Open Source Science For ESO Mission Data Processing Study

Oct 19th, 2021

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Study Goal

Identify and assess potential architectures that can meet the ESO mission science data processing objectives

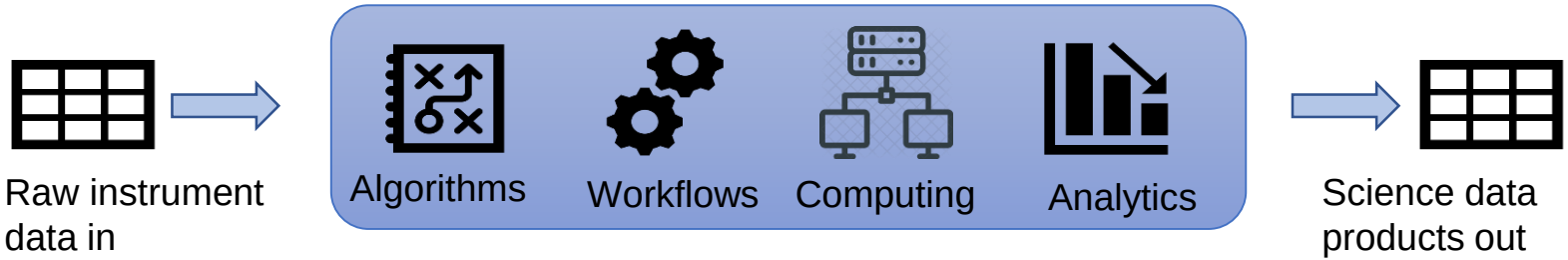
- promote open science principles,
- enable data system efficiencies,
- support earth system science.

Aligns with the challenge set down by Karen St. Germain to create a single observatory that combines data from the ESO missions to understand the earth as a system and accelerate our ability to apply this understanding (Presentation on June 14, 2021).

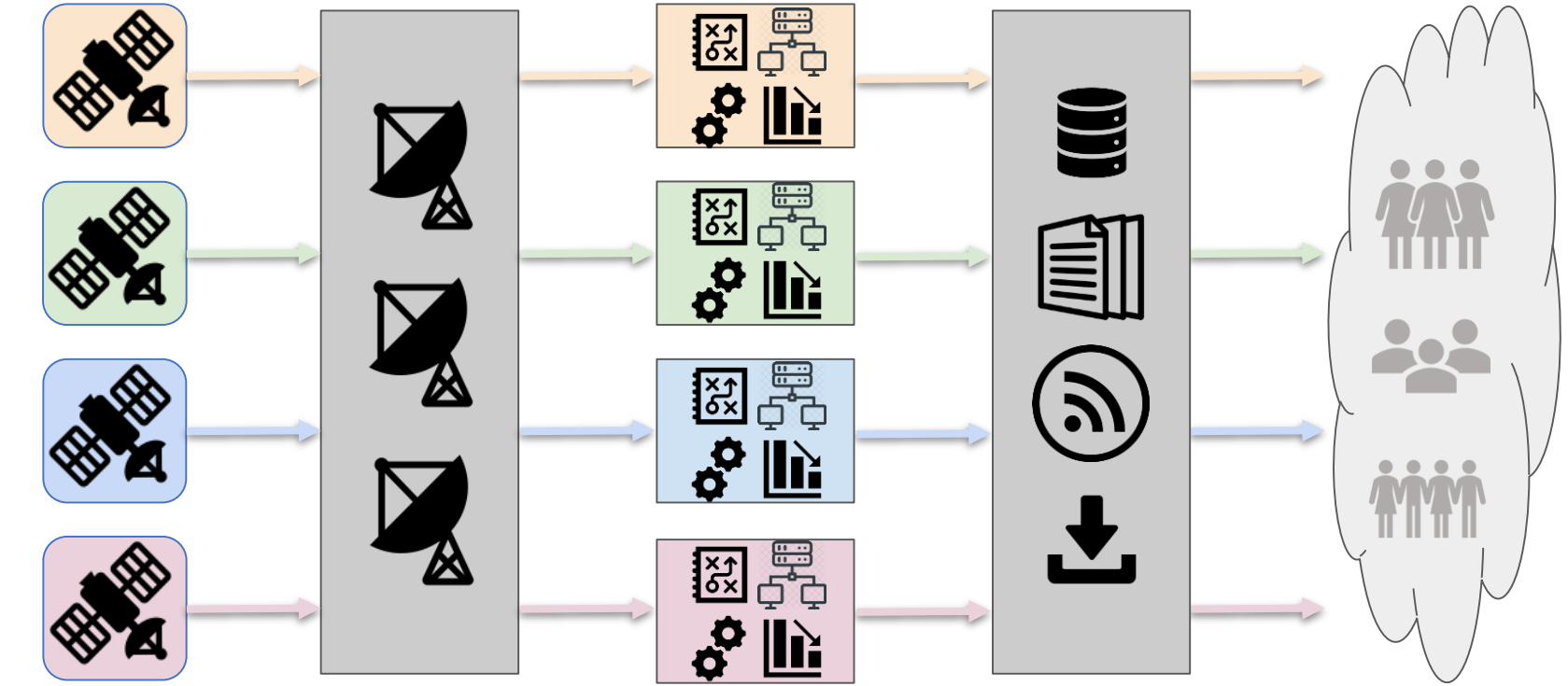
Definition of a Mission Science Processing System

