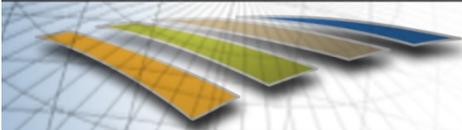




Landsat Data Continuity Mission (LDCM) USGS Project Status Report

June 23, 2009

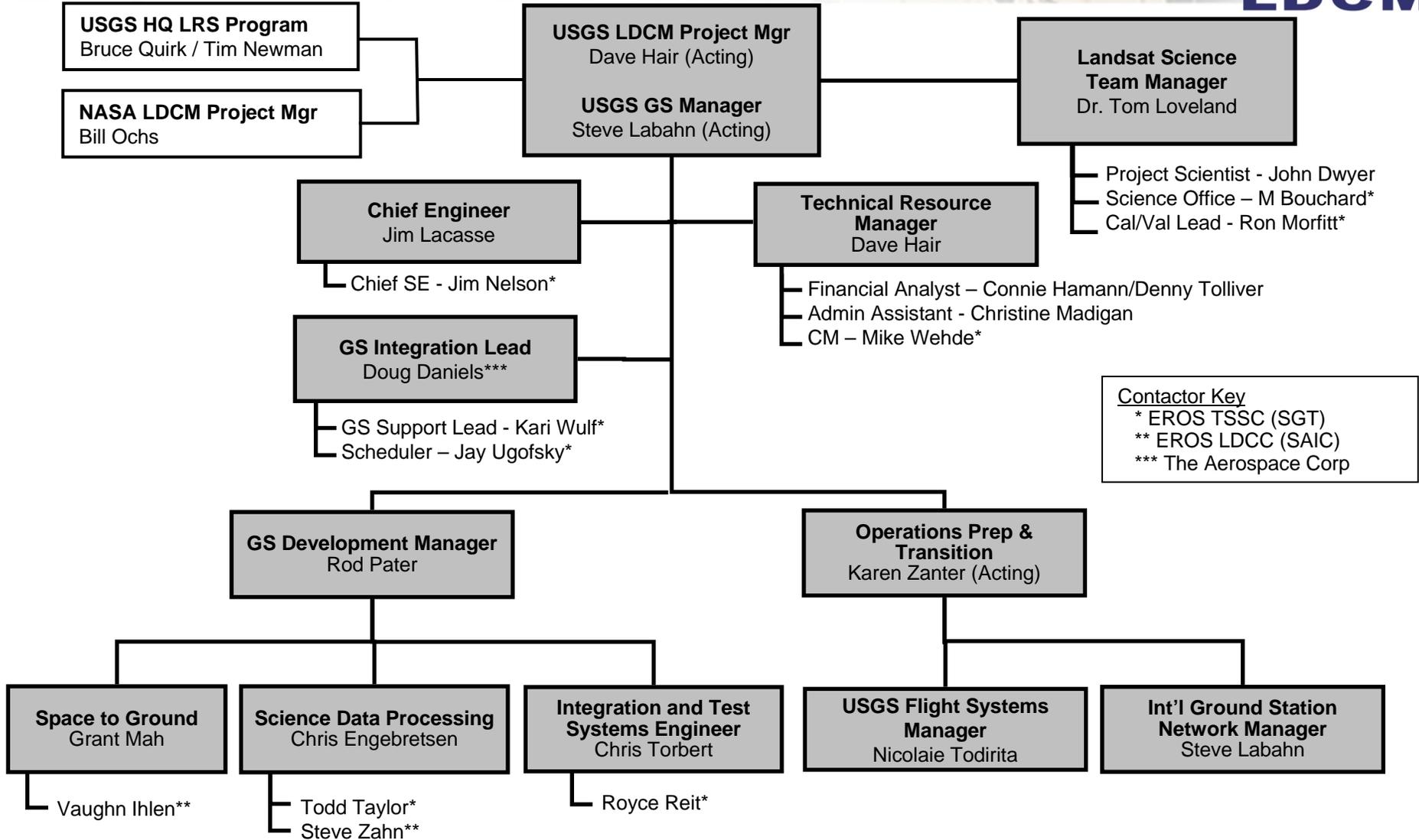
John Dwyer
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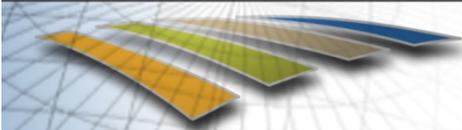
 Topics**LDCM**

