

Dev::V1 Release

From WiseWiki



WSDS Version 1 Release Report



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Delivery Information

Version 1 was delivered on July 16, 2008. The version 1 release code base has been tagged in the WSDC Subversion repository as 'release-v1'. RTB test inputs and products have been archived in /wise/rtb/v1.

Version 1 Required Capabilities

Here are the WSDS v1 release requirements.

- Cluster: prelim
- Storage: proto
- QA: proto
- Multi-frame pipeline: proto
- Archive: proto
- Ingest: prelim
- ICal: prelim
- Pcal: proto
- Coadd: prelim
- DetEx: prelim
- Frame pipeline: complete
- Scan pipeline: proto

Version 1 Capabilities

Ops Hardware

- 1 Gb/s ethernet dedicated subnet
- Development Server: RHE4 Linux, x64
- File Server: Solaris 10, ZFS, SPARC, 2TB RAID 5
- 12-node, 96-core cluster: commodity Linux, x64

Development and Build Management

- **Subversion** revision tracking and management
- Template-based **Makefile** build and delivery system
- **Roundup** issue tracking
- Wiki for documentation and misc help

Exec

- **Parameter handling**

- Parameter types, aliases, defaults, constraints, dependencies
- Parameter inheritance from parent to child jobs
- Parameter files

- **Concurrent Job Management**
 - Condor job initiation and monitoring
 - Ganglia web-based cluster resource monitoring

- **Logging**
 - Parameter values
 - Job resource monitoring
 - Error and warning output
 - Tracking output
 - Environment (Host, location, PID, time, etc.)
 - Memory footprint
 - CPU usage
 - disk+network I/O

- **APIs**
 - Condor
 - Table handling
 - FITS image file access, manipulation
 - DBMS access
 - JPEG and SVG plot generation
 - Misc support library tools (NAIF tools, math libs, etc.)
 - Ops archive data location and access

- **Ops archive**
 - Directory layout
 - Scans, frames
 - L0 archive
 - Processed data products
 - Cal and reference data
 - Flats, darks, masks, etc.
 - PSFs, aperture corrections
 - Distortion fit
 - 2MASS reference catalog
 - Simulated frames pseudo-ingested (with fixups) into realistic L0 names and locations
 - Sample, preliminary MOS products ingested into realistic names and locations

Scan Pipeline

- **Concurrent cluster processing**
 - One frameset per core
 - Capture, report job status
- **QA data generation** (esp. scansync data)
 - Numerous trend plots
 - Scansync
 - PSF image generation
 - Moment/geometry computation
 - PSF JPEGs
- **Photometric calibration (PCal)** (not integrated in v1)
 - Read frame PCal tables
 - Compute scan mag zero point
 - Write offset data
 - Write meta-data
- **Frame index update** (not tested in v1)
- **QA on-demand report generation**
 - Scan-level trend plots
 - Drill down to frame-level detail

Frame Pipeline

- **Instrumental calibration (ICal)**
 - Application
 - Apply flats, darks, bias/offsets
 - 32-bit mask image generation
 - Reference pixel handling
 - Preliminary droop, non-linearity handling
 - Full error model producing an uncertainty image
 - Generate QA stats and plots
 - Cal generation
 - Tempcal: Generate sky-offset estimate from on-orbit data
 - Flatcal: Generate flat estimate from on-orbit data
- **Level 2a image generation**
 - Uses AWaic module (coadder) to generate a single frame "coadd"
 - Generate intensity and ancillary images: mask, uncertainty, coverage
- **Single-band detection and extraction (SDEX)**
 - Special-purpose use of MDEX module on 1a/2a images (instead of 1b/2b)

- One extraction file per-band for SFPRex
- **Generate 2MASS position reference list**
 - Position based DBMS query
 - Source quality filter
- **Astrometric calibration**
 - SFPRex: position reconstruction and refinement
 - Read position reference list and 4 bands of SDEX extractions
 - Merge bands
 - Derive rough band-to-band corrections from mergers
 - Rough position reconstruction from pattern match between references and extractions
 - Correlate merged extractions to position references
 - Perform 12 or 20 parameter fit across all bands between extractions and reference sources
 - Careful error tracking and propagation
 - Copious meta-data output including RvB files
 - New frame WCS data for all bands
 - gnDStr: Distortion computation
 - Read numerous SFPRex RvB files
 - Compute new distortion coefficients
- **Level-1b image generation**
 - Apply SFPRex results to 1a frames to generate 1b frames
- **Level 2b image generation**
 - Run AWaic on 1b frames to generate 2b frames
 - Read PSFs
 - Upsample
 - Remove distortion
 - Generate optimally interpolated 2b images
 - Generate ancillary images: mask, uncertainty, coverage
- **Multi-band source detection and extraction (MDEX)**
 - **MDET: Multi-band detection**
 - Read 2b intensity images
 - Utilize ancillary images output by AWaic
 - Estimate slowly-varying background
 - Generate point-source-optimized 4 band detection image
 - Threshold detection
 - Write detection list
 - **WPhot: Aperture and profile-fitting extraction**

