ATMOSPHERE

National Aeronautics and Space Administration

Open Source Science for ESO Mission Processing Study

Workshop #1
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AOS Mission Data Processing System Perspective

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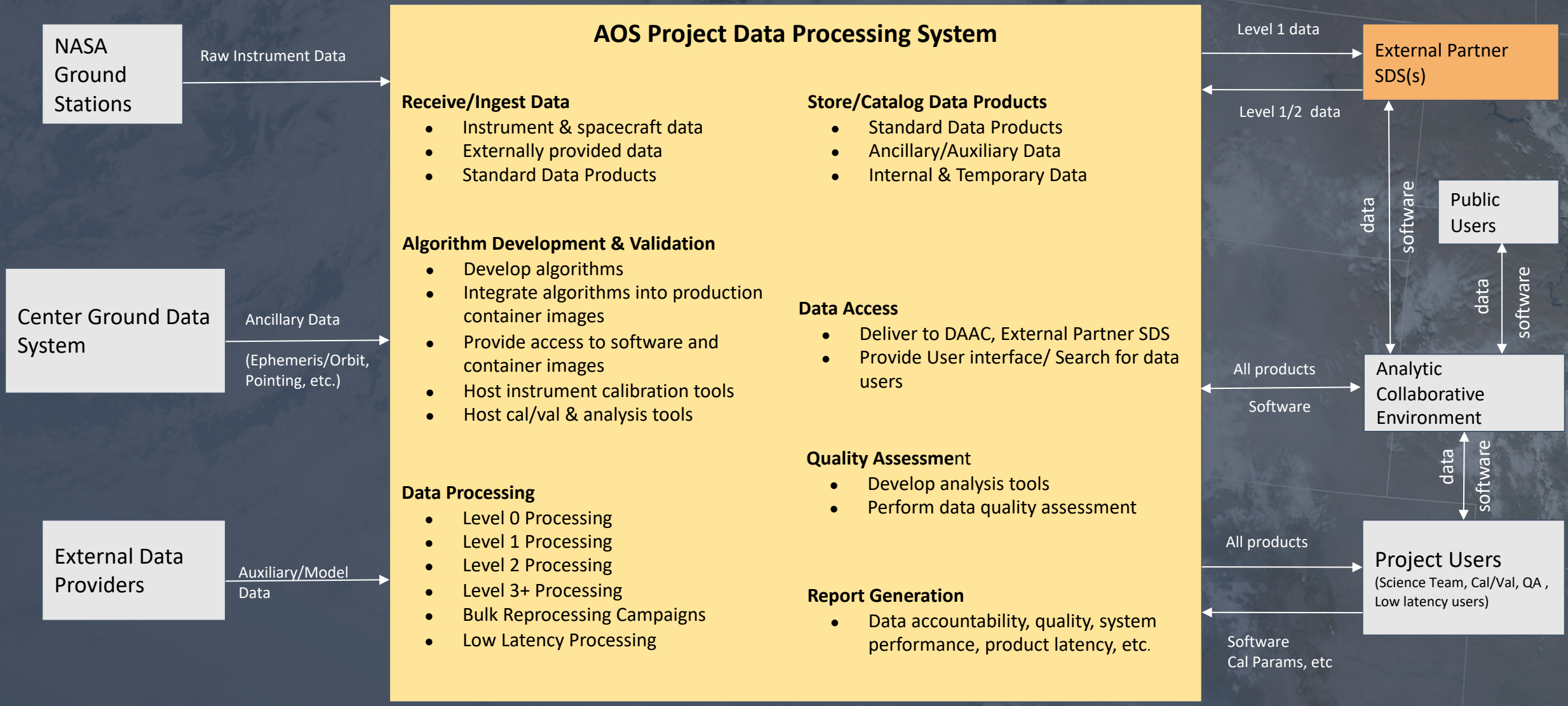
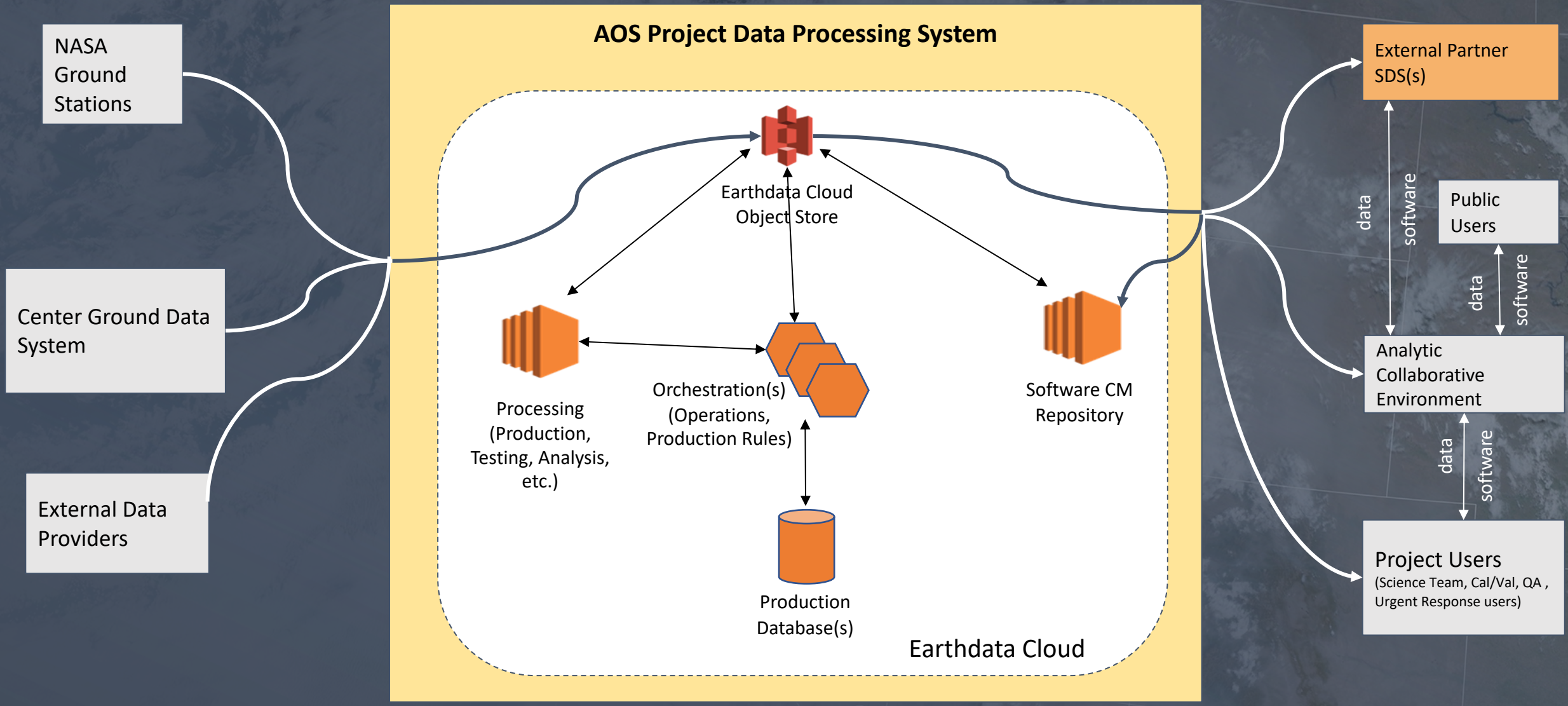
Pre-Decisional



