Open Source Science For ESO Mission Data Processing Study

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Study Goal

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

- promote open science principles,
- enable data system efficiencies,
- support Earth system science,
- expand participation to mission science beyond the funded science teams.

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).

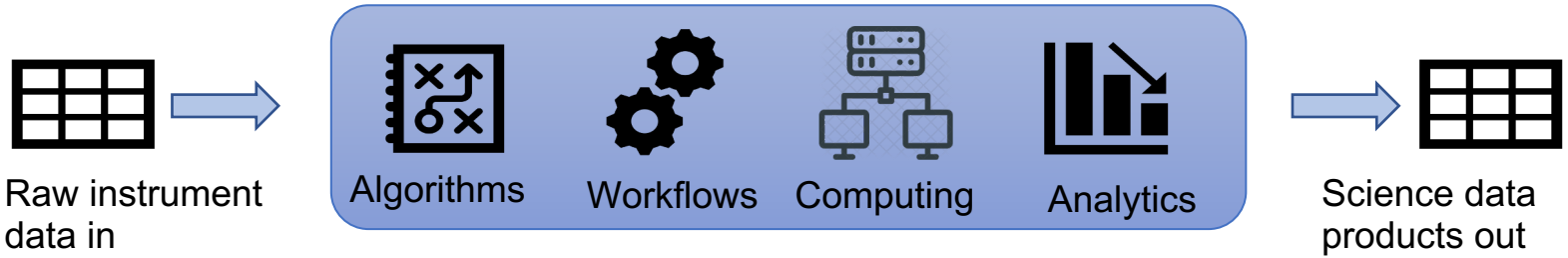
Study Principles

- Will establish a System Architecture Working Group to study the potential architectures
  - Comprised of science data system experts who represent the diversity of the data system community and are connected to the end-user science community.
  - Consist of members from the ESO missions.
- Meetings will be held in the open
  - Workshops will be recorded.
  - Workshop artifacts will be citable with DOIs and accessible through the Study website and Github.
  - Notes from One-on-One meetings (between the study team and other entities) will be accessible.
- Will ensure community participation
  - Provide mechanisms for continuous feedback.
  - Actively seek out feedback from historically excluded communities.

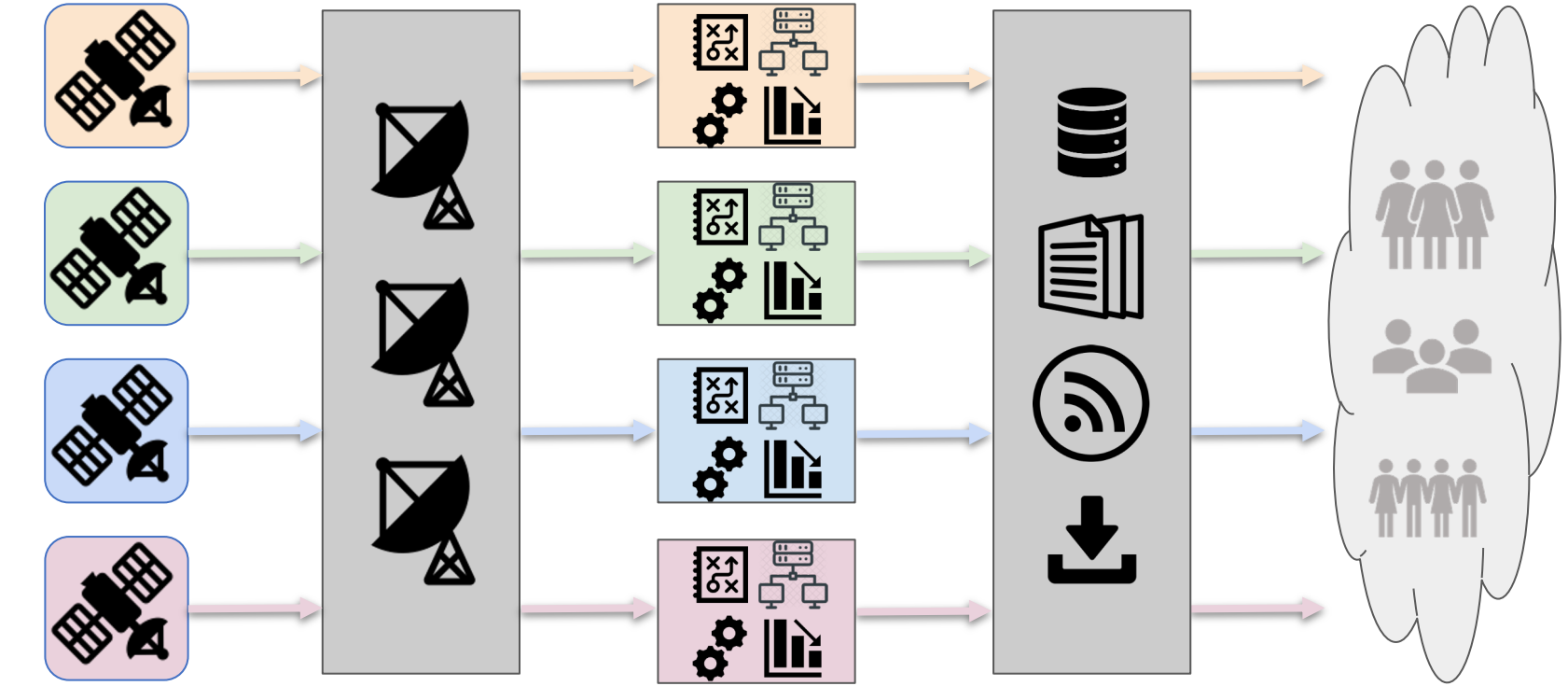
Definition of a Mission Science Processing System

