EOSDIS
NASA'S EARTH OBSERVING SYSTEM
DATA AND INFORMATION SYSTEM

http://earthdata.nasa.gov

NASA Earthdata Cloud

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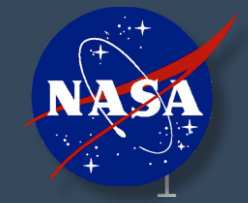
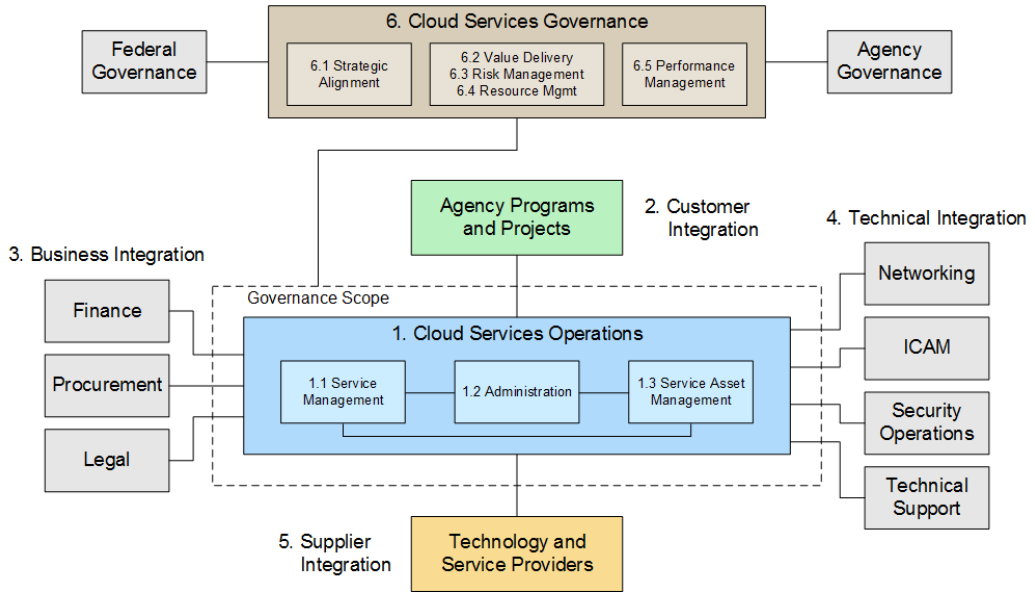


