unitar

United Nations Institute for Training and Research

GRASS GIS in Grid Environment

22nd April 2009

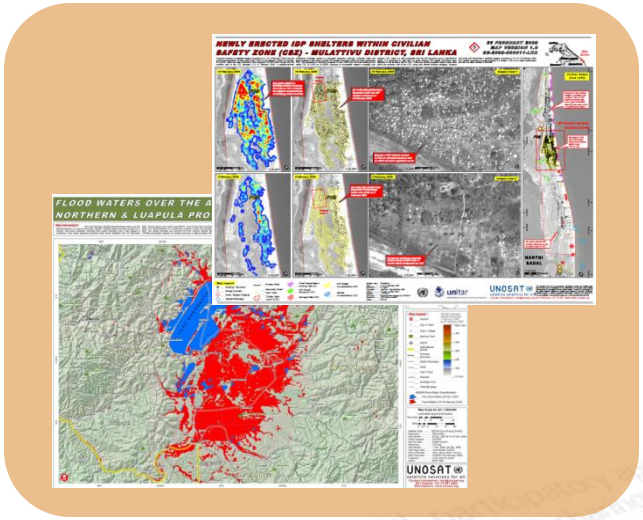
ISGC2009

- **UNOSAT**
  - Grid projects
- **GRASS GIS**
  - Integration in Grid environment
- **Current Status**
- **Future Plans**

What is UNOSAT?

- UNOSAT is the UN Institute for Training and Research (UNITAR) Operational Satellite Applications Programme, implemented in co-operation with the European Organization for Nuclear Research (CERN).

- Supports early warning, crisis response, human rights, sustainable recovery, vulnerability reduction and local capacity building



What we do?

- Humanitarian: Rapid mapping in support to disaster management, relief & human rights

- Training and awareness raising: Customized, from user-perspective

UNOSAT Grid Projects 2004 - 2008

Global **Mo**nitoring for **S**ecurity and **S**tability

*March **2004** - February **2008***

CERN

IT Department

*March **2004** - Present*

PC based users, Mobile phones with GPS

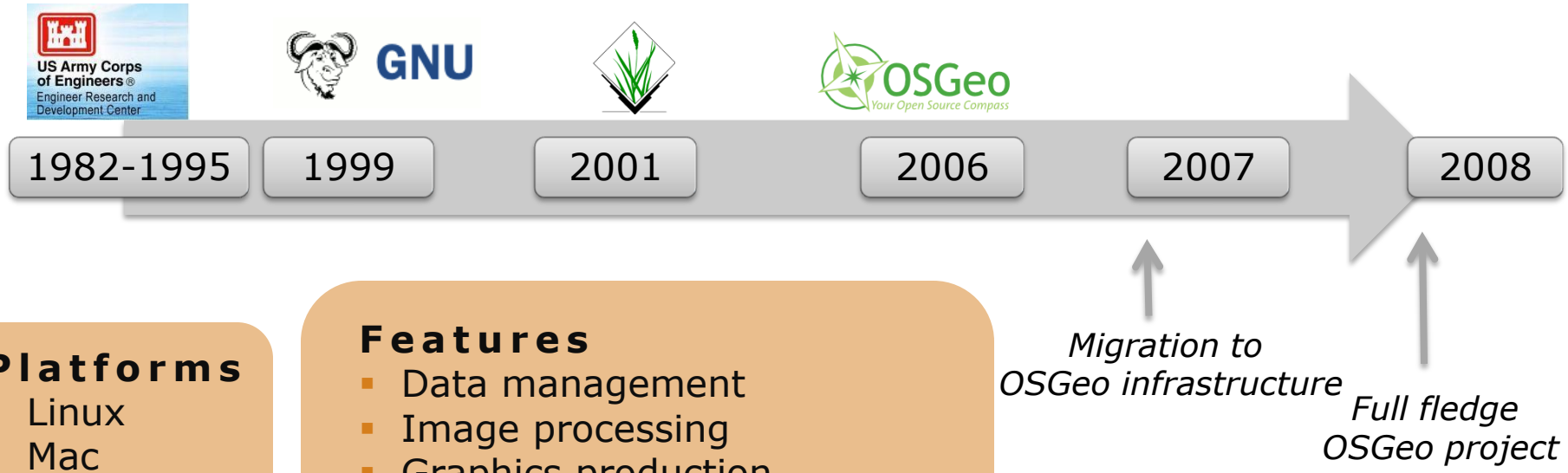
Web-browser based user-interface, mobile phone application

Compression, processing and storage

- Satellite imagery storage, metadata processing
- Web interface
- Mobile phone user interface

