PDR Preparation

MO & DA Review

7/24/01
Agenda

• Introduction
• PDR Preparation
• Documentation
• Risk Management
• Schedule
Introduction (Scope)
PDR Preparation

- Production of Five Review Documents
  - Concept of Operations
  - Requirements Specification
  - Software Development Plan
  - Preliminary Design
  - Interface Control Document (Draft)

- Risk Management
  - Identification of High-Risk Threats
  - Risk Mitigation Plan
Documentation Development for PDR

MO & DA Quarterly Review
7/24/01
Operations Concept Document Evolution

USNO Project Team Review

v0.1
release date: 19 July 2001

v0.2
6 Aug 2001

USNO Project Team Review

v0.3
31 Aug 2001

I ncorporate NOFS, Non-pipeline Functionality, section

v0.3
31 Aug 2001

USNO Project Team Review

v0.4
13 Sept 2001

General Review

v0.3
31 Aug 2001

Final Edit

v0.9
4 Oct 2001

v0.9
4 Oct 2001

v0.9
4 Oct 2001

v1.0
11 Oct 2001

comments due: 31 July 2001

24 Aug 2001

27 Sept 2001

7 Sep 2001

31 Aug 2001

4 Oct 2001

11 Oct 2001

19 July 2001

31 July 2001

24 Aug 2001

27 Sept 2001
# PDR Document Schedule

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PDR Document Schedule (contd)
Concept of Operations

Status

• Based on:
  - MRD, SRD, Calibration Plan (draft)
  - Interviews with MO & DA personnel

• Purpose
  - Produce a conceptual description of a system that meets program level requirements
  - Serve as a basis for deriving system-level functional and performance requirements

• Draft version 0.1 released 19 July 2001
  - Intended for internal (USNO) review only
  - Does not include:
    • Simulator
    • Non-pipeline operations
  - Closure date for comments: 31 July 2001
Concept of Operations
Status (contd)

• Version 0.3 will include Simulator, non-pipeline operations
  - Closure date: 24 August 2001
• Version 1.0 target release date 11 October 2001
Concept of Operations

• SOC Data Processing System is divided into four subsystems:
  - Data ingestion
  - Data archiving
  - Quicklook
  - Astrometric and Photometric Data Analysis
Data Ingestion, Data Archiving Subsystems

- **Data Ingestion**
  - Monitors staging area
  - Makes ingested data accessible to other three subsystems

- **Data Archiving**
  - All data received from MOC is copied to permanent storage medium (DVD)
  - Entry made into archiving database
  - Intended for problem recovery
Quicklook

• Purpose:
  - Instrument/spac...
Rough Centroiding & Photometry

Engineering Data Formatting and Archiving

Trim and Alignment

Trend Archive

Anomaly Resolution

Trend Analysis and Anomaly Detection

Trending Displays

Anomaly Resolution

From APDA Working Catalog

From APDA

Copy of working catalog

Charge injection, focus test, attitude, SOH, tracking, time conversion data

Acquisition: frame, attitude

Science data

TBD trend and anomaly reports and displays

PSFs, Flats, Sky, bg

Astrom., photom. inputs

Centroid, photometry inputs, target pathology flags, TDI/spin mismatch, Earth-instrument angle, attitude

To APDA

Anomaly alert

From On-line Repository

MOC

Instrument command scripts

From APDA

QL Catalog Copy
QL Questions, Issues

• What are the centroiding outputs?
• How are potential source pathologies identified?
  – Astrometric
  – Photometric
• What are the parameters that will be monitored?
• What are the anomaly condition indicators?
  – Out of bounds
  – Singularities
• Anomaly recovery procedures are TBD
• Trending, anomaly reports and displays are TBD
APDA

• Purpose
  - Science data reduction
  - Analysis-intensive trending
    • PSF
    • Sky background
    • Flat fielding
From on-line data:
- Centroiding and Photometry
- Photometric Calibration (std. stars)
- Working Catalog

Centroiding and photometry results:
- Grid star centroids
- Grid star photometry
- Non-grid centroids
- Non-ref. star photometry
- Non-reference photometric results
- Non-grid astrometric parameters
- Global pointing solution

Periodic Copies:
- Centroiding and photometry results
- Grid star centroids
- Grid star photometry
- Non-grid centroids
- Non-ref. star photometry
- Non-reference photometric results
- Non-grid astrometric parameters
- Global pointing solution

Dependencies:
- To QL System, From QL System
- Centroid, photometry inputs, target pathology flags, TDI/spin mismatch, Earth-instrument angle, attitude
- Sky observations, Flatfield data
- High SNR data, Sky background, Flatfield trending
- Attitude, TBD trends

From On-line Archive and/or QL System:
- Pointing results
- Attitude, TBD trends

PSF Trending, Sky Background, Flatfield Trending
- PSF Archive, Sky Archive, Flatfield Archive

DRAFT SOC APDA Conceptual Design 7/19/01
APDA Questions, Issues

- Trending subsystem: does it belong in QL or APDA?
- Trending Issues: How are we going to do these?
  - PSF-Archive-Centroiding
  - Sky background-Archives-Centroiding
  - Flatfielding-Archive-Centroiding
- Centroiding needs to be worked out
  - Inputs, outputs
  - Feasibility

- Global Solution
  - There is a lot of stuff inside the GS process—basic feasibility of solution needs to be shown
- Photometric calibration
- Prototyping has concentrated on the Global Solution process
  - May want to direct some prototyping effort to other technical risk areas
Requirements Status

