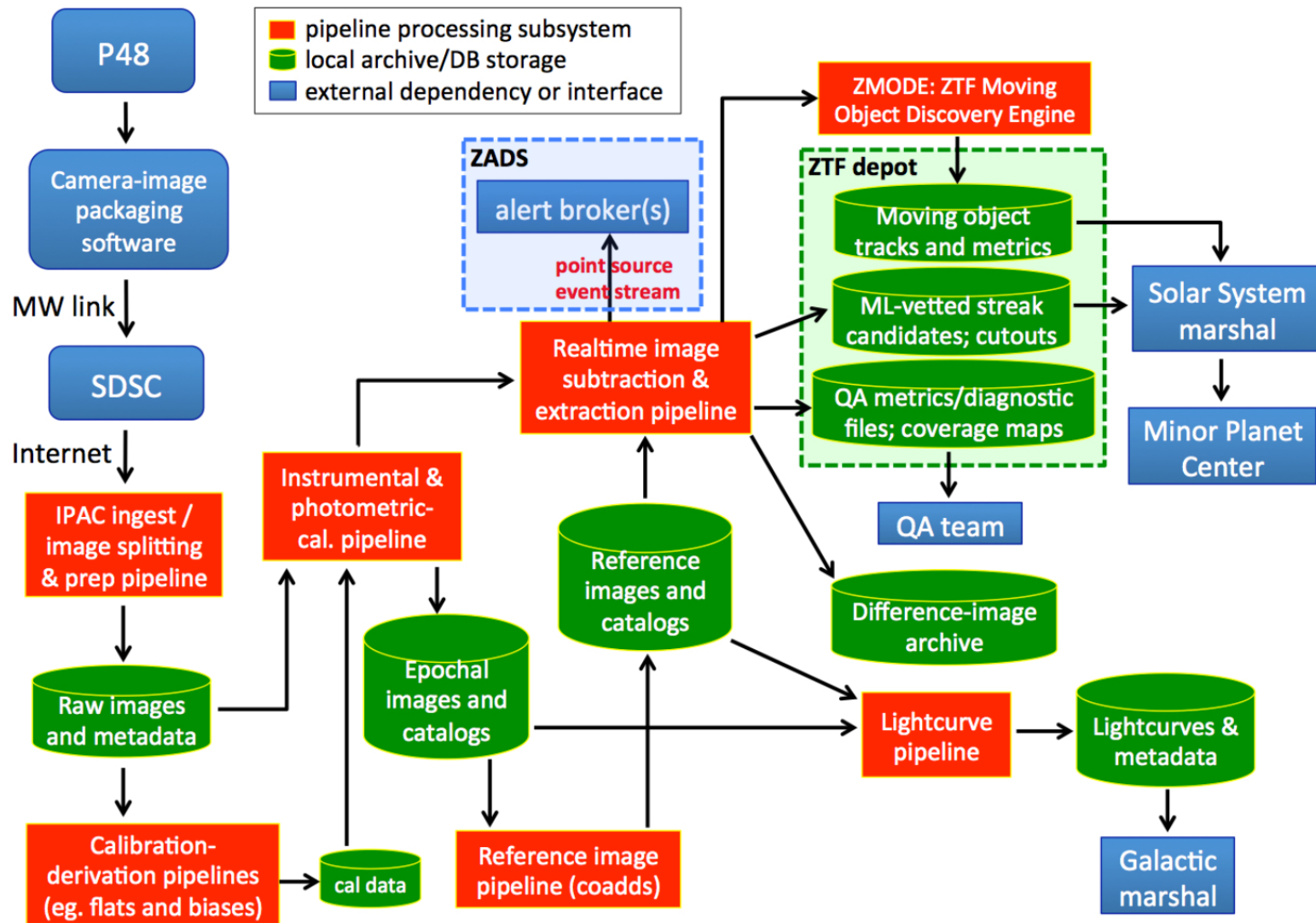# ZTF Science Data System update

Frank Masci

Science Steering Committee meeting, June 21, 2018

Refresher on data flow

Recent Updates (~ last three months)

- Alert packet generation infrastructure, Kafka software, hardware in place and interfacing with UW.
- Finalized Version 0 of alert packet schema (contents). More metrics planned
- Filtering of difference-image extractions for alert packets to mitigate 'obvious' false positives.
- Improvements to differential (PSF-fit) photometry in alert packets; lots of R&D to get this right.
- Archiving of alert packets at IRSA – now subject to same user/programID access policies.
- Moving Object detection pipeline from event-linking is operational and tuned.
- Fast-Moving Object (streak) detection operational and tuned.
- More accurate reporting of known asteroids/comets in alert streams using latest ephemerides.
- 'Matchfile' (lightcurve) files based on matching extracted epochal photometry now routinely made.
- Test version of lightcurve query GUI and time-series analysis tool in place – uses 'matchfiles'
- Ghost prediction and masking
- All ancillary archive products now accessible using GUI.
- Realtime reporting of QA metrics, pipeline status, and failures for camera/engineering teams.
- Data System documentation and paper (in review)

In Progress
(completion expected within the next month)

- More metrics for alert packets, specifically related to photometric calibration and quality
- Cross-match event extractions to Gaia and include nearest associations in alert packets
  - Primarily to report bright stars that saturate in ZTF and that are missed by PS1
- Lightcurve retrieval GUI and time-series analysis tool ready for testing by partnership
- Generate matchfiles (lightcurve files) containing only *partnership* data
- Enable image cutouts on archived *compressed* difference images; already possible on other images
- Assist ML team with completeness analysis using known asteroids (from Ashish)
- Force masking of repeated (same pixel) optical/detector pixels reported by Marshals (from Mansi)
- Synopsis of nightly subtraction images (that generated alerts) for completeness studies (from Lin)
- Data System paper corrections from Pub. Board

Longer-term/ongoing tasks
(expected completion for most: late Fall 2018)

- Automated correction of flat-fields for edge / scattering / shadowing effects.
- Star-flat generation and application if improvements are significant (DESY group input)
- i-filter fringe correction module (DESY group input)
- Exposure-time correction map (tiny impact: $<\sim 0.2\%$)
- Astrometric corrections at high airmass ($>\sim 3$) to support ToOs / partnership observations
- Update to Gaia DR2: for astrometric calibration
- Update to PS1 DR2 when available: for both photometric calibration and alert cross-matching
- Update S/G classification scores for PS1 used to associate with alert stream (with A. Miller)
- Bulk reference image regeneration prior to LIGO/Virgo runs in Oct 2018 (complete by Sep 2018)
- Generate all-sky depth-of-coverage maps for survey-ready reference images
- Continue to refine and support ML training for streaks (fast moving objects)
- Continue to support ML training for point source events

Additional functionality (pending approval and costing):
- Forced photometry service with more accurate reporting of upper-limits (object based)
- Fake transient injection pipeline and infrastructure