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

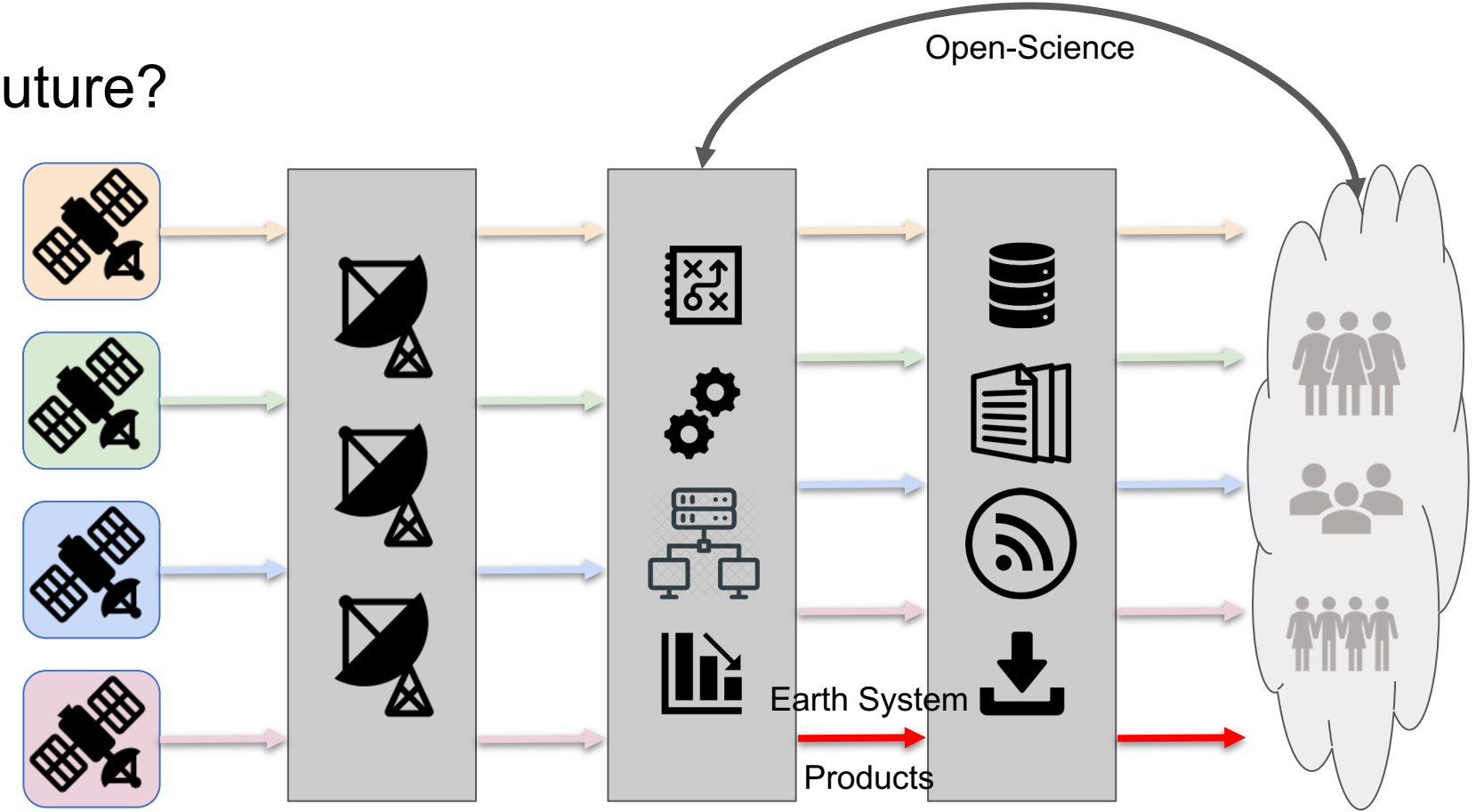
This includes the software tools that support the development of the processing algorithms and validation and analysis of the processed data.



