RadioNet3 JRA Hilado

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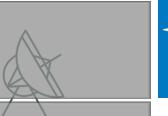
Science & Technology Facilities Council

CSIRO

SKA AFRICA
SQUARE KILOMETRE ARRAY

LOFAR

UNIVERSITE D'ORLEANS

JIVE
JOINT INSTITUTE FOR VLBI IN EUROPE

iram
Institut de Radioastronomie Millimétrique

ESO

INAF ISTITUTO NAZIONALE DI ASTROFISICA

ASTRON
Netherlands Institute for Radio Astronomy

UNIVERSITY OF OXFORD

ONSALA RYMDOBSERVATORIUM
CHALMERS TEKNISKA HÖGSKOLA

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Board 2013/03/18

Contract No: 283393

RadioNet3 – Hilado

- High performance processing of extremely Large Astronomical Datasets in an Open-source environment
  - Weaving together several groups and critical themes

- Aperture synthesis imaging, wide range of frequencies.
  - <1GHz specific issues e.g. ionosphere, crowded fields
  - >10GHz specific issues e.g. mosaicking
  - Common issues: e.g. differing primary beams, polarization, convolution, automated data editing

Goal

- ☐ Create optimized prototype software and demonstrator processing pipelines that improve the capabilities of currently planned software packages for existing and emerging radio telescopes.

- ☐ Thus increase the potential of the RadioNet user community in opening up those facilities for the more demanding scientific applications.

Contract No: 283393

Status

- Slow start due to staffing issues
  - Oxford, Cambridge JIVE, ESO
  - All partners now fully staffed

- Work started in all workpackages
  - Except WP4 (JIVE), as planned
  - Role Cambridge in WP1, WP4 being redefined within DoW

- Meeting structure in place
  - Kick-off in 2012/04/26-27, formal start 2012/07/01
  - Monthly telecons planned
  - F2F in Oxford (planned Feb -> April)

Optimization of CASACore and of CASA applications

□ **First analysis identified several key issues**

  □ **Static variables in Casacore heavily used in ALMA CS**

    □ **Been made thread-safe to increase robustness**

  □ **ASDM data files not understood by most packages**

    □ **ASDM Storage Manager written to avoid extensive copying, leading to 15% speedup of pipeline**

  □ **Datasets very large, leading to storage issues**

    □ **Experiments with (non-lossless) compressed storage being done, leading to factor 4 smaller files with ~% differences in images. Needs further research!**

Fast Transient Imager

- **Key steps in pipeline targeted for speed-up**
  - **Flagging:**
    - **on-line flagger (Rob Nieuwpoort, based on Offringa's rficonsole) developed, ready for evaluation**
  - **Demixing (that is: subtracting A-team sources):**
    - **NDPPP being redesigned for online use**
  - **Averaging**
    - **NDPPP being redesigned for online use**
  - **BBS:**
    - **StefCal being considered as fast solver in BBS (Souley Madougou, UvA)**

Large solvers for ALMA and the SKA

□ **Theoretical analysis of convergence has been verified, reduced complexity algorithms still seem to perform well enough (StefCal followed by BFGS)**

□ **Several extreme cases in full polarization (found by Oleg Smirnov) have been considered**

　□ **StefCal performs well in these cases, where standard Levenberg-Marquardt solver is slow or gets in local optimum**

□ **Extreme tests with varying system noise being carried out**

　□ **So far the algorithm seems to be sufficiently robust**

Bringing it to the user

- **Cambridge proposal to work on a high-level interface language for data-reduction that can very efficiently bridge the gap between batch/script and interactive use of data reduction environments (may also be useful for distributed/parallel data reduction).**
  - **The high-level language would provide a next generation interface that could build on top of both NRAO CASA/casapy and ParselTongue.**

- **Application in JIVE ecosystem being considered.**

Plans for 2013

- **Full detailed workplan (integration of WP3 and WP4)**
  - Delayed due to delay in f2f meeting

- **All workstreams will complete their analysis phase by the end of the year**
  - Corresponding deliverables may be delayed by 1 month

- **All workstreams will start developing prototype code in the course of 2013**
  - Deliverables planned for 2014

Issues (1/2)

- The project has been significantly downscaled, therefore groups are small and Hilado is a relatively small project at all partner institutes
  - Bilateral working relations will accomodate this:
    - WP1: ESO (DP) – ASTRON (GvD)
    - WP2: ASTRON (GvD, RN) – Oxford (SS)
    - WP3: Oxford (SS, RM) – ASTRON (SW)
    - WP4: JIVE (DS) – Cambridge (BN)

Issues (2/2)

□ The project has started late at several partners, leading to some synchronisation issues: after the kick-off several workstreams started full steam, others were delayed

  □ This will be resolved by the f2f meeting in Oxford

  □ Detailed plan will be issued right after that meeting

□ The improvements achieved in WP1 will find their way into ALMA/EVLA/… processing, but we need to ensure that Hilado is credited for this

  □ Presentation at conferences like CALIM should ensure this

Planning

- Analysis
- Prototype
- Demonstrator
- Publication
- Workshops

Nr.	Vorgangsname	2012				2013				2014				2015			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	**WP 10 Hilado**																
2	**WP 10.1 Optimisation CASACore and Apps**																
3	Profiling of algorithms																
4	Analysis of data formats																
5	Profiling of software code																
6	Design Review of optimisation strategies							31.12.									
7	Prototyping optimised software																
8	Completion of optimized imaging code libraries										02.07.						
9	Demonstration on benchmark platforms																
10	Publication of results																
11	**WP 10.2 Fast Transient Imager**																
12	Analysis of algorithms and dataflow																
13	Design Review of Fast Transient Imager						02.07.										
14	Development of prototype software																
15	Completion of FTI prototype code										02.07.						
16	Development of demonstrator																
17	Final reports																
18	**WP 10.3 Large solvers**																
19	Research in mathematical foundations																
20	Analysis of platform requirements																
21	Design Review Parallel Solvers						02.07.										
22	Development of prototype software																
23	Completion of code library for parallel solvers								01.04.								
24	Demonstration on benchmark platforms																
25	Benchmarks completed												02.04.				
26	Publication of results																
27	**WP 10.4 Bringing it to the user**																
28	Workshops with community (1)																
29	Workshops with community (2)																
30	Workshops with community (3)																
31	Definition of interfaces																
32	Completion of improved ParselTongue library								01.01.								
33	Configuration of applications																
34	Demonstrator for selected applications																