output valid	input=points areas elevation lines output=patch_27623

# Bug reports: Communication Flow



(Percentages are estimated)

# GRASS Quality Assessment II

## GRASS GIS Software Evolution Project: Software engineering



GRASS GIS EVOLUTION PROJECT - Monitoring The World Leading Free Software GIS Evolution - Mozilla Firefox <2>

File Edit View Go Bookmarks Tools Help

http://web.soccerlab.polymtl.ca/grass-evolution/grass-browsers/grass-index-en.html

ML R local "R" GRASS BBB Ponsl TN-cat LEO E/I,I/E CSeer Scholar TWIKI Gmail Post2CUL-Net Post2CUL-Eden

grass import globe Web Site Img Groups News Scholar Print Opts Search Special Page Info Up Selected Highlight grass import

 **Welcome to the SOCCER Lab** 

**GRASS GIS Software Evolution Project**

*You are entering a site devoted to monitor and improve GRASS software quality*  
*This site is updated daily: 2006-05-05*

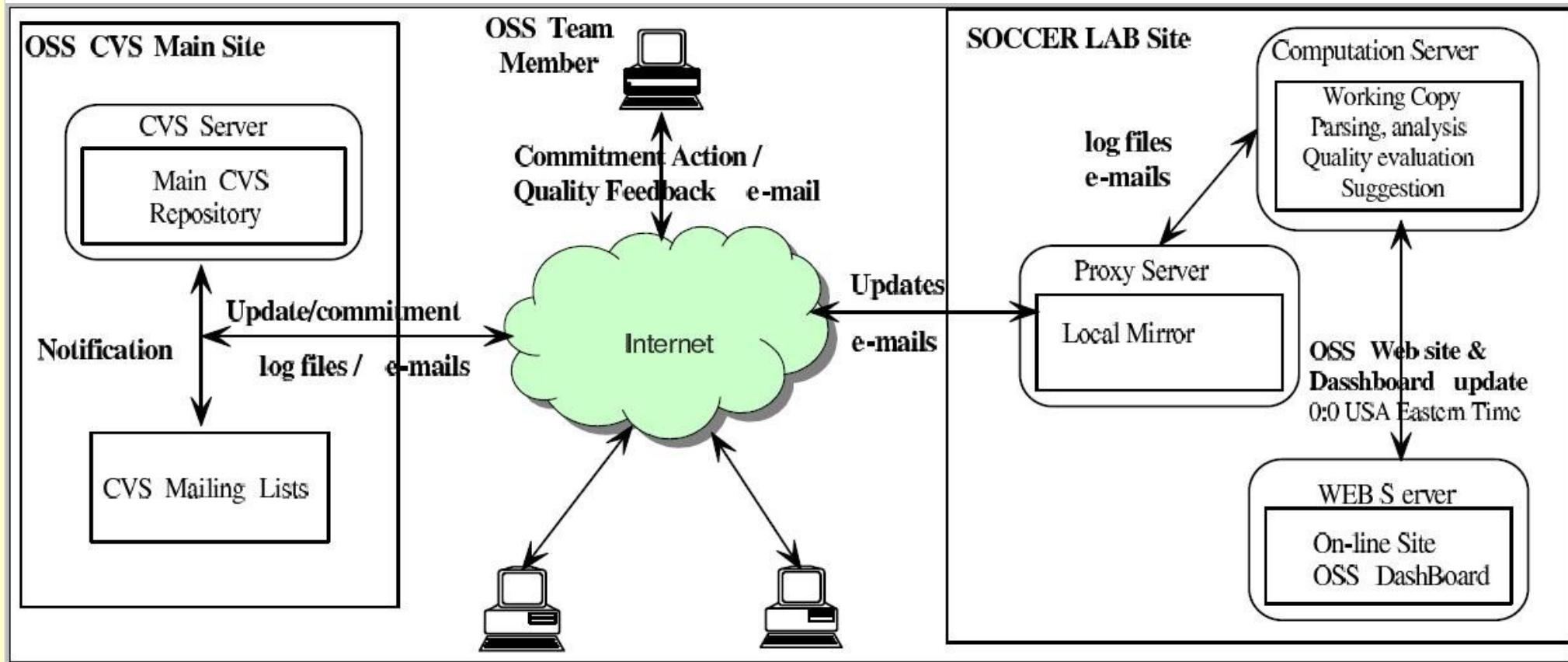
Currently active features:

