Vision and Objectives

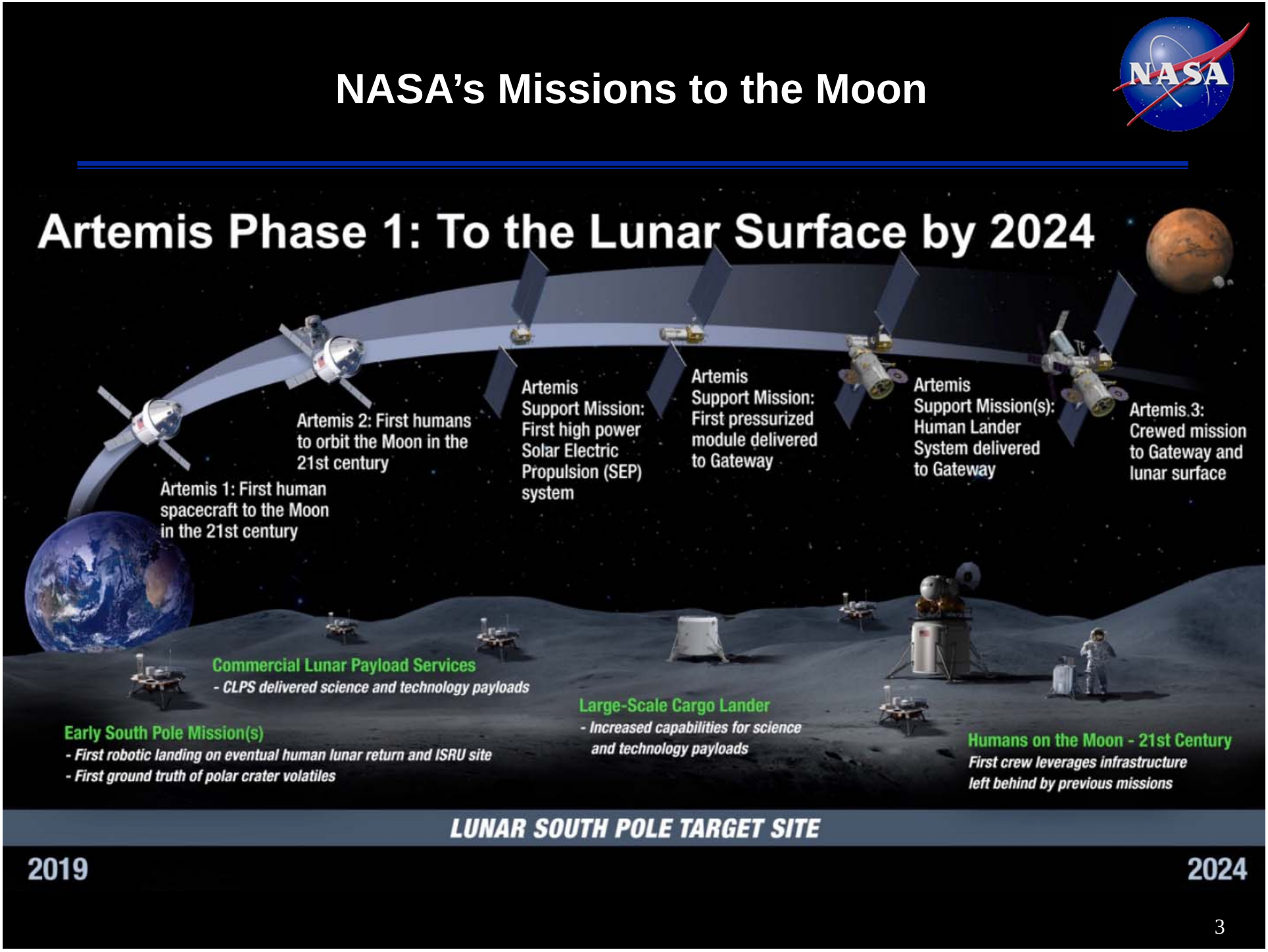
Chris Hansen, EVA Office Manager
EVA Office on behalf of the Gateway Program

NASA'S Vision and Objectives

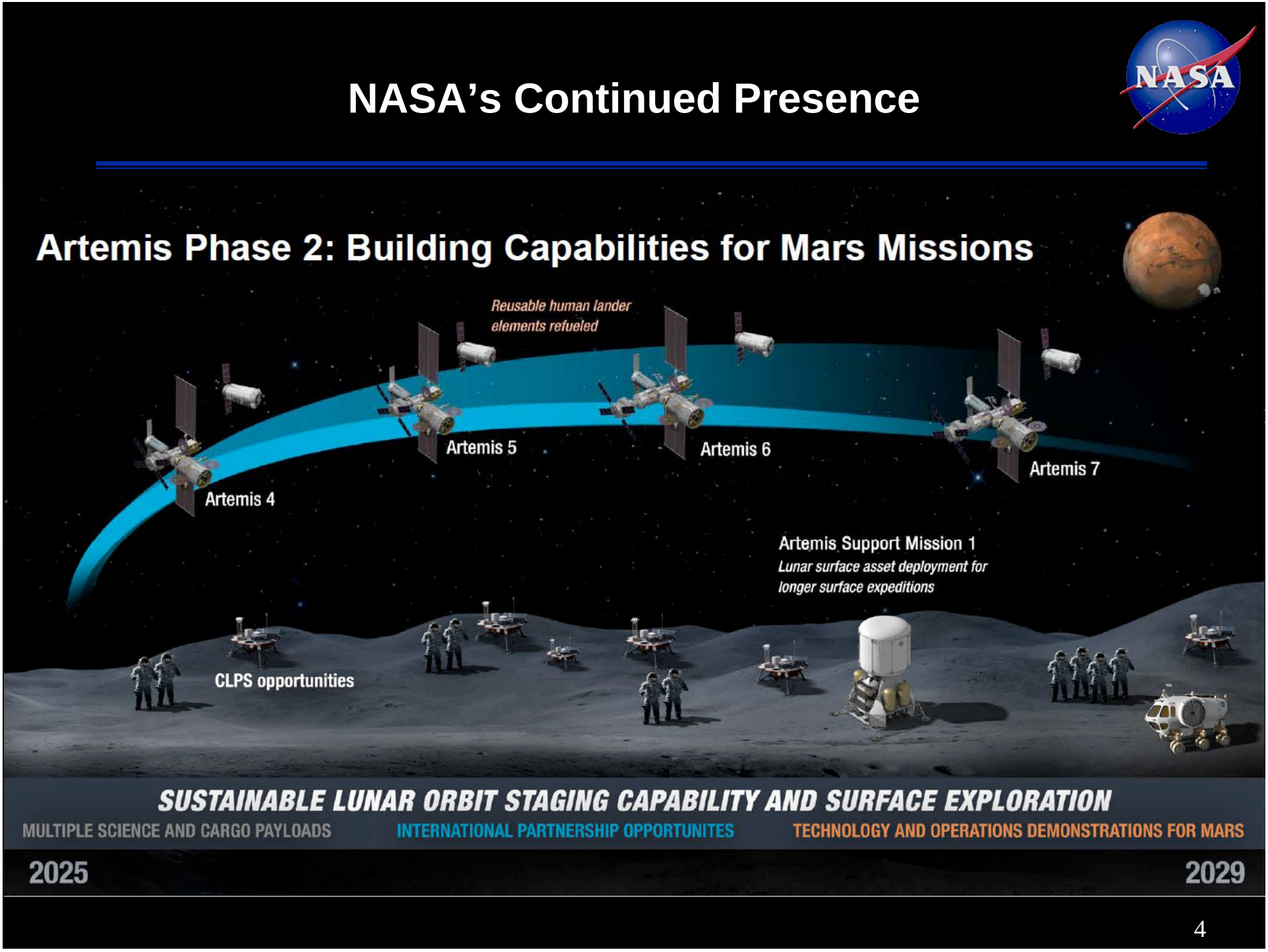
Space Policy Directive 1: To the Moon, then Mars

"Lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities. Beginning with missions beyond low-Earth orbit, the United States will lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations…"

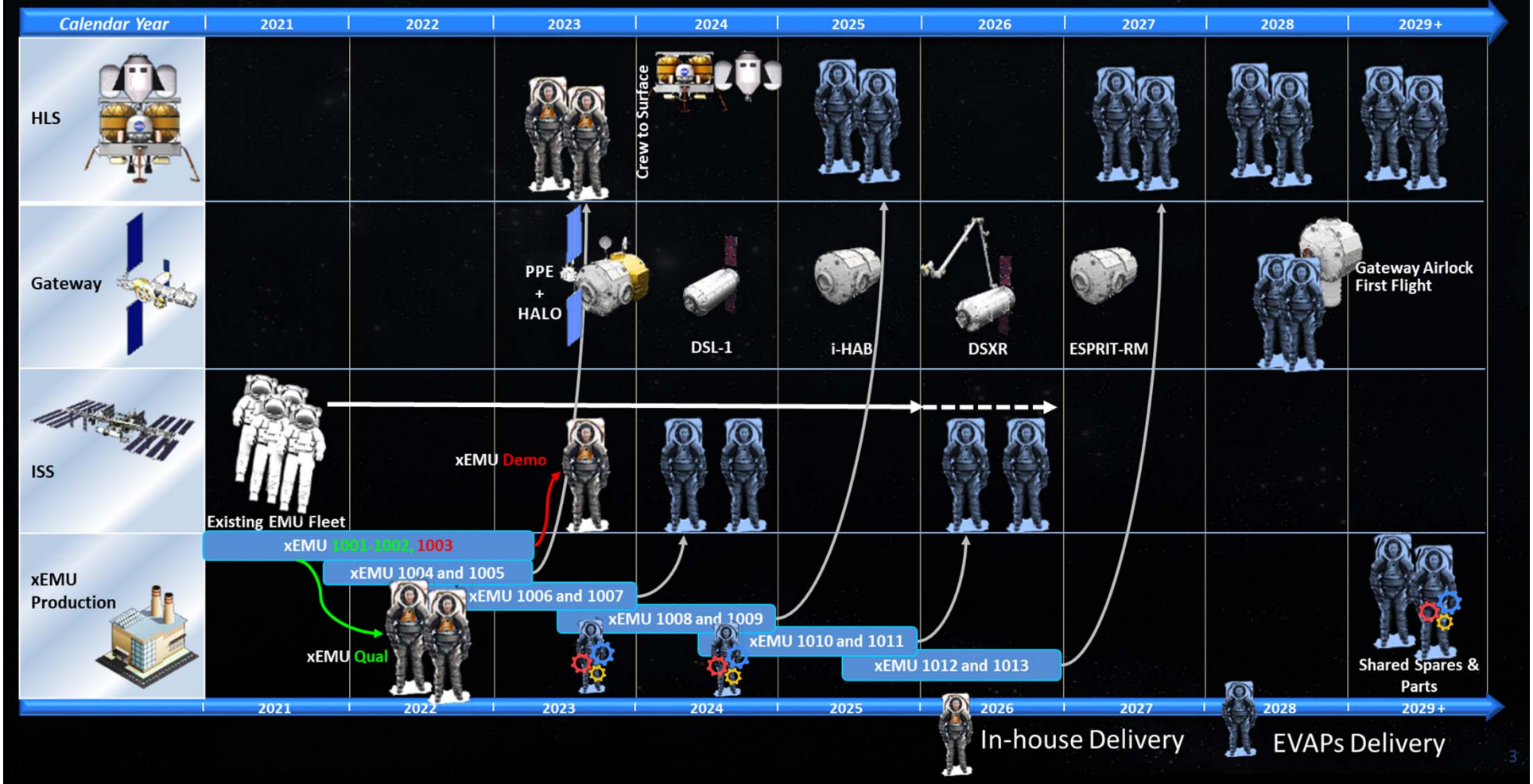
NASA's Missions to the Moon



NASA's Continued Presence



Notional xEVA Integrated Program Strategy



The Exploration EVA suit architecture will support a sustainable Lunar campaign and fulfill multi-programs/roles

EVA Office Vision/ Objectives

- NASA with an immense amount of industry assistance is embarking on the first flight certification of a new EVA suit in almost 40 years
- To support extension of ISS and missions to Cis-lunar space and the Lunar Surface we are looking for a vendor to take lead for production and servicing of a suite of exploration EVA hardware
  - xEMUs
  - Vehicle Integration Equipment
  - Exploration Tools
- We are looking for vendors who:
  - Can lead the transition of the in-house development into an efficient production environment
  - Is open to reducing the barriers to entry for component suppliers while maintaining a healthy and reliable supply chain
  - Can partner with NASA to maintain open communication and data sharing
  - Is prepared to make improvements to the design to improve production schedule, suit reliability & performance while reducing overall life cycle cost

