WISE Science Data System Design

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IPAC

WSDC Functional Block Diagram

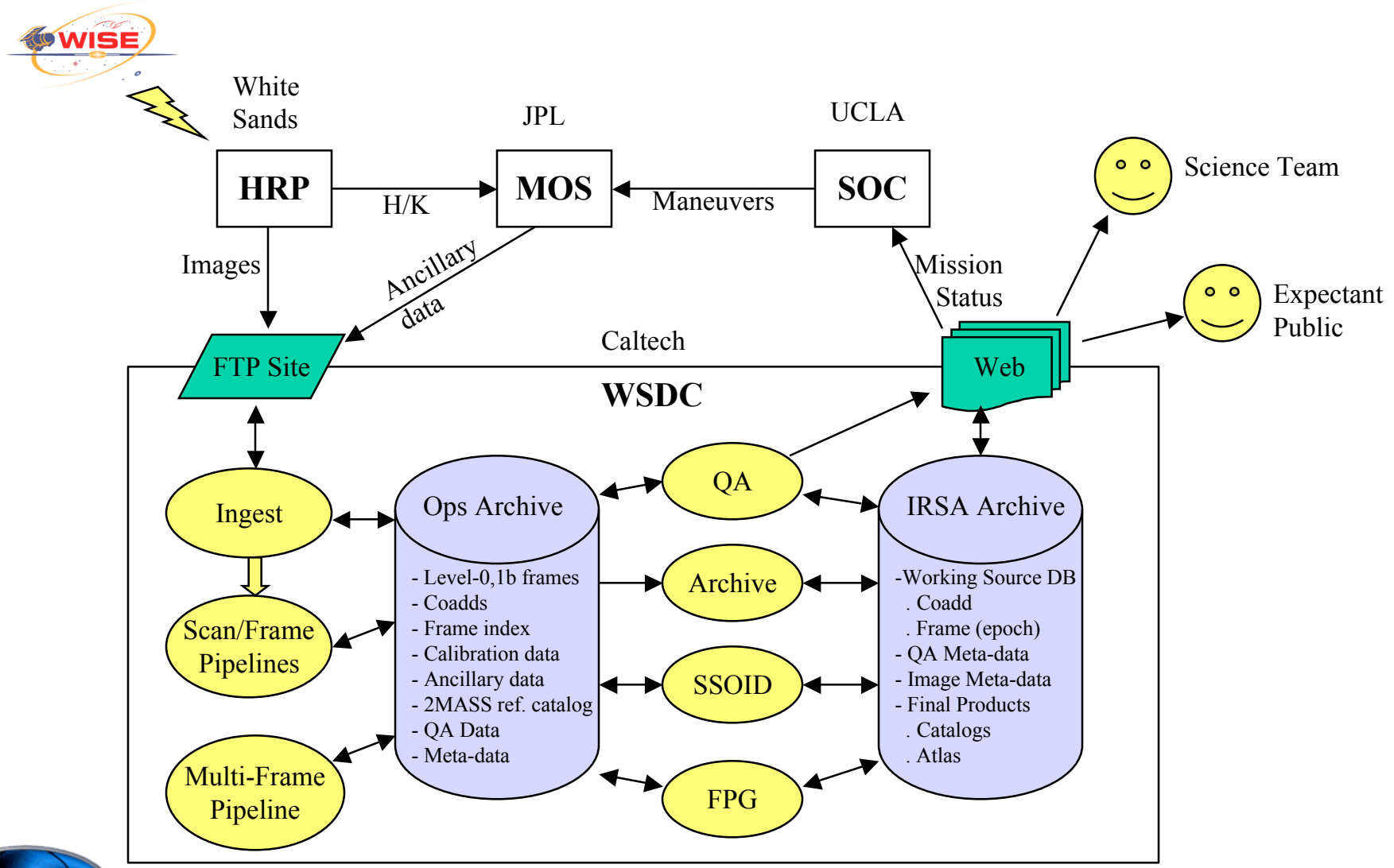


Image Data Levels

- Telemetry: CCSDS source packets
- Raw: FITS, integer 2.75” pixels, band+time meta-data
- Level-0: Raw + real pixels, add much meta data
- Level-1: Level-0 + instrumental, astrometric/photometric calibration
  - Level-1a: Level-0 + instrumental calibration applied to pixels
  - Level-1b: Level-1a + astrometric/photometric calibration in header
- Level-2: Level-1 + upsampled and undistorted (rubber-sheeted)
  - Level-2a: Level-1a + upsampled and undistorted
  - Level-2b: Level-1b + upsampled and undistorted
- Level-3: Multiple frame coadds, upsampled, undistorted
- Atlas images: Selected FPG Level-3 products

External Interfaces

Diagram from Roc

External Interfaces

- From MOS/GDS ICD
- High Rate Processor (HRP)
  - **To WSDS:**
    - Data push using FastCopy
    - Manifest of files to be delivered
    - CCSDS source packet virtual channel (1A-1D) file for each band

      WIS_HRP_PKT_FE1A_YYYY_DDD_HH_MM_SS.bin
      WIS_HRP_PKT_FE1B_YYYY_DDD_HH_MM_SS.bin
      WIS_HRP_PKT_FE1C_YYYY_DDD_HH_MM_SS.bin
      WIS_HRP_PKT_FE1D_YYYY_DDD_HH_MM_SS.bin
    - HRP to JPL via trunked T1 lines, then to IPAC via Internet
    - 4 transfers/day totaling 25GB
    - 14 hours/day transfer time
      - HRP->JPL: 4Mbit/s
      - JPL->IPAC: timing test shows 80Mbit/s
  - **From WSDS:** Nothing

External Interfaces

- MOS
  - **To WSDC:**
    - H/K CSV: temperatures, rates, etc.

      WIS_WTCCS_TYPE_YYYY_DDD_HH_MM_SS.csv
    - ADCS S/C attitude (C-kernel), S/C time (Clock-kernel), S/C Ephemerides (SP-Kernel), read with the JPL NAIF (Navigation and Ancillary Information Facility) toolkit

      WIS_EOS_clock_file_YYYY_DDD_HH_MM_XX.txt
    - Command Mnemonic File (CMF) - maneuver command quaternions

      WIS_SEQ_CMF_YYYY_DDD_HH_MM_SS.txt
    - Predicted Events File (PEF): N/SEP crossings (orbit #'s), SAA entry/exit, Science scan start/stop

      WIS_SEQ_SEQID_YYYY_DDD_HH_MM_SS.pef

0941934127:172 2009-310T00:22:07.673 GEV,S_POLE_CROSS,REQ_2$_1GEV; << Spacecraft south pole crossing >>;
0941935556:150 2009-310T00:45:56.584 GEV,NODE_CROSS,REQ_3$_1GEV; << Spacecraft ascending node crossing >>;
0941936985:123 2009-310T01:09:45.479 GEV,N_POLE_CROSS,REQ_4$_1GEV; << Spacecraft north pole crossing >>;
0941944815:069 2009-310T03:20:15.271 GEV,SAA,REQ_6$_1GEV,2009-310T03:21:03.236; << South Atlantic Anomaly >>;
0941944815:069 2009-310T03:20:15.271 OEF: IN_SAA=TRUE;
0941944863:060 2009-310T03:21:03.236 OEF: IN_SAA=FALSE;

- Mission, H/K data for deep archive

External Interfaces

- MOS (continued)
  - **From WSDC:** Deep archive of mission+H/K data, QA reports
- SOC
  - **To WSDC:** Survey plan

WIS_EOS_SURVEY_PLAN_YYYY_DDD_HH_MM_SS.txt

```
#TOGGLE          0.2200
#MOONAVOID       1.2300
#ECLIPSEBIAS     0.0000
#BIAS            0.0000
#BIASMAX         0.0000
#DIHEDRAL        0.0000
#SCANRATE        0.0000     3.8000     0.0000
#    Time now: 10/26/2007   13:51:11
# Start time: 12/03/2009   01:30:00
#    End time: 12/10/2009   01:30:00
0.5   1310522757.860   0.027640   0.190134 -0.966404 -0.170731   0.000000   3.800000   0.000000
1.0   1310525373.402  -0.960474   0.150126  0.101595  0.211258   0.000000   3.800000   0.000000
1.5   1310528228.944  -0.099569   0.210886 -0.962331 -0.139757   0.000000   3.800000   0.000000
2.0   1310531324.486  -0.964983   0.179824 -0.025653  0.189244   0.000000   3.800000   0.000000
2.5   1310534180.028   0.027908   0.190253 -0.966589 -0.169503   0.000000   3.800000   0.000000
3.0   1310536795.570  -0.960701   0.148895  0.101355  0.211215   0.000000   3.800000   0.000000
```

  - **From WSDC:** Survey progress, Quicklook, QA Report

External Interfaces

- Science and Project Team
  - **To WSDC:** Algorithms, ground test/cal data analysis
  - **From WSDC:** Archive access, Quicklook, QA results, images
- SDL, JPL
  - **To/From WSDC:** Ground test data
- Public
  - **From WSDC:** IRSA access to
    - Atlas images
    - Catalogs and meta-data
    - Explanatory Supplement

Driving Requirements

- Key WSDC System Level Functional Requirements
  - Design of Processing Capabilities
    - Capable of supporting a 13 month mission (L4WSDC-83)
    - Ingest (L4WSDC-29-36), Pipelines (L4WSDC-37-49), Archive (L4WSDC-50-59), QA (L4WSDC-62-66)
  - Throughput and Latency
    - Data volume: 25GB/day (L4WSDC-30), 50GB/day peak (L4WSDC-31)
    - 6 months of data acquisition (L4WSDC-82)
    - Quicklook: QA report within 24 hours (L4WSDC-32)
    - Scan/Frame Pipelines: Level-1 available within 3 days (L4WSDC-39)
  - Robustness
    - Disaster recovery (L4WSDC-54)
    - 50% Processing Margin (L4WSDC-70)
  - Schedule
    - Preliminary release: EOO+6 months (L4WSDC-4)
    - Final release: EOO+17 months (L4WSDC-8)
  - Archive: Public access through IRSA (L4WSDC-51,53,60,61,86,etc.)