- [GRASS source code browser - Navigate dirs, files and functions](#)
- [GRASS statistic browser - Navigate developer contributions, CVS info, commit, code size](#)
- [GRASS clone browser - Navigate clone clusters, view clone deltas](#)
- [GRASS monster browser - Navigate monster functions](#)
- [GRASS comparandum tool - Compare files in an intelligent way](#)
- [GRASS Work Package Browser - Select a Work Package to Improve GRASS quality](#)

Done  3 neteler.osgeo

# GRASS Quality Assessment II

## Improvement of source code base



Ref.: *A feedback based quality assessment to support open source software evolution: the GRASS case study*  
S. Bouktif, G. Antoniol, E. Merlo, and M. Neteler, ICSM 2006

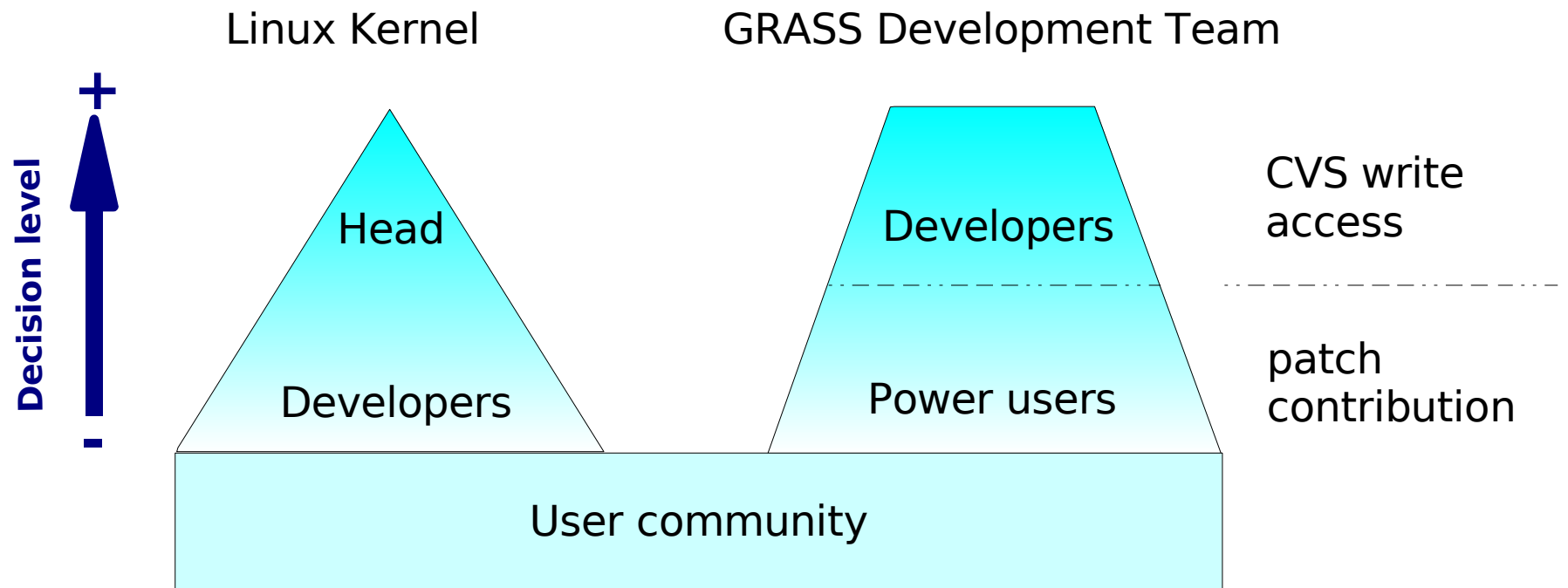
# Outline

## Seminar

- Introduction to the GRASS project
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- Legal Issues

# FOSS Software development structures

## Organizational structures of development teams



GRASS: No BDFL (Benevolent Dictator For Life)

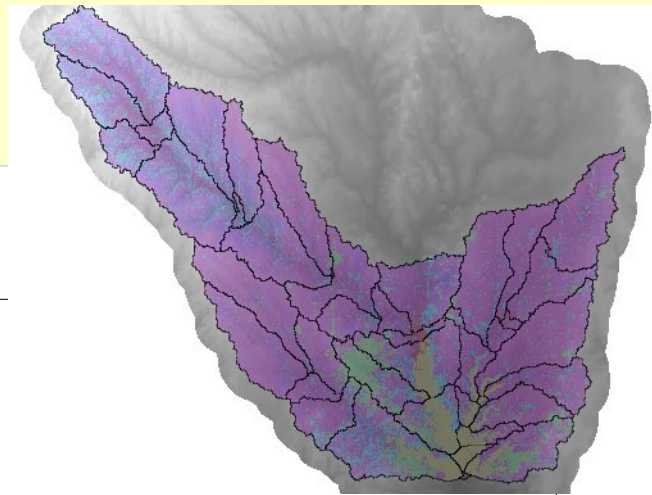
[http://en.wikipedia.org/wiki/Benevolent\\_Dictator\\_for\\_Life](http://en.wikipedia.org/wiki/Benevolent_Dictator_for_Life)

