



CASA

Common Astronomy
Software Applications

CASA Development Activities

Status, Opportunities, and
Constraints

Jeff Kern
NRAO



CASA and the ALMA Pipeline

- Common Astronomy Software Applications (CASA) is the data reduction package for the ALMA telescope.
 - Joint development of NRAO, ESO, NAOJ and [newly] ASIAA
 - C++ libraries with python interface layer
- Pipeline (see previous talk)
 - Python structure on top of CASA functionality to automate the processing of data (Total Power and Interferometry)
- This Talk
 - CASA Context
 - Highlight status of past and current projects
 - Gaps, things not planned, etc.
 - Constraints: What we can support and what we can't. Deployment



CASA Context

The CASA package Pipeline are under active development:

- Algorithms and Functionality
 - Polarization Calibration and Imaging
 - Advanced Imaging (see later talks)
- Pipeline Imaging
- High Throughput Computing
 - MPI Based parallelization
- Optimization of IO Performance
- Cloud based processing (AWS /XSEDE)
- Archive reprocessing
- Very Large Array Sky Survey (VLASS)



Previous Projects: CARTA

- **Cube Analysis and Rendering Tool for Astronomy**
 - See talk later today!
- Project to implement next generation cube viewer and analysis tool.
- Will replace existing CASA Viewer once all features are complete
- Development model had one member of CASA team throughout project (in house expertise for extended maintenance).
- Project maintained on GitHub, open source with CASA/ASIAA as major partner.
- Extension planned by study to add interactive clean capability
- Contributions from IDIA (SA) are planned on scalability to LARGE datasets.



Previous Projects: ADMIT

- **ALMA Data Mining Toolkit**
 - See talk by P. Teuben
- Version 1.0 is complete, and is undergoing acceptance testing.
- Will soon move to GitHub for maintenance, and community contributions.
- Built and distributed by NRAO beside CASA distribution (for now)
- Integration with ALMA workflow pending acceptance and use of ALMA Imaging Pipeline in production.



Previous Projects: Studies

- Definition of VLBI Processing requirements (complete)
 - What would be required to support VLBI in CASA for ALMA
- XCLASS / ARTIST incorporation in CASA (in progress)
 - Dense/blended line identification and modelling
- Topological Analysis (in progress)
 - See talk by P. Rosen.
- Cleaning Up Interactive Cleaning (new)
 - Introduction of interactive clean capabilities in CASA
- Joint Deconvolution of ALMA Data (new)
 - See other talk by P. Teuben



Opportunities

- Source Extraction / Image Segmentation
 - ALMA Optimization of a catalog builder
 - ADMIT and TDA more PI driven.
- Imaging Algorithms (speed, cubes, dynamic range)
 - See talks by S. Bhatnagar and U. Rau
 - Effort to make these production, not just prototype
- CARTA plugins
- New / novel ADMIT ATs
- VLBI Capabilities
 - Effort underway from BlackHoleCam/JIVE.
 - Are there gaps for general ALMA applicability?
- Camera / Phase Array Feed processing
 - Path to data reduction and imaging is unknown.



Constraints

Any proposal that has a software deliverable will be reviewed for impact on the existing team.

- Items that need to be addressed:
 - Long term maintenance: Who? How much? What about improvements? Knowledge transfer.
 - Integration support and distribution:
 - What are the integration constraints?
 - Who builds and distributes the software?
 - Supported platforms?
 - Software engineering and documentation:
 - Regression test suite?
 - Coding guidelines and language choice
 - Third party libraries (choices and versions)