The set of algorithms, software, compute infrastructure, operational procedures, and documentation to automatically process raw instrument data through to science quality data products.

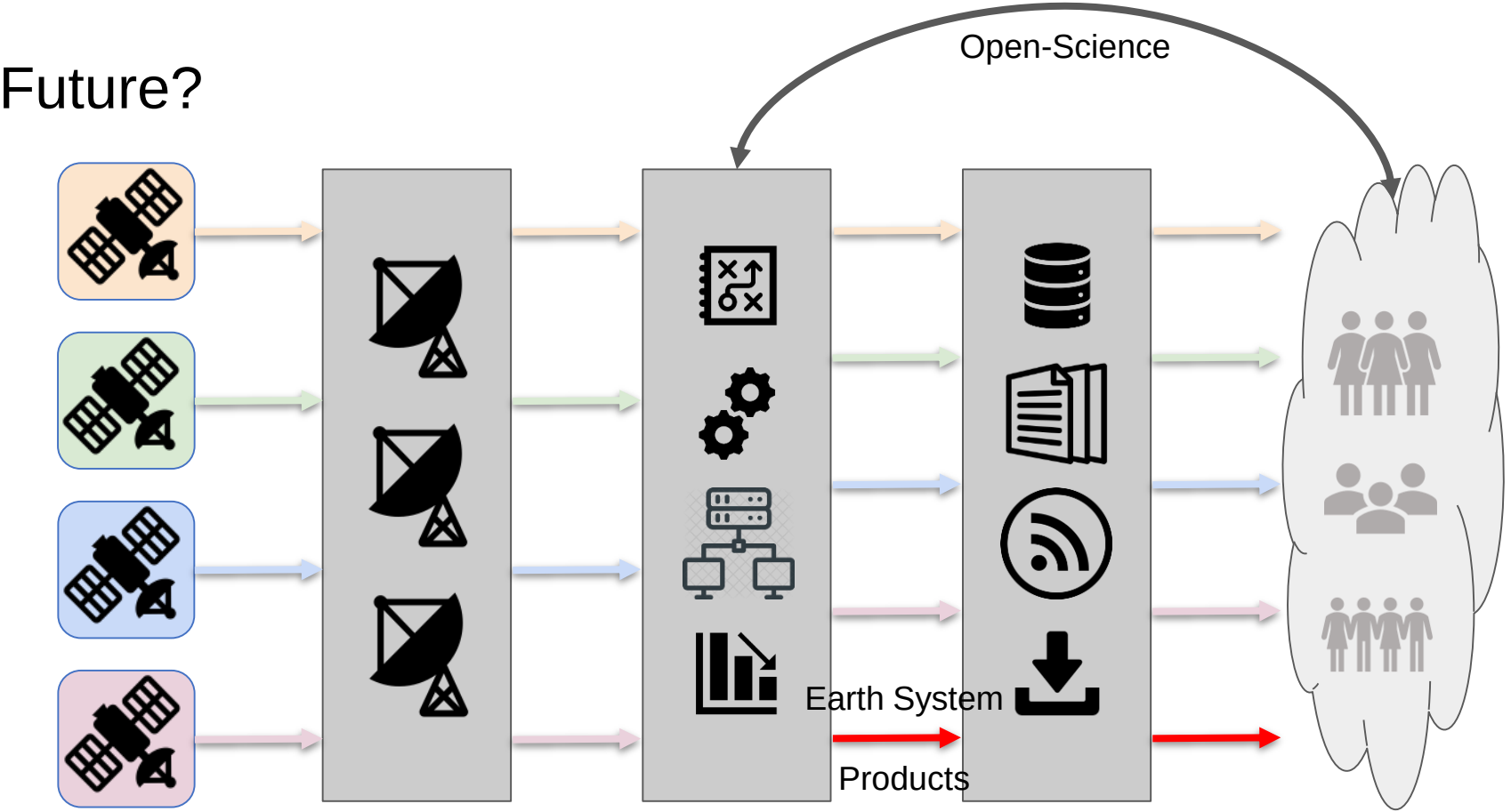
This includes the software tools that support the development of the processing algorithms and validation and analysis of the processed data.