<http://producingoss.com/>

# GRASS Development Team: Structure & “Code habitats”

- Two main types of developers are observed:
  - generalist
  - specialist (majority)
- It appears that many developer assign themselves to a “code habitat”, their area of expertise (in GRASS a selection of libraries or commands which are maintained)
- these “habitats” are often stable over years
- there are also partially abandoned code areas (~ 10% of the code) which are functional but aren't really getting improved
- A very few are experts for code portability (ANSI C etc standards)
- One “garbage collector” (generalist) fixes lots of *odds 'n ends*

# Conflicts in the community



## Decision making the hard way (1/3)

### [GRASS5] Transparency added

~~Hidden Content~~

Sun, 19 Feb 2006 05:38:08 -0600

- Previous message: [\[GRASS5\] v.out.vtk and r3.out.vtk](#)
- Next message: [\[GRASS5\] Transparency added](#)
- **Messages sorted by:** [\[ date \]](#) [\[ thread \]](#) [\[ subject \]](#) [\[ author \]](#)

Oops! the attached file is too big. Try this:  
<http://geni.ath.cx/grass/transparency.png>

-----  
I've added transparency feature to display drivers (XDRIVER and PNG) and d.rast and d.vect now have transparency= (%) option. You can find a screenshot attached in which two rasters and one vector are overlaid.

```
# opaque drawing
d.rast dem
# 80% transparency, -o is needed not to clip previous drawings
d.rast landuse trans=80 -o
# 90% transparency with blue area fill
d.vect subbasins trans=90 fcolor=blue
```

Please find attached the png file.

I hope you enjoy this.

~~Hidden Content~~

New feature added...



# Conflicts in the community

## Decision making the hard way (2/3)

### [GRASS5] Transparency added

~~XX~~

Sun, 19 Feb 2006 12:48:27 +0100

- ◆ Previous message: [\[GRASS5\] Transparency added](#)
- ◆ Next message: [\[GRASS5\] Re: \[GRASSLIST:10405\] Transparency added](#)
- ◆ Messages sorted by: [\[ date \]](#) [\[ thread \]](#) [\[ subject \]](#) [\[ author \]](#)

---

On Sun, 19 Feb 2006 05:38:08 -0600

~~XX~~

> Oops! the attached file is too big. Try this:  
> <http://geni.ath.cx/grass/transparency.png>

>

> -----

> I've added transparency feature to display drivers (XDRIVER and PNG)

Great stuff!

~~XXXXXXXX~~

First reactions,  
but...

# Conflicts in the community

## Decision making the hard way (3/3)

### [GRASS5] Re: [GRASSLIST:10405] Transparency added

~~XXXXXXXXXX~~

Sun, 19 Feb 2006 13:08:47 +0000

- Previous message: [\[GRASS5\] Transparency added](#)
- Next message: [\[GRASS5\] gis.m and d.m gone](#)
- **Messages sorted by:** [\[ date \]](#) [\[ thread \]](#) [\[ subject \]](#) [\[ author \]](#)

---

~~XXXXXXXXXX~~ wrote:

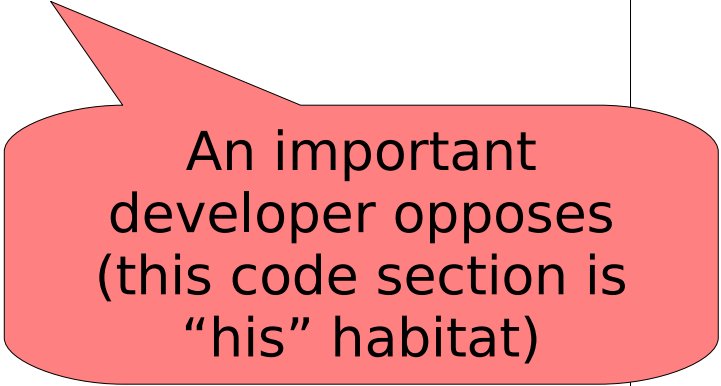
> I've added transparency feature to display drivers (XDRIVER and PNG) and d.rast  
> and d.vect now have transparency= (%) option.