Technical Overview
Proposed Contract

Stephanie Flint, PDT Chair

Starting with the Basics…

- xEMU is NASA's next generation spacesuit for the 2024 Lunar Surface mission
- xEMU is deep space / micro-gravity compatible and is intended to support missions on ISS, HLS, and Gateway
- We are leveraging industry capabilities to produce the required fleet of lunar suits and provide the necessary services to maintain the xEVA System

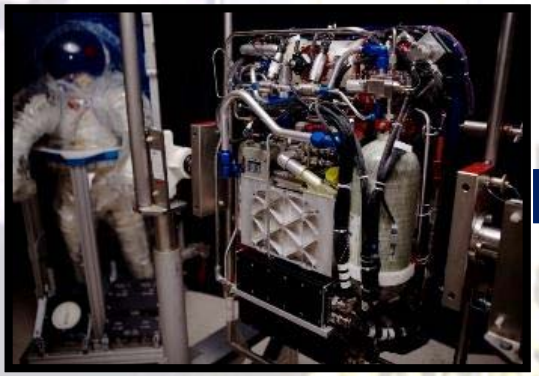
When the first woman and next man step foot on the Moon in 2024, they will be wearing the next generation of spacesuits designed to give astronauts enhanced mobility to accomplish their exploration tasks on the lunar surface!

NEWS: Our #Artemis astronauts will #SuitUp in a high-tech spacesuit called xEMU. @NASA will build the 2024 suit for the first woman and next man on the Moon. We'll ask U.S. companies to manage production for 2025 & beyond. More: https://t.co/5g2KDcHdHs

Jim Bridenstine
twitter.com

Exploration Extravehicular Mobility Unit (xEMU)

xEMU Subsystems



PLSS 2.0 Test Unit
(~May 2014)

Final xEMU PLSS
Packaging (Aug 2019)

Pressure Garment Subsystem

- The pressure garment prototype has been assembled and tested with flight crew, including small-stature females that have historically not been fit by prior EVA Suit designs
- The pressure garment components for the pre-qual test unit (DVT) are in production and assembly

Portable Life Support Subsystem

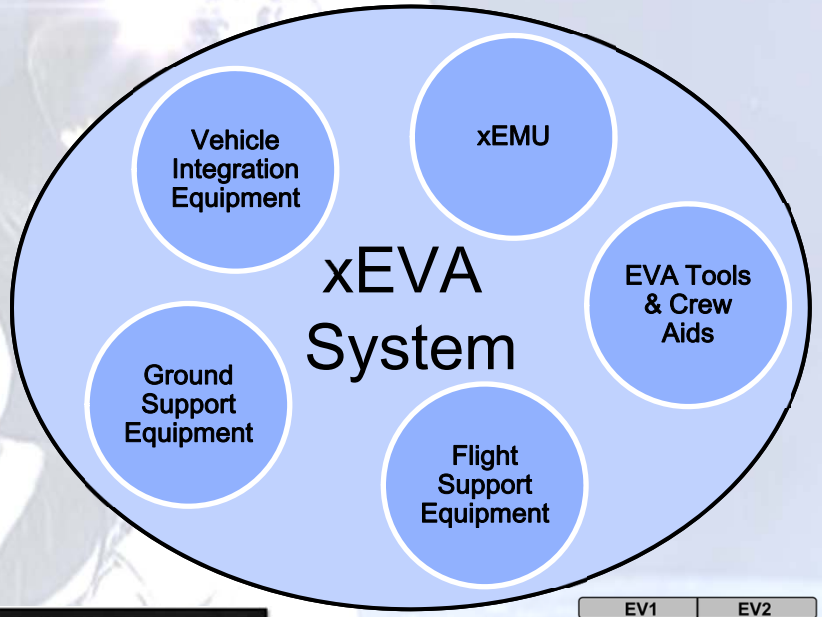
- NASA has invested in exploration EVA Life Support over the last ~10 years, developing a design with inputs from across the aerospace/human spaceflight community
- Several generations of components have been acquired leading up to present day, raising the Technology Readiness Level (TRL) with the aim of increasing the industry base.
- A majority of critical components are sourced from Commercial and Industrial suppliers

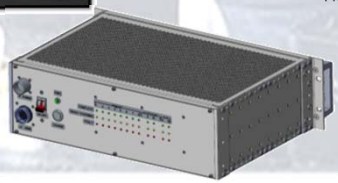
xEVA System is More than a Suit

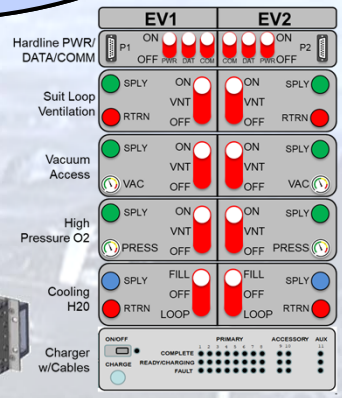
- The xEVA System will be capable of operating in micro and partial gravity and interfacing with multiple vehicles depending on the mission concept of operations.

MICRO-GRAVITY EVA ON A SPACECRAFT
(ENGINEERED SURFACE)

PARTIAL-GRAVITY EVA ON LUNAR SURFACE
(IN A VACUUM)







Development Status

- The Exploration EVA team is at the mid-point of flight design, development, and certification of the exploration suit, VIE, FSE, and Tools for Lunar Surface and Deep Space.

- Initial flight copies of this suit and system hardware will be produced by NASA to support initial Lunar sortie mission in 2024 and an ISS demonstration in 2023

- NASA is aiming to increase the competitive industry base for EVA by commercializing fleet production

Assume that the xEMU will evolve from the ISS 2023 Demonstration and 2024 Lunar configurations into a sustained ISS and Lunar presence spacesuit.

