Report from the Short Term Mission – STM

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Report:

1. TOPIC

The purpose of this STM was threefold:
1. The exchange of information on science and technical operating practices, the current state of the LOFAR software platform and the roadmap for its evolutionary development.
2. As part of the LOFAR Efficiency improvement project, to investigate the development of the automated handover of international LOFAR stations to local mode during normal ILT time for opportunistic observations during times when such stations are not actually in use for ILT observations. For IE613, this would allow space weather monitoring during ILT time when the Irish station is not actually in use for ILT observations. This also affords the possibility of more maintenance windows should those be necessary
3. Investigate/initiate the development a LOFAR command simulation suite. The idea being that station control script development could be carried out even when not connected to station hardware (i.e. during ILT time) using simulated LOFAR commands to provide realistic station responses/error outputs if user input is incorrect.

2. PROPOSED AND PERFORMED WORK

ASTRON proposed <u>initially</u> to host a 2-day meeting with I-LOFAR staff in the second quarter of 2019 to exchange information on aspects of technical operations of an International LOFAR station. In addition, this meeting was to establish the feasibility and timeline for the work required to develop the International LOFAR station automated handover capability and simulation software described above. <u>Further visits will be necessary as this aspect of the work develops</u>. 2 meetings were held with relevant ASTRON staff to open the discussions on these topics and to explore the feasibility of the work.<u>This gave us a better understanding of</u> A detailed report on these meetings is given below

3. CROSS-DISCIPLINARITY

- Although the main topic of the STM is outlined above, there was also time to get some training in the use of a new near field RFI locator tool for LOFAR as well as some useful conversations with the ASTRON pulsar experts regarding pulsar measurements at IE613.

4. IMPACT

Following discussions with other international station owners, the automated station handover proposal is of interest to many. As a group we would hope to push this proposal via the International LOFAR Telescope technical operators group.

5. PUBLICATIONS

n/a

The project leading to this publication has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730562 [RadioNet]

Report #1

Summary of meeting at ASTRON regarding ILT -> Local -> ILT switchover, 2018-04-10.

Present: Klaas Stuurwold, Jurjen Sluman (ASTRON) & Joe McCauley (ILOFAR)

The meeting topic was to explore the feasibility of creating a means of automatically handing over International stations from ILT to local mode during gaps in the schedule (Local Gap Time, henceforth LGT) for individual stations so that this 'dead time' can be utilised locally as needed.

ILT observations are carried out based on the schedule which is held in the OTDb (ObservationTreeDataBase).The contents of this database trigger an observation which uses parameters from the database such as which stations are to be used, targets, times. Next to the observations also the pipelines with all its parameters are stored into this database.

Currently the switching from ILT to local is carried out manually. A number of things have to happen in sequence for a given international station:

1. Set station to swlevel 0.

2. Set station config on LCU from ILT to local.

3. Set S1 & S2 switch configuration from ILT to local.

The above sequence takes ~10 minutes.

(All scripts/processes must work fine, otherwise it will take more time, such as loading firmware version page0 of the RSPboards, if this fails a 48V reset will be done by the script and will take some extra time)

Going from local to ILT, the sequence is:

1. The local-user should set the station in swlevel 0.

2. Set S1 & S2 switch configuration from local to ILT.

3. If still running processes in the swlevel(s) ,set station to swlevel 0.

4. Set station config on LCU from local to ILT.

5. Set station to swlevel 6.

6. Optionally do a PPS tune.

The above local to ILT switch takes up to ~25 minutes due to the PPS tune if all goes well. If there is a problem, then a 48V reset may be required. This obviously adds to the time required for the local to ILT switch. It is therefore suggested that initially a minimum gap of 2 hours in the schedule be available before an LGT be made available. As the procedure is refined/tested, this gap might be reduced.

Local operators can be automatically notified by email when the switch from ILT to local is completed and possibly just before the switch back to ILT is commenced. This, in addition to notifying local operators that the handover has happened, could potentially be exploited to trigger a local observation out of normal working hours if necessary.

Sometimes the ILT task scheduled after any potential LGT switch will be of such importance that the (small) risk of such a switch would be inadvisable. That being the case, it is understood that not all potential LGT

would be made available. Procedures for publishing LGT on the publically viewable schedule are still to be clarified, taking into account input from the ASTRON astronomers.

At the moment, during switchover, manual intervention is required (go/no go) by the operator at different points. It is felt by the ASTRON side that the scripts used for this part can be modified easily enough by the Radio Observatory Software Department and/or Klaas and/or the Radio Observatory Operators (Jurjen/Richard/Paul)

The means of triggering this switch over for individual stations will have to be done by creating a new type of event in the OTDb & associated software like the Scheduler and Resource Assigner, along with some (expected to be minor) modification of the relevant software. This has to be done by the ASTRON software team. At the moment this team is overstretched, so this could be an issue. It would be helpful at this time if, at least, the required resources for this part could be quantified so that we could get an idea of a potential timeline.

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Report #2
Summary of meeting with the ASTRON software team 12/04/2019
Present Jaspar Annyas & Auke Klazema (ASTRON), Joe McCauley (ILOFAR)

Exploitation of schedule gap time
ILOFAR propose exploring a means of automatically handing over International stations from ILT to local mode during gaps in the schedule (Local Gap Time, henceforth LGT) for individual stations so that this 'dead time' can be utilised locally as needed.
While ASTRON are looking to introduce dynamic scheduling (which might touch on this area), this is at least 2 years away.
During a meeting with the operations team, the feeling was that if a suitable event can be created by the software team that this could be used to trigger the necessary switchover scripts. They felt that modifying the necessary scripts should not present major challenges.
What the operations team were proposing involved full switching from ILT to local mode, however the software team feel that it would be better to switch the station only to local mode but keep the network in ILT mode. This would minimise the risks involved in network switchover. ASTRON would in this case need to find a way to ring fence the local station from the point of view of security.
The software team propose:
1. Identify a method of finding suitable gaps in the ILT schedule which could be used as LGT. Initially these would be restricted to 0900-1700 so that any issues in returning a station to ILT operation could be dealt with promptly.
2. Auke will work on an estimate of what is necessary to identify such gaps after the April 23rd software rollout.

LOFAR command simulation
ILOFAR propose development of a LOFAR command simulation suite. This would facilitate development of observation scripts offline for International stations and result in less script debugging during local station time. This is particularly important for new users on International stations where local access time is limited.
The original ILOFAR suggestion is to take the existing LOFAR command source code, strip out parts which interact with hardware and recompile so that the resultant executables give a reasonable representation of the command response (as shown on the console) when real commands are

executed on the LCU. This response initially might not be 100% fool proof, but would certainly be helpful in reducing 'live' debugging on the LCU.

The ASTRON software team suggested that it might be feasible to setup an RSP & TBB board in a separate rack which could be used in script development. The advantage of this could be that the response from such a system might be 100% identical to the station response. The software team however agreed to investigate giving access to the LCU command source to facilitate the investigation of a software simulator.