Geotechnologien-Projekt EXUPÉRY

– KOORDINATOREN: TORSTEN DAHM, MATTHIAS HORT, JOACHIM WASSERMANN –

Summary of 3rd Exupéry Workshop Feb. 11–12th, 2009 and "Field Test" Feb. 10–12th, 2009

Not all of the groups in Exupéry participated in the meeting (list of participants in the appendix). The contact list for Exupéry has been updated since some new colleagues lately involved the project: http://www.Exupéry-vfrs.de/Meetings.215.0.html

The 'field test' started on Tuesday, 10th Feb. and the meeting was held from 11–12th Feb., while the testing of equipment, installation and improvement of software and fixing of bugs was an aspect during the whole time. Both meeting and 'field test' were focussed on the deployment of the Exupéry system at the Azores beginning in April 2009. The first equipment is shipped to the Azores on Monday, 16th February, so that computers and sensors brought to Hamburg were already packed for shipping after the meeting had finished.

The time schedule for the pilot experiment at the Azores is:

- Feb. 13 Container packing, arrival about 15th Mar. at Ponta Delgada
- Mar. 17 unloading container and finalizing planning of seismic network
- Mar. 24 till April 2 installing seismic stations (Lars, Moritz, Carina, Arturo, Hort, Jonas) and installing IBIS system (Gwendolyn + 3 persons)
- Till Apr. 9 installing computer system (Hans-Peter Stittgen)
- Apr. 4 till 6 Poseidon boarding
- Apr. 6 till 16 Poseidon cruise, OBS network
- ? Mini DOAS (Thor Hansteen, *)

Summary of the 'field test':

Local station data and local systems:

Sensors and systems that will be installed at the Azores comprise the data-base and data centre unit, the seismic stations, GPS data and IBIS unit. A test installation of the mesh-type WLAN communication system will be installed for to establish real-time data connection for 5 seismic and the GPS stations. The other 15 seismic stations as well as the ocean bottom component of the network is operated in remote mode and data can be used after recovery to test the continuous data processing tools. Several problems with software but also hardware has been identified during the Hamburg meeting:

1. Serious problem had been identified for communication devices. The mesh nodes were configured and had been successfully tested for an ATOP mode, where a static point-to-point connection between individual nodes is supported. The point-to-point connection bears high risk of connection losses. Therefore, it was considered as most important to realise a dynamic mesh configuration for the WLAN nodes, as it was originally planned in the proposal. Such a mesh configuration had already been build

by the Potsdam partners with their own instruments. The problem with the Hamburg-build stations was difficult to solve in short time because the cards and nodes did not work stable at the beginning. Daniel Vollmer, a technician from Universisty of Potsdam, was asked to travel to Hamburg to help with the difficult situation. Matthias Ohrnberger and Daniel Vollmer worked day and night and found that the configuration problem can be solved, but not sufficiently tested.

2. A link between digitizer and a mesh node was not possible to test because of the problems described above. However, at least the SeedLink server could be successfully installed on the flash disk. A disk dump of the short-time developed solution and configuration was created and distributed between groups.
3. A connection between mesh-nodes and data processing unit was not tested because of lack of time and the problems described above.
4. The central processing server and the data base system was successfully booted and configured during the test. EARTHWORM and SEISCOPMP3 were both installed and working with SeedLink seismic data from the global and German network. People were trained how to start, stop and configure the EARTHWORM and SEISCOMP3 system.
5. First test runs using IBIS data were successful the last day of the meeting.
6. First mappers were finished during the test.
7. Prototypes of key-files had been created. Hardware specification of the sensors and nodes deployed at the Azores was compiled.
8. Matthias Ohrnberger provided a note on the meshnode issues that was already sent to you by email but because the mailing list was just updated the note

Data provided from non-local (satellite) sensors:

Satellite data fit the standards defined by WP3. There were some problems with the SO_2 trajectory shapefiles and GeoTiff of infrared data but the problems were solved a few days before the meeting. The test data can be shown in the GIS interface and the corresponding XML files fit the database scheme. What the members of WP2 still have to provide are the styles for the GIS interface.

Summary of the meeting and general aspects:

We had a presentation of GIS capabilities by JenOptik. The final GIS interface will be installed over the internet once the system is set up at the Azores. It was agreed that GIS time filter function should be changed so we have then the possibility to set up a global time filter. Database structure is almost completed. H.P. Stittgen reported that the XML form ground SO_2 measurements are not available. He will also prepare the Post-GIS tables in the next days needed by the GIS interface.

The group agreed on two important features we need to realize during the Azores field test:

- We need the possibility to connect to our central server via internet. This possibility may be limited to one or two of our administrators, in order to monitor the data acquisition, fix bugs or re-install software components and updates. The external access is related to security issues and has therefore been clarified well in advance.

- We suggest that, during the time of the experiment, continuous data from Fogo Island of the Azores seismic network are linked by SeedLink to the Exupéry processing unit. Only then reliable automatic event detection and real-time locations can be tested. Currently, about 7 stations send continuous but analogue signals to the seismological centre of the government. The data are digitised and stored in a 48 h buffer in home-build format. Carsten Riedel can provide an example of a conversion / reading program. Arturo knows the details of the data flow and file formats.