NASA's Enterprise Approach to Cloud



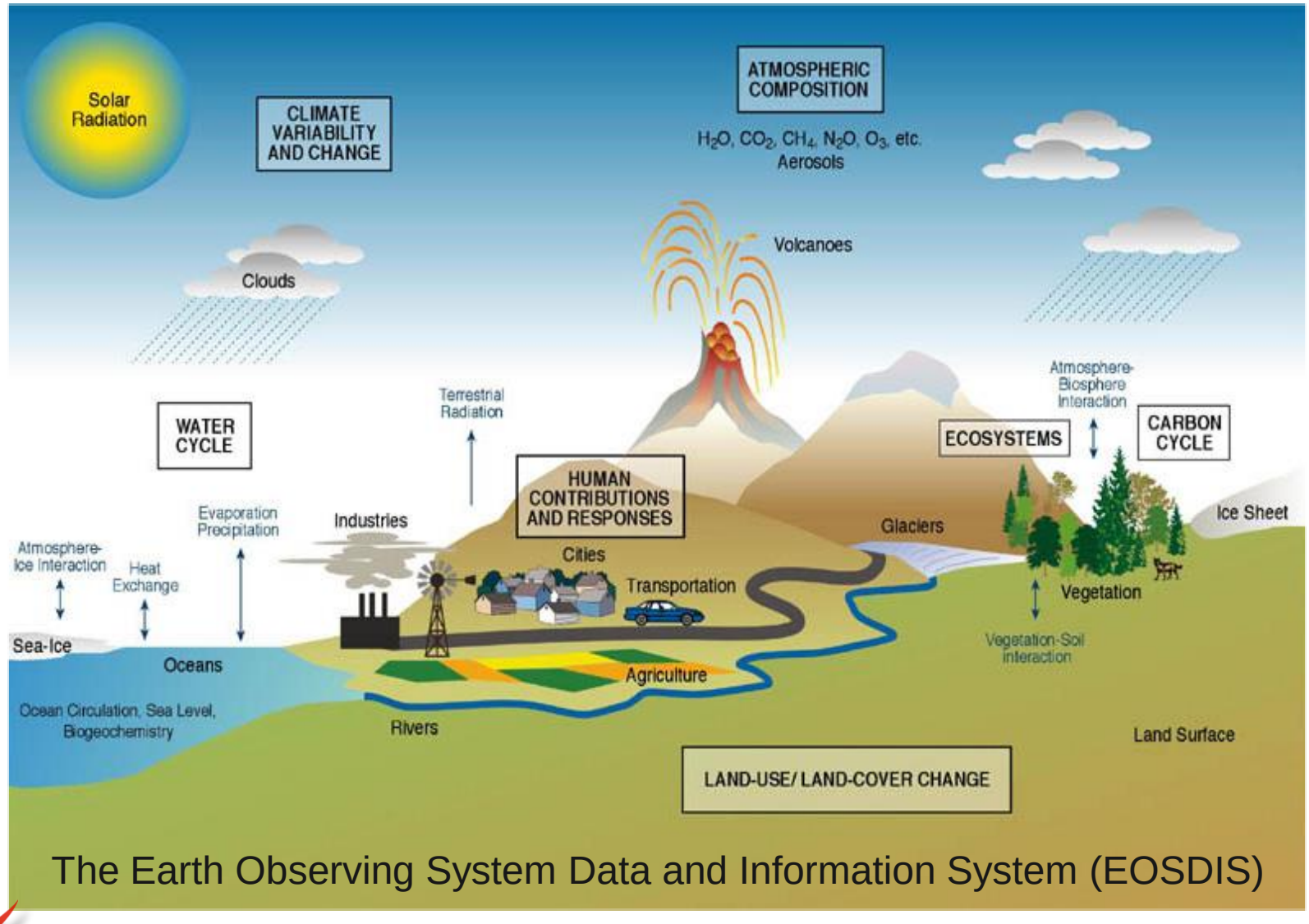
All users leverage the CIO Cloud Framework to minimize start-up time and costs

- Cuts months from cloud learning curve
- Significantly reduces "pioneering" costs
- Reduces duplication of effort

Key Elements of the Enterprise Cloud Framework

- The NASA CIO is responsible for delivering enterprise-class commercial cloud computing services to the entire agency
- Focus on smart consumption of commercial Cloud Services
- Standardized Agency governance
- Integrated hierarchical approach to cybersecurity
- Standards and guidance for technical integration with Agency infrastructure, processes, services
  - Networking, security operations, authentication services
- Common procurement vehicles with proper terms, conditions, best practices
  - All users obtain access to cloud computing directly through OCIO or delegated authority
- Payment system to facilitate "pay as you go" within Agency constraints
- Integration with Agency IT service catalog and help desk

EOSDIS Comprises Data of the Whole Earth System



The Earth Observing System Data and Information System (EOSDIS)

Atmosphere
- Winds & Precipitation
- Aerosols & Clouds
- Temperature & Humidity
- Solar radiation

Ocean
- Surface temperature
- Surface wind fields & Heat flux
- Surface topography
- Ocean color