Geographic Resources Analysis Support System
GRASS GIS

http://grass.osgeo.org/



Platforms
- Linux
- Mac
- Microsoft Windows

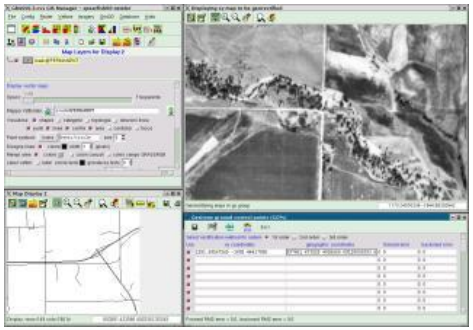
Features
- Data management
- Image processing
- Graphics production
- Saptial modelling
- Results comparable to those obtained with commercial software

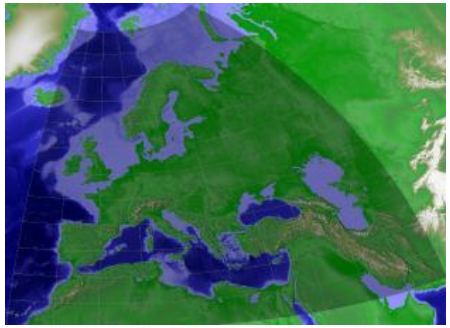
Version: **GRASS 5.4.1** released 26 July **2007**

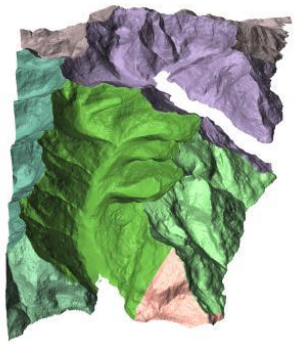
Latest stable release: GRASS 6.4.0RC4 released 12 Apr 2009

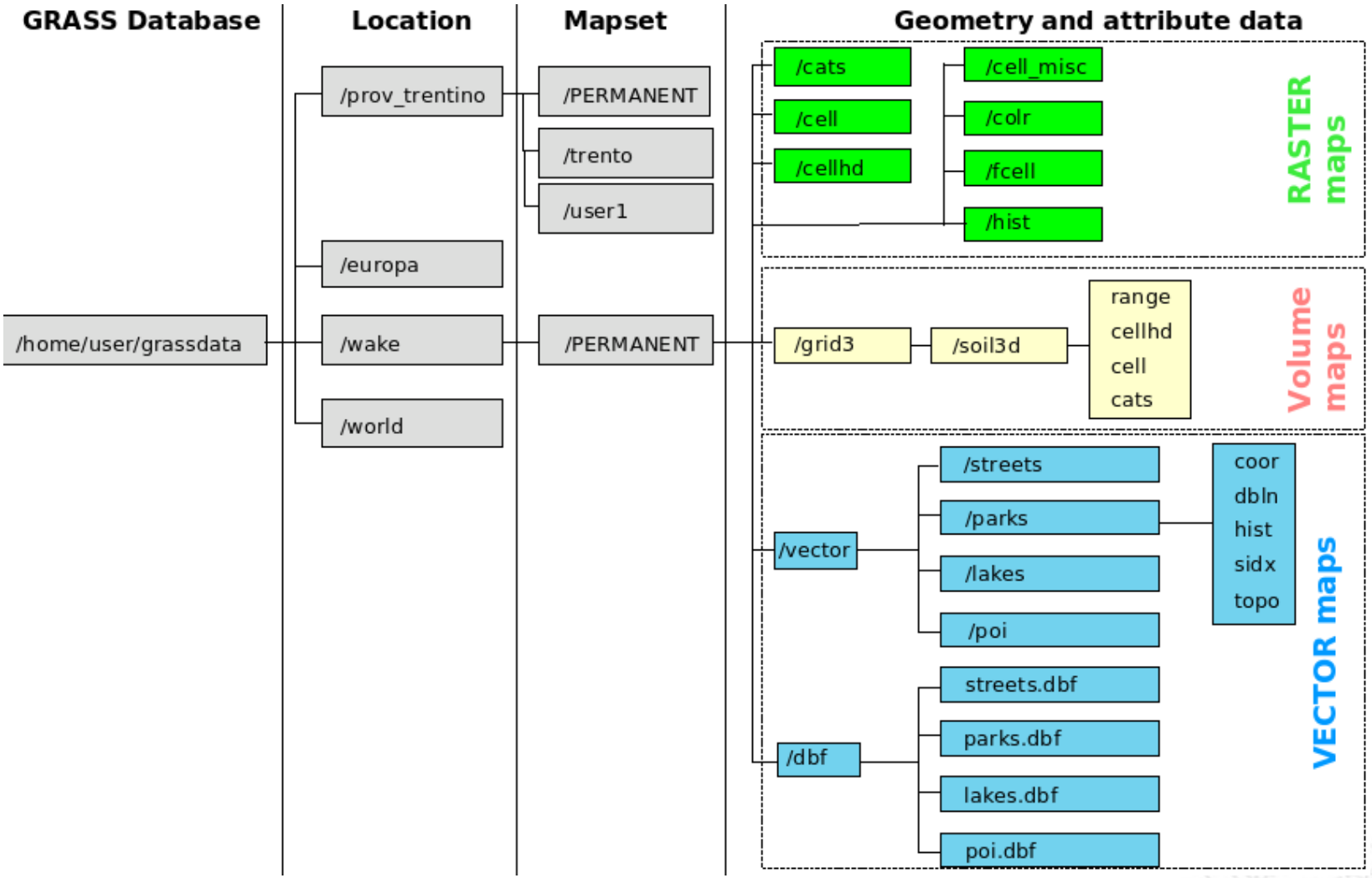
Aditional Libraries needed for most operations
GDAL - Geospatial Data Abstraction Library
PROJ.4 - Cartographic Projections Library

