

## Minutes of Meeting LOFAR Software

<b>Date:</b>	2008-06-03
<b>Next meeting:</b>	2008-06-11 9:15-10:15
	Paviljoen West room
<b>Present:</b>	
Andre Gunst	Yes
Ronald Nijboer	Yes
Ruud Overeem	Yes
John Romein	Yes
Michael Wise	No

cc: Arthur Coolen, Jurjen Sluman, Pieter Donker, Chris Broekema, Martin Gels, Joris v. Zwieten, Marcel Loose, Adriaan Renting, Ger van Diepen, Max Avruch, Peter Boonstoppel, Michiel v. Haarlem, Jan Reitsma, Ger de Bruyn, Arno Schoenmaker, Hanno Holties, Corina Vogt, Jan Noordam, Joe Masters, Lars Bühren, Dion Kant, Johan Hamaker, Maaijke Mevius

### *Remarks previous minutes*

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### *Announcements*

- Today the contract with IBM is signed about the BG/P.
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### *Action item overview*

ID	Date submitted	Description	Owner	Planned date	Status
49	20080116	Simultaneous data storage of TBB and in OLAP to validate inverse poly phase filter bank of Kalpana.  Dataformat should be changed. Although the observation was executed, it is unclear if the data has been made available to the Kalpana and the CR group. A question to be followed up with Observatory personnel.	John/Andre	20080204	ReOpen
53	20080206	Estimation of work if CS1 is scaled up to 20 stations. See the section before the	John, Ruud, Ronald	20080227	Open
56	20080528	Questions for Hanno: (1) Status manual operations DP <sup>3</sup> pipeline, (2) How do people know when an observation is done, (3) why not observing during the week, (4) propose regular system checks, scripts are available to do basic data validation	Michael	20080604	Open
57	20080528	Figure out the data format of the dipole positions. Positions will be delivered in ETRS. These coordinates must be converted once in a half year into ITRF. Hans van de Marel is responsible for the coordinates in LOFAR. The impact of this change is that the	Ruud	20080604	Closed

		content of the configuration files need to be changed and in the AMCserver the code needs to be changed. This will be planned for Step 6.			
58	20080528	Check bandpass shape implementation of OLAP.	Andre	20080604	Open
59	20080528	Check if Casey validated the imager properly and what the findings are and document it.	Michael	20080604	Open
60	20080528	Plan GSM meeting.	Michael	20080604	Open
61	20080528	Organise a build environment meeting (John, Ruud, Marcel, Ger)	Andre	20080604	Open
62	20080603	Design/decision local mode of E-LOFAR stations	Andre	20080611	Open

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## **Progress**

### **Stations (André):**

Achieved since last meeting:

- Dips: Michiel Brentjens can currently predict the dips. The cause is in the BeamServer software and can be due to a division by 0 in e.g. an arctan function. Ronald suggest to use arctan2 function (to be continued).
- Long distance delay tracking observations have been done. James Anderson will look for fringes.
- Eric has already started to implement the 16 bit to 4 bit option, because the devil is in the details and you really have to do the job to be sure if it is feasible.

Problems / current activities:

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Next actions:

- Step 5

### **OLAP (John):**

Achieved since last meeting:

- At 17 June the BG/L will be shut down. It is unknown how many months we are down.
- Chris has answered questions for the CEP tender
- Martin is done with the non micro station mode. The keys which are necessary by those programs have to be added to SAS/MAC.

Problems / current activities:

- John is busy to port code to BG/P for tests.

- Rob will be investigating the tied array beamforming mode (first adding all the stations of the superstation and correlating that with the other stations). Rob will implement the tied array beamforming and Martin the control.
- Robustness for failing disks is not included yet (Arnold Meijsters).

Next actions:

- Step 5

### **Offline pipeline (Ronald):**

Achieved since last meeting:

- Marcel and Joris are finished testing the Global Solver (only minor tests should be done still). Pandey will commission the Global Solver.
- Ger made a report about the HDF5 comparison with the CASA core table system.

Problems / current activities:

- Ger is now busy making a light weight mosaicing function.
- Ronald is continuing with the strategy document and has identified four different approaches.
- Adriaan debugged the C++ version of DP<sup>3</sup> (planned finish date is end of the week).
- Maaijke is busy testing if you have to do peeling or making simulanous solutions.
- Pandey is busy testing the HBA dipole beam model in BBS
- Pandey will test the online bandpass removal. John will produce datasets with and without the online bandpass removal enabled. André needs to verify the current module implements the correct weighting formula for the digital bandpass.

Next actions:

- Step 5
- Step 6: commission the Global Solver

### **SAS + MAC + SHM (Ruud):**

Achieved since last meeting:

- It is currently possible to switch between PVSS 3.7 and PVSS 3.0.
- The content of the PVSS 3.7 can be (almost) automatically regenerated.
- Pieter is done with testing the functional blocks of the station calibration algorithm. Next action is to let Stefan test those blocks and integrate it.
- All screens of Navigator 1.0 are translated to Navigator 2.0. The remaining task of Arthur is to make additional screens for Navigator 2.0 to access the additional information. So, in principle Step 5 is done for Arthur.

