CASA

Joe McMullin

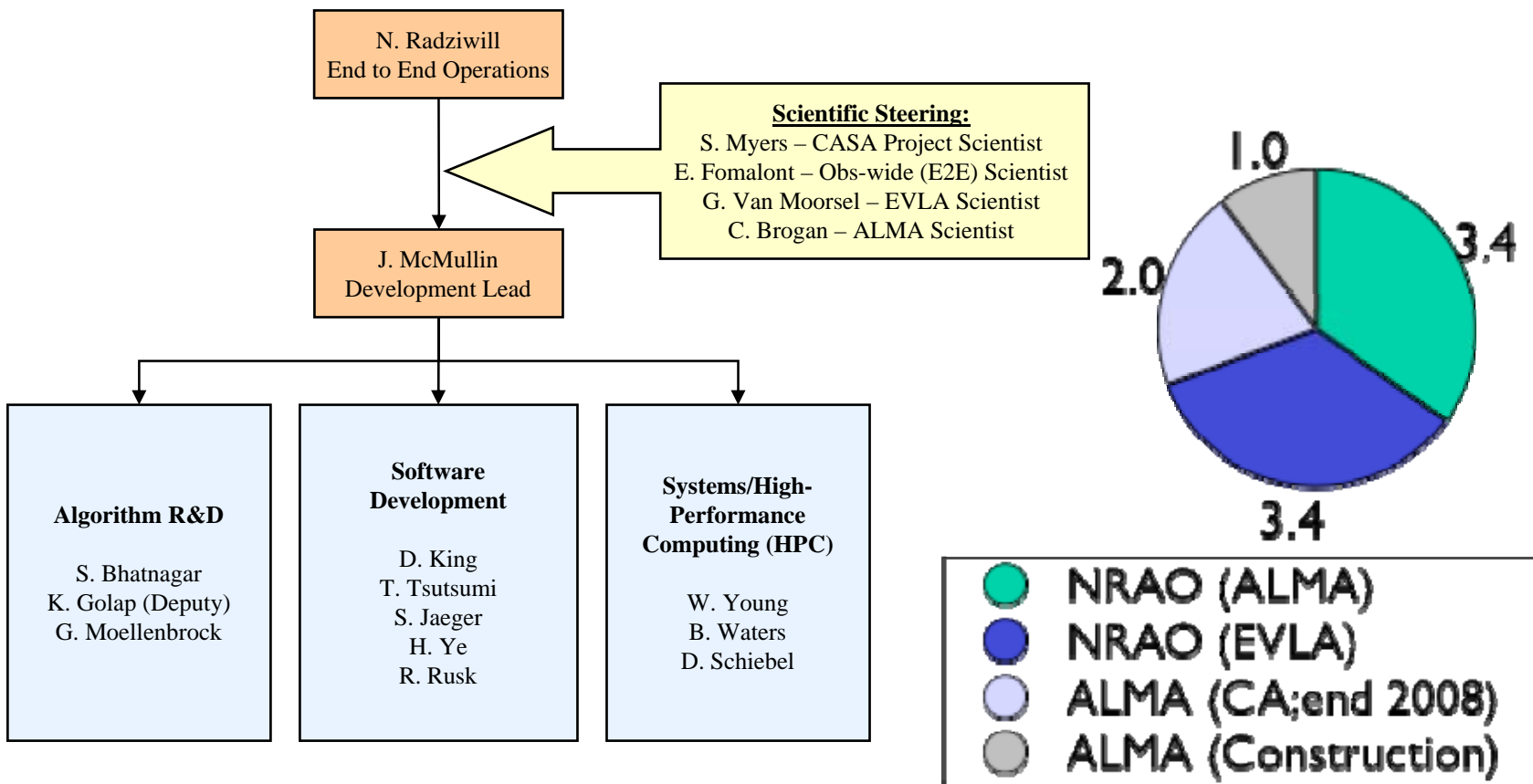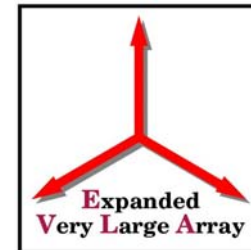# Outline