GRASS modules are designed under the Unix philosophy and hence can be combined using shell scripting to create more complex or specialized modules by a user without knowledge of C programming.



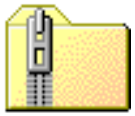





GRASS Database
Location
Mapset
Geometry and attribute data
/home/user/grassdata
/prov_trentino
/europa
/wake
/world
/PERMANENT
/trento
/user1
/PERMANENT
/cats
/cell
/cellhd
/cell_misc
/colr
/fcell
/hist
RASTER maps
/grid3
/soil3d
range
cellhd
cell
cats
Volume maps
/vector
/streets
/parks
/lakes
/poi
coor
dbln
hist
sidx
topo
/dbf
streets.dbf
parks.dbf
lakes.dbf
poi.dbf
VECTOR maps

Integration in Grid environment

Image data



GRASS GIS (tar.gz)

Storage Resource Manager

Storage Element

CASTOR

CERN Advanced STORage manager

Job Description Language
&
Shell script files

Integration in Grid environment

Image data

GRASS GIS (tar.gz)

GRASS GIS 5.4.1 Binaries

GDAL - Geospatial Data Abstraction Library

PROJ.4 - Cartographic Projections Library

Integration in Grid environment

Job Description Language
&
Shell script files

- Very basic jdl file for the inicial testing
- The operations to perform on the data files are defined in the wrapper script which is uploaded at submition time
  - To do a diferent analysis of an image we only need to change the wrapper script

filename.jdl →

```
Executable = "filename.sh";
StdOutput = "filename.out";
StdError = "filename.err";
InputSandbox = {"./filename.sh"};
OutputSandbox = {"filename.out","filename.err"};
```

filename.sh →

- Copies the source date and GRASS GIS tar ball to the worker node.
- Sets the GRASS GIS environment variables
- Executes the GRASS commands
- Copies the results back to the storage element

Integration in Grid environment


```
#!/bin/bash

# variables
FILE=image1.tif
OUTPUT_PREFIX=unsupclass_6_

# 'static' variables
GRASS_FILE=grassgis54.tar.gz
LFN_GRASS=/grid/unosat/agagodas/grass/$GRASS_FILE
LFN_DATA_SOURCE=/grid/unosat/agagodas/data/source/
LFN_DATA_RESULTS=/grid/unosat/agagodas/data/results/
LFN_DATA_SOURCE_FILE=$LFN_DATA_SOURCE$FILE
GRASS_ROOT=grass_root
mkdir -p $GRASS_ROOT
cd $GRASS_ROOT
lcg-cp -v lfn:$LFN_GRASS $GRASS_FILE
tar xvzf $GRASS_FILE
lcg-cp -v lfn:$LFN_DATA_SOURCE_FILE $FILE
```

Copy the files from SE to the WN

```
#variables to customize:
GISDBASE=$PWD
GISBASE=$PWD
MAPSET=PERMANENT
#generate temporary LOCATION:
TEMPDIR=$$.tmp
mkdir -p $GISDBASE/$TEMPDIR/temp
(...)
```

Set the GRASS GIS Environment variables

Integration in Grid environment


```
grassdata=$(ls $GISDBASE/$location_name/$MAPSET/cell/)

        i.group group=group subgroup=subgroup input=$A
        i.cluster group=group subgroup=subgroup sigfile=sigfile classes=6
        i.maxlik group=group subgroup=subgroup sigfile=sigfile
class=unsupclass
        r.out.tiff input=unsupclass output=unsuplcass_$(date
+"%d%m%y_%H%M%S")

for outputfile in `ls $OUTPUT_PREFIX*`; do echo "### Saving output file
$outputfile:"; lcg-cr -v file:$outputfile -d srm://srm-
public.cern.ch/castor/cern.ch$LFN_DATA_RESULTS$outputfile -l
$LFN_DATA_RESULTS$outputfile; done
```