Tasks to be finished between 12th February and beginning of April 2009:

1. **All the data providers** should prepare metadata for their GIS results (static metadata like layer's name, short description, contact person with an e-mail) and send also the colour table (can be sent as ASCII or as an image) to S. Bernsdorf (gruener.heinrich@googlemail.com).
2. All leaving to the Azores should bring their software with them in the case something goes wrong. **Responsible: each group**
3. What we have to decide is whether we use university or governmental network at the Azores. The best would be if **Matthias Hort** writes to the director of the centre and ask about the possibilities. If there are some security problems it may be sensible **to buy a router and connec**t our computers through it to the network in order to minimize security risk. **Responsible: Matthias Hort for establishing the agreement and Klaus Stammler and the local administrator for technical details and solutions.**
4. The possible linking of the Fogo island part of the Azores seismic network has to be organised. A first step is to discuss with Theresa and the local responsible whether and how we get permission (**Matthias Hort**). Secondly, the technical solution has to be solved. **Arturo** knows the system in detail and can help with this issue.
5. In order to have an alternative mesh-node communication solution, 16 additional CF cards will be bought. We will use them to install an alternative software solution that will be used if the original plans fail so the communication works in the mode transmitter-receiver and not as a mesh node. About 16 flash cards (2 Gbyte, either Kingston, Scan Disk or Extreme) should be bought, configured and distributed to users. **Responsible: Hamburg**
6. Check if there is UMTS on Azores (IBIS might have problems with the wireless connection over 17 km, USB stick using UMTS network might be a temporal solution). **Responsable: Arturo, Gwendolyn**
7. Additional testing of the mesh nodes before leaving to Azores (3 by **Arturo**, 2 by **Gwendolyn** and 3 by **Moritz**).
8. Scripts for the automatic FTP upload and download for the satellite data. **Responsible: each group**
9. SeedLink functions and real time system will be tested in the next days by **Robert** in Munich.
10. Finishing of remaining mappers at the BGR (**Sittgen**) during the next weeks.
11. Installation problems for the GIS system will be solved on the test server at the BGR before April (**Sittgen, Stammler**).

12. Scripts for the automatic FTP upload and download for the satellite data have to be finished as soon as possible. **Responsible: WP2 (FTP upload) and Sittgen (reading results to the database)**

Hamburg, Feb. 13th 2009 Torsten Dahm, Klemen Zakšek

Appendix 1: List of participans

BGR	Stammler, Stittgen,
DLR	Cong, Eineder, Rix
GFZ	no paticipants
IfM-Geomar	no paticipants
Jena	Bernsdorf, Müller
LMU München	Barsch, Beyreuther, Wassermann
Uni. Hamburg	Dahm, Juretzek, Lohse, Krieger, Montalvo Garcia, Zakšek
Uni Potsdam	Ohrnberger, Hammer, Müller-Wrana, Vollmer
TU Darmstadt	Gerstenecker, Läufer, Steineck

Appendix 2: Note on the meshnode issues by M. Ohrnberger

Dear all,

after our meeting from tuesday to thursday we have been only
partly successful in establishing the communication among
mesh-nodes and the setup of the acquistion system (seismic).
Therefore I'd like to summarize shortly the state of
the exupery mesh node network and related issues.

You can take these notes as a starting point for the
upcoming battery of tests which will be necessary to be performed
until the real field work:

1) 18-? nodes available (currently 16, 1 in Mexico, 1 broken)

2) nodes are identical in hardware design
    - two wlan cards (max. 200 mW), 1 RS232, 1 USB, 1 ethernet
    among other interfaces and capabilities, those are the one we
    are most interested in.

3) nodes have been configured orginally with imedialinux
(www.imedialinux.com),
which is an embedded linux used for router configurations (AP, bridge
and station mode)
These modes of communication (Access Point, Station and Bridges)
have been tested by Arturo and can be considered as fall-back solution
for the
communication. It is no mesh-network.
On Tuesday we have added a sample seedlink installation on
one of the compact flash cards for this imedia configuration -
The steps to perform this are:
- use fdisk to add an additional partition on the compact flash card.
- make filesystem (ext2 or ext3) on this extra partition
- mount this partition under same mount point (e.g. data)
- unpack seiscomp 2.1 package (statically compiled for x86 linux)
- run bin/make_key + bin/make_conf - specfiy needed parameters,
station naming etc. etc. - the configuration to be used is earthdata
serial plugin on /dev/ttyS0 with 115200 kB/s, both seedlink and
slarchive should be installed, 1 day of data should be buffered in segments

4) after 3 days of testing for the real mesh operation we opt now
   for the following configuration:

- OpenWrt (latest development branch) kamikaze 8.09_rc2 (www.openwrt.org)

- configure ONE wlan card in adhoc mode (check /etc/config/wireless!)

