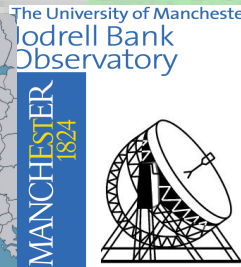


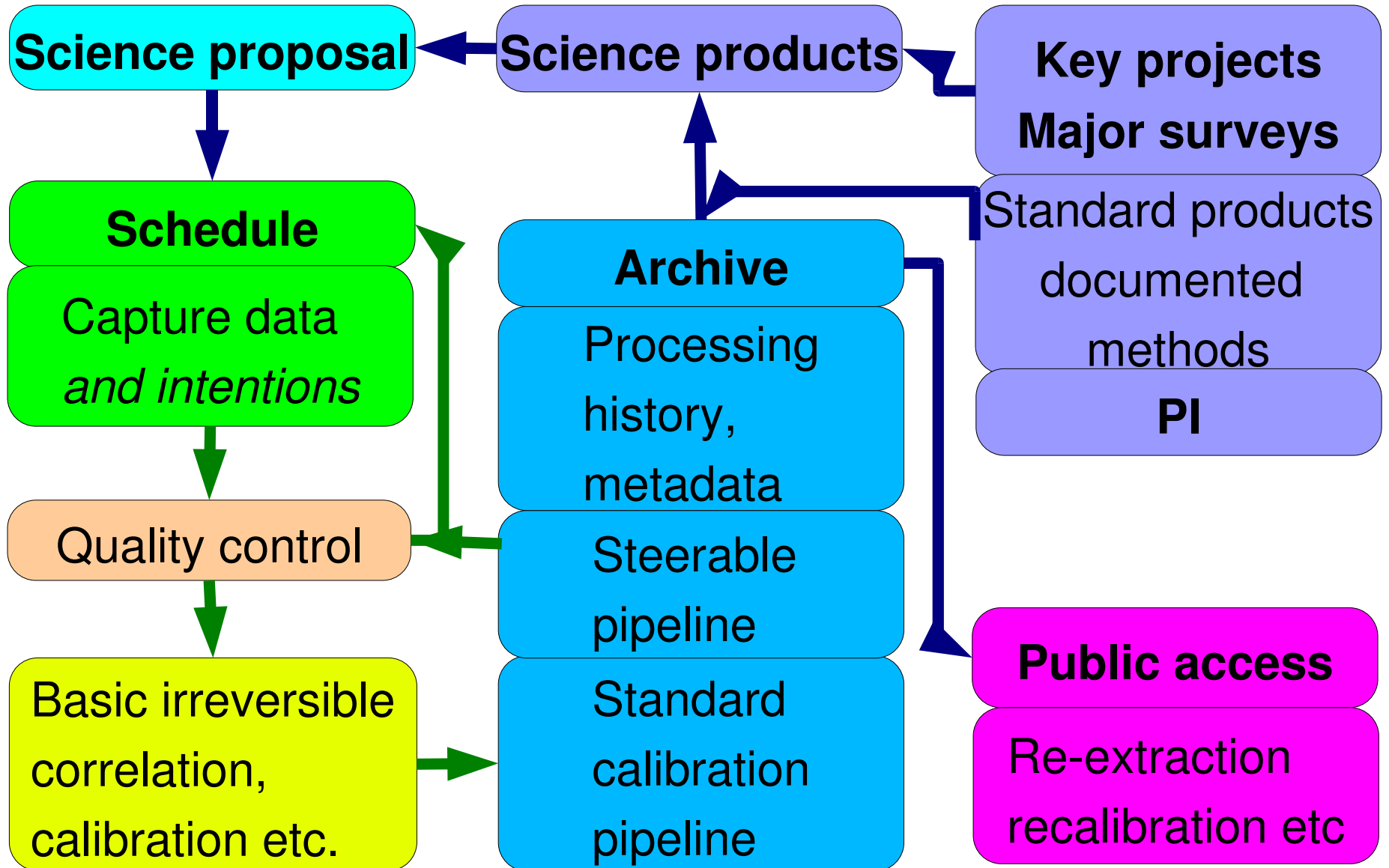
Pipelines and Interoperability from the astronomer's Perspective