Please take a copy of your work, because I'm going to revert these changes shortly.

--

~~XXXXXXXXXX~~

(later the day an explanation was posted)



An important developer opposes (this code section is "his" habitat)

# Decision making

## **GRASS project:**

- rather clear expertises of the developers
- “habitats” can be observed – developers only work on code families
- discussions (even lengthy) via “grass-dev” mailing list [1]
- New GRASS Project Steering Committee (PSC) formed in 2006

## **Other projects:**

- similar to GRASS project, BUT:
- formal voting on “Requests For Comments” (RFCs)

[1] <http://grass.itc.it/pipermail/grass-dev/>

# Outline

## Seminar

- Introduction to the GRASS project
- Communication structure
- Code development
- Structure of the development team: be collaborative in the cyberspace
- **Legal Issues**

# Code vetting

## Legal aspects

- License compicance (GRASS: GPL)
- Don't copy from books like “Numerical Receipes in C”
- Ensure that 3<sup>rd</sup> party contributions are clean
- Employers must agree that worktime is spent

Full transparency and peer review help to minimize the risk.

## Apache or OSGeo Foundation

- Incubation phase
- Graduation



<http://incubator.apache.org/>

# OSGeo Foundation: Founding projects

MAPSERVER



Mapbender

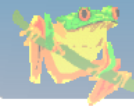


Open Source Geospatial Foundation



Autodesk®  
United States MapGuide  
Open Source

GeoTools   
The open source Java GIS toolkit



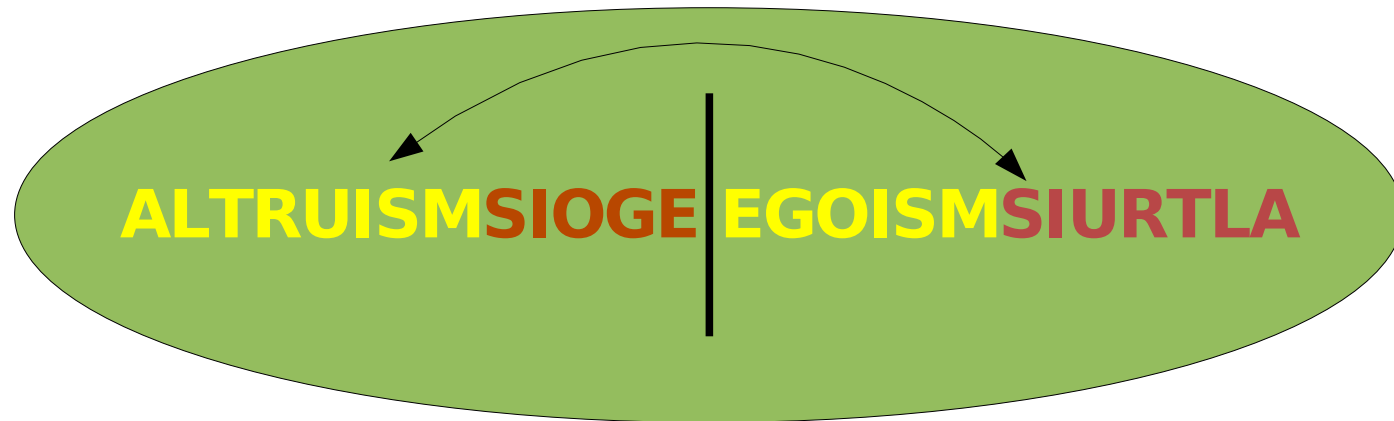
Community Mapbuilder

Founded 4<sup>th</sup> February 2006, Chicago

<http://www.osgeo.org>

# Why does a developer contribute to Free Software?

I will help others (because) they will help me



Everyone is expert of only a limited area...  
...ask the expert if you don't know!

The driving force behind FOSS development  
is **meritocracy**.

# Proposal for Thesis

```
/*!
 *fn int Vect_rewind (struct Map_info *Map)
 *brief Rewind vector data file to cause reads to start at beginning
 *return 0 on success, -1 on error
 *param Map_info structure
 */
int
Vect_rewind (struct Map_info *Map)
{
    if (!VECT_OPEN (Map))
        return -1;

    G_debug (1, "Vect_Rewind(): name = %s", Map->name);

    return (*Rewind_array[Map->format][Map->level]) (Map);
}
```

## Copyright transfer of a GPL project to a foundation

- what are the implications of a copyright transfer of an entire GPL'ed software project to a legal entity?
- how is the copyright transfer affected by different legislations (international development teams)?
- does the copyright transfer really protect the developers?