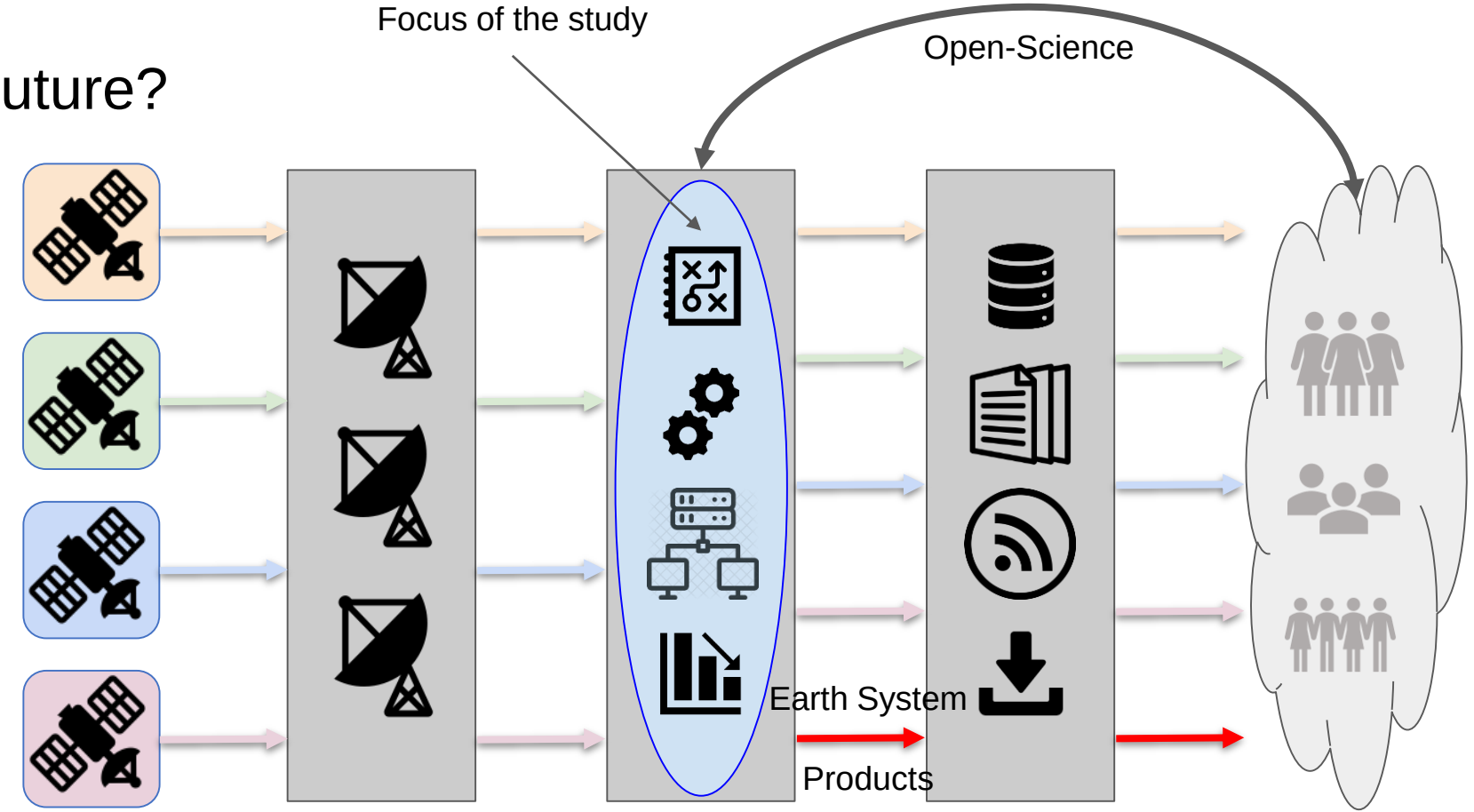
Current Ground System Architecture



Future?


Open-Science
Earth System
Products
ESO Instruments
Ground Stations
(Multimission)
Processing
(Multimission)
Archive & Distribution
(Multimission)
End Users

Future?


Focus of the study
Open-Science
Earth System
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(Multimission)
Processing
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Archive & Distribution
(Multimission)
End Users

Study Participation

Steering Team

- Andrew Bingham, JPL
- Andrew Mitchell, GSFC
- Chelle Gentemann, Farallon Institute
- Luke Dahl, JPL

System Engineering Support

- Karen Yuen, JPL
- Sara Lubkin, GSFC

System Architecture Working Group (SAWG)

- Co-Chairs
  - **Elias Sayfi** (JPL)
  - **Natasha Stavros** (U. Colorado, CIRES)
- ESO Mission Representatives
  - **Hook Hua** (SBG & NISAR/SDC)
  - **Curt Tilmes** (AOS)
  - **Bernie Bienstock** (MC)
- Community Representatives
  - **TBD** (Instrument/Science algorithm developer)
  - **Wenying Su** (Science applications developer)(LaRC)
  - **Andy Michaelis** (Open source developer)(ARC)
  - **Lesley Ott** (Numerical modeler)(GSFC)
- Large Scale Processing Systems Representatives
  - **Evelyn Ho** (ESDIS) (GSFC)
  - **Chris Engebretson** (USGS)
  - **Adrian Parker** (NOAA)
  - **Sean Harkin** (MSFC)

Study Approach

- Workshop #1 - Understand the NASA program goals and ESO mission needs.
  - Virtual, Oct 2021
- Workshop #2 - Understand the state-of-the-art in mission data processing systems and open science, as well as seek community input.
  - In person, Feb 2022
- System Architecture Study - Conduct a 4 month architecture study.
  - Apr - Jul, 2022
  - Will reach-back to the ESO missions through the SAWG members
- Workshop #3 - Make a recommendation.
  - Aug, 2022

System Architecture Study Working Group (SAWG)

Collect and evaluate the architecture drivers

- ESO program goals, constraints, and opportunities.
- ESO mission objectives and requirements.
- State of the practice in open-science and data processing systems.
- Community recommendations.

Perform a trade study

- Establish viable architectural options and implementation approaches.
- Establish weighting criteria, execute, and analyze the trade space.

Make a recommendation

- Document the approach and conclusions.