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- B2E
- Can the data be uniquely calibrated?
- Science-ready products
 - Resampling, re-imaging
- Local or remote processing?
- What users want what
- Documentation



Beginning-to-End (B2E)



Store/harmonise metadata

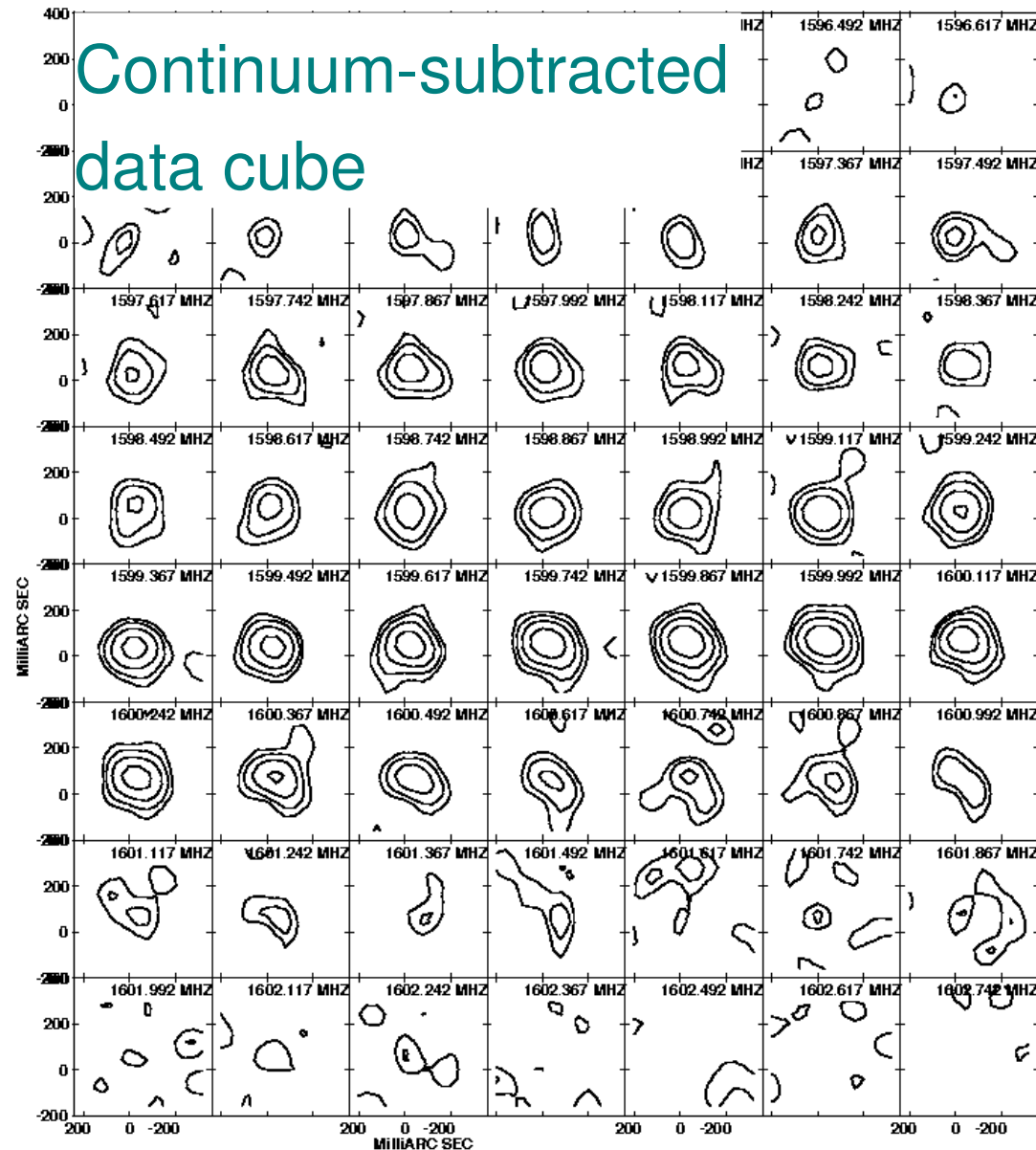
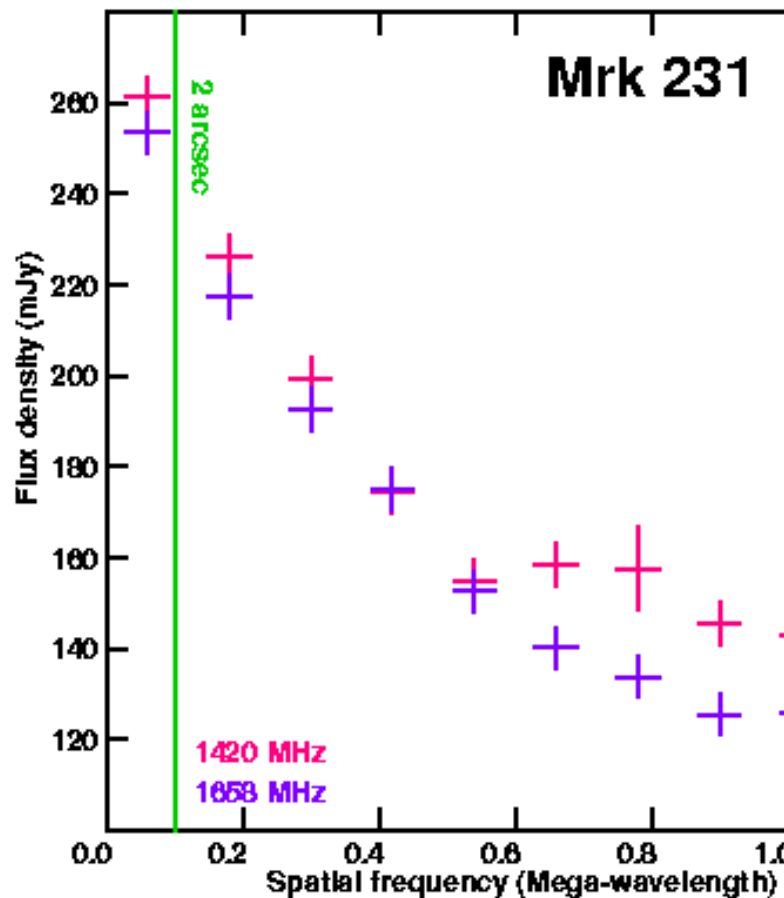
- B2E approach passes metadata from each stage
 - Many settings can be determined automatically
 - Pass instrument log, cal info etc. for processing use
- Must be suitable for relevant packages
 - *Preserve metadata in FITS \Leftrightarrow MS conversions*
- Human-readable metadata
 - Diagnostics of data quality
 - Details for experts
 - Intelligible information for all users
- Examples: ALMA SDM
 - Proposal tool
 - Scheduling tool
 - Science pipeline and products