Cryosphere
- Sea/Land Ice
- Snow Cover

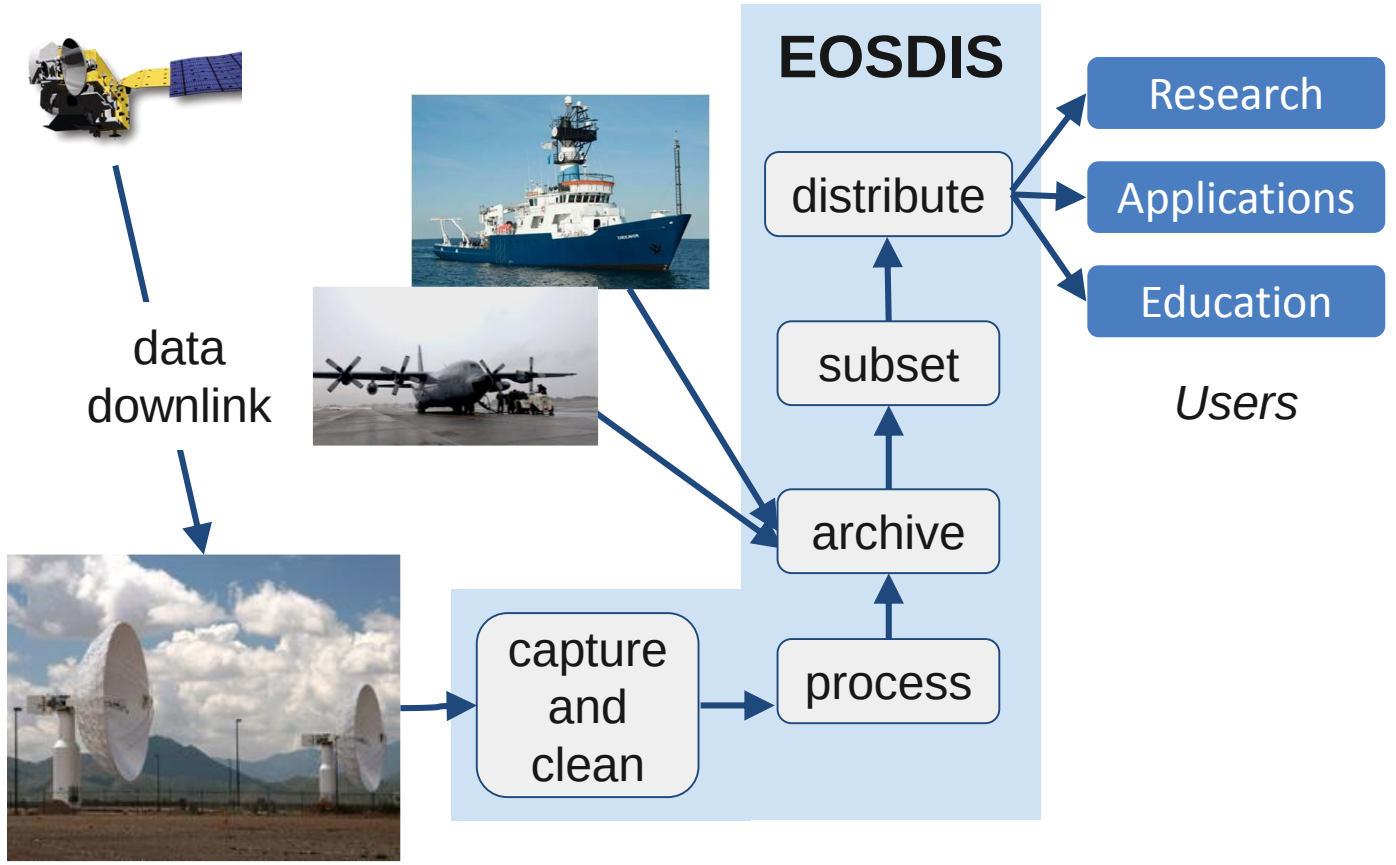
Land
- Cover & Usage
- Soil Moisture
- Topography & elevation
- Temperature