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**“Community based software development: The GRASS GIS project”,**

© 2006 Markus Neteler, Italy

<http://mpa.itc.it/markus/teaching.html>

[ OpenDocument file available upon request: neteler at itc it ]

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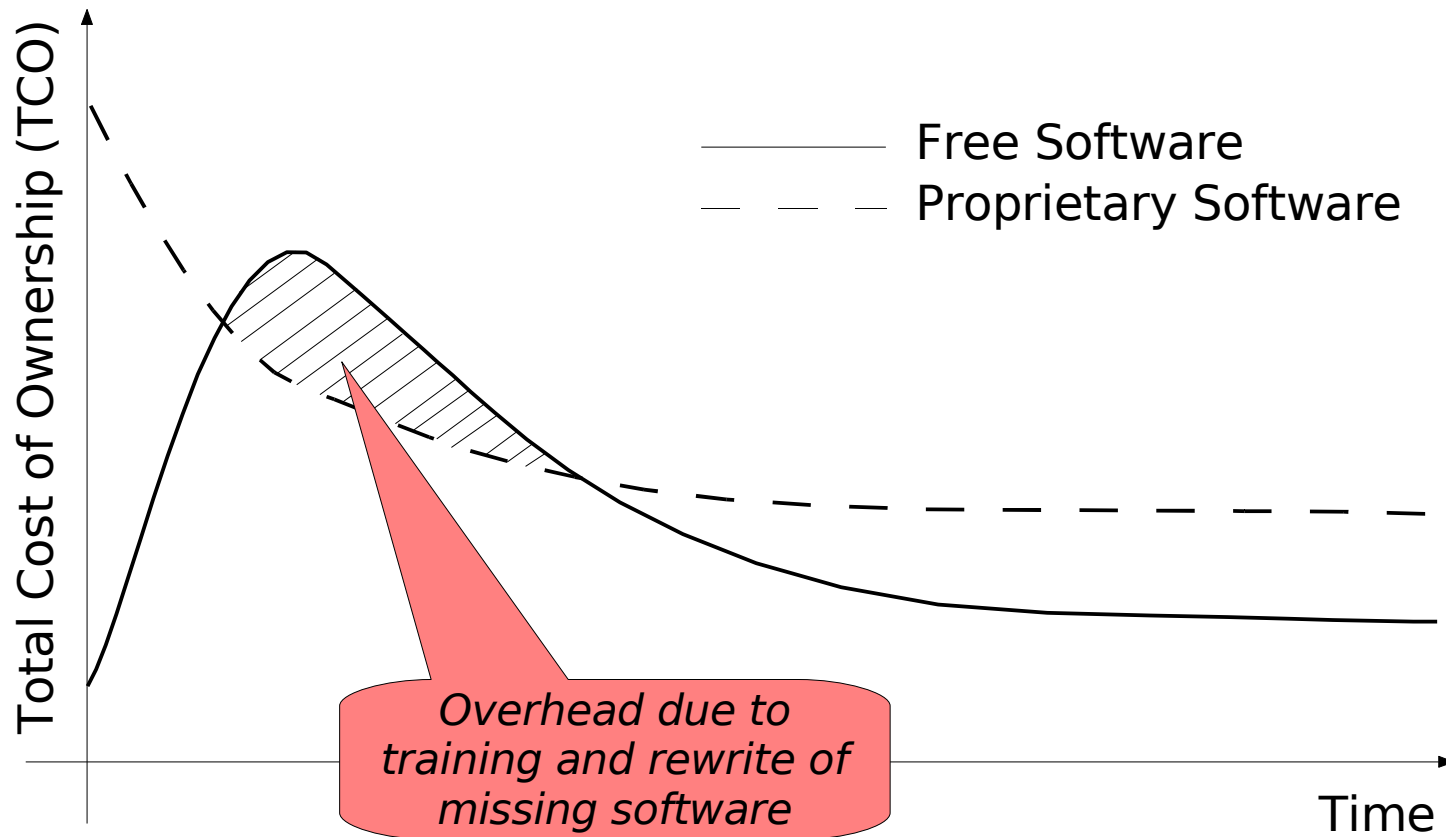
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# Software operating costs (customer)



*B. Reiter 2004  
after Wheeler 2004*