Flexible data products

- Full primary beam: $>10\text{k} \times 10\text{k}$ pixels
 - Only image areas of interest
- Range of image products
 - Other users want other regions...
 - Within uniformly calibrated region
 - 'Peeling' region
 - Weighting: trade resolution/sensitivity
 - Average/smooth channels differently
- Combine/compare different arrays/configs/epochs
- Split into smaller time intervals
- Rotate phase centre to extract variability curves
- Usually best to go back to visibility data
- Not to mention recalibration e.g. better position... 4

More data products

Calibrated,
binned visibility
amplitudes



Observatory domain

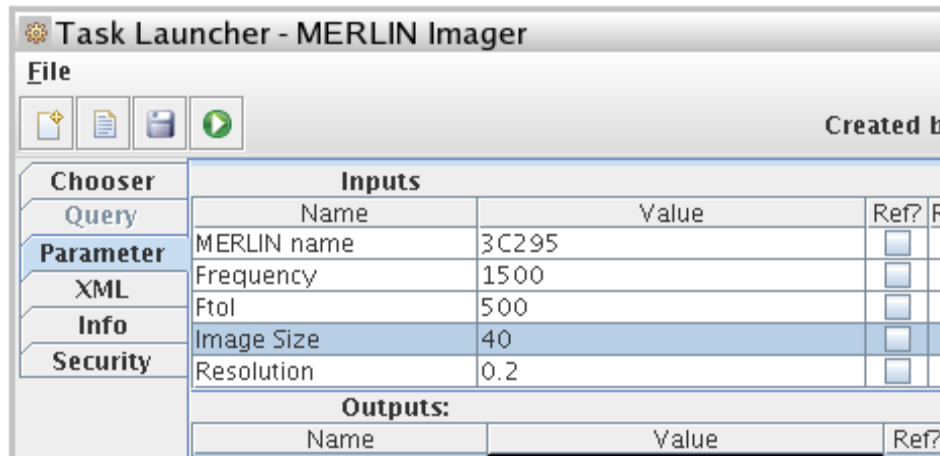
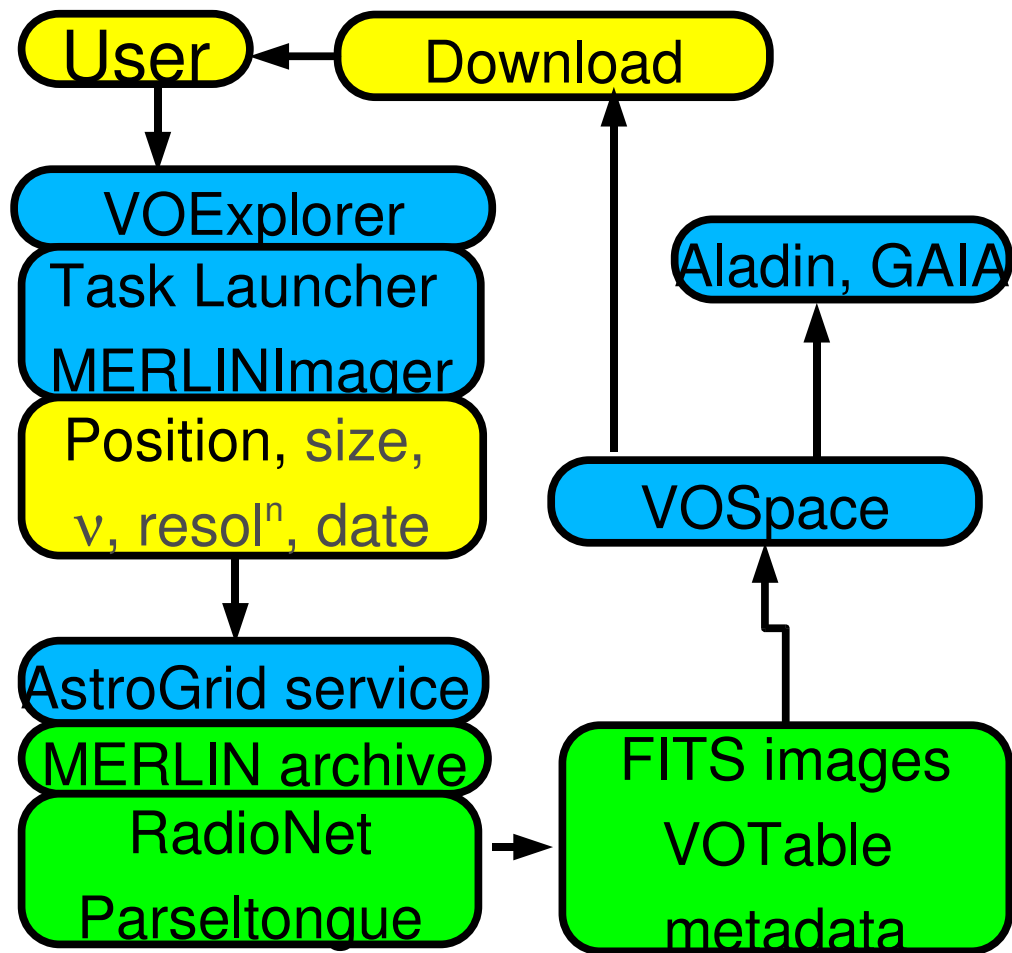
- Instrumental calibration in standard modes
 - Standard data reduction procedure
 - May need human judgement e.g. some editing
 - But generally accepted 'best' route
 - Observatory (steered) pipeline
 - Capture heuristics
- Calibration using calibration sources
 - Fields may be of science interest in their own right
 - Build up libraries of calibrator properties
 - Observatory (steered) pipeline
- Provide full and simplified data processing histories
- Simple scripts/procedures for skilled astronomers
 - e.g. run after more editing
 - Should produce same results as observatory pipeline