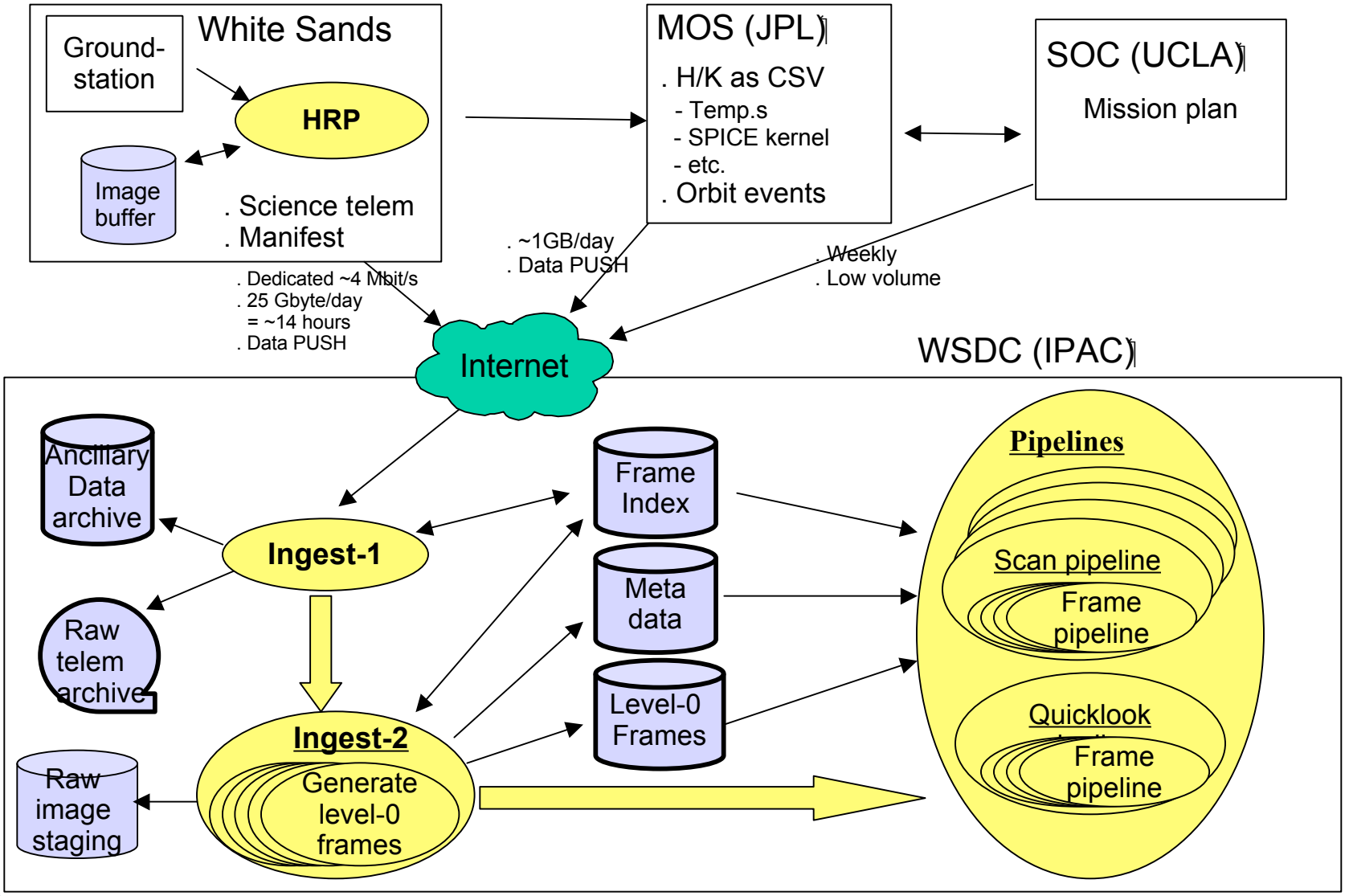
Derived Key Design Features

- A compute cluster composed of interchangeable inexpensive nodes
  - Capability, latency, robustness, schedule
- Maximal use of node-local storage to offload network
  - Latency, schedule
  - Medium cost storage and servers
  - Archive, robustness
- Minimal reliance on external services (IRSA, license servers, etc.) for ingest and pipelines
  - Latency, robustness
- Dedicated ops and QA staff
  - Latency, robustness, schedule
- Daily backup of critical data, off-site storage of critical data, disaster recovery plan
  - Schedule, latency, robustness
- Maximal leveraging of IRSA/IPAC expertise and infrastructure
  - Schedule, robustness

