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EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

# Launch Delay Activities

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## Exposure Time Calculators (ETC)

- Gathered user feedback after GO proposal deadline was delayed
  - #1 Request: “Make it easier to perform calculations, especially for simple cases”
- ETC upgraded to version 1.3 in November 2018 ([release notes](#))
  - Add **Quick Start** that guides user through a simple point source calculation
  - Harmonize ETC and APT terminology to extent possible
  - Add links to relevant ETC documentation
  - Simplify wavelength update when changing gratings →
  - Expand MIRI MRS channels and/or wavelength ranges
  - Instrument-specific improvements (e.g., BOTS subarrays, NIRSpec detector noise)
- Discussing priorities for ETC 1.4 and 1.5 development sprints
- Strongly considering web tool that plots precomputed S/N curves

Wavelength (0.985) in "Aperture Spectral Extraction" strategy must be in range (1.66,3.17), which is set in the Strategy tab.

Update to midpoint, 2.415



## Astronomer's Proposal Tool (APT)

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- APT 26.1.1 released 2018 Oct 8
  - Update to Java 10, which requires 64-bit system
  - Associate background “shadow” observation with solar system target
  - Consider orient constraints when splitting observation into visits
  - Update MIRI MRS dither patterns
  - Harmonize ETC and APT terminology to extent possible
  - Dither to compensate for slightly different MIRI filter wedges
- APT 27.0 release scheduled for 2019 Feb 28
  - Graphical visit timeline
  - Rewriting MSA Planning Tool to improve usability and reduce maintenance costs
- APT 27.1 release scheduled for 2019 May 23
  - GTO/ERS teams will use this version to provide inputs for duplication checking



## Observatory Script Subsystem (OSS)

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- **Observatory Test Bed (OTB)**
  - Fixed hardware and software issues
  - Workaround for flight software issue
  - Now moderately oversubscribed
  - Rehearsals, script certification, ...
- **Level 2 certification**
  - OSS 7.0.2 completed Nov 2018
    - [N.B. Certified on OTB]
    - Dithers (at last!)
    - Target acquisition, except for MIRI LRS TA
    - More coordinated parallels
  - OSS 8.0 in progress
    - Fix bugs and close liens
- **Level 1 testing**
  - Improved requirements traceability
  - Verifying all code paths
  - Generating verification reports
- **Development**
  - OSS 8.0.1 and 8.0.2 in progress
    - Update high-gain antenna
    - Update MIRI anneal
    - Use pre-compiled scripts (if available)
  - OSS 8.1 after verification work
    - Reuse exposure setup when dithering
    - Other long-standing requests...
    - Certified ~1 year from now



## Precompile onboard scripts (OE1)

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- Issue: Script compilation times are much larger than expected
  - Each new activity (e.g., optical/exposure specification) triggers script compilation
  - SODRM+APT predicts that script compilation will consume 2% of mission lifetime
  - Actual compilation times are ~3-4 longer than current APT predictions
- Mitigation: Precompile low-level scripts, recompile top-level scripts
  - Reduces script compilation to <1% of mission lifetime
  - Goddard plans to deliver this new capability in ISIM FSW 14.45 [pre-shutdown]
  - ISIM FSW 14.45 needed to support OTIS testing in Jul 2019
  - JWST systems engineering and ISIM FSW will formulate validation plan
  - Requires OSS script testing, but not formal re-certification



## Reuse IDAQ configuration (OE2)

- Issue: Detector and data handling configuration is a large overhead
  - Detector and data handling (IDAQ) configuration occurs before every exposure
  - SODRM predicts that IDAQ configuration will consume 7% of mission lifetime
- Mitigation: Reuse IDAQ configuration within an activity
  - Only one configuration per activity (e.g., optical/exposure specification)
  - ISIM flight software has already implemented this capability
  - Reduces detector setup time to ~2% of mission lifetime
  - Top enhancement planned for OSS 8.1