Problems / current activities:

- As it stands now: real significant different observations on BG/P has as a consequence that the RSP Driver must be restarted with another configuration file. This is the case if the station data must be send to different IOs of the BG/P from observation to observation.
- Ruud made a proposal to change the MAC/IP addresses (pending). The idea is to integrate the Station ID in the MAC and IP addresses.
- Metadata flow work is ongoing. Arno is busy with a mechanism to distribute the static meta data from SAS to the stations. It would be great if that can be finished as well in Step 5.
- Distribution of PVSS data to SAS works in principle.
- Extra status registers which are implemented in the FPGAs are not driven yet by the LCU.
- The RCU is currently able to drive the power supply of the HBA independent of the modem (which is desirable from an EMC perspective). The remainder left is that the LCU can also drive this bit.
- Reading back the HBA delays should result in really reading back those values from the Front End (FE) units instead of reading back what was written to the FEs: this gets a priority which will be dealt with by Ruud in the week from 9-14 June.

Next actions:

- Step 5
- Step 6: software suitable for ITRF coordinates, coordinates available centrally in a SAS database.
- Wish list: horizon vector in the stations, beamtracking suitable for the solar system.

### **User Software (Michael):**

Achieved since last meeting:

- Updates of the TBB reader have been done by Lars and Joe.
- Joe made downsampling of raw data possible and converts this to HDF5. Not all applications need the full time resolution now.
- Lars has updated the Time Series data format specification to include various metadata.

Problems / current activities:

- Joe has prototypes available to access a MySQL database with simple functions. He interacts with Ruud about how to connect this to the SAS database.
- Through the connection of the magnetism KSP, people of Italy are busy with visualisation software which can be of use for LOFAR or modified for our application.

- Joe will be upgrading the DAL to use the new version 1.8 of the HDF5 library. This update will make the DAL compatible with the HDF5 image classes Ger v.D. has implemented in the development version of CASACORE.
- Alexander is updating the image cube format definition as well as writing up a design for a radio image cube mosaicing tool based on the AIPS++ routine.
- Lars is busy with the near field imager (skymapper).
- Alexander is checking how much work is required to connect DAL to CASA core for using the HDF5 data format.

Next actions:

- Step 5

## ***Holidays***

Ruud: 26 Juni – 14 Juli 2008

John: From ~26 August 3 weeks and structural one day off from ~26 August onwards.

Ronald: 25 August to 12 September

Andre: 25 June – 18 July

Michael: 16-27 June

## ***Software integration***

Achieved since last meeting:

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Problems / current activities:

- A request of Michiel Brentjes was to keep a clean trunk. John suggests to tag the production release.
- Marcel is busy with streamlining the build environment
- Compile a list of anticipated data products and calibration or metadata files associated with each of the pipelines.
- LOFAR development software needs to be build in Kubuntu (Michael has volunteered)

Next actions:

- Define the length of Step 4.
- Step 2+: A test program will be initiated to verify the functioning of the LOFAR software in a more structured way. In OLAP it is possible to store the raw station data and feed this into the pipeline later on. This makes it possible to define a standard data set, which can be applied to the pipeline as soon as major software changes have been taken place.

## ***Scaling up work for 20 stations***

### Stations:

- For the stations the split HBA field boards must be produced and tested in the field.
- The firmware for the HBA field split must be written.
- Additions in the LCU software for the HBA field split are required.
- One central clock should be implemented in the super station.
- HBA calibration should be in place.
- Definition of test suite to be run by the LCU.

### OLAP:

- Should be made suitable to handle multiple independent RSP datastreams without correlating all of them (now OLAP correlates also the different RSP datastreams from the same station to support microstations).
- The network surrounding BG/L should be modified in order to split BG/L in four independent partitions. Will be done after the BG/L decision.
- Possibly optimizations in the IO nodes to cope with the 32 MHz bandwidth are necessary. Will be done after the BG/L decision.
- Making the storage section fault-tolerant and more efficient by using multiple compute cores.
- Tied-array beamforming definition will be done in Step 5 and implementation in Step 6.
- Performance tests of alternative BG/L solution.
- Snapshot imaging support.
- Multiple observations or one observation with multiple beams which change as a function of time.

### Offline:

- Bundle validation
- Ionospheric approach for 20 km distance between stations
- Multi-beam processing for clock calibration
- ...

### SAS/MAC:

- Finishing Navigator 2.0 in Step 5.
- Making screens for the 20 station configuration
- Proof reaction times.
- Performance measurements triggers.
- Scheduler?