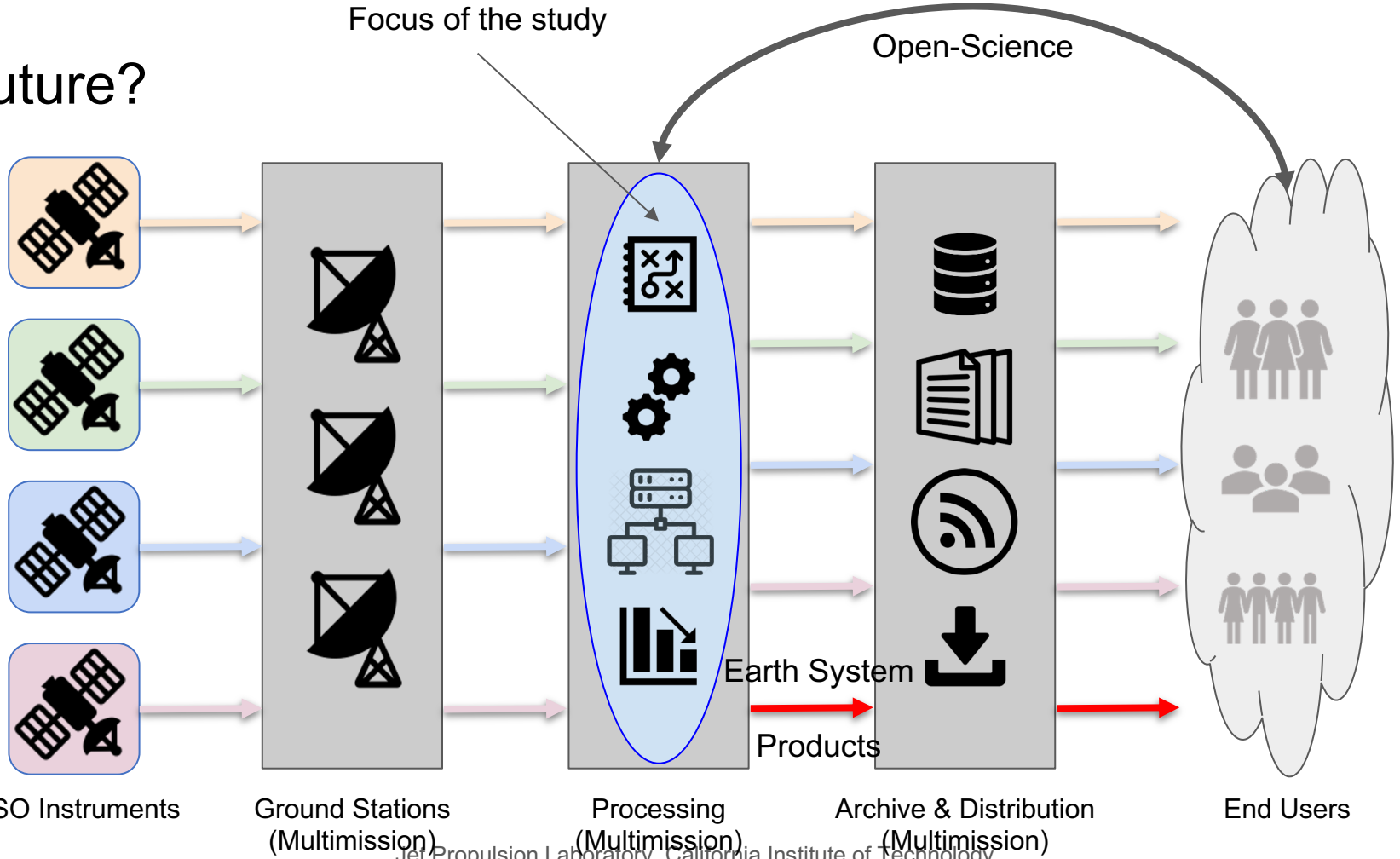
Current Ground System Architecture



Future?


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

Future?


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

Study Participation

Steering Team

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

Technical 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)

System Architecture 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.

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
  - Invitation & RFI
- 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.
  - Virtual, Aug 2022

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. Promoting open source principles,
    b. Enabling data system efficiency,
    c. Supporting Earth system science,
    d. Expanding participation.
3. Establish programmatic and mission point of contacts in support of co-development of future ideas and concepts.

Success criteria: Report summarizing the findings.