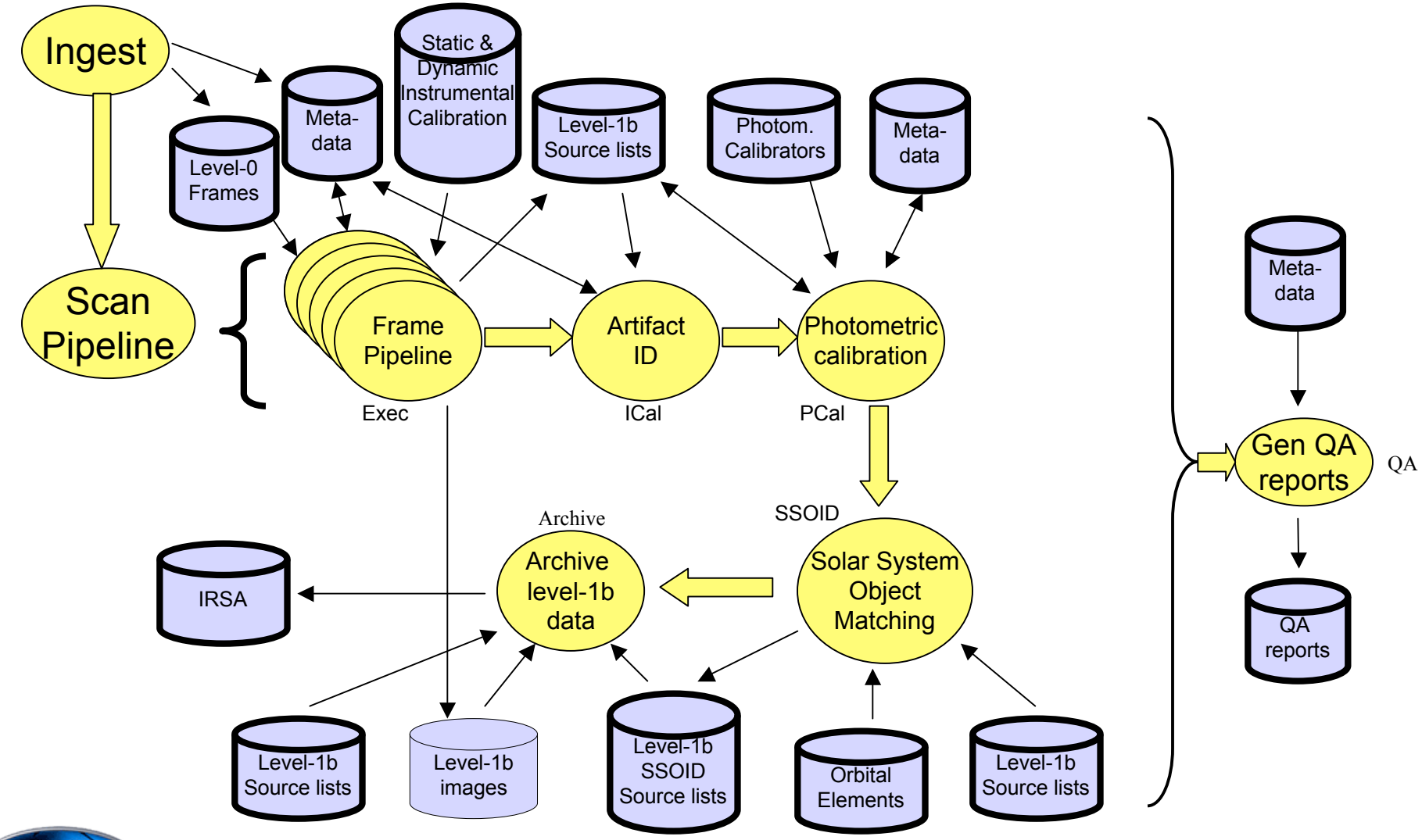
Sub-systems

- Summarys from Roc

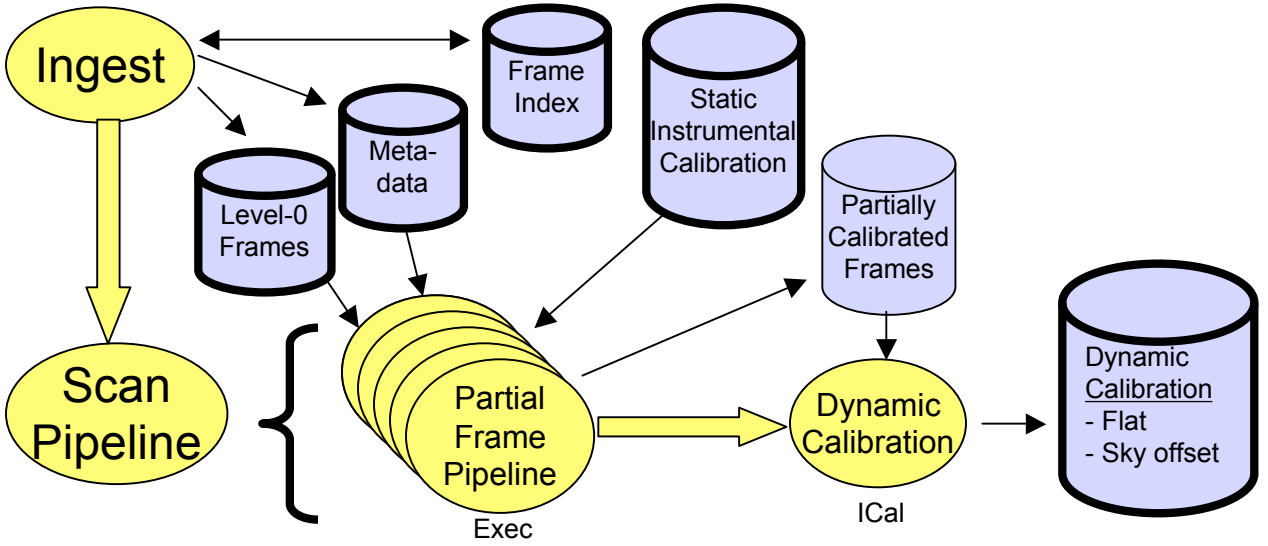
Sub-systems: Ingest



Sub-systems: Scan Pipeline

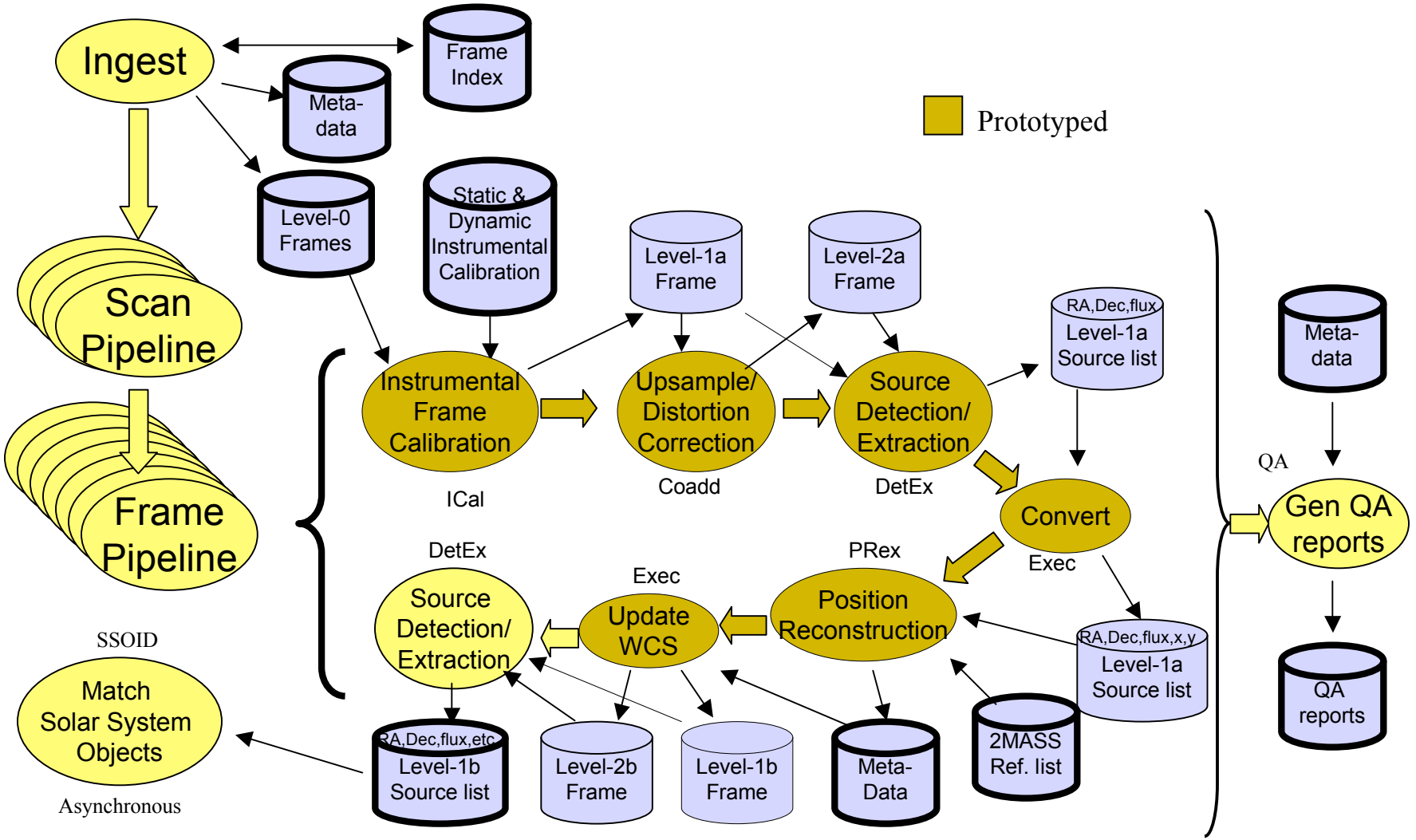


Sub-systems: Scan Pipeline, Dynamic Calibration

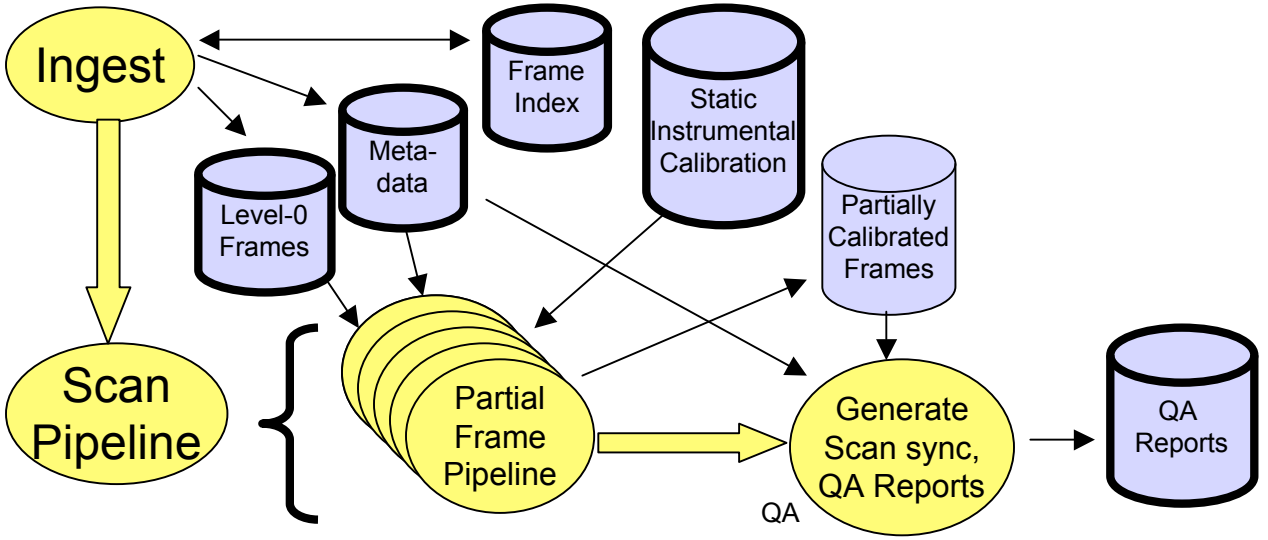


- Ingest runs dynamic calibration prior to the normal frame pipeline when …
  - … any of these conditions apply …
    - An anneal has occurred with no intervening dynamic calibration
    - Some other event which might modify the flat or sky offset
  - … and sufficient frames exposed after the last anneal (or other event) are available
- ~10 orbits of recent frames which meet certain constraints are selected
  - Out of confused areas, away from exciting background features
  - No known anomalies or saturated sources, few radiation hits
  - Etc.