- Organization

- Purpose/Census

- Current Status

- Schedule

- Testing/Community Use of CASA

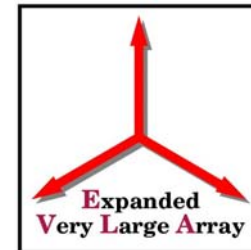- Demo

CASA Organization

N. Radziwill
End to End Operations

Scientific Steering:
S. Myers – CASA Project Scientist
E. Fomalont – Obs-wide (E2E) Scientist
G. Van Moorsel – EVLA Scientist
C. Brogan – ALMA Scientist

J. McMullin
Development Lead

Algorithm R&D

S. Bhatnagar
K. Golap (Deputy)
G. Moellenbrock

Software Development

D. King
T. Tsutsumi
S. Jaeger
H. Ye
R. Rusk

Systems/High-Performance Computing (HPC)

W. Young
B. Waters
D. Schiebel

1.0
3.4
2.0
3.4

- NRAO (ALMA)
- NRAO (EVLA)
- ALMA (CA;end 2008)
- ALMA (Construction)

Common Astronomy Software Applications (CASA)

- ## What is it?

  - Suite of applications for the reduction and analysis of radio-astronomical data (derived from the former AIPS++ package)
  - Developed by ALMA/EVLA to be their principal reduction package.

- ## Key User Differences

  - Python/Ipython interface
  - Task interface to functionality
  - Full in-line help
  - Smaller package size
  - Faster startup time
  - Performance improvements
  - Smaller memory footprint
  - Expanded functionality
  - Scientist-written documentation

CASA Summary Interface

- Ipython & Python
  - File system navigation, application help, namespace completion, auto-parenthesis, session logging, command history with searching, numbered input/output, macro system for re-execution of previous input
  - Powerful scripting language; many mathematical/astronomical libraries available

- Matplotlib
  - 2D plotting library (interactive, publication quality plots)

- CASA
  - Task environment, simple parameter setting interactive mode, scripting mode, save/restore of settings

- GUIs
  - Viewer (Qt based); table browser (Java based)

CASA Functionality

- Tasks
  - Most often used functionality;
  - easy navigation within the package (help, inp)
  - Prototype task system - exploits IPython (tab completion, shell access, etc)
  - Documentation = Cookbook

- Tools:
  - Full functionality represented; tasks are a layer on top of this to enable easier access to the most often used applications
  - Underneath for fine adjustment, manipulation, prototyping
  - Documentation = User Reference Manual

Documentation

QuickTime™ and a
Apple Intermediate Codec decompressor
are needed to see this picture.

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Schedule

- 2007

  – Focus: Usability, simple end-to-end synthesis imaging, documentation

  – Goal: Beta release

- 2008

  – Focus: ALMA commissioning, EVLA prototype correlator, User support, Algorithm development

  – Goal: First Public release

- 2009

  – Focus: Extended functionality

  – Goal: ALMA/EVLA Science support

Schedule - 2007

- **Alpha Release (Mar 2007)**
  - ALMA External Test
    - Update 1 (Jun 07)
      - ALMA/EVLA Internal Test
      - ALMA External Test
    - Update 2 (Aug 07)
      - ALMA/EVLA Internal Test

- Beta Release (Sep 2007)
- Core package from EVLA POV
- Capability to reduce basic VLA data sets end-to-end
- Support for ALMA/EVLA projects
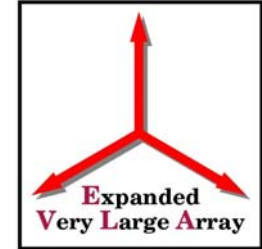- Commission User Support system (1st quarter)

Status

- Development progress over the last year
  - Focus on User Interface
    - Task/tool interface
  - Core Functionality
    - Single Field/Mosaics
      - Data Assessment/Editing/Calibration/Imaging
 - User Documentation
  - Open testing