- Read detection list
- Read PSFs
- Measure from 1b images
 - Preliminary aperture measurement of detected sources to get rough x,y,flux,bg,noise of each detection
 - Do maximum-likelihood profile fit of all detections
 - Simultaneous multi-band parameter generation
 - Passive/Active deblending of detections
 - Final, multi-aperture measurement
 - Per-source BG and noise estimate
 - Multi-aperture flux estimate for each deblended, post-profile fit source
 - "Standar aperture" is aperture corrected to produce final aperture flux estimate
- Generate QA data
- **Artifact Flagging (ArtID)** (not integrated in v1)
 - Read MDex source list and update with artifact ID data
 - Experimenting with diffraction spike finding/flagging
- **Photometric calibration (PCal)** (not integrated in v1)
 - Determine if calibrators may be present in frame
 - Read primary and secondary calibrator lists
 - Read MDex source list
 - Filter extraction candidate list by SNR
 - Match to calibrators
 - Save calibrator and extracted source mag info
 - Save QA info and other meta-data
- **QA**
 - Scansync source list
 - Single-band JPEGs
 - 3-band color JPEGs
 - ICal pixel trend plots/stats
- **Frame index update** (not tested in v1)

Multi-frame Pipeline

- Throughput matching
- Background matching
- Outlier detection

- Coadd
- Intensity, coverage, uncertainty, mask image generation
- QA data generation
- Wrapper combining all of above

Ingest Pipeline

- MOS Ingest
 - Read, interpret NAIF kernels with NAIF library tools
 - Store products in standard ops archive locations
 - Build event table from PEF
- L0 Ingest
 - Depacketize, decompress images
 - Locate relevant events from event table (scan start/stop, SAA, etc.)
 - Locate C kernel record for frame to get ADCS position
 - Construct level-0 FITS files
 - Attach copious meta-data to FITS headers
 - Store in L0 archive
 - Preliminary merge of L0 data across deliveries
 - Meta-data, QA data output

Version 1 Testing

Level-0 Frame Processing

- Simulation contents
 - Real 2MASS objects
 - Simulated galactic and extra-galactic sources plus zodi background
 - Rad hits, diffraction spikes, latent images
 - Solar system objects
 - 70 frame simulated pseudo-scan
 - Fragments of several overlapping adjacent scans
 - Covers ~ 8 sq. deg.s near $\text{el}_{\text{lat}}=0,+30$ (mid galactic latitude)
 - Central coverage depth ~ 12 frames (12×8.8 secs)
- Processing
 - 70 frame sim run from L0 archive
 - L0 images+headers only prerequisites (meta-data tables to be added)
 - Single scan pipeline command line to concurrently process all 70 frames
 - All frames complete without errors

- Preliminary run time ~15 minutes for scan; over budget, but formal benchmark not ready yet
- Prototype QA products auto-generated on demand

Ingest Processing

- MOS Preliminary Ancillary data
 - SCLK, LSK, CK NAIF kernels
 - Planned Event File (PEF)
 - Survey Plan
 - Other reference command files
- Image data
 - Ned simulations, compressed, packetized
 - Realistic CCSDS source packet telemetry
 - 2MASS objects not yet positionally coordinated with C kernel
- Processing
 - Read, interpret, rename, relocate MOS ancillary data using realistic ops archive reference data names and locations
 - Relocate image telemetry for 4 bands using realistic names and archive locations
 - Read, decompress frame data
 - Look up relevant ancillary data from ops archive reference data for each frame
 - Write L0 frames with meta-data in headers
 - Processing time: <2 sec/frame/band single core
 - Concurrent processing (1 core per band) TBD

Results

All tests completed without errors and demonstrated the expected capabilities. Analysis on the resulting products shows better than expected performance in astrometry and relative photometry.

Problem Reports

All PR's tracked in Roundup tagged with the 'for v1' category were resolved prior to delivery except PR 42 which was deferred. PR 42 related to prototyping the Multi-frame pipeline executive. The necessity for this in v1 was eliminated by the development of a

special purpose wrapper (see PR 26) to perform coadding with AWAIC. Since no other multi-frame functionality is available yet, this was deemed adequate.

Here are the v1 PR's.

List of issues

ID	Activity	Title	Status
urgent			
26	1 month ago	For v1: Coadd script running b'gnd matching, outlier detection and coaddition	resolved
41	2 weeks ago	Update wsfpipe to handle new QA, wphot, wawaic and sfprex	resolved
42	2 weeks ago	Write elementary multi-frame pipeline	deferred
feature			
20	1 month ago	Write prototype ingest executive for managing a delivery	resolved
19	1 month ago	Write prototype ingest for MOS products	resolved
15	1 month ago	Prototype quicklook QA for webQA	resolved
12	1 month ago	Prototype Ingest QA for web QA	resolved
39	1 month ago	WISE::QA::Plotter.pm	resolved
14	1 month ago	Integrate scan synchronization with pipeline	resolved
13	2 weeks ago	Prototype Ingest QA	resolved
wish			
9	2 months ago	More flexible output file naming in psfgrid	resolved
1..11 out of 11			



Liens

Missing Capabilities

Frame pipeline executive missing PCal integration

Although prototyped, the frame pipeline PCal component was not integrated at the time of the release. This is a minor issue.

Frame pipeline executive missing ArtID component

This is an error in the schedule. Since ArtID was not scheduled to be even in prototype form at v1, the Frame pipeline executive should not have been listed as "complete" at v1, but "preliminary".

Items to Watch

Run time

Though no formal benchmark is possible yet, and no requirements were levied on v1 run time, it is known that the frame pipeline takes much longer to complete than will ultimately be acceptable. We will be tracking this with a requirement of reducing the problem significantly (or having a concerted plan to do so) by v2.

Resource monitoring

As per a CDR board recommendation, we need to compare resource usage by pipeline modules to confirm our ability to process our expected data load in the time available. As noted above, resource monitoring on the pipeline runs is in place, but we have not yet levied explicit per-module quotas on resources to module cognoscent engineers. There was no requirement this be completed by v1, but we are mindful of the short term need for this. It will be done prior to the v2 release.

Document Number

WSDC D-P004

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