- ◆ USGS LDCM Project Team Update
- ◆ Status Highlights
- ◆ Review Progress
- ◆ Budget Shortfall & Mitigation
- ◆ TIRS Development Strategy
- ◆ Algorithm Delivery Status
- ◆ Summary

USGS LDCM Project Organization

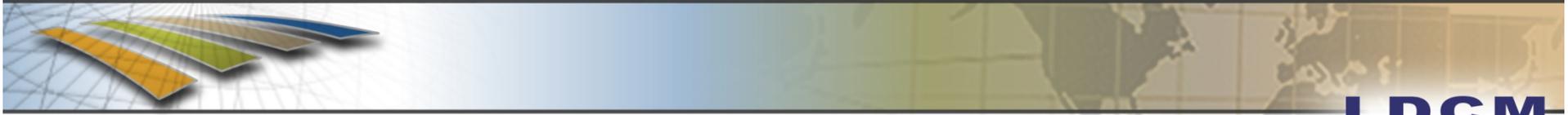
LDCM



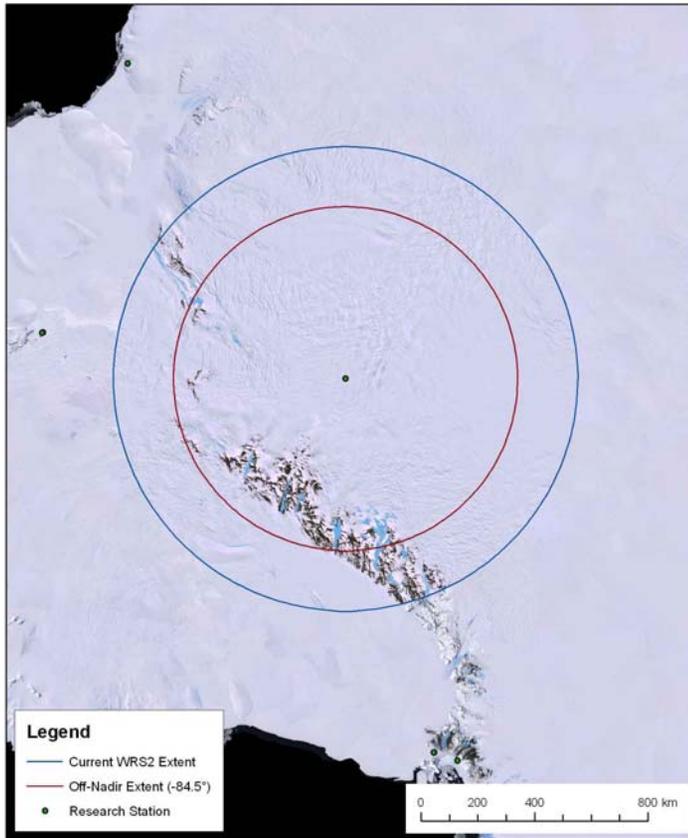
Status Highlights (1 of 2)

