

# **LSST Data Management Working Group Report**

Static/Shape Pipeline

# Shape/Static Pipeline WG Membership

- Andy Connolly (chair)
- Charles Alcock
- Chuck Claver
- Inwoo Han
- Chris Jermaine
- Tod Lauer
- Tony Tyson
- Dave Wittman

# Where do we need to be at the end of R&D?

- What state do we need to be in to begin the construction phase for this area of the data system?
  - Stacking, PSF/Distortion, Shapes algorithms tested and validated on precursor and simulated data
  - Photometric/astrometric calibration procedures tested on simulated data
  - LSST simulator
  - QA outputs for shape measures defined (QA)
  - Metadata for science analyses defined (data model)
  - Data deliverables defined

# Issues Addressed

- What issues did you consider in your discussions, and what was the result?
  - Image Stacking
    - Effect of Differential Chromatic Refraction and moving sources
      - Iterative approach to solution (the “crappy” stack)
      - Need for Dispersion Corrector?
      - Existence of precursor data (ESSENCE, DLS, Megacam....)
    - Optimal weighting and reconstruction
      - Kaiser approach vs subset coaddition vs image reconstruction
      - General coaddition facility within pipeline
      - Remapping for rotation
      - New data formats for dealing with image stacking
    - How well can we do with metrology
      - Wavefront sensing vs stars in field for defining psf (feedback)
      - Colors of stars in PSF calibration
    - Rate of stacking
      - 1month, 1 yr, 2 yrs, 4yrs....

# Issues Addressed

- Photometric/Astrometric calibration
  - LSST photometric system (self calibration algorithms)
  - Absolute calibration of filters/CCDs to fundamental system
  - Requirement on photometric accuracy
  - Errors (systematic) on photoz's
- Metadata and science outputs
  - Telescope facility database
    - Status of telescope as a fn of time (T, actuators....)
    - Query with the science data
  - Definitions of sky conditions/selection fn
    - Seeing, reddening, sky level, transparency....
    - Compact definition (e.g. psf, spherical polygons)
    - Search selection fn as part of science query

# Issues Addressed

- Data Products
  - Best sky (highest image quality – fed back to scheduler)
  - Coadds: 1 month, 1yr, 2yrs ....
- Colors
  - Coaddition of colors
  - Need for covariance in colors (and everything else)
  - Representing color as principal vectors
- Compression
  - Lossy
- Data processing requirements
  - No initial concerns