- run olsrd (not yet automatically starting - boot script not
functioning properly)

- configure wlan and wired ethernet with static ip addresses in the
follwoing
   subnets (see /etc/config/network):
   ath0 (wlan) --> 192.168.2.1x
   eth0 (wired) --> 192.168.3.1x
   x corresponds to the serial number which has been
   written on the backside of the nodes by Arturo (ASE-x) -

   NOTE: here we have to make a difference between nodes in the field
   and those (maybe just a single one using both wlan cards?) which are
   located in PDL (Punta Delgada) at the observatory. For those nodes,

the eth0 has to be configured to 192.168.1.1x!! (if not, backrouting from
mesh cloud to exupery private computer network 192.168.1.x is not possible!). The best node for this would be the ASE-00 !
this node should get then the IP address 192.168.1.100 on the eth0 interface, which is exactly the IP address that Klaus has set up on the acqusition computers for the routing to the mesh-cloud.

there is a concept figure attached - please note, that this is approximate and conceptual ... the numbers are mostly for illustration purposes, as well as the number of nodes, etc.

5) 5 of the mesh nodes will be used for seismic data acquisition (seismic nodes),
another 8 will take care of the GPS acquisition (GPS nodes).

SEISMIC NODES

Seismic nodes will be connected with the RS232 output of the EarthData Loggers and will acquire the raw seismic data from the digitizer using a local seedlink installation at the meshnodes.

The images that we have distributed (on the way to be operational) to Arturo, Moritz, Gwen and Lars contain a local seedlink installation on the third partition (/dev/hda3) in directory /home/sysop.

Note: we agreed to be careful about the naming policies in order to create
no larger confusion for the data streams which finally go into the seedlink
server running in the field central computer network.
We have to fix the association between meshnode number (is related to the IP on the wireless mesh network - see above) and the EDL, which have been already given names like EXU01 to EXU30.
We should use those as stations names and the network code is AZ.
As far as I understood from Lars, the numbers EXU01 to EXU09 are the data loggers with Mark seismometers and some of them (first 5) are not(!) yet shipped to the Azores, as they will be used for testing.
Note that the match of Station number and IP address is crucial for the key generation on the central seedlink server which transfers the data from the remote seedlink installations on the meshnodes.

seedlink data acquisition can be started/shutdown remotely (there is no bootscript yet):

```
ssh root@192.168.2.1x "cd /home/sysop;operator/oprshell < startup"
ssh root@192.168.2.1x "cd /home/sysop;operator/oprshell < shutdown"
```

you could also look at log files:

```
ssh root@192.168.2.1x "tail -f /home/sysop/logs/seedlink.log"
```

etc. This is still a matter of testing how to deal with odd situations of
power loss or reboot in the field. Using the RS232 interface on the meshnodes has a drawback: during startup of the meshnode, the serial interface can be used to obtain new images for the system. Thus, when the serial ine of a running EDL is connected during startup, the meshnode thinks, that it receives a new image, and does NOT boot! There is one solution: we can switch off the serial console in the meshnode BIOS (press S during startup, you will see the BIOS). BUT BE CAREFUL! once the serial console is deactivated, you can't see anything anymore

on the
serial interface using a terminal connection! - so you can't even get into the
BIOS anymore!!!!!!!!!! To revert this situation, one has to switch the S1 on the board during startup - unfortunately there is no switch soldered on the board!!!
Daniel tried yesterday, and it is possible to fake the switch by grounding the S1!
Please leave these operations for later - Arturo will test workarounds for this
and we hope it is not necessary at all to apply any of these things!!

another comment on the serial line: I ahve edited the file /etc/inittab in order to uncomment the line with /dev/ttyS0 - this disallows a login on the meshnode over the serial line - this is also necessary to not interfere with the data acquisition on the serial line - if you need to debug
on the serial line- please edit /etc/inittab again!

GPS NODES

The GPS nodes are going to be fixed by Gwen and the group in Darmstadt. Gwen has got her own fallback system, which is an Ubuntu installation running on the GPS nodes in AP, STA and bridge communication modes. If I understood correctly Gwen will test also an olsrd meshing using her ubuntu nodes. No switch to OpenWrt is planned so far (?) - in any case it is a good chance to have an alternative
olsr performance test with Ubuntu. What seems to be unsolved is the driver
problem for the atheros chipset in adhoc mode (?).

For the data acquistion on Gwen's GPs nodes, the raw GPS data is caught through the USB interface (usb to serial - correct?) and then transferred to the central GPS computer in the field central, where the full DGPS correction can be applied. Finally the corrected time series (x,y,z components of 8
GPS stations sampled @ 1Hz) are then sent to the data base on a per file basis (10 minutes).

6) some other convenient information:

accessing the meshnodes on the serial console, use parameters:

38400 8N1

there exists only the root user on the OpenWrt - the password is 4root4
at the end, it might be good to change this default value with a more secure password....

finally, I want to thank Daniel for being so spontaneous to
come to Hamburg immediately for assisting us
during Wednesday and Thursday in this battle.
And now: happy testing

best regards
Matthias

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