LDCM

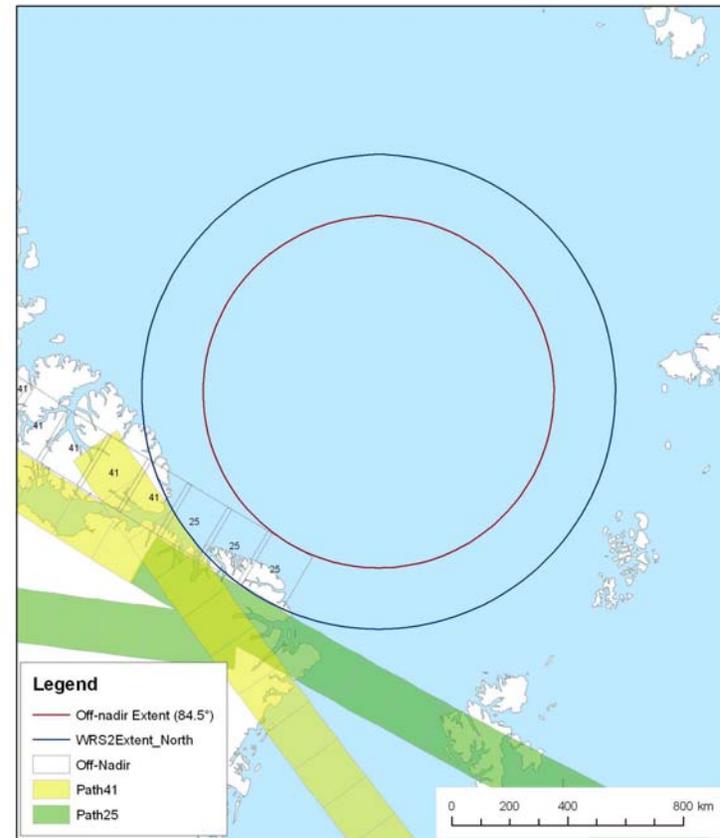
- ◆ January meeting summary published in NASA *The Earth Observer*
- ◆ Contributed to assessment of science and operations impacts of TIRS-OCO configuration
- ◆ Participated in TIRS calibration and algorithm reviews
- ◆ Began delivery of final phase algorithm description documents
- ◆ Created off-nadir scene-framing algorithm description document
- ◆ Continuing investigation into browse specifications
- ◆ Draft manuscript on the cloud assessment methodology was completed
- ◆ Completed analysis of the extent of LDCM off-nadir coverage of polar regions



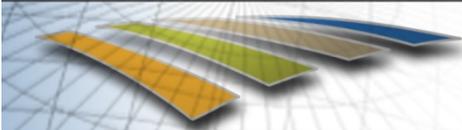
LDCM Off-Nadir Antarctic Extent



LDCM Off-Nadir Arctic Extent



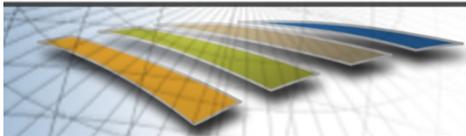
Off-nadir pointing enables imaging of an additional 360,000 square miles of both the Antarctic and Arctic regions



Status Highlights (2 of 2)

LDCM

- ◆ CAPE equipment has all been ordered and deliveries have started
- ◆ Worked through Integration & Test plans with NASA to set up CAPE in the MOC
- ◆ Work continues on schedule for CAPE code and unit test and development integration
- ◆ Completed work to define the DPAS Architecture
- ◆ Baselined the DPAS requirements for the July SRR
- ◆ Managed Integration of TIRS Requirements into the DPAS Baseline
- ◆ Started Scenarios for the DPAS Operational Concept Document, including TIRS
- ◆ Initiated work to define the operations transition roles and responsibilities, as well as the operational structure
- ◆ Significant progress working to mitigate budget shortfall

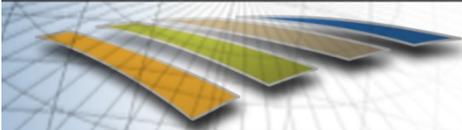


Schedule – Ground System Reviews

LDCM

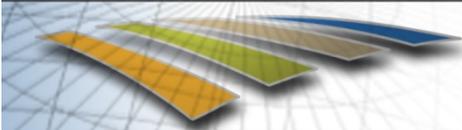
Preliminary Design Reviews (PDRs)	Date
Collection Activity Planning Element (CAPE) Infrastructure Element (IE) – Spiral User Portal Element (UPE) Storage and Archive Element (SAE) Image Processing Element (IPE) Ground Network Element (GNE) Mission Operations Element (MOE)	✓ Apr 2008 ✓ Jul 2008 ✓ Jul 2008 ✓ Aug 2008 ✓ Oct 2008 ✓ Apr 2009 ✓ Apr 2009
Data Processing and Archive Segment (DPAS) SRR Data Processing and Archive Segment (DPAS) Ground System (GS)	Jul 2009 Aug 2009 Sep 2009

Critical Design Reviews (CDRs)	Date
Collection Activity Planning Element (CAPE)	✓ Jan 2009
Ground Network Element (GNE) Mission Operations Element (MOE) Data Processing and Archive Segment (DPAS) Ground System (GS)	Aug 2009 Aug 2009 Feb 2010 Mar 2010

Budget Shortfall & Mitigation (1 of 2)**LDCM**

Key drivers and circumstances resulting in project shortfall:

- ◆ Original USGS budget for LDCM based on commercial “data buy”, with flat funding profile
- ◆ LDCM was later recast to a free-flyer mission from the NPOESS platform
 - ◆ Rigorous latency requirements tied to NPOESS network were transitioned to free-flyer model
 - ◆ Additional scope was required to address new mission definition:
 - Mission Operations Center and Flight Operations Team
 - Mission Operations Element
 - Science Data Scheduling and Acquisition
 - Ground Network
- ◆ Addition of the TIRS instrument
- ◆ Original ground system architecture approach was based on a block replacement every mission



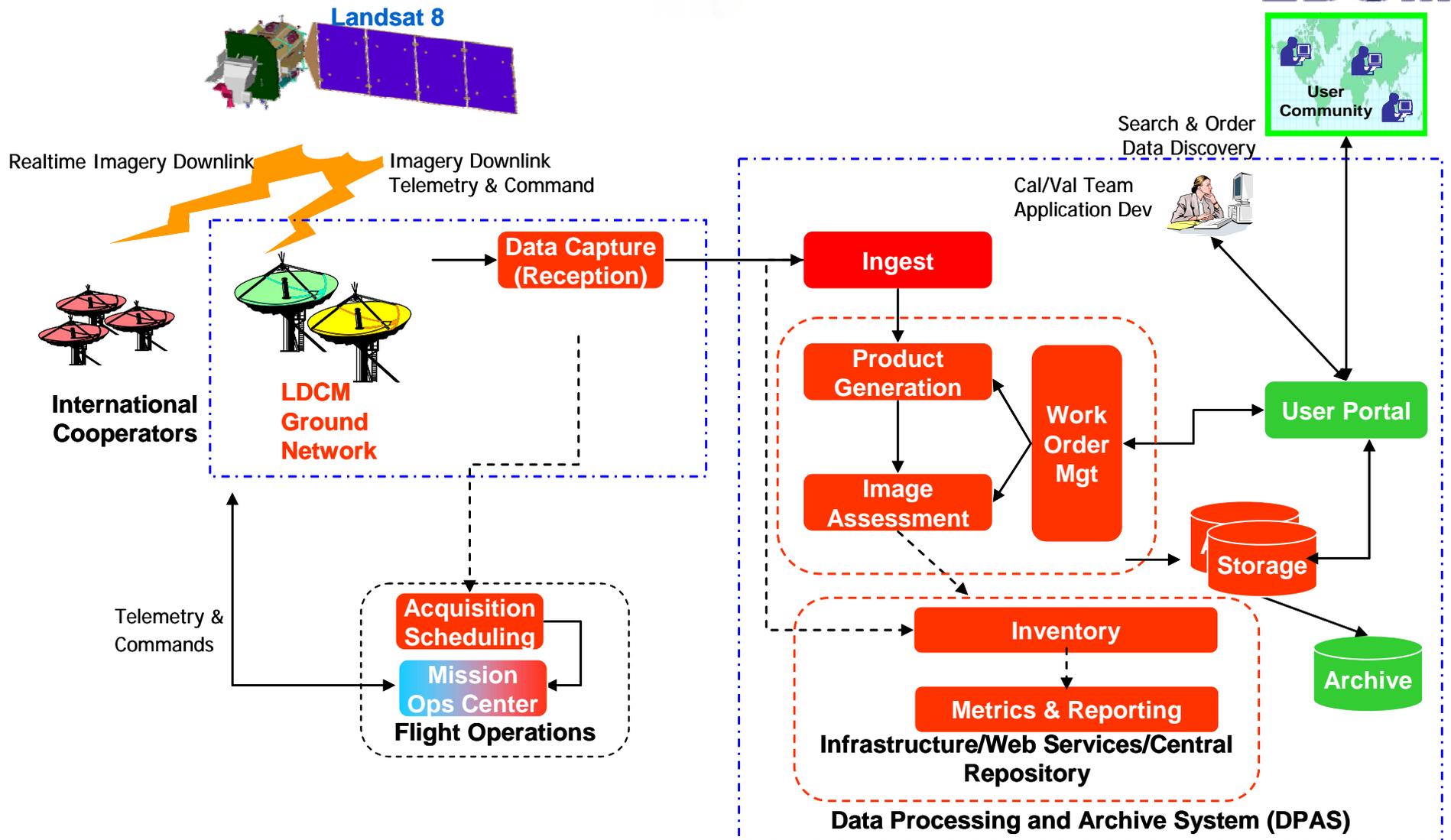
Budget Shortfall & Mitigation (2 of 2)