Astronomer domain

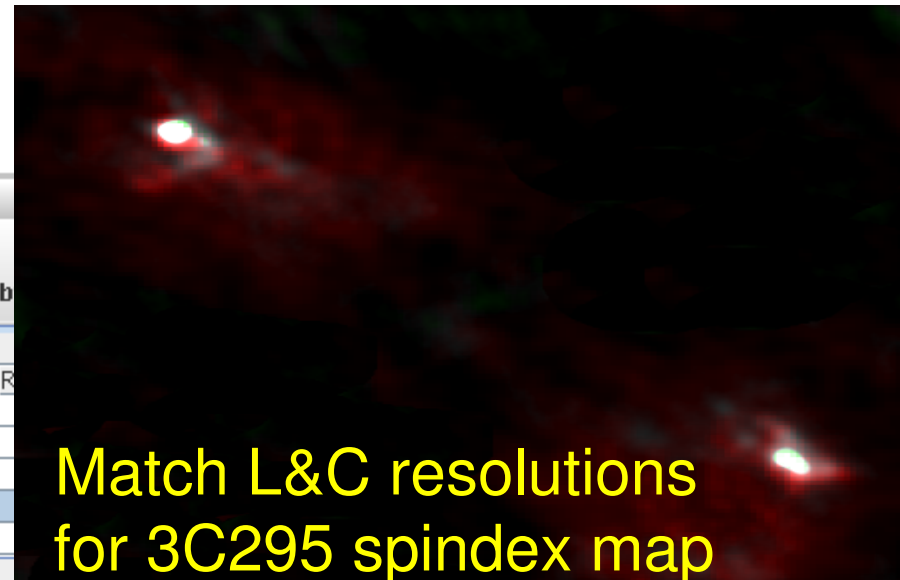
- Less specialised observational astronomers
 - Will install maybe one interferometry package
 - Self-calibration to emphasise properties of interest
 - Reweight, combine, etc. :- flexible products
 - Model fitting, extract spectra, measure polarization...
 - Provide guidelines for any popular package
- Unwilling to handle visibility data at all?
 - Encourage collaboration
 - Educate graduate students/PDRA/any beginners
 - e.g. RadioNet, NRAO schools
 - Promote interoperability of techniques
 - Use VOs and VO tools for remote access
 - Simple non-jargon parameter tweaking
 - Pipeline runs at specialised centre, serves products

