

Minutes of Meeting LOFAR Software

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|----------------------|-----------------------|
| Date: | 2008-05-28 |
| | |
| Next meeting: | 2008-06-04 9:15-10:15 |
| | Paviljoen West room |
| Present: | |
| Andre Gunst | Yes |
| Ronald Nijboer | Yes |
| Ruud Overeem | Yes |
| John Romein | No |
| Michael Wise | Yes |

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

- A LOFAR software meeting in Chicago will be organized by LWA. Michael and André are planning to go.
- Tied Array mode meeting was held. The outcome is that there is a concrete set of tests now, that can be done to do the commissioning.
- Job adds (one developer, one postdocs) are out (from LAD board).
- BG/L will be upgraded to a BG/P. Probably the BG/P will arrive half June. That means we go off line for a while.

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^3 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 | Michael | 20080604 | Open |

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|----|----------|---|---------|----------|------|
| | | validation | | | |
| 57 | 20080528 | Figure out the data format of the dipole positions. | Ruud | 20080604 | Open |
| 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 | Andre | 20080604 | Open |

Last: 61

Progress

Stations (André):

Achieved since last meeting:

- The cause of the dips in the observations are currently isolated to the BeamServer software, because an observation where all the weights of the beamformer are send manually via a script showed no dips (to be continued).
- First 20 HBA production ready prototypes will be produced.

Problems / current activities:

- Long distance delay tracking is not tested again. No fringe yet. Possible help could be to use the raw data from the TBBs.
- Eric Kooistra is busy investigating the feasibility to increase the number of station output beams with a factor of 4. The penalty is that the amount of output bits is decreased from 16 to 4 bit as well.

Next actions:

- Step 5

OLAP (John):

Achieved since last meeting:

- John and Chris are busy with BG/P issues and porting to test its performance. Porting the software to BG/P is expected to take at least 4 months extra work. One big advantage of the BG/P compared with BG/L is that more stuff is supported which we need to use.

Problems / current activities:

- John is busy to port code to BG/P for tests.
- Martin is a busy with non micro station mode. A quarter of the band is processed by separate partitions. This does support multiple modes at the same time (tied

array and correlation). For this reason we also need single partition. A disadvantage of one partition is that if hardware fails than the system hangs (system is not fault tolerant against failing hardware).

- 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 busy testing the Global Solver.
- Joris has wrapped Sarod's beam model code such, that it can be included in BBS.
- Ger made a light weight imager.
- A Lions meeting was held in Leiden and there was concluded to go forward with BBS.

Problems / current activities:

- Ger is now busy making a light weight mosaicing function.
- Ronald got feedback about the calibration strategy document of Johan. Currently the model assumes a general Jones matrix in each direction, which includes the beams, ionosphere and the electronic gains. According to Johan you cannot separate those. Jan Noordam his approach is to solve those effects separately. We do not know yet which approach to follow.
- Adriaan finished almost the C++ version of DP³ (planned finish date is end of the week).
- Maaijke is busy implementing SPAM (based on spears point and peeling) ionospheric model of Huib Intema 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

SAS + MAC + SHM (Ruud):

Achieved since last meeting:

- Busy with making it possible to select PVSS 3.7 or PVSS 3.0 for continuity.
- 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.

- Last Monday a meeting was held concerning the deployment of the LCU initiated by Arno (Michiel B., Arno, Menno, Ruud). Needs the position of each single dipole at CEP, because the beam model changes if an antenna is for example broken. This information should be available in the SAS database.

Problems / current activities:

- Max is busy modeling the stations for the fault models of SHM.
- Ruud made a proposal to change the MAC/IP addresses (pending).
- Metadata flow is ongoing. Metadata infrastructure from MAC to SAS in is place yet and works for the states.
- 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.

Next actions:

- Step 5

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:

- Marcel made the SVN server available to the DMZ (De-Militarized Zone) making it visible to the outside world

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 |
|---------------|---------------------|---|
| 02 | 20061220 | Every Step will start with a Kick-off meeting, in which the complete software team participates. |
| 03 | 20061220 | The project team starts immediately with the preparations of the next CDR in order to preserve progress of the CS1 realization |

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| 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 μ 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. |

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| 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. |

Last: 33

Table round

- Michael: When data is taken, is it then processed to the DP³ manually by the observers? If this is the case, then people can start working on pre-processed data. Ronald: this is not done now. Michael will ask Hanno.
- Andre: Can we place the input cluster back to do pulsar observations while BG/L is replaced. Reconsidering this question, perhaps the storage cluster can be used for this as well.
- Michael: We need commissioning test reports? Yes, we agree.