Sub-systems: Frame Pipeline

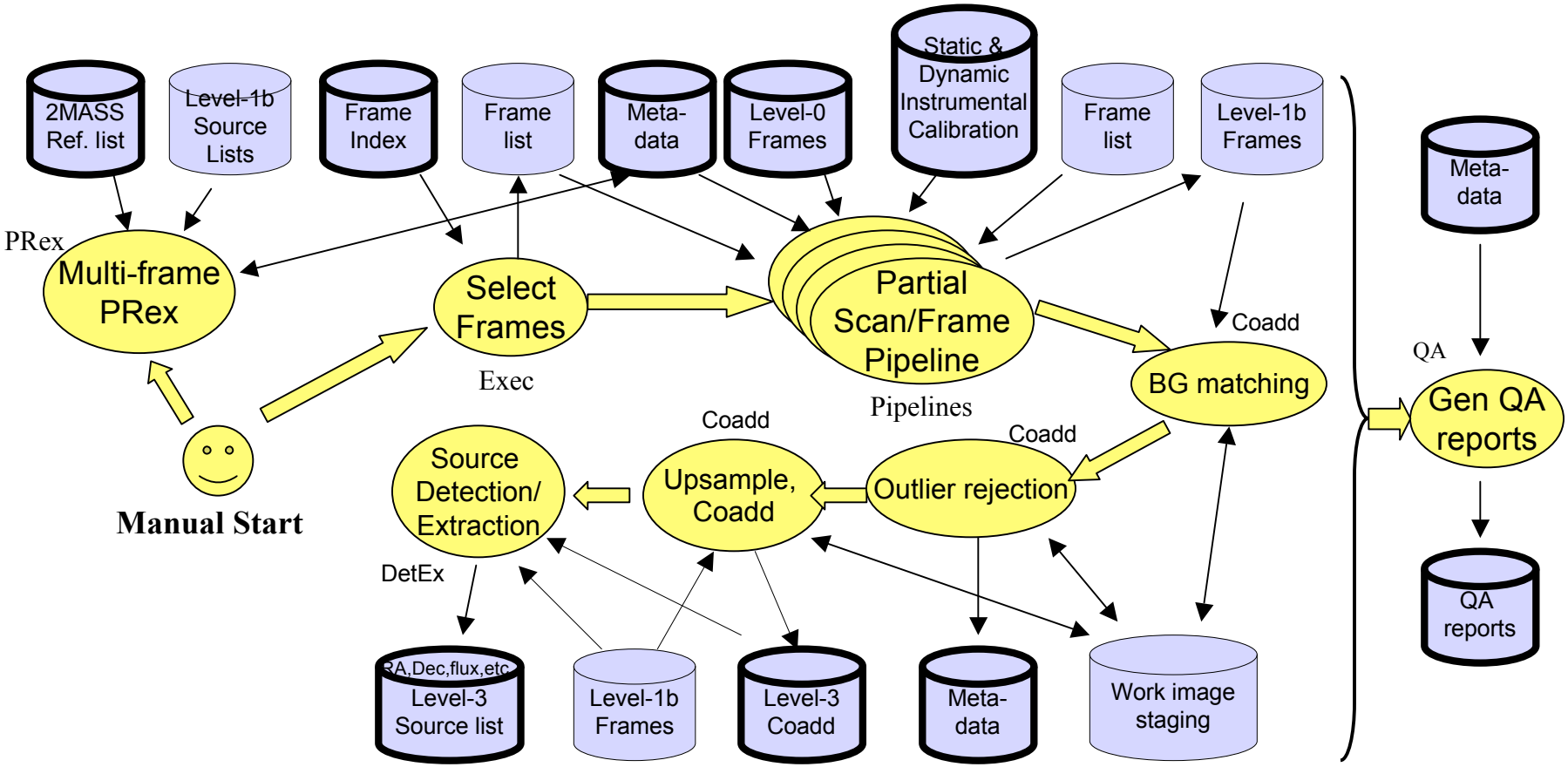


Sub-Systems: Quicklook Pipeline

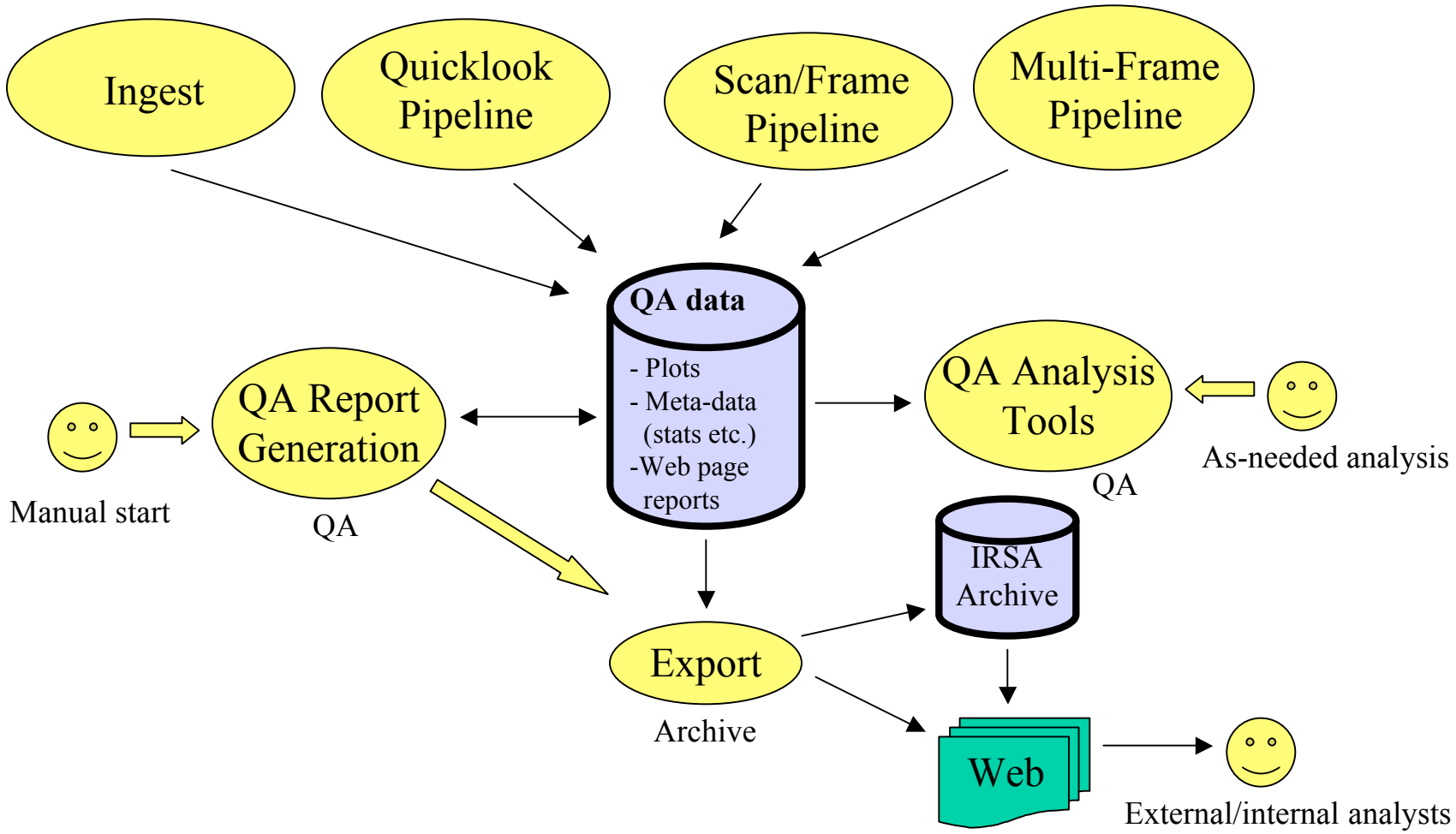


- Same as Scan/frame pipeline, except …
  - Only a select few frames processed
  - Processed for each delivery without delay, no waiting for pending frames
  - No dynamic calibration in frame processing; use static calibration only
  - Source catalogs not archived
  - Specialized QA: Scan frame sync, + … TBD
  - No Solar System object matching
  - Pipeline output in separate location from Scan/frame pipeline output