MERLINImager

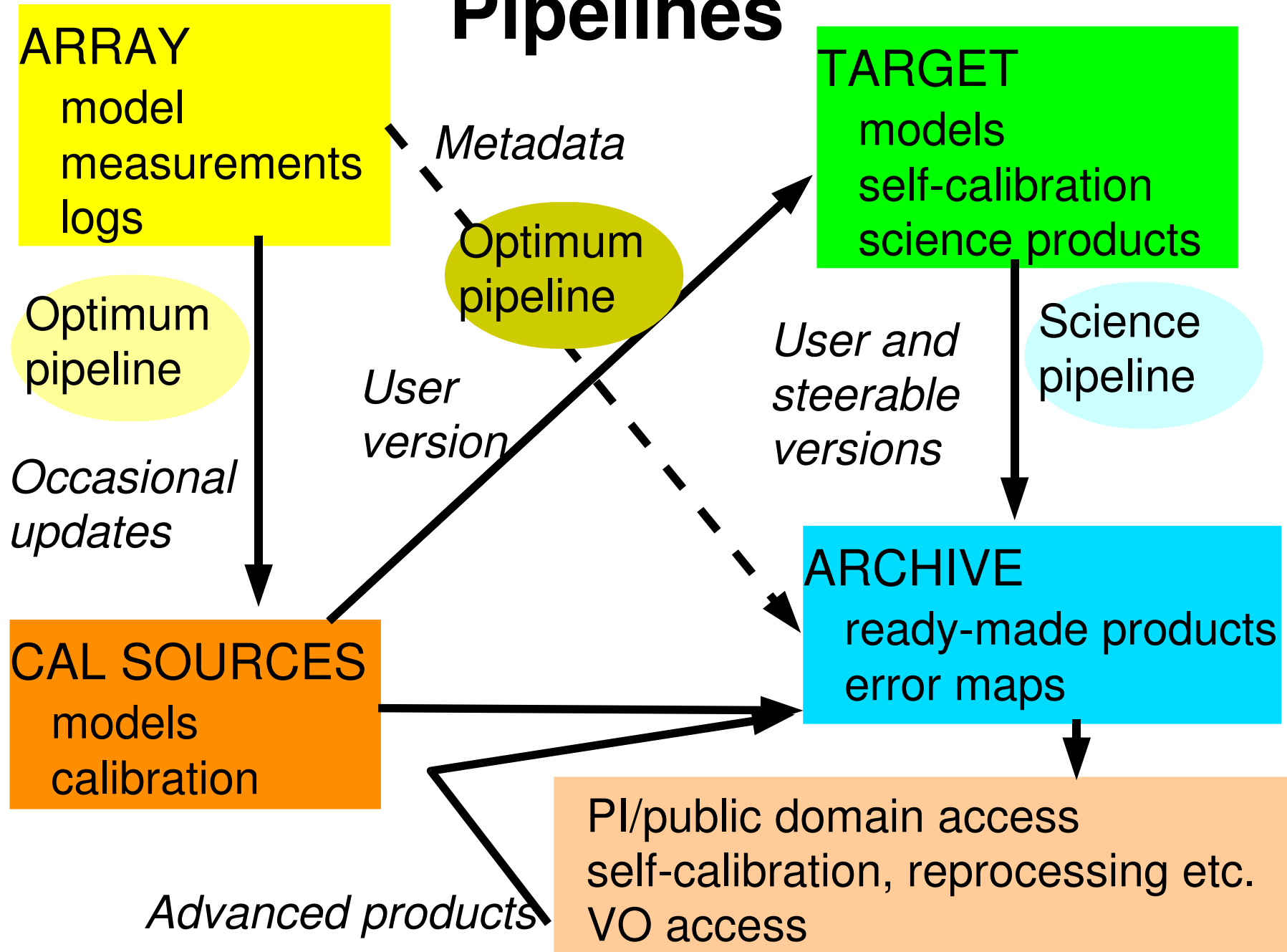
- Customised images from calibrated visibilities
- Non-jargon inputs
- Heuristics to restrict to sensible domain in use
- Analyse in VO Aladin



Match L&C resolutions
for 3C295 spindex map



Pipelines



Documentation

- Instrumental data path
 - Technical details (we are usually good at that!)
 - Explain for non-radio astronomers
 - e.g. what determines flux scale accuracy
 - Limitations and diagnostics
- Data reduction packages
 - Technical documentation
 - For developers, sysadmin debugging etc.
 - User manual *not tied to any single instrument*
 - Make clear applicability scope of examples
 - Cookbooks are great - but can get bloated
 - Could be a range of expanded, targeted manuals
 - Example scripts and procedures
 - Separate 'news' and 'comment'
 - Log/error messages should be diagnostics

Summary

- Automate everything possible
 - Instrument-specifics best applied by instrument-experts
 - Full history, skilled users can repeat/alter
- Make target-specific requirements easy for users
 - Examples, scripts
 - Quality diagnostics
 - e.g. VO model uv-plane filling as image quality measure
 - Provide guidelines for any popular package
 - Preserve metadata in data format conversions
- Document for different levels of expertise
- Remote on-the-fly access to appropriate products
 - Even PI's value quick look!
- Publish pipelines and workflows (lunchtime suggestion)
 - Generate readable narrative from scripts cf UML?