Template	Values			Overhead Every Exposure						Overhead Every Activity						%MLT Recovered			
	# Activities	# Exp	# Int	Setup			Cleanup			Setup+Cleanup			Setup		Cleanup		Setup+Cleanup		
				OH	SODRM	%MLT	OH	SODRM	%MLT	SODRM	%MLT	SODRM	%MLT	SODRM	%MLT	SODRM	%MLT	SODRM	%MLT
miring	4458	36959	47932	20	739180	1.61%	12	443508	0.97%	1182688	2.58%	89160	0.19%	53496	0.12%	142656	0.31%		2.27%
nrcimg	9827	20981	30954	30	629430	1.37%	22	461582	1.01%	1091012	2.38%	294810	0.64%	216194	0.47%	511004	1.11%		1.27%
mirmrs	1336	8756	18639	30	262680	0.57%	16	140096	0.31%	402776	0.88%	40080	0.09%	21376	0.05%	61456	0.13%		0.74%
nrsifu	1252	7083	9530	17	120411	0.26%	7	49581	0.11%	169992	0.37%	21284	0.05%	8764	0.02%	30048	0.07%		0.31%
nrsmos	1620	3731	5622	45	167895	0.37%	7	26117	0.06%	194012	0.42%	72900	0.16%	11340	0.02%	84240	0.18%		0.24%



## Update APT overheads

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- Known liens against APT timing model
  - APT underestimates actual compile times
  - Precompile will eventually reduce overheads
  - IDAQ reuse will eventually reduce overheads
- We are currently using OTB test cases to validate APT overheads
  - OTB execution times are substantially longer than predicted by APT
  - Analyzing OTB telemetry to identify any issues beyond compile time
  - Discrepancies could be due to OTB, APT, OSS, Spacecraft, etc.
  - Must finalize APT overheads before GO Call for Proposals
  - Goal is to finalize APT overheads before GTO/ERS finalize targets/observations



## Data Management Subsystem (DMS)

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- DMS build summary

<b>DMS</b>	<b>Development complete</b>	<b>I&amp;T complete</b>
7.1.3	Jun 2018	Aug 2018
7.2	Dec 2018	Mar 2019
7.3	Jun 2019	Aug 2019

- Calibration pipeline is just one of several DMS components
- DMS 7.2 creates guider products
- DMS 7.3 will complete association processing (combine exposures)
- Started getting simulated data from OTB in Oct 2018
- Development still making major changes to data models and code
- Repository is public, but no supported releases yet



## Simulated data for testing

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- Test stage 3 of calibration pipeline (process associations)
  - Need realistic, self-consistent, dithered scenes
- Multi-Instrument Ramp Generator (MIRaGe)
  - Get observation specification from an APT file
  - Generate source catalog from Gaia, WISE, and 2MASS
  - Generate \_uncal files in the format expected by the calibration pipeline
  - Use WebbPSF to generate point spread functions (PSF)
  - Use SIAF for aperture geometry and optical transformations
  - Simulate NIRCcam, NIRISS, and FGS imaging
  - Simulate NIRCcam (and NIRISS ~done) Wide-Field Slitless Spectroscopy (WFSS)
  - Simulate NIRISS Aperture Masking Interferometry (AMI)
  - Adding spatially variable PSF
- Repository: <https://github.com/spacetelescope/mirage>
  - Need to make 0.5 TB of reference data available online



## Data analysis tools

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- Delivered last 5 requirements at the end of 2018

DMS-233	The DMS shall provide a capability to display and analyze Archived Science Data and Science Data Products.
DMS-630	The DMS shall provide the capability to combine JWST datasets including tools to determine dataset registration and optimal combination of 1-d spectra, 2-d images and 3-d spectral data cubes.
DMS-632	The DMS shall provide tools to enable analysis of JWST IFU data.
DMS-633	The DMS shall provide facilities for analyzing JWST spectral data.
DMS-634	The DMS shall provide tools for modeling JWST instrumental effects.