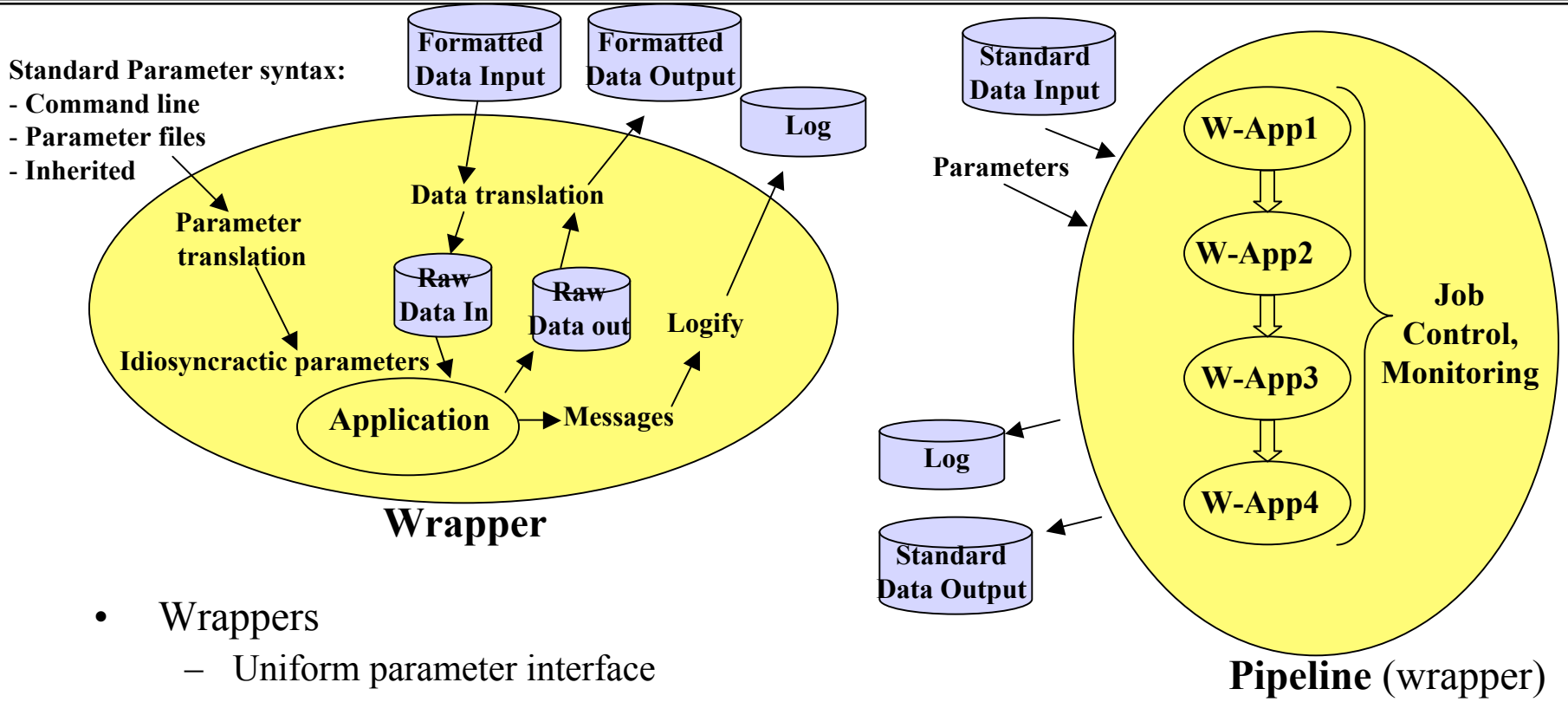
Sub-systems: Multi-frame Pipeline



Sub-systems: Quality Assurance

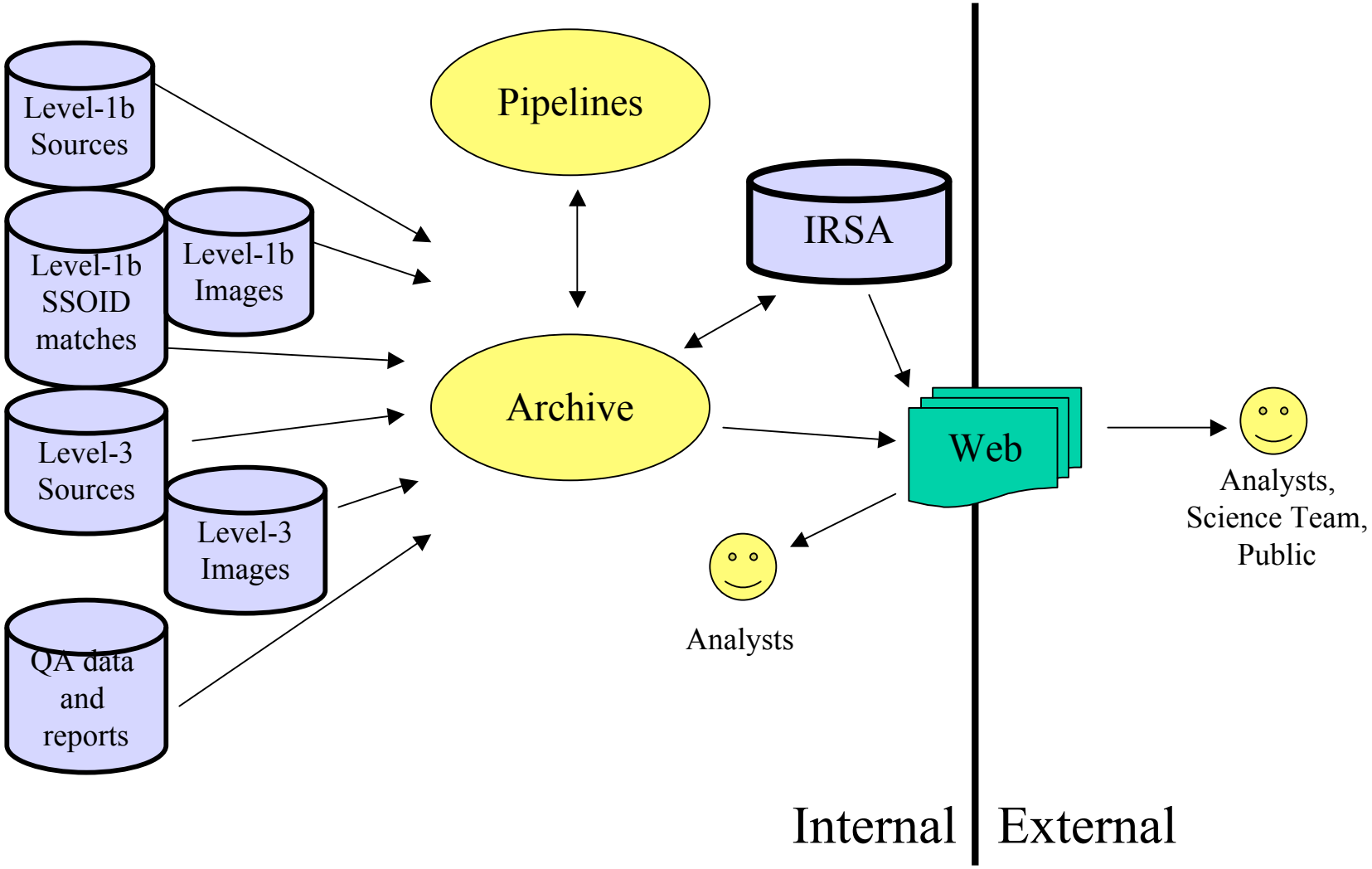


Sub-systems: Executive

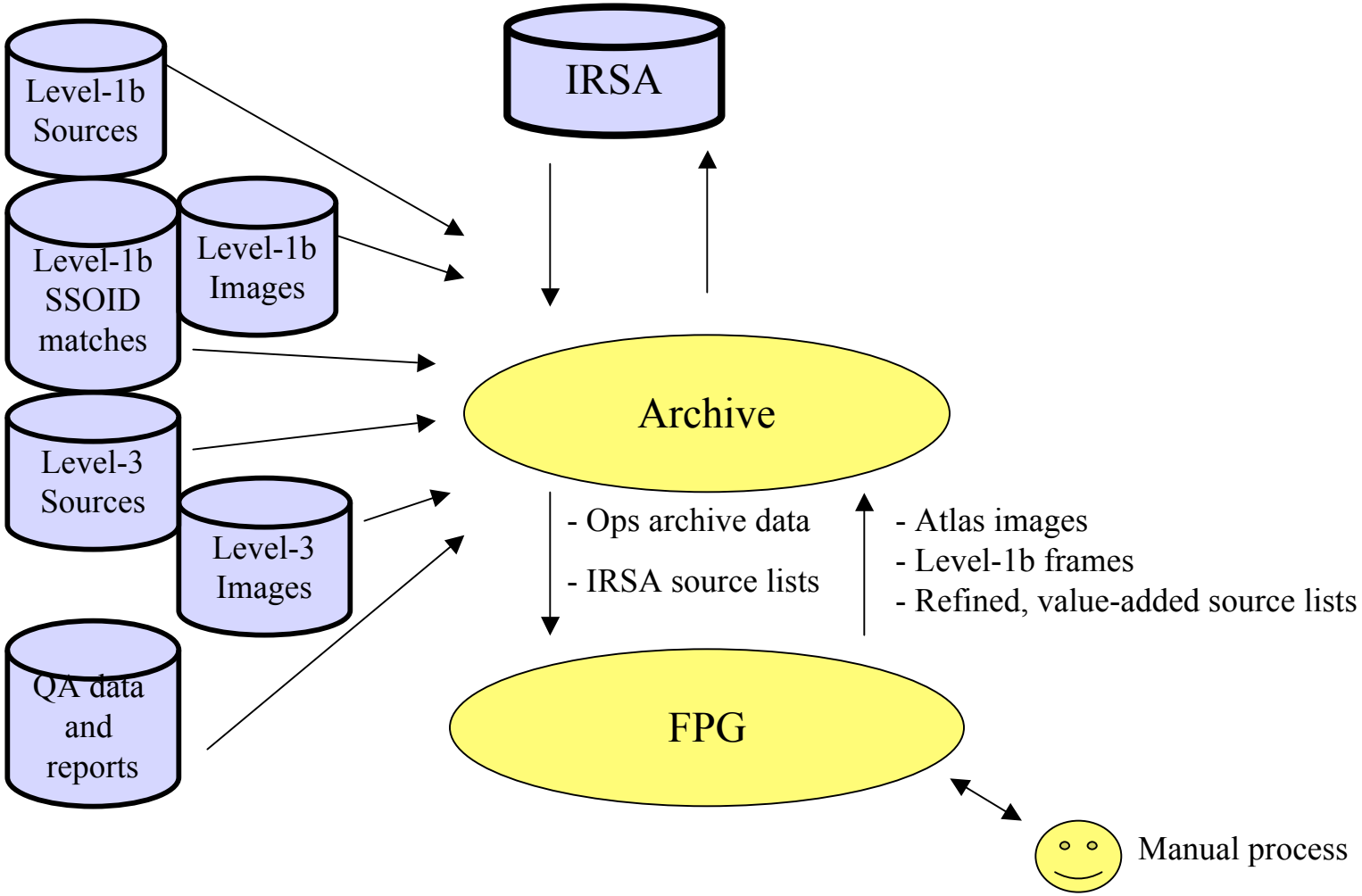


- Wrappers
  - Uniform parameter interface
  - Input/Output Data massaging
  - Stdout/Stderr message logging
  - Job Control and monitoring
    - UNIX exec/fork+IPC, or Condor
  - Pipelines are wrappers too
  - Parameter handling
    - Parameter type/constraint checking
    - Read from and/or save to parameter files
    - Inherit parameters from parent processes
  - Print context (host, release, etc.)

Sub-systems: Archive



Sub-systems: Final Product Generator



Ops Archive Layout

Standard file naming scheme

Standard path structure

Local vs. global storage

Symlinks

Versioning

Ops Archive Layout

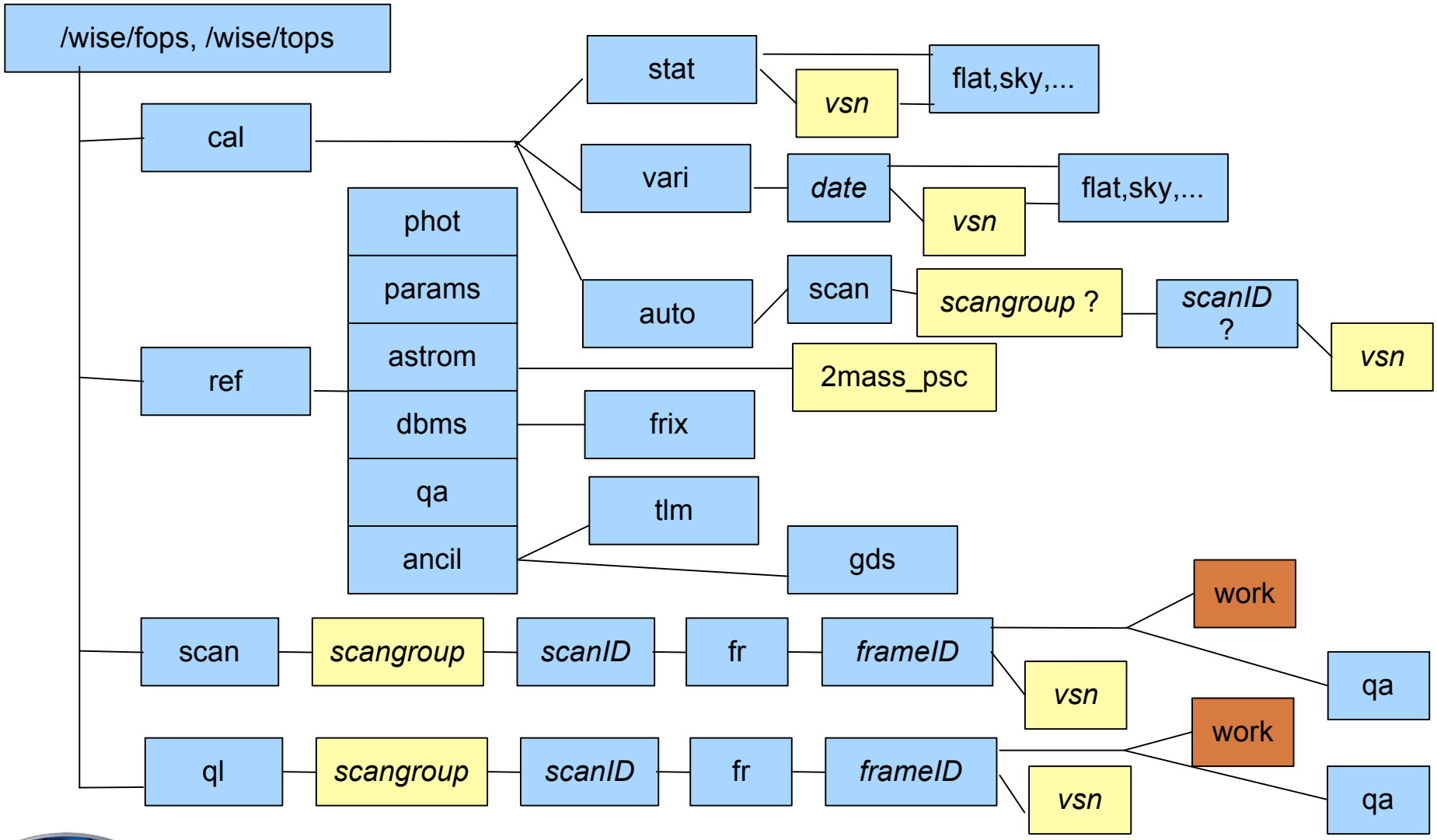
- Standard file naming scheme

  /Standard path / base name - band - type [*- variety*] *. format*

  - Standard path: see next
  - Base name
    - Frame ID: scanID+frame no., e.g. “12345a123”
      - » Scan ID equals name of half-orbit where most of the scan occurs. Provided by MOS meta-data.
      - » Frame number is computed by ingest based on scan start/stop times in MOS meta-data
    - Coadd ID: TBD
    - Calibration images: ifrcal
    - Etc.
  - Band: “w1”-”w4”
  - Type
    - “int” = intensity image
    - “unc” = uncertainty image
    - “posref” = Prex position ref. catalog
    - Etc.
  - Variety: optional sub-type specification, often used for image levels
  - Format: mostly “.tbl”, “.fits”

  – E.g. /wise/fops/scan/5a/12345a/fr/123/12345a123-w2-int-2b.fits

Ops Archive Layout



Ops Archive Layout

- Work directories are node-local but globally accessible
  - The work symlink in the Ops Archive frame pipeline output directory points to NFS-exported node-local storage. E.g. *these all represent the same location on disk*:

    Ops Archive symlink: /wise/fops/scans/1a/00101a/fr/007/work
    Global NFS Export: /compute/wcnode01/wise/fops/scans/1a/00101a/fr/007/work
    Visible only on wcnode01: /local/wise/fops/scans/1a/00101a/fr/007/work
  - Access through /local will often be faster than using NFS and will reduce LAN traffic
  - Users will access the data through the /wise/…/work symlink
- Scan group symlinks provide scaling and load balancing
  - Scan group symlinks may point to different automounted NFS-exported partitions
  - Allows for scan/frame pipeline data to be spread over up to 20 devices. E.g.

    /wise/fops/scans/**1a** → server1:/exports/wise/fops/scans/1a
    /wise/fops/scans/**1b** → server2:/exports/wise/fops/scans/1b
    /wise/fops/scans/**2a** → server3:/exports/wise/fops/scans/2a
- Frame pipeline output may be versioned
  - Data from previous runs which we may wish to save moved into a version
    /wise/fops/scans/1a/00101a/fr/007/**v1**
  - Currrent, up-to-date data always available in the parent directory, which is also given a version symlink

    /wise/fops/scans/1a/00101a/fr/007/**v2** → **.**

Data Throughput and Sizes

Sizing assumptions

Ops network, archive and backup

Network loading

Archive volume

CPU times

Data Throughput and Volume

- Sizing assumptions (rounded)

– Level-0 frameset (including meta data):	14 MB
– Level-1 frameset = L0 * 3:	42 MB
– Ops coadd set = L1 * 4:	168 MB
– Ops coadds tiling sky:	70,000
– New ops coadds per day:	500
– Framesets per ops coadd:	20
– Framesets per day:	7100
– 6 month mission framesets:	1,300,000
– Ingest per frameset:	5 seconds
– Scan/frame pipeline per frameset:	4 minutes
– Partial scan/frame pipeline per frameset:	20 seconds
– Coadd per frameset:	3 minutes
– Processing cores:	200
– Processing nodes:	25
– Deliveries per day:	4
– Compressed raw telemetry per day:	25 GB
– Average compression ratio:	2
– Source list table, frameset:	5 MB
– Source list table, coadd:	50 MB

Data Throughput and Volume

- Ops Network, Archive and Backup Volume GB/Day

	Network		Archive	Backup	
	In	Out			
Ingest:	30	120	150	150	raw+level-0
Scan/Frame:	120	400	350	40	mainly level-1b images
Ops Coadd:	500	100	1	1	transient only
QA and Misc:	10	10	1	20	mainly jpegs and docs
Daily Total:	660	630	502	181	
6 Month Total:			90,000	30,000	uncompressed

- Network bandwidth
  - Assume ops go dark for 8 hours/day, so a processing day is 16 hours
    ~1,400 Gbytes/day = ~200 Mbits/sec average
  - Assume sustained peak load is 5 times the average, implies we need to support ~1 Gbit/sec.
  - Assume a network can be no more than 50% loaded to sustain a given rate, implies **we need ~2 Gbit/sec rated network capacity**
  - Achievable with careful design and cheap hardware