Goals of Workshop #1

1. Understand the requirements, objectives, and constraints driving each mission science data processing system.
2. Seek opportunities to advance the science data systems in the context of
    a. Enabling efficiency,
    b. Supporting Earth system science,
    c. Promotion open source science.
3. Establish programmatic and mission point of contacts in support of co-development of future ideas and concepts.

Success criteria: Report summarizing the findings.

Agenda

Day 1: Tuesday October 19th, 2021 (1 - 5 PM EST)

Duration	EST	PST	Topic	Speaker
0:05	1:00 PM	10:00 AM	Welcome & Purpose	Andrew Mitchell
0:15	1:05 PM	10:05 AM	Earth Science Division (ESD) Opening Remarks	Kevin Murphy
0:15	1:20 PM	10:20 AM	SMD Scientific Information Policy	Steven Crawford
0:15	1:35 PM	10:35 AM	Overview of the Mission Processing Study	Andrew Bingham
0:15	1:50 PM	10:50 AM	ESDS Perspective of Open Science	Katie Baynes
0:15	2:05 PM	11:05 AM	Q&A with the System Architecture Working Group	
0:10	2:20 PM	11:20 AM	Break	
0:15	2:30 PM	11:30 AM	Flight Projects Program Perspective	Charles Webb, Kathleen Boggs
0:15	2:45 PM	11:45 AM	R&A Program Perspective	Jack Kaye (TBC)
0:15	3:00 PM	12:00 PM	Earth Science Technology Office (ESTO) Perspective	Pam Millar, Jacqueline Lemoigne-Stewart, Ben Smith
0:15	3:15 PM	12:15 PM	Q&A with the System Architecture Working Group	
0:10	3:30 PM	12:30 PM	Break	
0:15	3:40 PM	12:40 PM	Applied Science Program Perspective	Lawrence Friedl (TBC)
0:15	3:55 PM	12:55 PM	High Performance Computing (HPC) Perspective	Tsengdar Lee (TBC)
0:10	4:10 PM	1:10 PM	Q&A with the System Architecture Working Group	
0:30	4:20 PM	1:20 PM	Open Discussion	
	4:50 PM	1:50 PM	END	

Day 2: Wednesday October 20th, 2021 (12:20 - 5 PM EST)

Duration	EST	PST	Topic	Speaker
0:10	12:20 PM	9:20 AM	Recap & Agenda	
0:15	12:30 PM	9:30 AM	NISAR Programatic Perspective	Gerald Bawden
0:15	12:45 PM	9:45 AM	NISAR Project Science	Paul Rosen
0:15	1:00 PM	10:00 AM	NISAR Project Data Processing Systems	Hook Hua
0:10	1:15 PM	10:15 AM	Q&A with the System Architecture Working Group	
0:05	1:25 PM	10:25 AM	Break	
0:15	1:30 PM	10:30 AM	AOS Programatic Perspective	Hal Maring
0:15	1:45 PM	10:45 AM	AOS Project Science	Scott Braun
0:15	2:00 PM	11:00 AM	AOS Project Data Processing Systems	Robert Wolfe
0:10	2:15 PM	11:15 AM	Q&A with the System Architecture Working Group	
0:05	2:25 PM	11:25 AM	Break	
0:15	2:30 PM	11:30 AM	MC Programatic Perspective	Lucia Tsaoussi
0:15	2:45 PM	11:45 AM	MC Project Science	David Wiese
0:15	3:00 PM	12:00 PM	MC Project Data Processing Systems	David Wiese
0:10	3:15 PM	12:15 PM	Q&A with the System Architecture Working Group	
0:05	3:25 PM	12:25 PM	Break	
0:15	3:30 PM	12:30 PM	SBG Programatic Perspective	Woody Turner, Ben Phillips, Laura Lorenzoni
0:15	3:45 PM	12:45 PM	SBG Project Science	Dave Schimel
0:15	4:00 PM	1:00 PM	SBG Project Data Processing Systems	Jeff Pon
0:10	4:15 PM	1:15 PM	Q&A with the System Architecture Working Group	
0:30	4:25 PM	1:25 PM	Open Discussion	
	4:55 PM	1:55 PM	END	