Beta Release:

- Schedule
  - April 15: Patch to testers

  - June 15: Test release 1
  - June 15-30: NRAO testing
  - July 9: ESO Tutorial
  - Aug 15: Test release 2
  - Aug 15-Sep 25: NRAO testing
  - Sep 30: Planned Beta release
  - Oct: Japan tutorial (possible)
- List at:
  https://wikio.nrao.edu/bin/view/So
  ftware/BetaPlanning

- Deliverables
  - Scientific scope:
- Data:
  - VLA (>1.3 GHz)
  - UVFITS
  - ASDM (mainly PDB)
- Modes:
  - Basic SFI
  - Basic Mosaics

  Operating Systems
  - RHE4.x
  - OSX 10.x
  - FC6
  - (64-bit Linux)

Schedule - 2008+
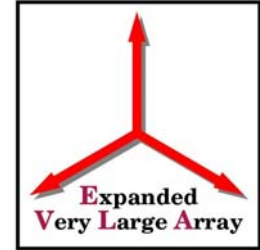
- Public Release
  - Quarterly patches to Beta lead to:
    - V1 (Oct 2008; tentative)
    - V2 (Oct 2009; tentative)
  - User Support
  - Core Functionality (P1, 80% P2 requirements)

- EVLA
- Support correlator (June 08)
  - Read in ESDM data from archive
  - Write-out FITS readable by AIPS
 - Data examination/exploration
  - Produce simple images

Testing

- Transition at end of 2006
  - Move from strict requirements check-out to usability, general functionality, filling the 'gap between the requirement and the expectation'

- Internal EVLA Test - Dec 2006
  - 9 NRAO scientists (AOC/CV)
- External ALMA test - Mar 2007
  - 9 scientists selected by ARCs
- Internal NRAO test - June 2007
  - 7 NAASC/NRAO scientists
- External ALMA test - July 2007
  - 10 ARC scientists
- Consistent weekly use/testing by NAUG (NRAO Application Users Group) members (began April 07)
- Plan to have *all* NRAO scientists use CASA by end of 2007

Testing
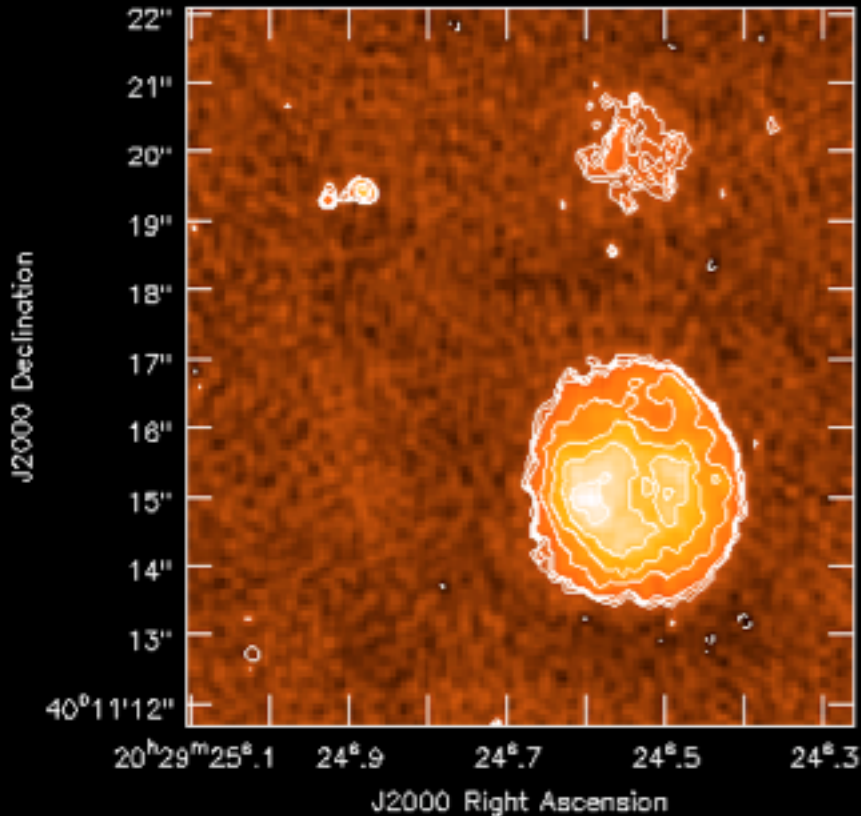
Katherine Johnston (St Andrews University): AFGL 2591 VLA A array X-band continuum observation. Multi-scale clean imaging.