## ***Decisions***

ID	Date submitted	Decision
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02	20061220	Every Step will start with a Kick-off meeting, in which the complete software team participates.
<del>03</del>	<del>20061220</del>	<del>The project team starts immediately with the preparations of the next CDR in order to preserve progress of the CS1 realization</del>
04	20070116	This meeting will take place every week on Tuesday 11:00. The existing software team meeting with all developers will stop to exist.
05	20070130	Step 1 will be changed to 16 subbands instead of 32 subbands.
06	20070130	Step 2 will contain a multiple node BBS. 6 $\mu$ Stations/Station will be postponed. Instead of this, 32 subbands measurements will be realized.
07	20070206	Step 1 will support 160 MHz observations. The other steps will support 200 MHz as well.
08	20070424	Step 2 will support 16 subbands @ 200MHz and 24 MHz at 160 MHz
09	20070424	During the rest of step two, OLAP will only support observations during the weekend.
10	20070522	The number of subbands per Measurement Set is set to 6 or 8 default.
11	20070522	Scheduler activities will be preferably activated in Q4 2007.
12	20070522	Procure, three Local Control Units to accommodate 12 microstations in CS010 in a quick way.
13	20070529	Integrate version numbers in all software.
14	20070529	Distinguish the software between a production version and an engineering version (partly now already the case).
15	20070605	All developed software under CVS will be transferred to Subversion. The main reason for this is that Subversion supports the integration of version numbers in the executables. In this way you can always retrieve which software is used for a certain build. First the impact of the transfer will be investigated by Marcel.
16	20070619	Marcel Loose will be the librarian of the LOFAR software. The available time for this will be shared with his BBS work.
17	20070710	The known pulsar survey mode will be the next mode to support (not in its full extent but partly on-line and off-line).
18	20070710	The temporarily off-line part of the known pulsar mode pipeline will not be under control of SAS/MAC. This will be put under control of SAS/MAC as soon as that software is available in the on-line part of the system.
19	20070814	Joe Masters makes the routine to read in the TBB data.
20	20071002	Fault tolerance of the system (mainly OLAP) is put at the top of the priority list after closing the SAS-MAC and CEP integration.
21	20071123	Kubuntu 7.10 desktop 64 bit OS is chosen for all machines except the BG/L and MAC/SAS machines
22	20071123	Station calibration work is smeared out over Step 4 and Step 5.
23	20071123	Global bandpass shape is moved to Step 5 because of its low priority.
24	20071211	Multiple beams per observation will be implemented instead of multiple observations (this is consistent with the plan).
25	20071211	Step 3 will be closed next Thursday. Any open items will be finished in Step 4.
26	20080130	Multiple beams are defined as multiple directions with the same set of antennas. Hence, only the angle, subbands and beamlets can be modified per beam.
27	20080206	Step 4 and Step 5 for MAC/SAS will be changed. The control of the offline pipeline will be postponed because the offline subsystems are not fixed yet. Currently the definition and design of the metadata flows will be set as goal for Step 4 and the implementation of the metadata flow will be the end goal of Step 5. Hence, after Step 5 (part of) the metadata is included in the Measurement Set.
28	20080213	Currently a single subband and single beam is stored in a Measurement Set. As soon as we are ready for mosaicing this probably should be changed in the future.
29	20080220	For storing the raw station beams the sanitizing operations like input buffer will be included in the online part. For this OLAP has to give operational support or instructions to the observers how to start up manually such observations. Since, this is an between solution this will not be automated via SAS/MAC.

30	20080227	Weekly build environment will be updated and automated.
31	20080227	After Step 5 the software documentation will be updated and obsolete packages will be removed.
32	20080423	Basically two Low Band modes will be supported initially: a LBL and LBH mode. The connection between antennas and RCUs have to be chosen such that those to modes make sense.
33	20080528	The position of all individual dipoles will be made available centrally in the database.
34	20080603	The data format of the positions will be delivered in ETRS coordinates by the roll out team. However, the data format of the positions will be stored in ITRF format in the LOFAR databases. Hence, all software and configuration files dealing with coordinates must be made compatible with the ITRF dataformat. Hans van de Marel is responsible to convert the ETRS coordinates to ITRF coordinates for the LOFAR system.

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### ***Table round***

- Ronald: CEP tender is almost closed. Who determines how the off line cluster is designed. Andre: people who are involved in the offline software design will also be involved in the hardware design (Ger van Diepen, Joris van Zwieten, ...).
- Ruud: How are the E-LOFAR stations connected? Currently the Effelsberg LCU can be reached only via a machine of Effelsberg. However, the MCU should be directly connected with the LCU. Another issue is that the E-LOFAR stations should be able to run autonomously. Suggestion is to use a two LCUs or virtual LCUs. Action Andre: decide for a design or organize a meeting with this specific topic.
- We can do pulsar measurements als BG/L is down. However only the raw UDP format is stored and then off line reprocessed in the BG/P. Porting this software to a cluster cost about two weeks work.