Human Dimensions
- Population & Land Use
- Human & Environmental Health

Components of EOSDIS End-to-End

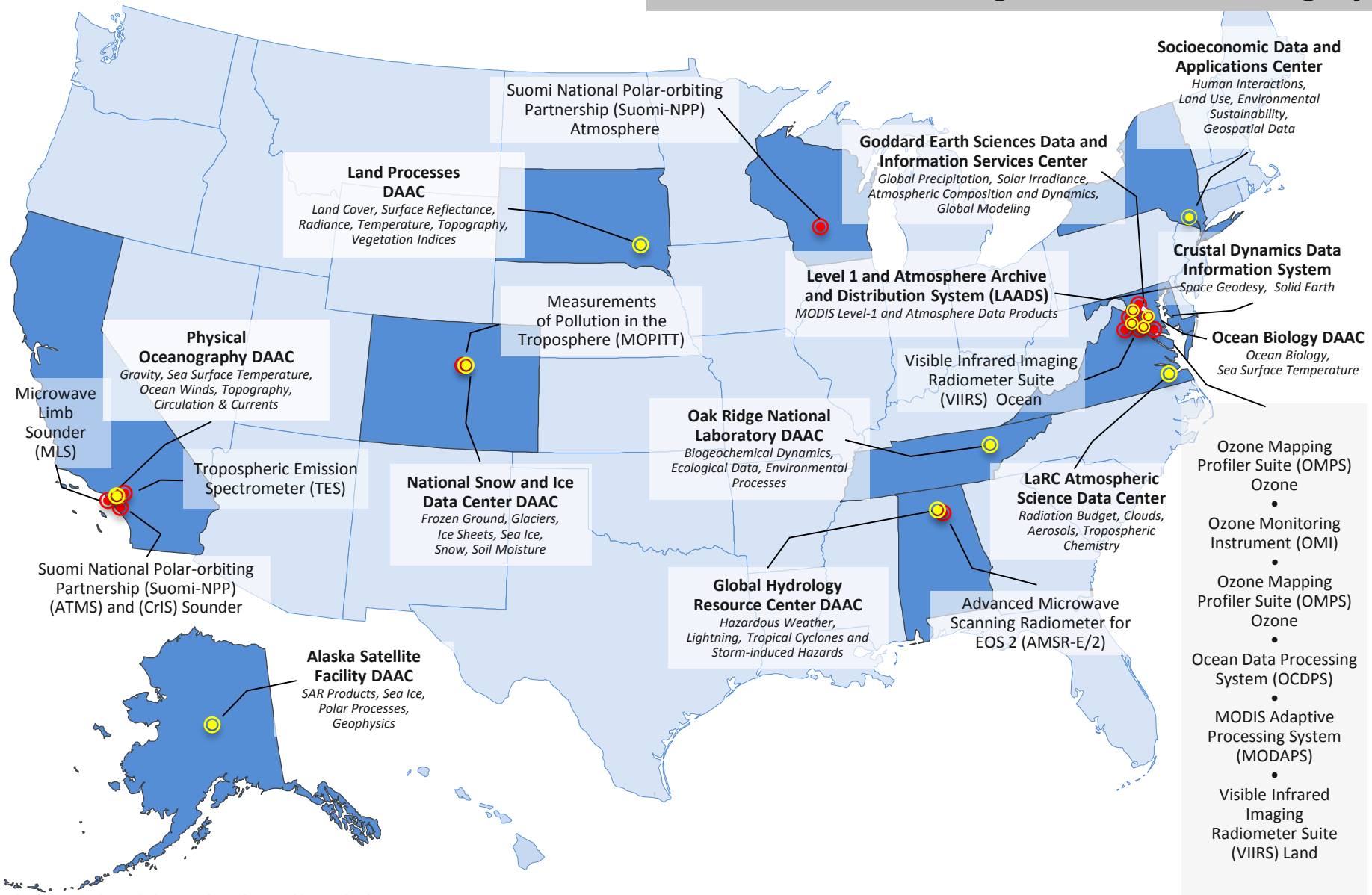
NASA's EOSDIS provides end-to-end capabilities for managing NASA's Earth science data from satellites, aircraft, field measurements, and various other programs.

EOSDIS is responsible for a data collection that is large in volume and projected to grow rapidly over the next several years.