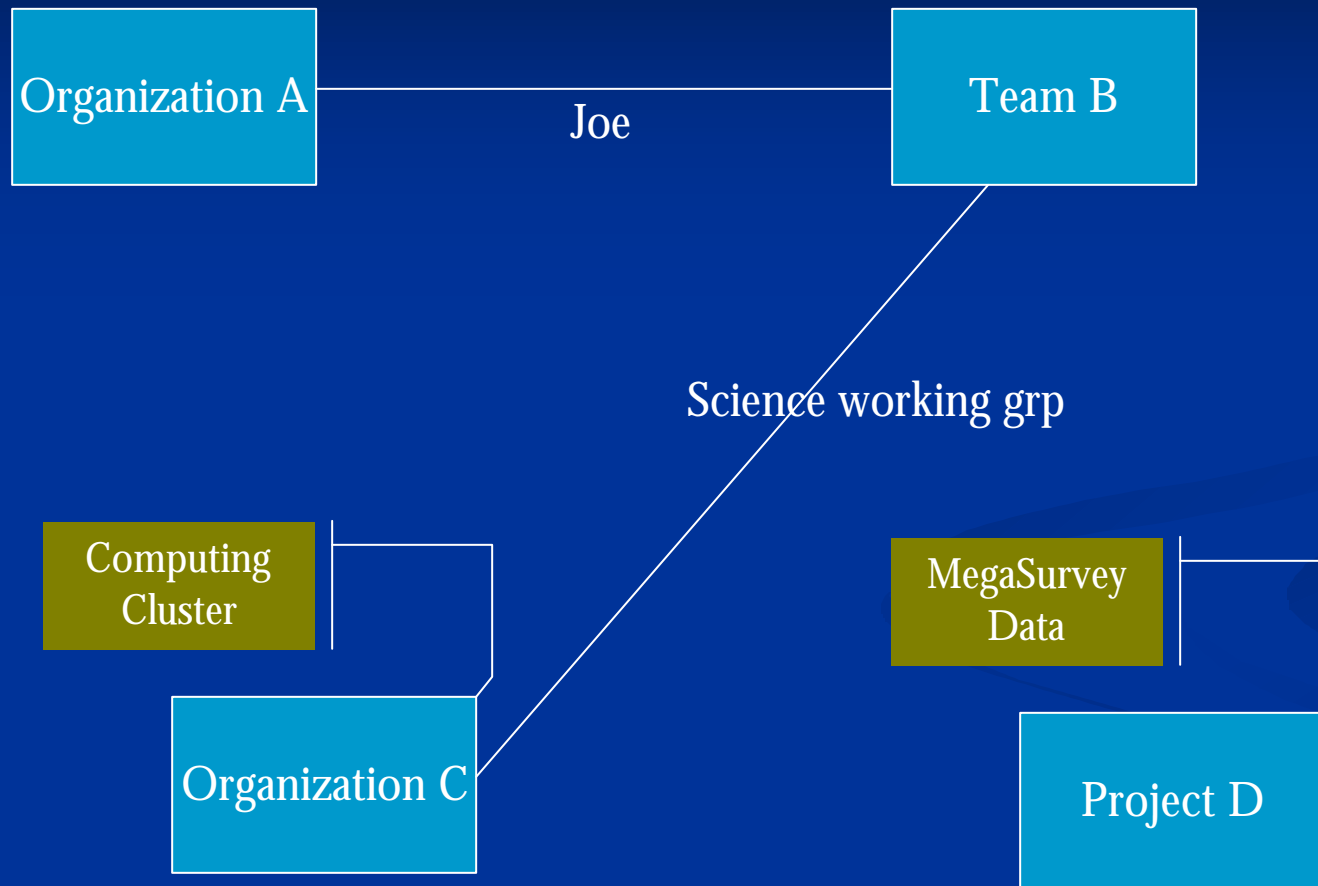
# Unresolved Issues

- What are the “tall pole” issues for this area?
  - Stacking accounting for DCR
  - Optimal weighting and image reconstruction
  - Ability to use metrology/wavefront to define psf
  - Optimal shape extraction
  - Photometric calibration algorithms (and absolute calibration of system)

# Team Makeup & Relationships

- Who are the players?
  - Erben, Kaiser, Lupton, Mellier, Monet, Wittman
- What collaborations already exist?
  - DLS, CFH Legacy, ESSENCE, SMACHO, VST
- What new ones might usefully be formed?
  - PanSTARRS, DES, WYIN-ODI
- If there are multiple collaborations working in this area, how can they support each other, and the overall goals of this LSST subarea?
  - Common test data and development environment
  - Simulator
  - Visualization tools

# Resource Map Example



# Needed Resources

- What's needed to get the R&D job done?
  - Right people
  - Salaries and time
  - Precursor and Simulator data in accessible form
  - Access to data from telescopes with wavefront sensors
  - Science requirements for defining success
- Any plans already in place to get these resources?
  - Most of the data for testing exists or accessible
  - Number of people working on these areas but not focused for LSST

# R&D Tasks / Milestones

- Given all of the above, try to rough out a plan for this area
  - Define expertise and developer groups
  - Define science requirements (astrometry, photometry)
  - Test data sets compiled (real, simulated)
    - Imaging, wavefront sensing psf, calibration
  - Algorithm development and testing
    - DCR, PSF, Calibration
  - Prototype implementations on precursor data 12/05
  - Interface development with data model by 6/06