- Most recent releases of the three major tools
  - SpecViz 0.6.2 (<https://github.com/spacetelescope/specviz/releases>)
  - CubeViz 0.2.1 (<https://github.com/spacetelescope/cubeviz/releases>)
  - MosViz 0.2.0 (<https://github.com/spacetelescope/mosviz/releases>)



## JWST Documentation (“JDox”)

- User feedback: “Improve navigation”
- Google analytics: Users missed useful content





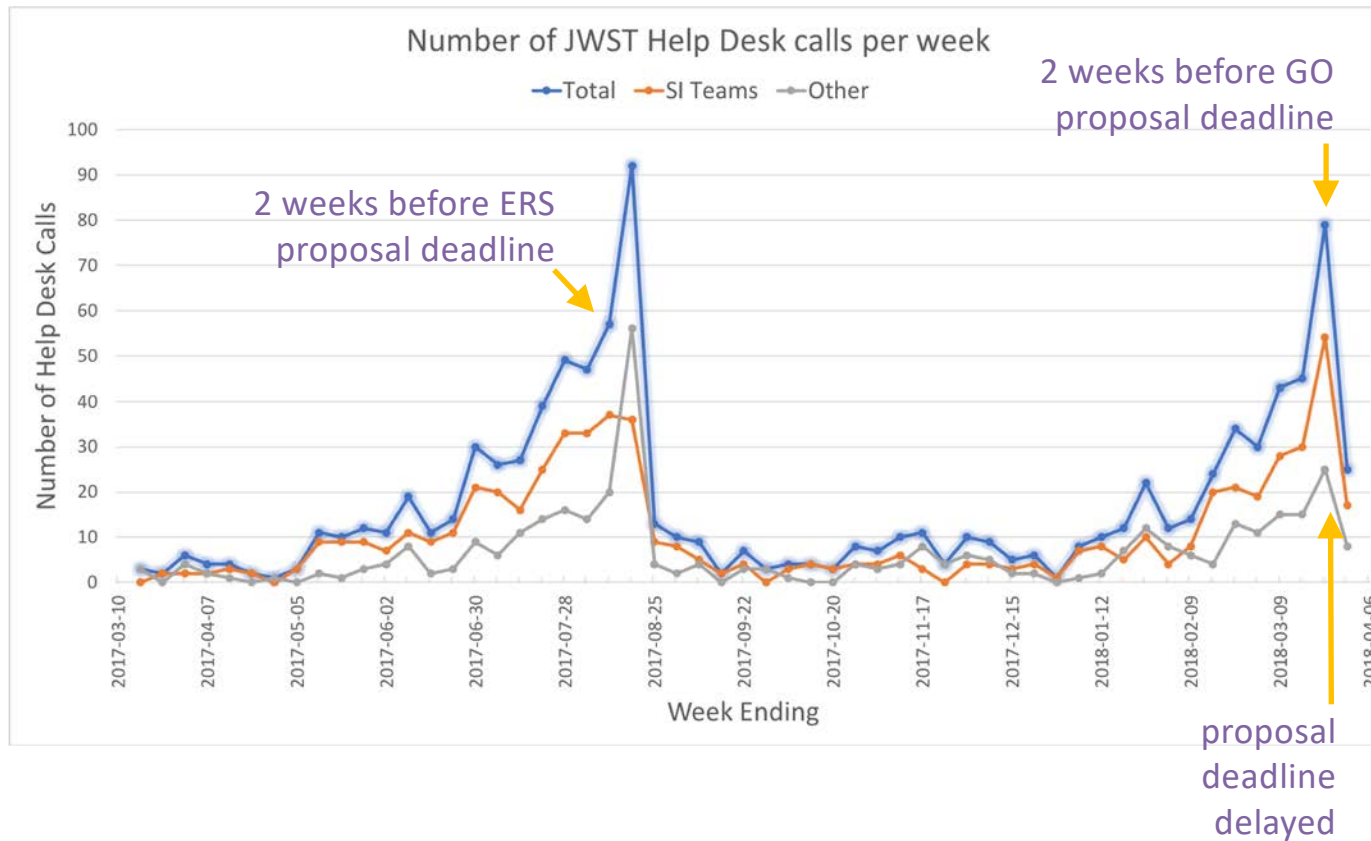
## JWST Documentation (“JDox”)