that

Community Use

Alpha
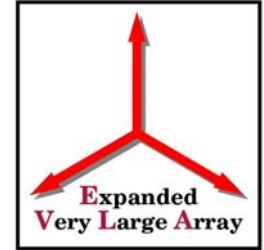- Selected Project members(ALMA/EVLA)

Beta
- 'Commission' user support
- Support via:
  - JIRA tracking
  - Multi-level support:
    - ARC/EVLA scientists
    - NAUG scientists
    - Developers

Planning:
- Oct 1-31 'Train the trainer' - support staff
- Oct 31-Jan 08 (TBC) - extend more broadly within projects
- Jan 1 - PR - open to project members

Functionality/Demo

- Interface
  - Python/Ipython
    - Shell access
    - \<TAB\> completion
    - Autoparenthesis
    - History/Search
    - Macros
    - Session logging
  - CASA Interface
    - Help system
    - Task environment
      - Globals
      - Error handling
      - Expandable params
      - Task execution
      - Save/restore

- Functionality
  - Example script execution
  - Data import
  - Data examination/flagging
  - Calibration
  - Imaging
  - Displaying images
  - Image analysis
  - Statistics
  - Profiles
  - Moments

CASA
Useful Web links

- CASA homepage: http://casa.nrao.edu
- JIRA (defect tracking): http://bugs.aoc.nrao.edu
- NAUG: http://www.aoc.nrao.edu/~smyers/naug