LDCM

- ◆ Budget Shortfall Mitigation
 - ◆ Clear that no “single change” would mitigate the entire budget shortfall
 - ◆ Ground System team identified mitigation options that related to:
 - Schedule/deliverable delays due to change in launch readiness date
 - Cost savings & avoidance options
 - System architecture options
 - ◆ Joint USGS, NASA meeting, Dec 2008, to discuss budget shortfall and mitigation options
 - Resulted in a joint recommendation to:
 - Change approach to ground system architecture
 - Implement a single MOC at GSFC through early operations
 - Change Flight Operations Team to support a single MOC
 - Push the staffing curve over by taking advantage of the change in launch readiness date
 - ◆ Additional changes include:
 - Reducing EROS Center overhead costs
 - Reducing offsite facility costs
 - Seeking additional funding
 - ◆ Recommended changes briefed to USGS HQ Geography, Contracts, and Legal
 - USGS Contractors received new direction Feb 2009

Original LDCM System Architecture

LDCM



New Development

Modified Landsat Architecture Reuse Elements

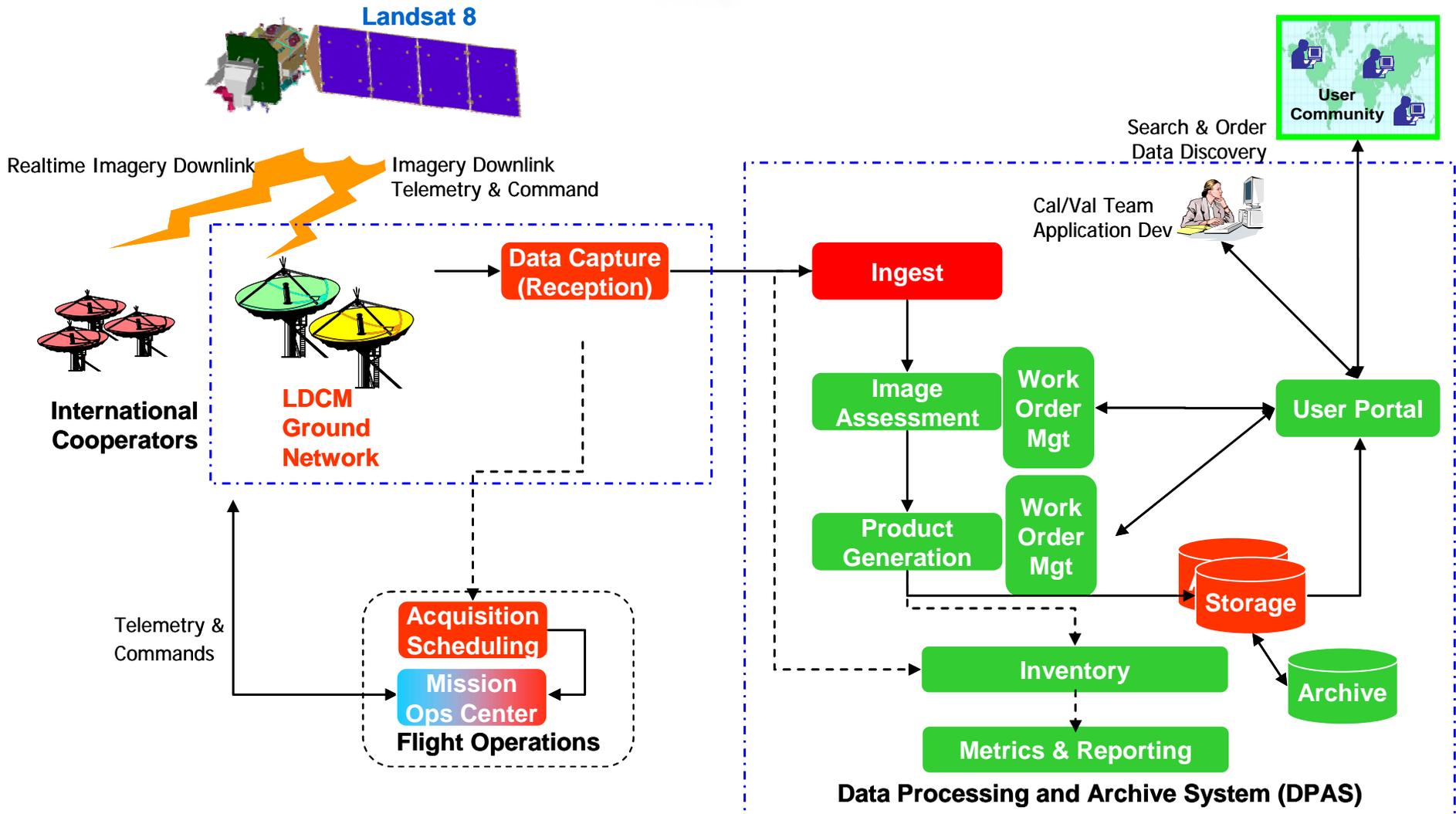
NASA

NOAA



New LDCM System Architecture

LDCM



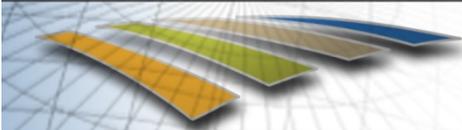
New Development

Modified Landsat Architecture Reuse Elements

NASA

NOAA





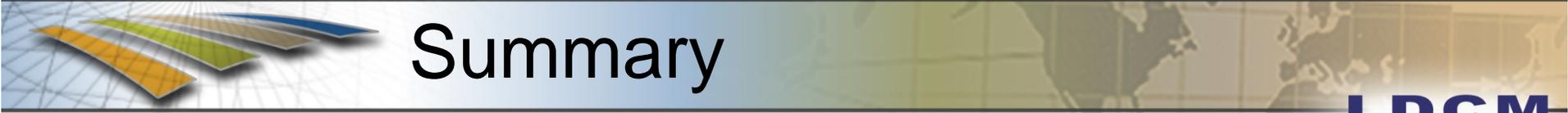
TIRS Strategy

LDCM

- ◆ USGS is cautiously taking steps to support TIRS, while it has not yet received funding to support the instrument
- ◆ Near-Term Purpose & Goals
 - ◆ Identify a TIRS Ground System design approach, which:
 - Minimizes risk to the mission and launch schedule – focusing on Mission PDR, DPAS PDR, and Ground System PDR
 - Minimizes the impacts to already approved and funded OLI efforts
- ◆ Notional Approach & Assumptions
 - ◆ Recognizing that the Ground System's knowledge about the specific TIRS algorithms is limited at the moment, the near-term strategy is primarily tied to algorithm maturity knowledge