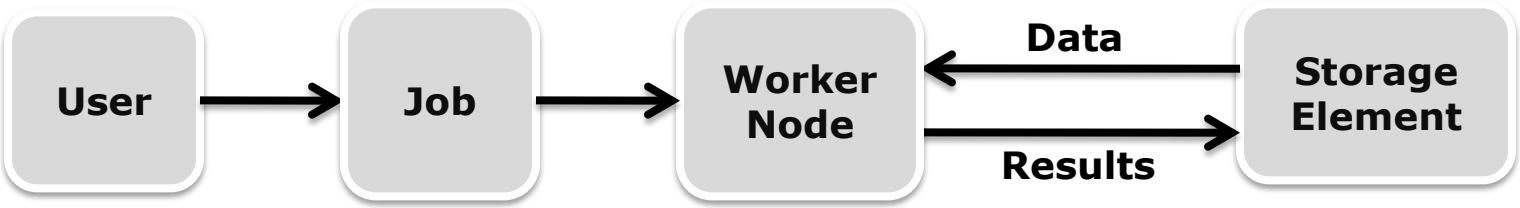
Execute GRASS GIS commands

Copy results to SE

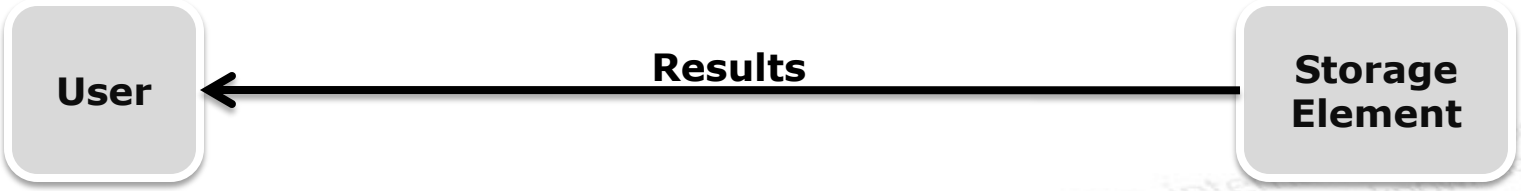
Current Status

- Data as been manually uploaded to the Storage Element

- A generic self contained GRASS GIS instalation has been created
- Two different types of jobs have been sucessfully submited and executed.



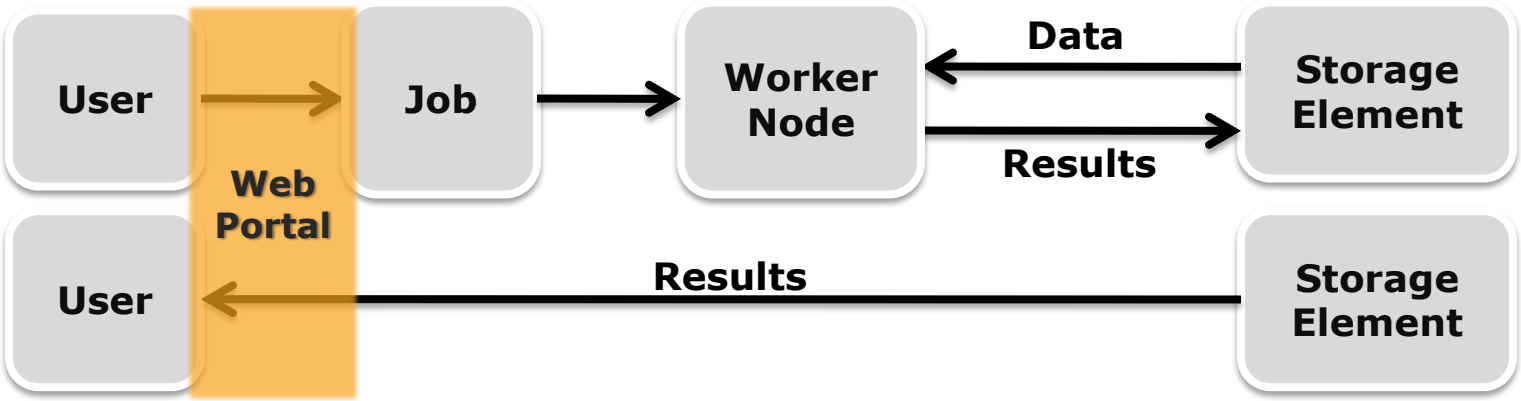
- The results have been manually retrieve from the Storage Element
- The validity of the results have been verified



Future Plans

- Upload all available imagery to the storage element while registering it in a metadata database.

- Select and test a list of predifined image processing operations.
- Create a web portal were registered users can request that existing images are processed using GRASS GIS. This will mask the use of the Grid infraestructure from the users and enable the use of the system from different platforms.



- Perform common operations on all available imagery (extract contour lines, unsupervised classification, vegetation index) and vector data.

www.unitar.org/unosat

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Thank you!

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