Data Throughput and Volume

- 6 Month Permanent Archive Volume (uncompressed)
  - Raw + level-0: **30 TB**
  - Level-1b: **60 TB**
  - Atlas: **20 TB** (2048*2048 1.375")
  - Catalogs, meta-data: **10 TB**
- Ops Processing Times
  - Ingest: 7100 framesets/day * 5 s/frameset / 4 cores
  - = **~2.5 hours/day**
  - Scan/frame: 240s/frameset * 7100 framesets/day / 200 cores
    = **~2.5 hours/day**
  - Ops Coadd: 500 coadd/day * 20 framesets/coadd * 180 s/frameset / 200 cores
    = **~2.5 hours/day**
  - 100% pad implies processing can be done in 16 hours

Testing

Delivery Validation

WSDS Verification

Testing

- Delivery Validation with Regression Test Baselines
  - When
    - As part of the formal delivery process
    - Starting between versions 2 and 3
  - Goal: Confirm readiness to proceed with operations
    - Successful code delivery
    - All important functions
    - Resource (CPU, disk) usage still acceptable
  - RTB contents
    - Input: A simulated mini-delivery (~4 scans = ~ 1000 framesets)
      - Initially with simulated data, then with real data during flight ops
      - Generate fake image telemetry from simulated images
      - Fake ancillary data for simulated images; arbitrary format
    - Output: Level-0,1b archive, frame meta-data

Testing

- Delivery Validation with Regression Test Baselines (continued)
  - RTB test procedure
    - Select RTB data. Massage as required. Assign version. Archive.
    - Using a trusted ops delivery, process RTB data using parameters as close to normal as possible
    - Version and archive resulting data
    - Select key comparison metrics
      - Pipeline return codes as expected
      - Presence of all expected products
      - Key trend statistics, e.g. SFPRex corrections, catalog statistics, image statistics
      - Be sure products from scan/frame pipeline, multi-frame pipeline, quicklook, and QA are included
    - Write code to compare key metrics and display results
    - Time passes …

Testing

- Delivery Validation with Regression Test Baselines (continued)
  - RTB test procedure (cont.)
    - Using integration ("int") delivery, run RTB data using same parameters as archived RTB run
    - Run comparison code
    - Manually examine comparison results as well as side-by-side image comparisons for a subset of images
    - Consult with subsystem engineers regarding differences
    - Present results to CCB
    - Repeat with ops delivery, except compare to int delivery: Results should identical except for timestamps, release strings, etc.
    - If there is a failure at any point, back up to previous successful step, debug, fix problem, proceed

Testing

- WSDS Verification
  - When
    - Begin test runs after version 2
    - Official run prior to ORR
    - As needed to re-verify
  - Simulation Test Data Characteristics
    - Up to 30 continuous orbits (60 scans) = ~2 days' data = ~1% of mission = ~700 coadds
      - Now have 73 frames of test data on hand for prototype testing
    - Varying pixel response, dark current, hot/dead pixels
    - 2MASS sources with modeled fluxes
    - Galactic model
    - Extra-galactic model
    - Some solar system objects
    - Complex backgrounds (cirrus etc.)
    - Extended objects
    - Truth: supplied flats, darks, source list with positions/fluxes

Testing

- Pre-flight WSDS Verification (continued)
  - Success criteria
    - Key performance requirements
      - Completeness, reliability, photometry, astrometry
      - Scan sync misalignment detection sensitivity
      - QA effectiveness
    - Key throughput requirements
      - Ingest, scan/frame, multi-frame run times
      - Data volumes

Testing

- Pre-flight WSDS Verification (continued)
  - Procedure
    - Standardize measurement tools for evaluating success criteria
    - Test prep
      - Acquire simulated data
      - Generate level-0 test archive (including meta-data)
      - Document simulation characteristics, locate truth data
    - Confirm suitability of desired delivery
      - Consult subsystem cogE's and cogSci's
      - Confirm success of RTB
    - Run scan/frame pipeline
    - Run multi-frame pipeline
    - Confirm success of runs

Testing

- Pre-flight WSDS Verification (continued)
  - Procedure (continued)
    - Collect and examine QA data
    - Run QA measurement tools
    - Internal+external science team support
    - Prepare report
    - In case of failure to meet one or more performance goals, consult with relevant cogE's, cogSci's, science team, project, and form a plan of action

Software Management

Coding Standards

Issue Tracking

Revision Control

Builds and Deliveries

Software Management

- Coding standards
  - Revision number in code, binary, and output messages
  - Error and warning message format
  - Error and warning to stderr
  - Termination status
  - FITS images/tables via CFITSIO, IPAC table files
  - Languages
    - Fortran 95 (g95 v0.91+)
    - Perl (v5.10)
    - C95 plus GNU extensions (gcc v3 or 4)
    - IDL (v6.2+)
      - Prototype, analysis code and QA, prefer not to have in ops pipeline code
      - Difficult to meet coding standards
      - Requires license server
  - Coding practices
    - Commenting, structure, variable naming, etc.
    - Functionality isolation
    - Reduce code duplication

Software Management

- Issue tracking with Roundup
  - FOSS, SQLite backend, Python implementation
  - Simple web interface, customizable catagories, resolution tags, etc.
  - Track s/w and doc bugs, feature requests
  - Elevate some issues to project level

List of issues

Your Queries (edit)

Issues
Create New
Show Unassigned
Show All
Search
Show issue:

Keywords
Create New

Administration
User List

Hello, demo
My Issues
My Details
Logout

Help
Roundup docs

ID	Activity	Title	Status	Creator	Assigned To
		critical			
468	2 minutes ago	Donec consequat convallis quam.	unread	admin	epsilon
288	2 minutes ago	Vivamus tincidunt.	done-cbb	admin	demo
228	2 minutes ago	Donec consequat convallis quam.	done-cbb	admin	beta
136	2 minutes ago	Suspendisse et turpis.	testing	admin	epsilon
99	2 minutes ago	Donec consequat convallis quam.	deferred	admin	epsilon
		urgent			
477	2 minutes ago	Vestibulum gravida.	deferred	admin	admin
472	2 minutes ago	Sed convallis vehicula felis.	deferred	admin	beta
355	2 minutes ago	Fusce pede enim, nonummy sit amet, dapibus a, blandit eget, metus.	done-cbb	admin	admin
289	2 minutes ago	Aenean non felis.	testing	admin	epsilon
282	2 minutes ago	Nam egestas eros.	unread	admin	alpha
196	2 minutes ago	Integer tellus quam, mattis ac, vestibulum sed, egestas quis, mauris.	in-progress	admin	admin
181	2 minutes ago	Nam odio mauris, dignissim vitae, eleifend eu, consectetuer id, risus.	in-progress	admin	epsilon
175	2 minutes ago	Integer tellus quam, mattis ac, vestibulum sed, egestas quis, mauris.	deferred	admin	beta

Software Management

- Revision control with Subversion (SVN)
  - Widely used
  - CL and web interface
  - Code and document version tracking
  - Tag releases for easy recall of complete code state
  - Branches for bug fixes in operational code
- Builds and Deliveries with Make
  - Idiosyncratic, but widely used and well known
  - Makefile templates make user makefiles simple

    EXECLIST = sfprex

    FLIST = sfprex.f
  - Links in standard libraries, include files, etc.
  - Maintains build isolation
  - Build and install is “make install CFG=ops”

Software Management

- Build Isolation
  - Want to be able to run with multiple independent build configurations
  - Associate a configuration with a target directory

Ops	operational	/wise/base/deliv/ops
Dev	global development area	/wise/base/deliv/dev
Int	integration for next release	/wise/base/deliv/int
Tim/dev	personal development area	/wise/base/deliv/tim/dev

  - Build/link code to resolve dependencies (libraries, modules, include files) strictly within the target configuration directory hierarchy
  - Makefile templates enforce isolation
  - User configuration controlled by environment variables
  - “Newcfg” utility allows users to switch between configurations
  - Wrappers report configuration in use in output messages

Software Management

- Build version tracking: "What version am I running?"
  - Wrappers print out configuration and release tags

    E.g. "CFG=**ops**, Release=**ops-v1.1**"
  - Subversion ties a release tag to all constituent code revisions. Any tagged release can be regenerated from the repository
  - Delivered code source or binaries have SVN revision number embedded

    version => '$Id: wsfpipe 428 2008-01-08 02:19:48Z tim $'
  - For important release builds, "make" starts with repository checkout

    make install CFG=ops RELEASE=ops-v1.1

Software Management

- Formal builds
  - Procedure
    - **CCB declares release.** Candidate release code in dev.
    - **Code freeze declared.** Further changes require CCB permission.
    - **Time passes.** Informal use and testing.
    - **Integration build.** "make install RELEASE=ops-v1.0 CFG=int"
    - **RTB's run on int.**
    - **CCB approves build.**
    - **Operations halted.** Current ops build saved.
    - **Ops build.** "make install RELEASE=ops-v1.0 CFG=ops"
    - **RTB's run on ops.**
    - **CCB approves return to operations.**
  - Adherence increases until full compliance prior to release 3
  - Code changes following a release require CCB approval
  - CCB comprised of local astronomers and engineers

Software Management

- CCB
  - Composed of WSDC key astronomers and engineers
    - Tim, Roc, Davy, ???
    - Add project-level delegate for key builds/releases
  - Evaluate
    - Changes appropriate for inclusion in ops code?
    - Build ready for delivery?
    - Hardware changes properly planned and appropriate?
  - Formed prior to version 2 release
  - Strictness increases over internal releases between versions 2 and 3 until strict change control in place prior to version 3

Development Schedule

The IPAC Advantage

Code Maturation

Phase-in Strategy

Project Milestones

Capability Phase-in Schedule

Development Schedule

- The IPAC Advantage
  - Close interaction between paired cogE's and cogSci's
  - Heritage
    - Many astronomers and engineers with experience in large, automated surveys
    - Large existing code base to use as model for new development
  - IPAC System Group (ISG)
  - Infrared Science Archive (IRSA)

Development Schedule

- Code Maturation
  - Prototype
    - Almost anything goes
    - Support data flow, key interfaces and downstream functionality
  - Preliminary
    - Early production code base
    - Meets most coding standards
    - Under revision control
    - Probably not feature complete nor ready for requirements verification
  - Complete
    - Feature complete
    - Aheres to coding standards
    - Ready for requirements verification and RTB's
  - Mature
    - In use in the "complete" state for TBD interval

Development Schedule

- Phase-in Strategy
  - Feature set at each version matched to ...
    - Project activities, particularly instrument development and testing, and Mission Scenario testing
    - Support for future development of dependent apps
    - Estimated development time and length of maturation period
    - Staffing profile
  - Parallel development of WSDS subsystems
    - By end of FY08, several development tracks will be underway simultaneously
    - As existing code matures developers can pick up new tasks
    - New hires pick up new tasks; minimize code hand-offs
    - Limited simultaneous development by one developer gives schedule flexibility at a cost of small efficiency loss