AOS Data Processing System Architecture

Pre-Decisional



AOS Data Processing System Architecture

Current Implementation Plan

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- Early development of simulation data and processing in the *Analytic Collaborative Environment*
- Algorithm Software will decomposed into reusable parts (libraries, executables, etc.)
  - Some parts can be shared across multiple algorithms.
  - Some parts can come from legacy missions.
  - Each algorithm will need to be analyzed and decomposed.
- Software will be developed within a Configuration Management Software Repository with automated Continuous Integration / Continuous Delivery / Continuous Deployment
- Production will be based on Algorithm Software fully integrated with runtime environment into Container Images that can run across multiple platforms
- Legacy Missions:
  - MODIS/VIIRS, OMI/OMPS, GPM, CrIS, CloudSat, CALIPSO, etc.

Project Schedule

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Pre-Phase A Start	2021-06-01
Preliminary SDS Architecture and Concept of Operations	2022-03-01
SDS Verification and Validation Approach	2022-04-01
Preliminary SDS Requirements	2022-04-01
Misson Concept Review	2022-05-15
KDP-A	2022-06-30
Preliminary SDS Verification and Validation Plan	2023-02-15
Preliminary SDS Configuration Management Plan	2023-02-15
SDS System Requirements Review	2023-02-15
Mission SRR	2023-04-30
KDP-B	2023-06-30
Define At-Launch Products/Processes and Draft Early ATBDs	2024-08-01
SDS Preliminary Design Review	2024-08-01
Mission PDR	2024-10-01
KDP-C; Mission Confirmation	2024-12-01
SDS Critical Design Review	2025-08-01
Mission CDR	2025-10-01
KDP-D (Inclined)	2027-08-01
I Launch	2028-09-01
P Launch	2030-05-02

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Supporting Open Science

- AOS will support **Open Science**: *A collaborative culture enabled by technology that empowers the open sharing of data, information, and knowledge within the scientific community and the wider public to accelerate scientific research and understanding.*[1]
- Given appropriate maturity, intellectual property, legal rights and credentials (Full public access where possible), the following will be available:
  - **Open Data** will be stored in an Open Object Store
  - **Open Source Code**, including libraries, production algorithms, analysis software, etc. will be stored in an Open Configuration Management Repository
  - **Open Container Images** which encapsulate the runtime environment with the integrated algorithm allowing complete production reproducibility on multiple platforms
- To the maximum possible extent software will be developed in the open with full transparency

[1]Ramachandran, R., Bugbee, K., & Murphy, K. J. Moving from Open Data to Open Science. Earth and Space Science, Wiley Publication https://doi.org/10.1029/2020EA001562

EARTH SYSTEM OBSERVATORY

Other

- Allow new processing software frameworks to be adopted and adapted rather than standardizing on one "stagnant" solution that tries to fit everyone
- Standardize ***interface*** from algorithm to processing framework
  - Encapsulate runtime environment with container images compatible with Open Container Initiative to ensure broadest possible support
  - It should be possible to plug in any algorithm into any processing framework
  - Keep interface standards as simple as possible as a “lowest common denominator” to allow maximum flexibility rather than trying to dictate how everything gets done
  - Allow flexibility in production rule specification