



High-performance pipeline processing for ASKAP

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1 Extended Abstract

The Australian Square Kilometre Array Pathfinder (ASKAP, [1]) is a radio-synthesis telescope located at the Murchison Radio-astronomy Observatory (MRO) in Western Australia, featuring thirty-six 12m dishes equipped with Phased- Array-Feed (PAF) receivers. These provide a wide, 30 square degree instantaneous field-of-view by forming up to 36 separate dual-polarisation beams at once. This results in a high data rate: 70 TB of correlated visibilities in an 8 hour observation, requiring high-performance calibration & imaging pipelines. The ASKAPsoft package has been developed specifically for meeting this challenging problem. Particular design decisions in the imaging algorithms, and the framework under which they run, have been made to meet processing requirements on memory and run-time, and scientific requirements.

The ASKAPsoft software is deployed on the Cray XC30 “Galaxy” supercomputer at the Pawsey Supercomputing Centre in Perth, Western Australia. Since ASKAP will be primarily a survey telescope, these processing pipelines must run in near-realtime, commencing once an observation is completed and completing in time to process the next. All calibration and imaging is done within these pipelines, followed by the formation of astronomical catalogues, and the resulting data products (calibrated visibilities, images, cubes, and catalogues) are stored in the CSIRO ASKAP Science Data Archive ¹

ASKAP is currently conducting its Early Science program with an array of 12 PAF equipped antennas. This is a series of small surveys that allow the ASKAP science teams to address key scientific questions in the lead-up to the full-scale Survey Science Projects with the full 36-antenna array, and at the same time contribute to the development of ASKAP operations and processing. We will present examples of these products such as a 31 square degree, continuum image of the field surrounding NGC 7232 (see Figure 1). Datasets from this and related observations are available now through CASDA

Throughout 2018 as larger numbers of telescopes become incorporated into the array, the processing will need to move to a fully online mode of operation, where observations are processed immediately upon completion of the data ingest and intermediate products are not retained. In this way the ASKAP telescope and its pipelines will play an important pathfinding role as we move towards the even more complex SKA Science Data Processor.

References

- [1] DeBoer, D., et al. 2009, Proceedings of the IEEE, 97, 1507

¹The CASDA search page is at <https://data.csiro.au/dap/public/casda/casdaSearch.zul>