MO & DA Review

7/23/01
SOC Requirements Status

• Based directly on SOC Concept of Operations v0.1
  - Projection of ConOps into “functional requirements space”
  - More important at this point in time to review ConOps document closely
• Purpose:
  - To produce a baseline set of functional requirements
    • System design proceeds from this baseline set
  - To provide a mechanism for traceability between source (high level) requirements and design elements
    • Ensures that all high-level requirements are being met by the design
  - To provide the set of test cases against which the implemented system can be tested
  - To set priorities for design and development
• Draft version 0.1 released 22 July 2001
  - Intended for internal (USNO) review only
  - Does not include:
    • Simulator
    • Non-pipeline operations
  - Closure date for comments: 31 July 2001
SOC Requirements Status (contd)

• Version 0.3 will include Simulator, non-pipeline operations
  - Closure date: 6 Sept 2001

• Version 1.0 target release date 25 October 2001
MOC-SOC ICD Status

MO & DA Quarterly Review
MOC-SOC ICD Status

• Purpose
  - Explicitly define the interface between the MOC and SOC
    • File types, formats, sizes, frequency, connection interruption recovery procedures, etc.
  - Can effectively be used to define Simulator-Pipeline interface

• Initial draft target date: 31 August 2001
• Version 1: CDR
MOC-SOC ICD: Issues

- MOC “push” vs. SOC “pull”
  - Initial inclination: MOC push
- Telemetry stream vs. discrete file delivery
  - Initial inclination: discrete file delivery
  - Initial list of file types:
    - Science Data files (10 second segment)
    - Full Frame file (individual CCD half)
    - Acquisition file (individual 600x600 window)
    - Charge Injection Test file (individual test profile)
    - Catalog Dump file (individual catalog dump)
    - Focus Test file (individual focus test)
    - Instrument Attitude file (10 second segment)
    - SOH file (10 second segment)
    - Ground Station Tracking file (10 second segment)
    - Time Conversion file (valid over 10 minute span)
Software Development Plan

• Outlines the Process for Producing Quality Software
  - System Overview
  - General Policies
  - Specific Development Plan
  - Risk Management
  - Configuration Management / Quality Assurance
  - Resource Analysis / Schedule

• Work-in-Progress
  - Available for Review in Early August
  - Version 1.0 Delivered at PDR
Risk Management

• Cost = Schedule = Technical Risk

• Two Areas of Technical Risk
  – Data Flow
    • Examine Other Large Data Volume Processes
    • Seek Research and Industry Expertise
    • Prototype
  – Algorithm
    • Identify High-Risk Areas
    • Produce Prototypes and Test
    • Develop End-to-End Framework Early On
### PDR Preparation Schedule

- Puts us on track for PDR in Late Nov / Early Dec 01
- Allows ample time for integration with NOFS effort
- Need to assess priority on prototyping
- Need to address process and design issues
- Schedule allows time for comment and buy-in from all players
- PDR success is achieved before, not at, PDR

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Requirements Document Evolution

USNO Project Team Review
- v0.1
  - Release: 22 July 2001
- v0.2
  - 6 Aug 2001
- v0.3
  - 31 Aug 2001
  - Incorporate NOFS sections
  - Non-pipeline functionality, sections
- v0.5
  - 27 Sept 2001
- v0.9
  - 18 Oct 2001
- v1.0

General Review
- v0.4
  - 13 Sept 2001
- v0.5
  - 20 Sept 2001
  - Final Edit

USNO Project Team Review
- v0.3
  - 24 Aug 2001
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  - 27 Sept 2001
- v1.0
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Comments due:
- 31 July 2001
- 6 Aug 2001
- 20 Sept 2001
- 11 Oct 2001
- 27 Sept 2001
- 31 Aug 2001
- 6 Aug 2001
- 24 Aug 2001
- 22 July 2001
Software Development Plan Evolution

- **v0.1**: Release date: 23 July 2001
  - USNO Project Team Review
  - Comments due: 31 July 2001
- **v0.2**: 6 Aug 2001
  - Incorporate NOFS section
  - 31 Aug 2001
- **v0.3**: 7 Sept 2001
  - General Review
  - 5 Oct 2001
- **v0.4**: 21 Sept 2001
  - USNO Project Team Review
  - 14 Sep 2001
- **v0.9**: 12 Oct 2001
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- **v1.0**: 19 Oct 2001
  - Release date: 23 July 2001
  - Comments due: 31 July 2001
  - 31 Aug 2001
  - 12 Oct 2001
  - 7 Sept 2001
QL: Anomaly Parameters

- QL trend shall generate running time histories of the following spacecraft and instrument operating parameters:
  - Image centroids vs. window centers
  - Standard deviation
  - Skewness
  - Kurtosis
  - TBD bimodality metric
  - TBD goodness-of-fit metric
  - Total counts per TBD reference stars
  - Total counts per CCD per unit time
  - TBD focus metric
  - TBD charge injection metric
  - Temperature
  - Power
  - Spin rate
  - Spin axis direction
  - Precession rate
  - Precession axis direction
  - Earth—instrument angle
  - TDI rate
  - TDI rate—spin rate difference
  - Observed attitude—model attitude difference
  - Observed profile widths—model profile widths difference
  - Observed counts—model counts difference