Scope of Work
(CLINS 1 - 3)

- In-source remaining DDT&E, assembly, and certification of initial test hardware and first three Exploration EVA (xEVA) shipsets to support ISS demo and Artemis III
  - NASA led DDT&E to enable design flexibility as vehicle contracts awarded and con ops matures
  - Utilize existing NASA facilities, equipment, and experienced team for parallel test series to accelerate schedule
  - After certifying and validating xEMU design, NASA can effectively move fleet production and sustaining back to industry
- Out-source follow-on production, sustaining, operations, and DDT&E for xEVA
  - Goal to bring on production Contractors prior to xEMU CDR to ensure seamless transition
  - To receive valuable independent assessments of the current design
  - To begin and conduct an efficient transition towards independent capability to provision and maintain a fleet of xEVA System hardware
  - Maintain a sustained pace of flight and training production and support services

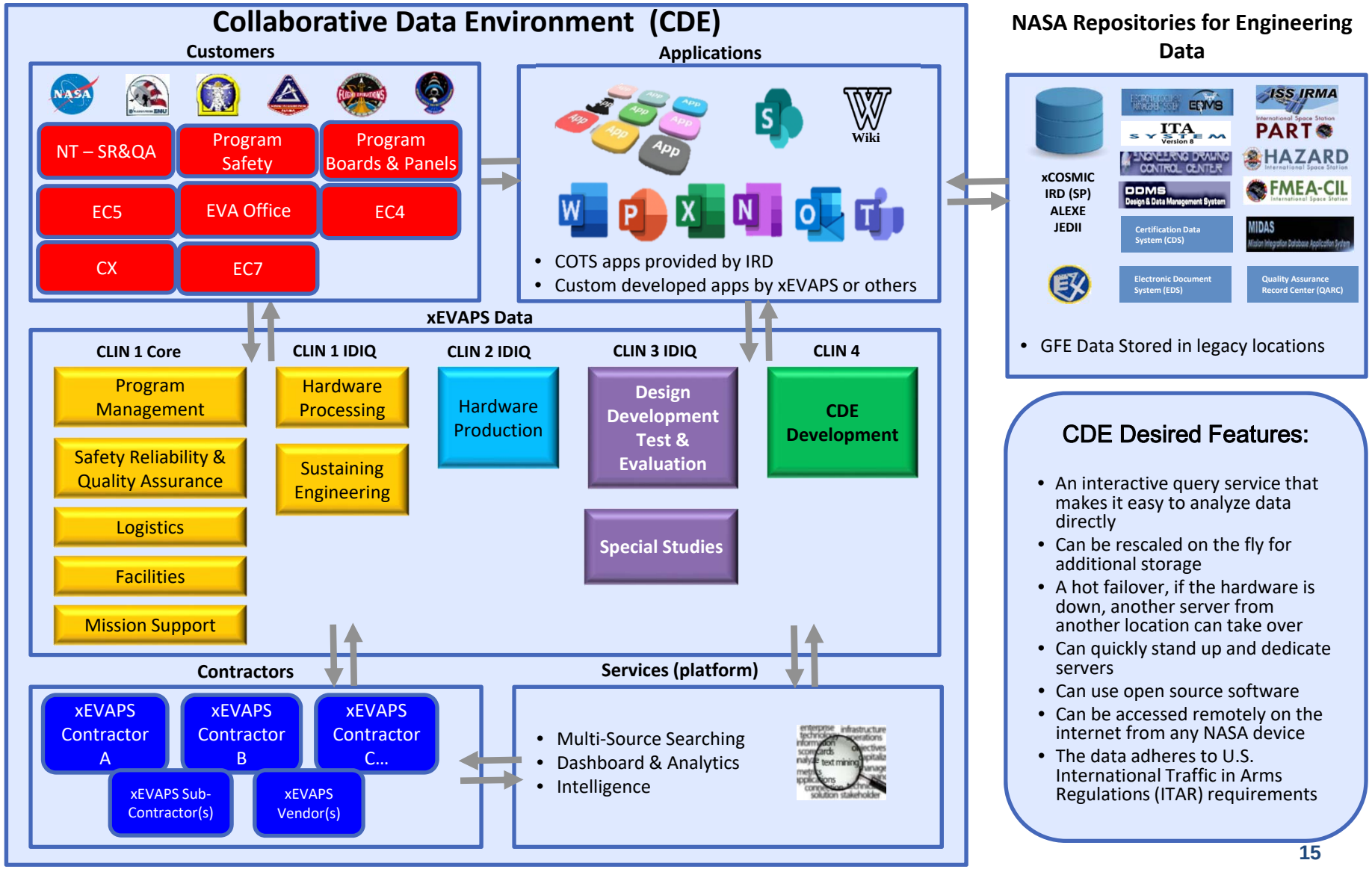
Scope is ultimately driven by our need to support Artemis III by 2024 and our desire to engage the best of Industry to support future missions.

What is a Collaborative Data Environment (CDE)?

The CDE is the data system the xEVA Community will use to collect, disposition, verify, store, search, retrieve, and report all types of xEVA Systems information and data

- All xEVAPS contractors will interface with each other and NASA through the CDE
- CDE Functions:
  - Stores and manages all xEVAPS contractor data (i.e. all data development under this contract)
  - Interfaces to many of the existing NASA repositories of xEVA System Data, such as the xEVA Project/Program Specifications, engineering, safety, and technical data
  - Supports the necessary business functions for the contract
  - Provides intuitive, quick, and easy access all xEVA System data
- CDE Infrastructure:
  - Leverages existing NASA, Contract partner, and COTS applications
  - COTS application customization and custom application development
- CDE Support Services:
  - Operations Management
  - Maintenance
  - End-user Support
  - Enhancement

What is a Collaborative Data Environment?



CDE Desired Features:

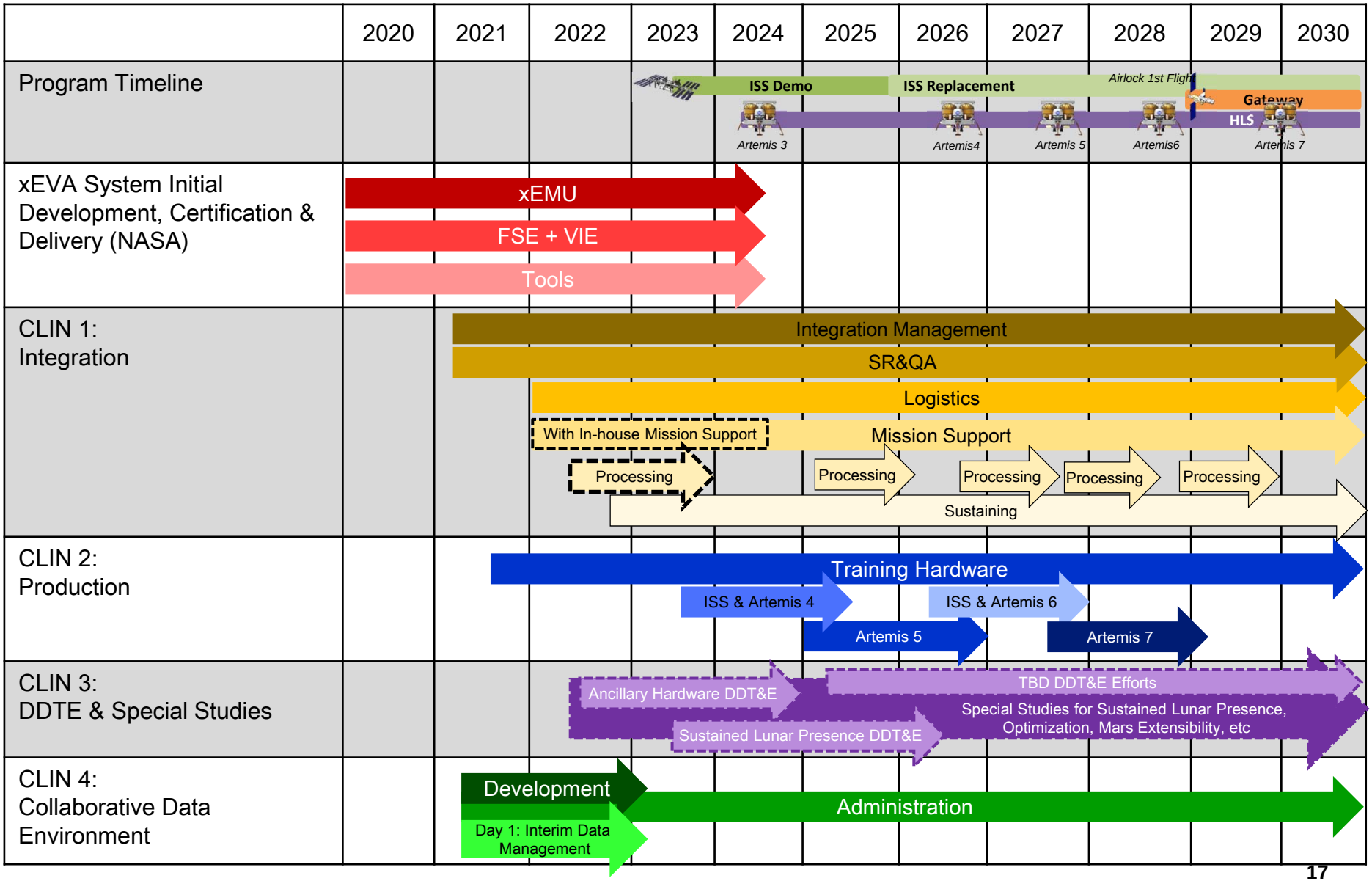
- An interactive query service that makes it easy to analyze data directly
- Can be rescaled on the fly for additional storage
- A hot failover, if the hardware is down, another server from another location can take over
- Can quickly stand up and dedicate servers
- Can use open source software
- Can be accessed remotely on the internet from any NASA device
- The data adheres to U.S. International Traffic in Arms Regulations (ITAR) requirements

Scope of Work
(CLIN 4)

The CLIN 4 provider will be responsible for establishing the CDE platform and processes needed to administer the xEVAPS Data

- Interim Data Management (Day 1 Plan)
  - Use existing NASA or COTS tools and processes to perform the data management and business analysis functions (DRDs financials, configuration management, etc.) until the CDE is developed and ready for implementation
- Development of CDE
  - Establish requirements for workflows needed based on the requirements of the other CLINs Statement of Work
  - Develop technical requirements for the CDE based on existing applications and user inputs
  - Begin development of the CDE to perform all the functions listed in the Performance Work Statement (PWS)
  - Migrate data from the interim data management solution to the CDE
- Administration of CDE
  - Ensure the environment is operating at the required performance and quality levels
  - Perform routine maintenance of the CDE based on the PWS