 - Assume instrument scheduling, downlinking, ingesting, archiving mission data, and storing LORa data is a given. This is our minimal/basic capability.
 - Subsequent processing steps, including product generation and distribution, preliminary design to be presented as 'plans' for developing preliminary design and 'impacts' to those parts of the Ground System instead of actual preliminary design.
 - Our plan is to develop preliminary design for IAS and LPGS, once we have more information about the specific TIRS algorithms at some anticipated date. It is expected that we will have more specific TIRS algorithm knowledge immediately following the Cal/Val TIM in early July.

Algorithm Delivery Status**LDCM**

- ◆ Total of 45 algorithms to be delivered for implementation to support on-orbit initialization and verification
 - ◆ Ingest
 - ◆ Image Assessment
 - ◆ Product Generation
 - ◆ CalVal Toolkit
- ◆ An additional 14 algorithms to be implemented by Initial Operations
- ◆ Algorithms are delivered in phases according to progression in the design and development of OLI instrument and Ground System Image Processing Element (IPE)
 - ◆ Phase 1 – completed for IPE PDR (Oct '08)
 - ◆ Phase 2 – to be completed by Data Processing & Archive Segment CDR (Jul '09)
 - ◆ Phase 3 – to be completed by Ground Readiness Tests (GRTs)
 - ◆ Phase 4 – delivered post-launch



Summary

LDCM

- ◆ Significant progress has been made on the Ground System
- ◆ Ground System approach and architecture is now taking advantage of existing capabilities to the extent possible
- ◆ Ground System preliminary design is underway to accommodate TIRS
- ◆ Budget shortfall has been mitigated to the greatest extent possible and additional funding has been requested
- ◆ On track to complete Ground System preliminary design review in September