- Proposing Opportunities
  - › Cycle 1 GO
  - › Previous Cycles
  - › Policies
- Proposal Preparation
  - › Methods and Roadmaps
    - Example Science Programs
    - Recommended Observing Strategies
  - Understanding Exposure Times
  - › Observatory Functionality
  - › Observatory Hardware
- Proposing Tools
  - › Exposure Time Calculator
  - › Astronomers Proposal Tool
    - APT Observation Templates
    - ETC to APT Interface
    - Video Tutorials
  - › Other Tools
- Instruments
  - › Mid Infrared Instrument
  - › Near Infrared Camera
    - › Near Infrared Imager and Slitless Spectrograph
    - › Near Infrared Spectrograph
- Data
  - › Understanding Data Files
  - › Obtaining Data
  - › Calibration and Data Processing
- Other
  - JWST Acronyms and Abbreviations
  - Latest Updates
  - Help Desk

- Improve navigation
  - Always show page tree with context-sensitive expansion
  - Improve links between articles
- Improve content
  - Update existing articles
  - JWST Project: “Improve documentation for pipeline and user tools”
  - User feedback: “More video tutorials”
- Switching from BrikIt Theme Press to Scroll Viewport
  - Handles documentation versioning and releases
  - Better compatibility with other Confluence plugins
  - Simpler publication workflow
- Store key quantities once and insert elsewhere as needed