- Python: http://python.org
- Ipython: http://ipython.scipy.org/moin/
- Matplotlib: http://matplotlib.sourceforge.net
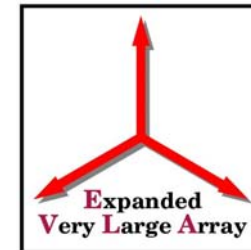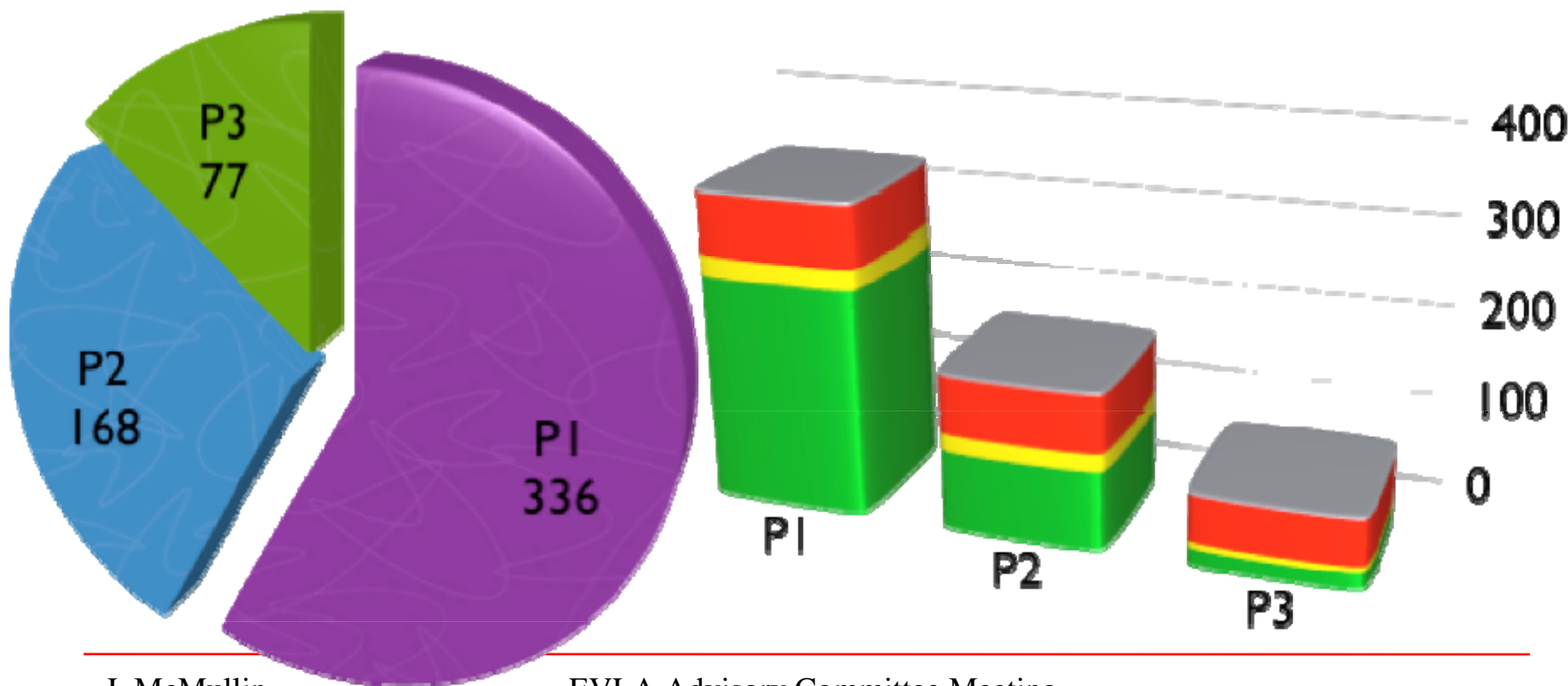- ASAP: http://www.atnf.csiro.au/computing/software/asap
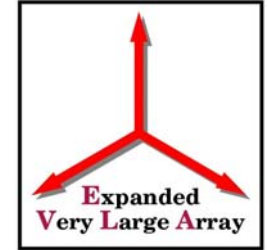
Extra Slides

Requirement Status

Summary tester comments from Mar 07 tests

Test Results (Synthesis)
(from Silvia Leurini)

PROs:

- Regression scripts worked well, and produced results comparable with the published ones.

- CASA is relatively easy to use. Most tools of AIPS++ have been replaced by tasks (similar to MIRIAD), which make easy to learn and use it.

- In this test, CASA was found to be of comparable speed to other packages (faster or as fast as AIPS and GILDAS, but still slower than MIRIAD).

Test Results (Synthesis)
(from Silvia Leurini)

CONs:

- The functionality for data reduction is still not complete, especially for data visualization and analysis (especially for line data).

- The viewer is nice, but limiting in several aspects.

- CASA is easy to navigate, but errors messages are sometimes obscure.

- Not all tools have been converted into tasks yet.

- Some tasks did not work properly in all their functionalities.

- Global parameters versus local parameters.

- Sometimes CASA still crashes.

Test Results (Synthesis)
(from Silvia Leurini)

The general level and organization of the cookbook is generally ok, but

- more introductory material should be included
- tutorials should be provided
- the content of the cookbook is often incomplete (not enough information on tasks, and their inputs, generally no background on the theory (deconvolution methods..))

Recommendation for beta release (from Silvia Leurini)

- The CASA team should focus on making the software more stable.

- CASA should be easy to install.

- Not all data format can be processed with CASA yet. For the beta release, CASA should read at least all standard uvfits format (defined as what AIPS can read); it should process AT LEAST VLA and PDBI data.

- More solid documentation; better error messages.

CASA Labor Camp - CASA Tutorial at ESO July 07