Development Schedule

- Project milestones most important to the WSDC
  - Simulation data deliveries: Summer ‘07 - Fall ‘09
  - WSDC CDR: Jan. 29-30 ‘08
  - Ground detector/payload characterization: Spring ‘08 - Fall ‘08
  - Mission scenario testing: Late ‘08 - Early ‘09 ???
  - ORR: Sept. 15 ‘09 ???
  - Launch, IOC: Nov. 1 ‘09 - Dec. 1 ‘09
  - Survey ops: Dec. 2 ‘09 - June 1 ‘10
  - Preliminary data delivery: Dec. 1 ‘10
  - Final data delivery: Nov. 2 ‘11

Master Schedule

Development Schedule

- Capability Phase-in Schedule
  - Version 0 Oct. 15 '07
    - Supports: Throughput testing, CDR prep
    - Capabilities
      - Frame pipeline: proto
      - Ingest: proto
      - Cluster: proto
      - Exec: prelim
      - SFPRex: prelim
      - ICal: proto
      - Coadd: proto
      - DetEx: proto

Development Schedule

- Schedule (continued)
  - Version 1 July 17, '08
    - Supports: Ground characterization
    - Capabilities:
      - Specialized ingest: complete (for ground data analysis)
      - Specialized analysis: complete (for ground data analysis)
      - 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

Development Schedule

- Schedule
  - Version 2 Feb. 28, '09
    - Supports Mission Scenario Testing
    - Capabilities:
      - QA: prelim
      - Archive: prelim
      - SSOID: prelim
      - Exec: complete
      - Multi-frame pipeline: complete
      - Ingest: complete
      - ICal: complete
      - PCal: prelim
      - Coadd: complete
      - DetEx: complete
      - Frame pipeline: mature

Development Schedule

- Schedule
  - Version 3 Aug. 4, '09
    - Supports ORR, Launch, IOC
    - Capabilities:
      - Specialized analysis tools: complete (for IOC data analysis)
      - QA: complete
      - SSOID: complete
      - PCal: complete
      - Cluster: mature
      - Storage: mature
      - Archive: mature
      - Exec: mature
      - Multi-frame pipeline: mature
      - Ingest: mature
      - ICal: mature
      - Coadd: mature
      - DetEx: mature
      - FPG: prelim

Development Schedule

- Schedule
  - Version 3.5 Jan. 26, '10
    - Support: Response to IOC, survey operations, preliminary data release
    - Capabilities:
      - QA: mature
      - SSOID: mature
      - PCal: mature
      - FPG: complete
  - Version 4 Oct. 18, '10
    - Support: Final product release
    - Capabilities:
      - FPG: mature

Design Issues and Concerns

- Hardware scaling
- Coadd run times vs. duty-cycle
- On-orbit detector behavior

Ingest Subsystem

Tim Conrow
IPAC

Driving Requirements

- FRD…

Overview

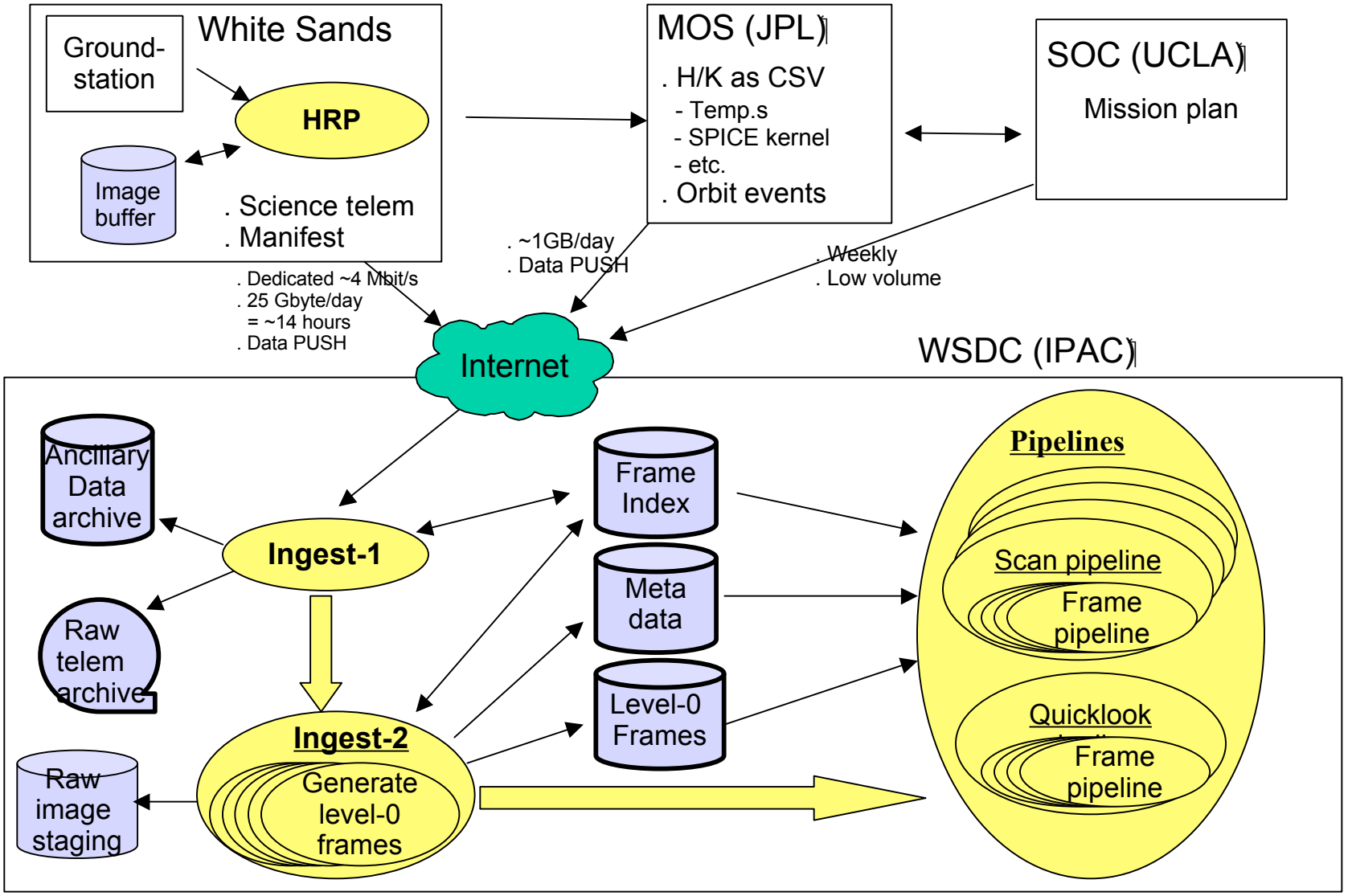
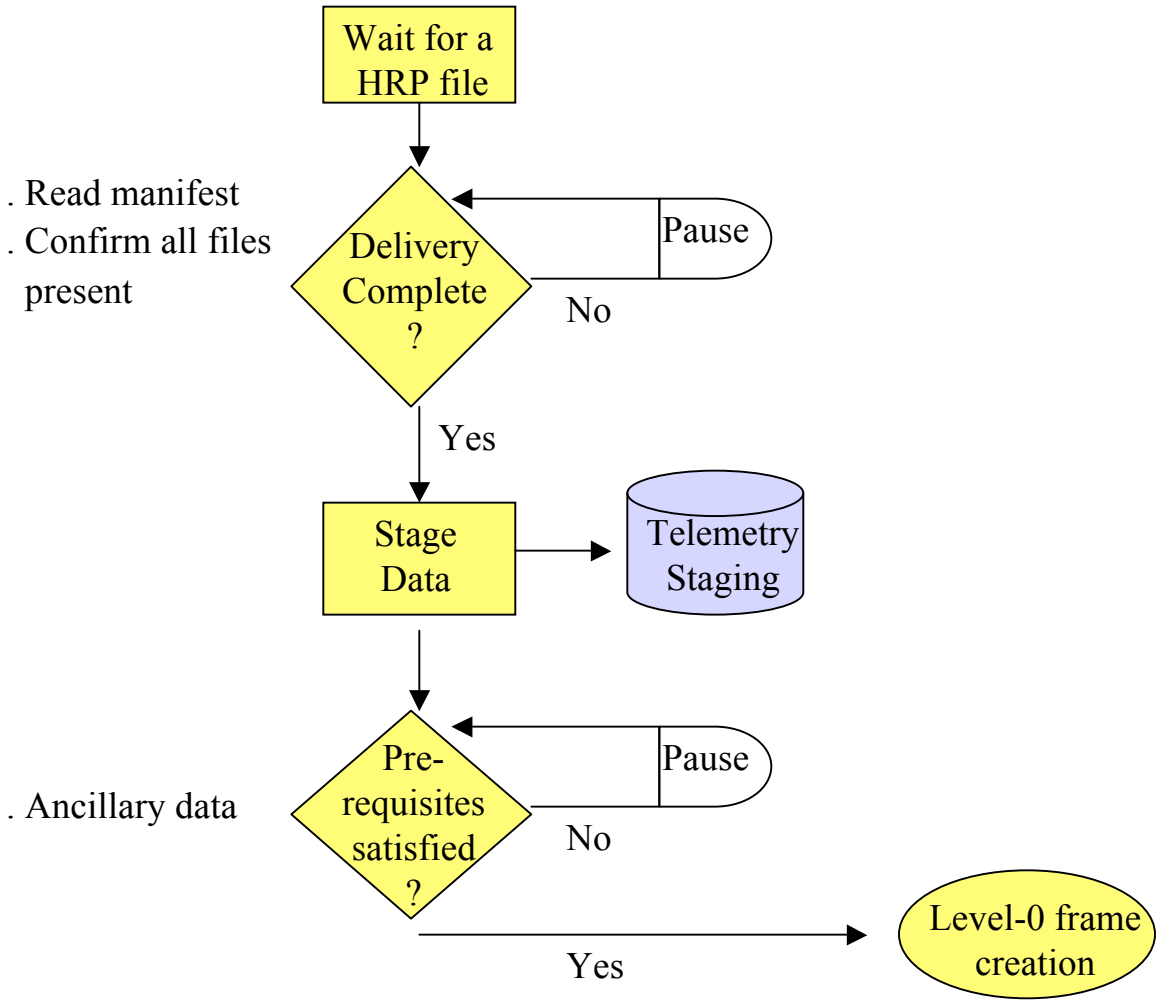
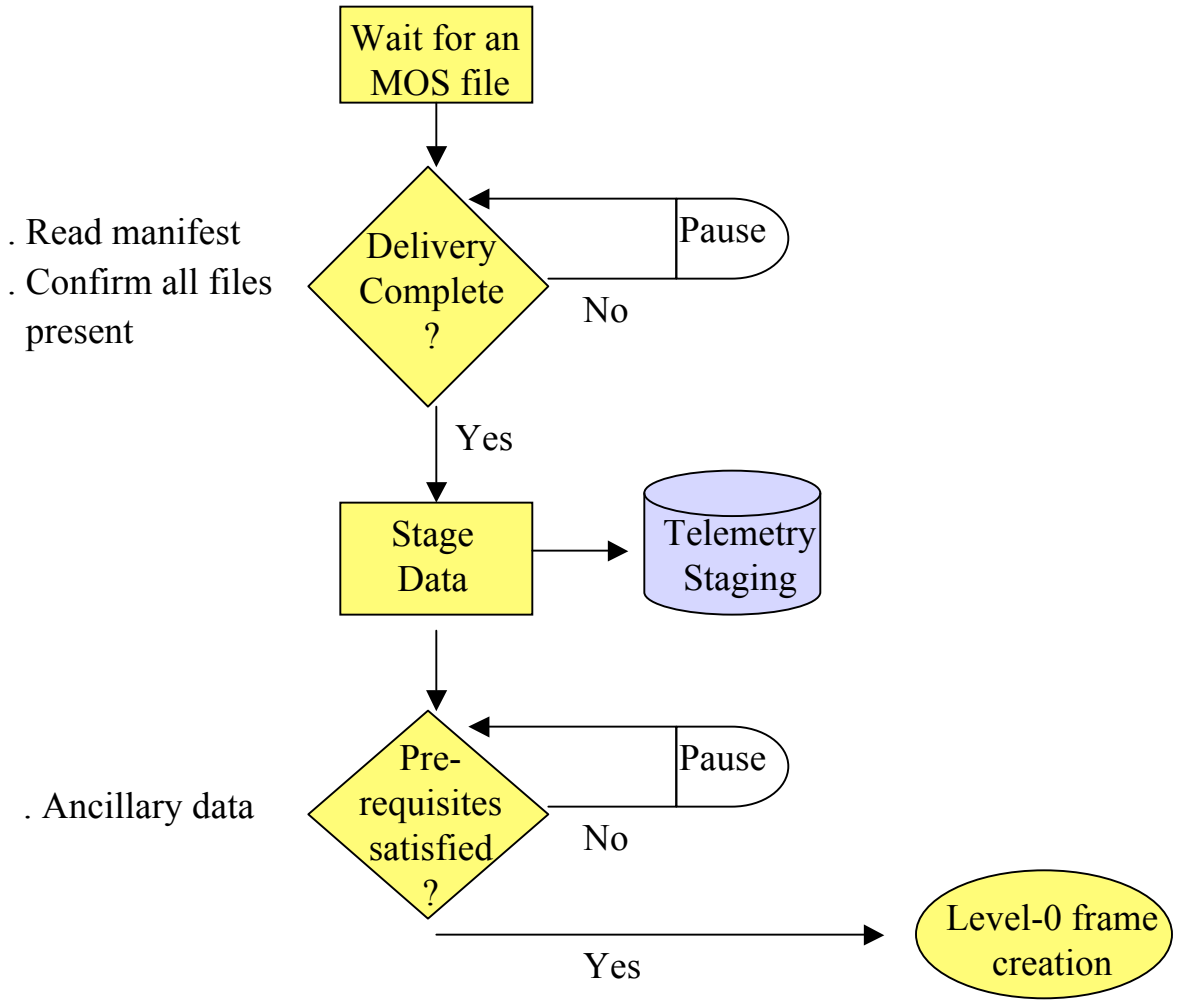