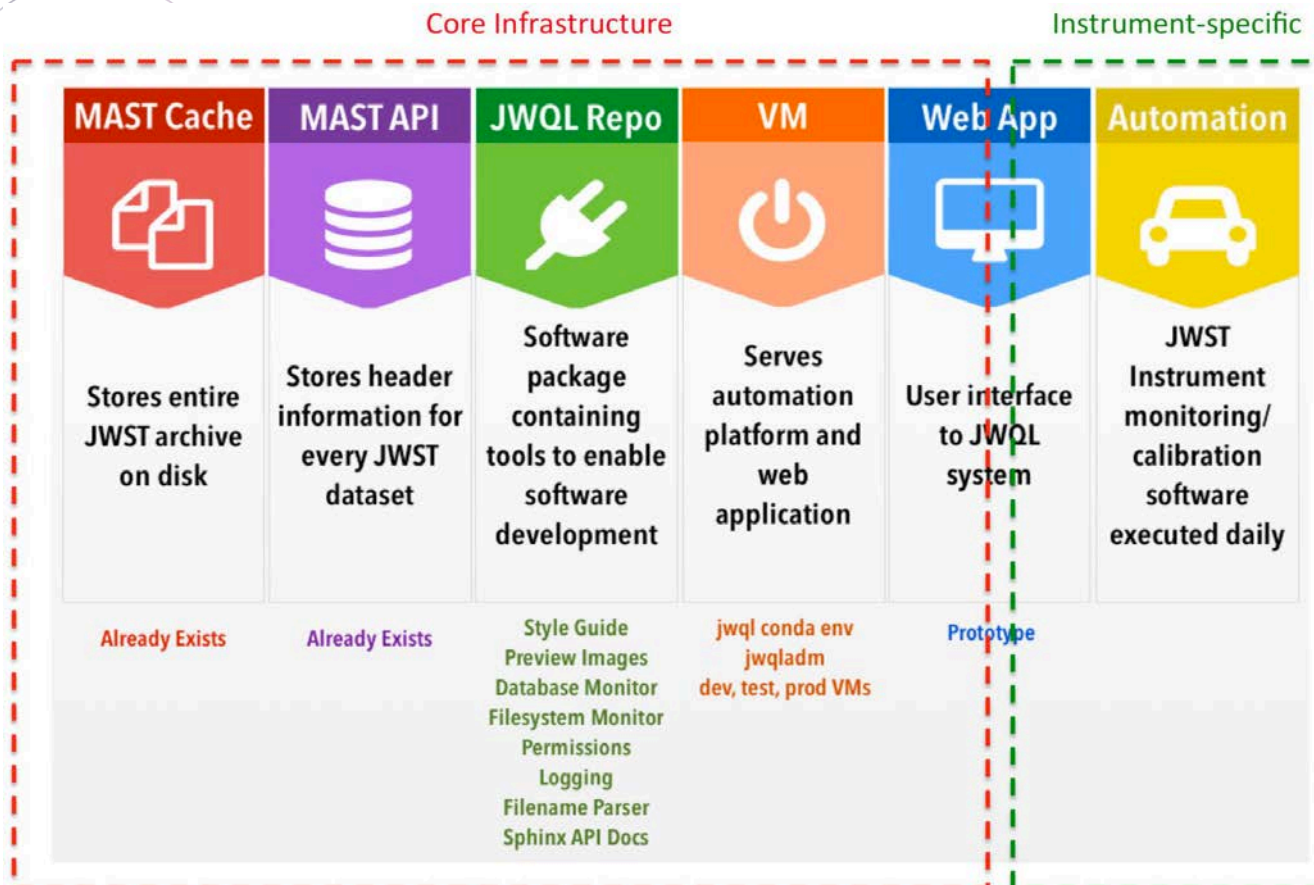


## Expected more Help Desk questions leading up to GO deadline





## Science instrument performance monitoring (JWQL)



<https://github.com/spacetelescope/jwql>

### Science goals:

- Assess data quality
- Trend performance
- Update calibration files

### Management goals:

- Avoid duplicate effort
- Write maintainable code

### Open questions:

- Support commissioning?
- Support external use?



## Maintain reference data

- Frequent updates to Calibration Reference Data System (CRDS):

Date	Pmap	Files	Instrument	Purpose
11/08/2018	<b>499*</b>	78	NIRCam	Initial delivery reference files for SUB512S subarray
11/05/2018	498	5	NIRSpec	Update map files for linearity
11/05/2018	<b>497*</b>	4	NIRSpec	Update map files for linearity (CRDS-240)
11/02/2018	496	4	NIRSpec	Update map files for gain (CRDS-241)
10/25/2018	495	16	NIRSpec	Rename EXP_TYPEs for target acquisition (CRDS-239)
10/25/2018	494	4	NIRSpec	Support NRSIRS2 in READPATT (CRDS-237)
10/08/2018	<b>493*</b>	5	System	New SYSTEM CALVER reference file for AUI CAL step
10/04/2018	<b>492*</b>	78	NIRCam	Initial delivery of PSFMASK files to support DMS 7.2
10/04/2018	491	5	NIRCam	Dummy dark for missing MASKA335R subarray
10/02/2018	490	8	MIRI	Initial delivery of PSFMASK files to support DMS 7.2
10/01/2018	<b>489*</b>	5	FGS	Update subarray names to match PRD (CRDS-236)
9/28/2018	<b>488*</b>	5	NIS, NRC	Support DMS Build 7.3 delivery

\* Pipeline mapping (Pmap) context adopted as the default



## Cycle 1 calibration plan

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- Calibration types
  - Serendipitous (use science data to calibrate)
  - Slew parallel (internal lamps)
  - Normal parallels (darks, NIRISS sky flats?)
  - External prime (flux calibration, wavelength calibration)
  - Internal prime (NIRSpec and FGS lamps)
- Progress to date
  - Identified reference files that may need to be updated during normal operations
  - Created calibration activity summaries (analogous to commissioning)
  - Created draft APT programs
  - Coordinated programs across instruments
  - Reviewed plan with Instrument Definition Teams
  - Internal review planned for April 2019