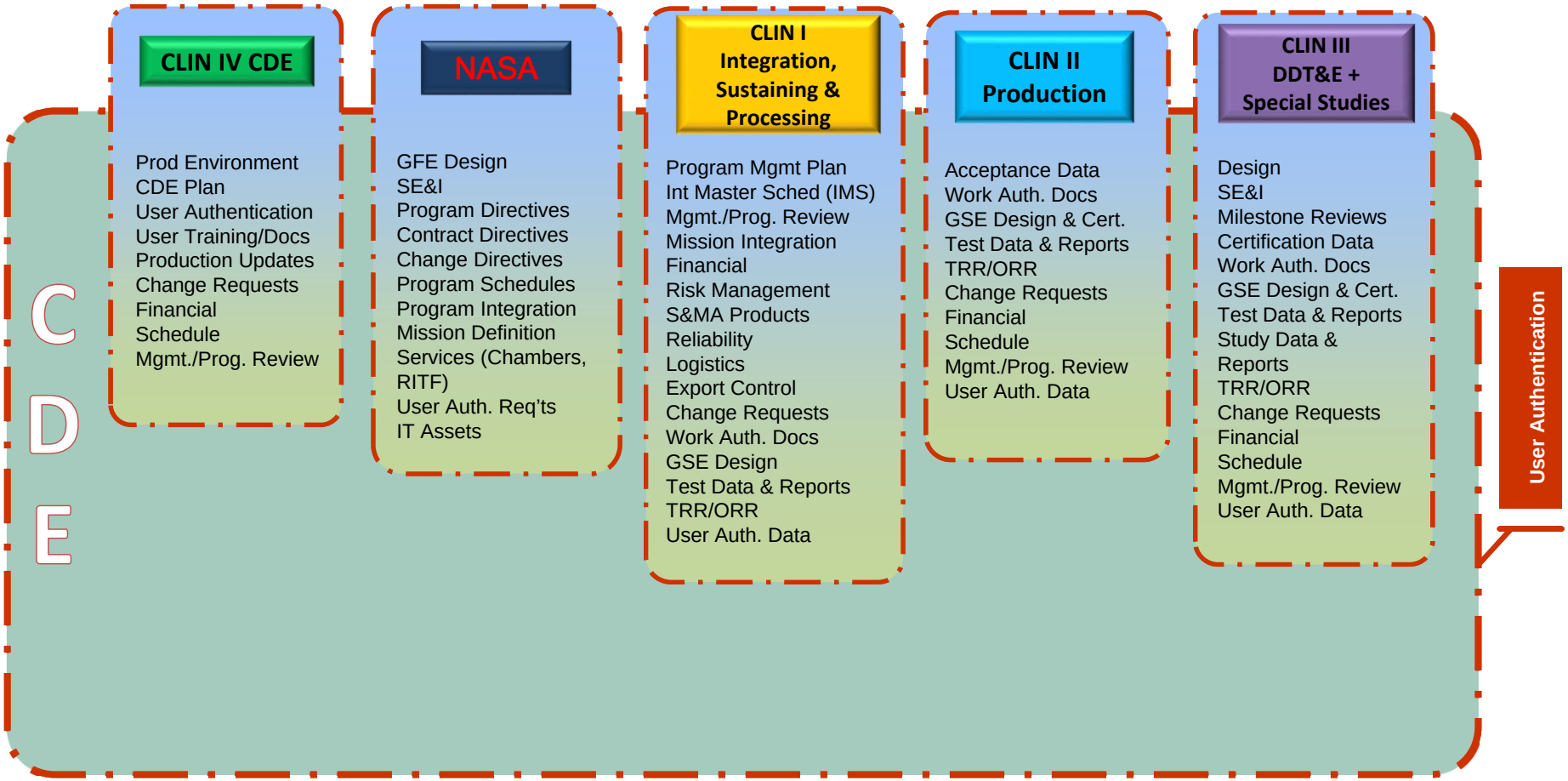
Notional Timeline for xEVAPS Scope



Collaboration

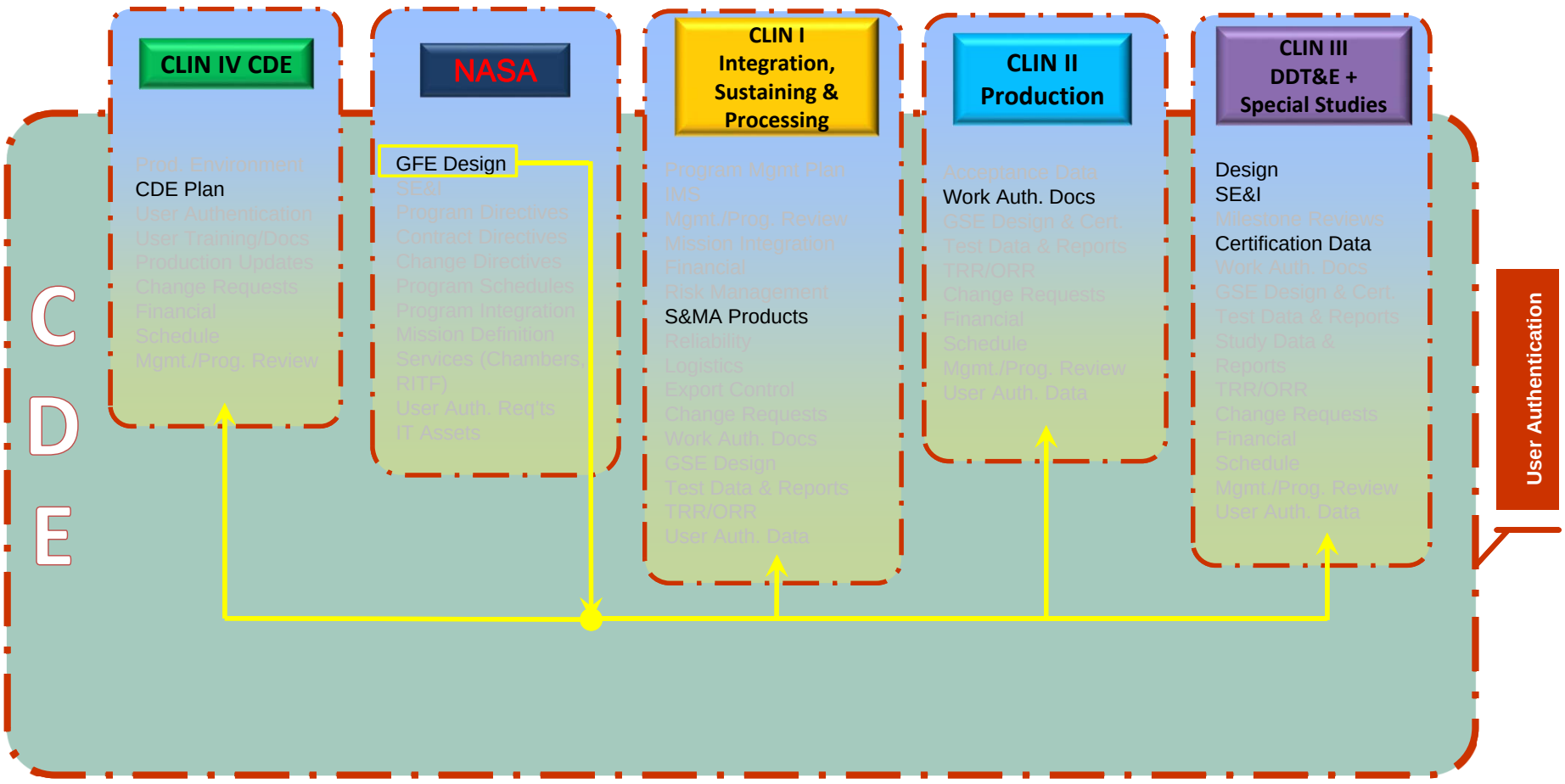
- In order to accomplish this scope of work, need collaboration among all the xEVAPS partners and NASA
- NASA's intent is to establish a cooperative working environment among the Contractors to provide the best capabilities of each partner toward xEVA System implementation
- NASA values open access of all xEVAPS partners to xEVA System data and expects limitations on access to data only where necessary
- Given the challenges of a multi-partner effort, the following slides provide examples of how data will flow through the CDE and be used by the partners