White Sands
Ground-station
HRP
Image buffer
. Science telem
. Manifest
MOS (JPL)
. H/K as CSV
- Temp.s
- SPICE kernel
- etc.
. Orbit events
SOC (UCLA)
Mission plan
. Dedicated ~4 Mbit/s
. 25 Gbyte/day
= ~14 hours
. Data PUSH
. ~1GB/day
. Data PUSH
. Weekly
. Low volume
Internet
WSDC (IPAC)
Ancillary Data archive
Ingest-1
Raw telem archive
Raw image staging
Ingest-2
Generate level-0 frames
Frame Index
Meta data
Level-0 Frames
Pipelines
Scan pipeline
Frame pipeline
Quicklook
Frame pipeline

Image Telemetry Receipt



Ancillary Data Receipt

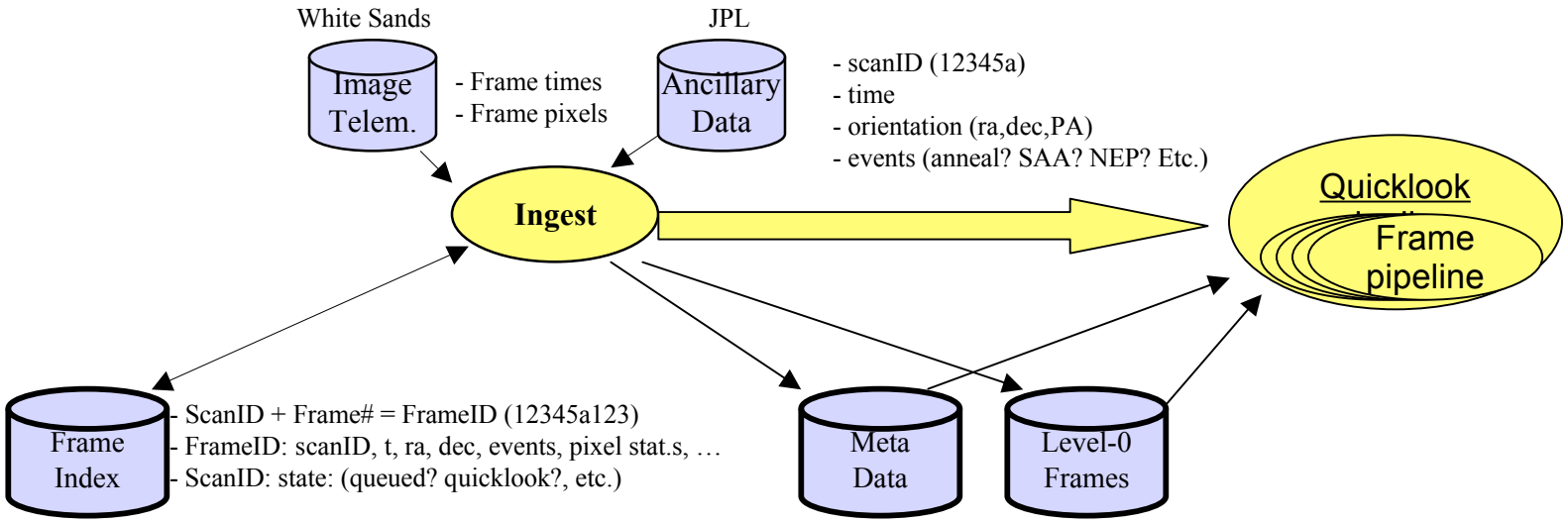


Level-0 Frame Creation

Ancillary Data Sync

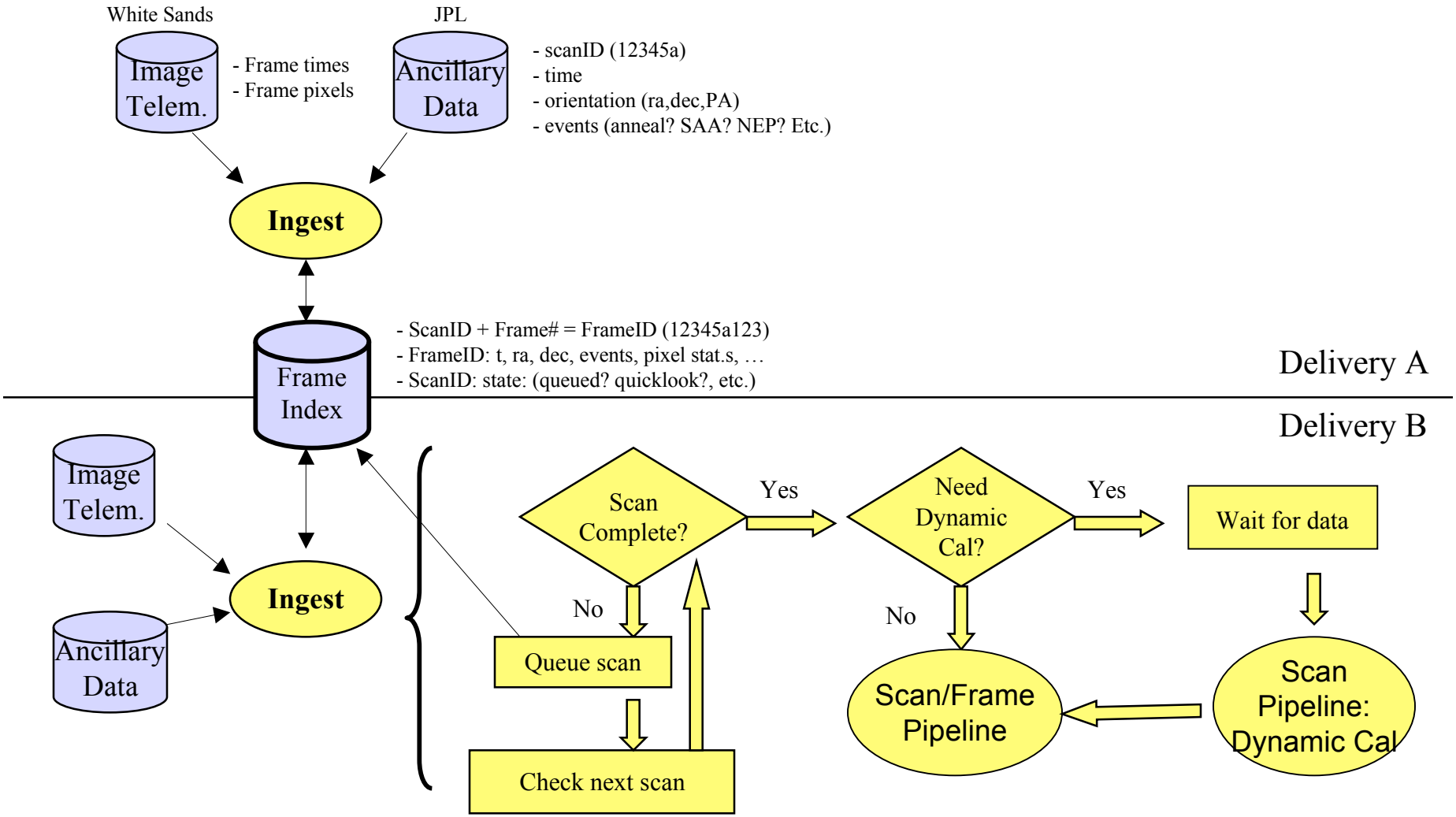
Frame Index

Quicklook Kickoff



- Choose frames for quicklook processing based on info in the frame index
  - In current delivery
  - Position (away from GP, LMC, etc.)
  - Events (away from SAA, anneals, etc.)
  - Image statistics (normal looking pixel histogram, normal source density)
  - Etc.

Scan Pipeline Kickoff



Ops Concept

Tim Conrow
IPAC

Requirements and Assumptions

IOC Ops

- IOC operations
  - 2 shift (day, swing), 7 day/week staffing

Routine Ops

- Routine operations
  - 1 shift, 5 day/week staffing