Data Management for the xEVAPS Contract



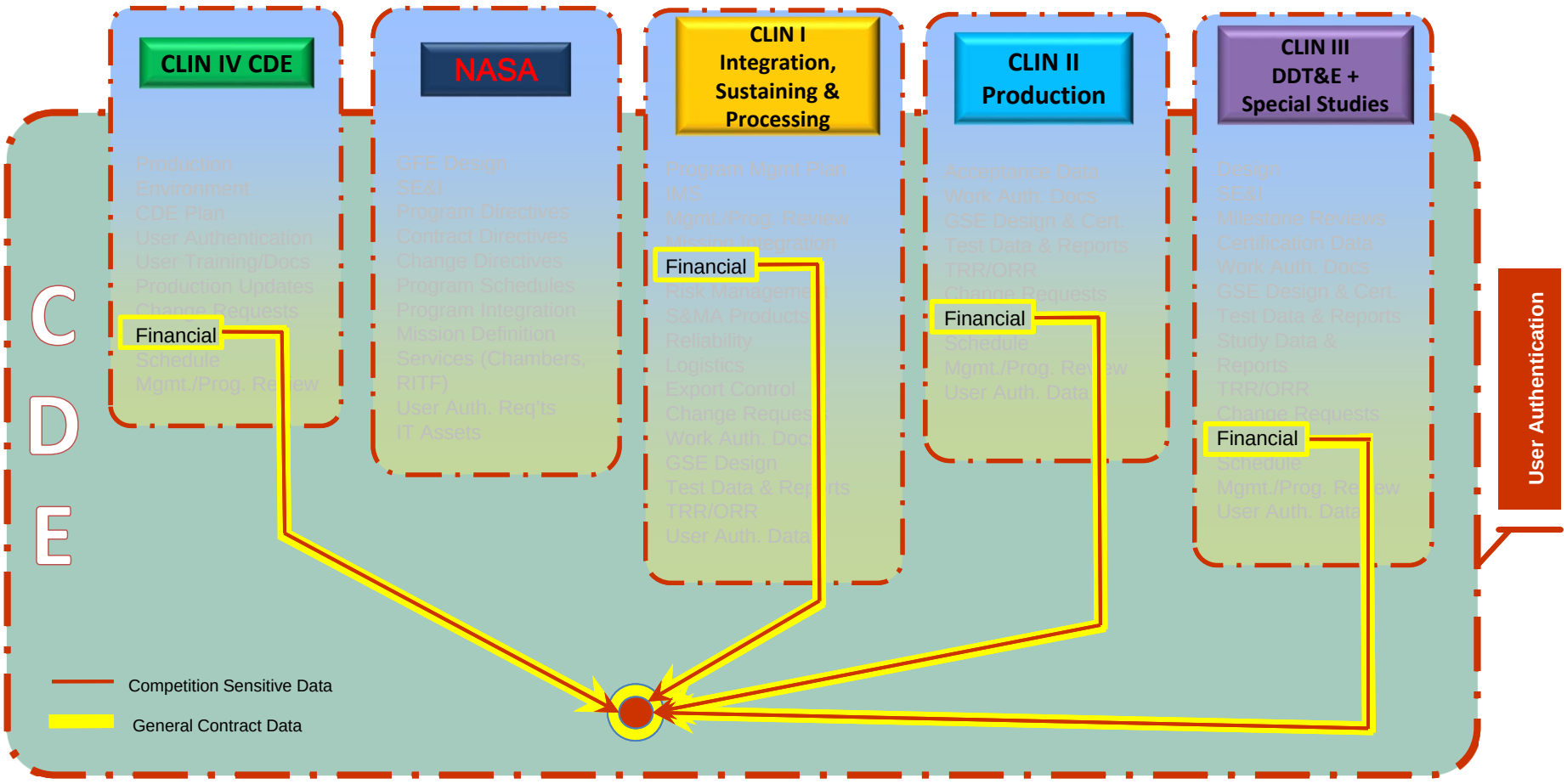
CDE Interface Diagram Example:

Movement of Design Data



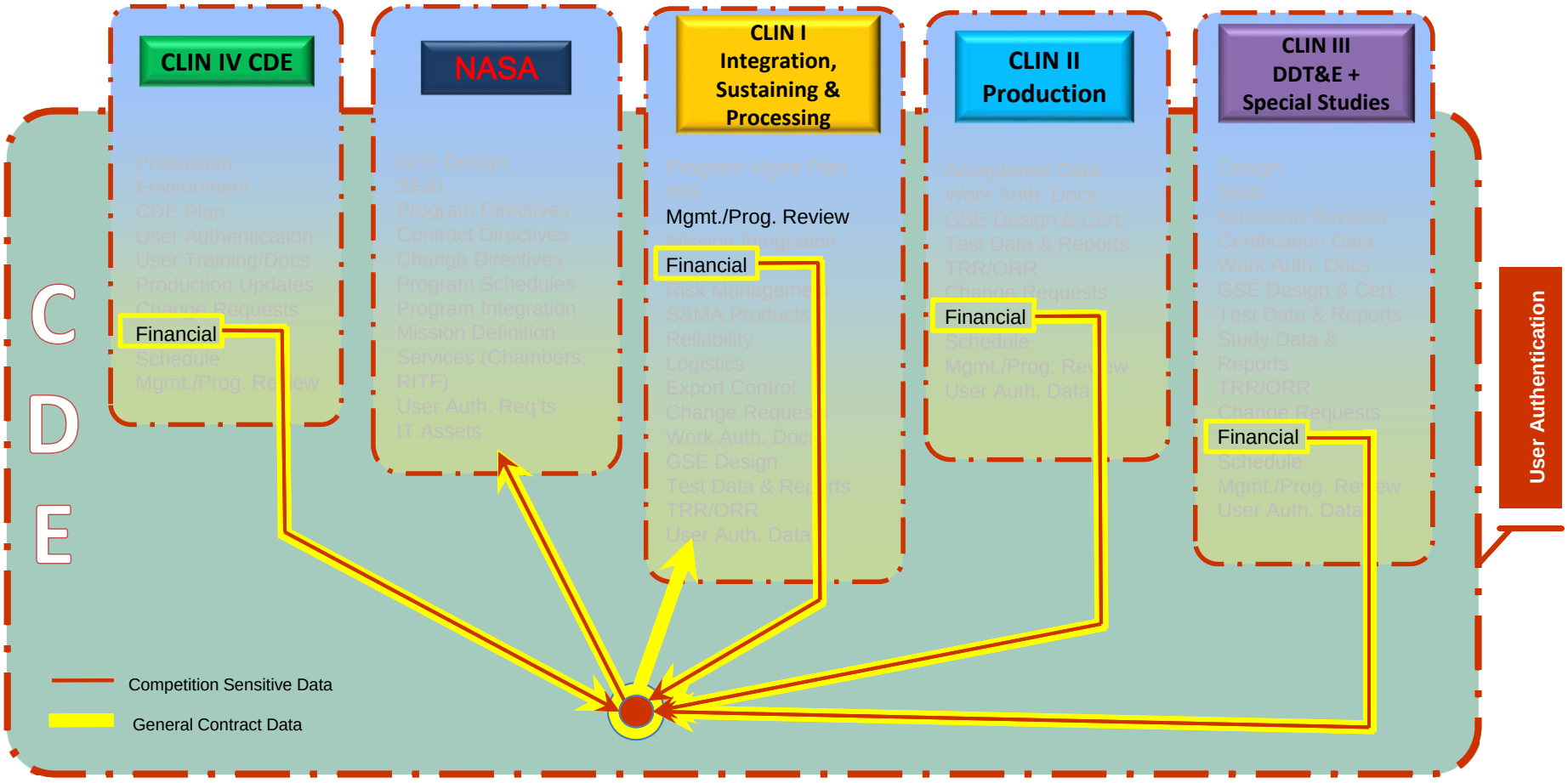
CDE Interface Diagram Example:

Movement of Financial Data (1/2)



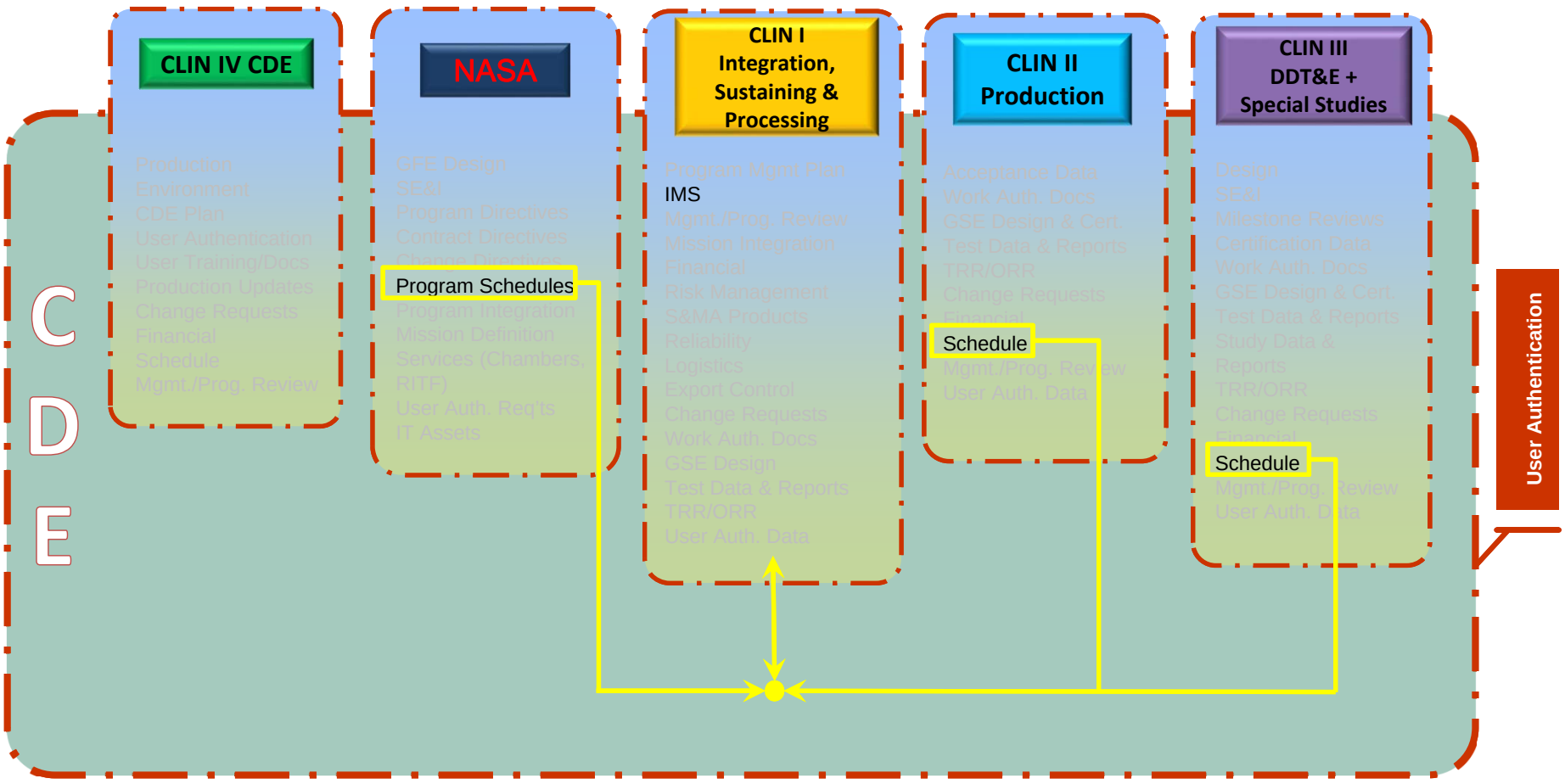
CDE Interface Diagram Example:

Movement of Financial Data (2/2)



CDE Interface Diagram Example:

Movement of Schedule Data



Goals for the Contract

Provide a flexible mechanism to assemble, test and provision flight and training of xEVA System hardware for ISS and Exploration Missions to Gateway and the Moon.

1. Meet the Agency's schedule to support the Artemis missions and ISS Demo
2. Promote commercialization
   - Lower barriers to entry
   - Increase design flexibility
   - Improve Industry expertise in space suit technology
3. Effective Data Management
   - Use proprietary solutions where technically valuable
   - Deliver an established design baseline to industry
   - Collaborative Data Exchange
4. Lower the cost of the system over time

Industry Perspective

- The intent of the Request for Information process is to seek industry feedback on a draft set of requirements prior to releasing the RFP.
- We welcome Industry's input for any elements of the SOW, and there are a few topics in particular that we would like to gain industry's perspective on for implementation and/or feasibility:

1. **Collaborative Data Environment**
    - How would Industry approach developing and working in a collaborative environment to execute the requirements in the statement of work?
2. **Earned Value Management**
    - Provide recommendations and/or potential drawbacks related to the use of EVM on the xEVAPS contract.
    - Provide recommendations for tailored EVM based on xEVAPS requirements.
3. **Program Requirements**
    - Given that new Programs are being stood up and many requirements currently do not exist, how can the government reduce the uncertainty associated with proposed costs?
4. **Contemplated Contract/Incentive Structure**
    - Provide recommendation and/or potential drawbacks related to the contemplated contract/incentive structure.
    - Provide advantages and disadvantages to dividing CLIN II and CLIN III into separate multiple-award vendor pools