EOSDIS Organization

EOSDIS 12 Distributed Active Archive Center (DAACs) and 13 Science Investigator-led Processing Systems (SIPS)



NASA Earthdata Cloud (EDC) – http://earthdata.nasa.gov

Motivation for Commercial Cloud

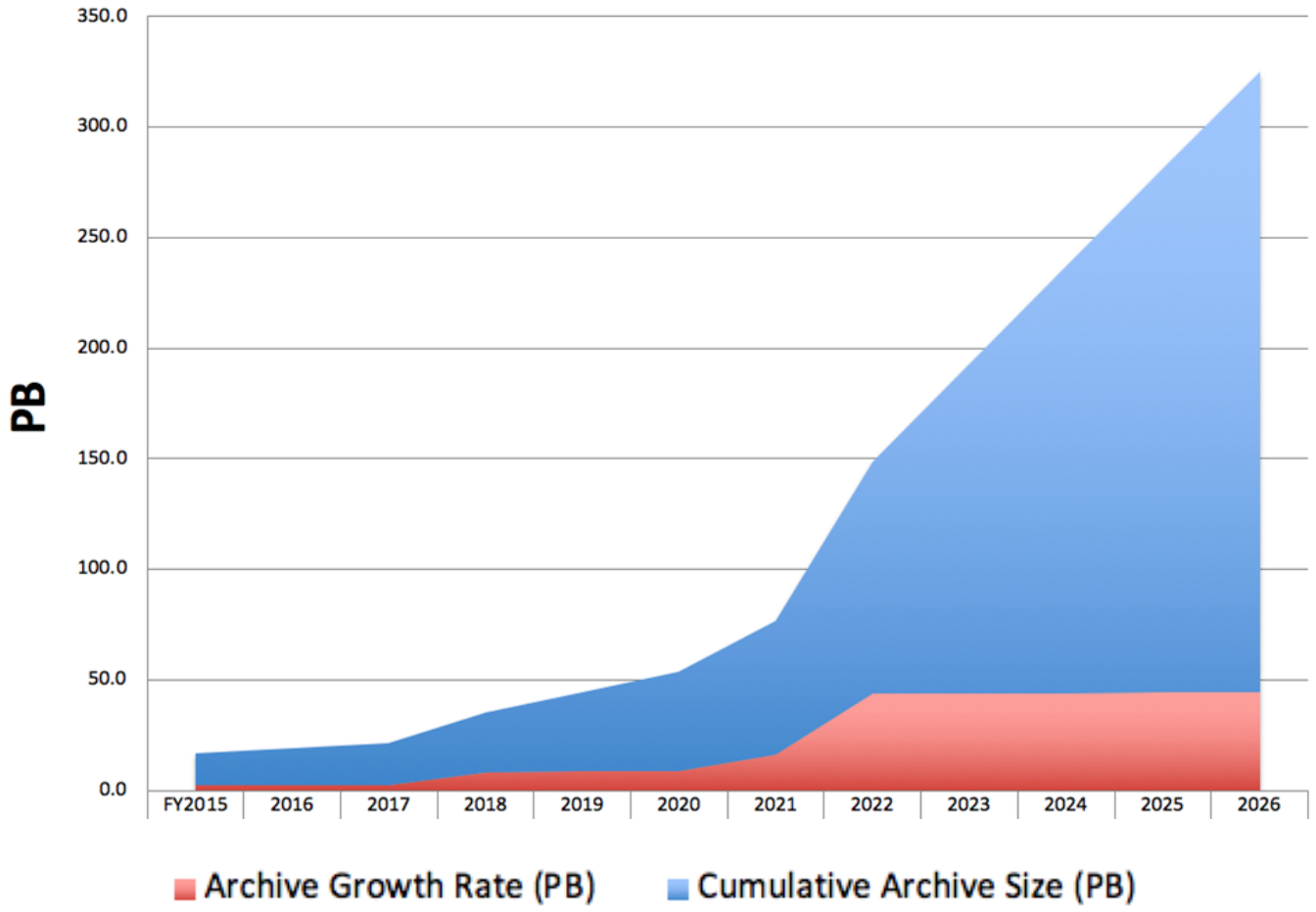
Motivation for Cloud

Growth of Mission Data & Processing: Projected rapid archive growth and the need to effectively process significantly larger volumes of new mission data requires **rethinking existing architectures**.

Data Systems: More cost-effective, flexible, and scalable data system ingest, archive, and distribution solutions are needed to **keep pace with new mission advancement**.

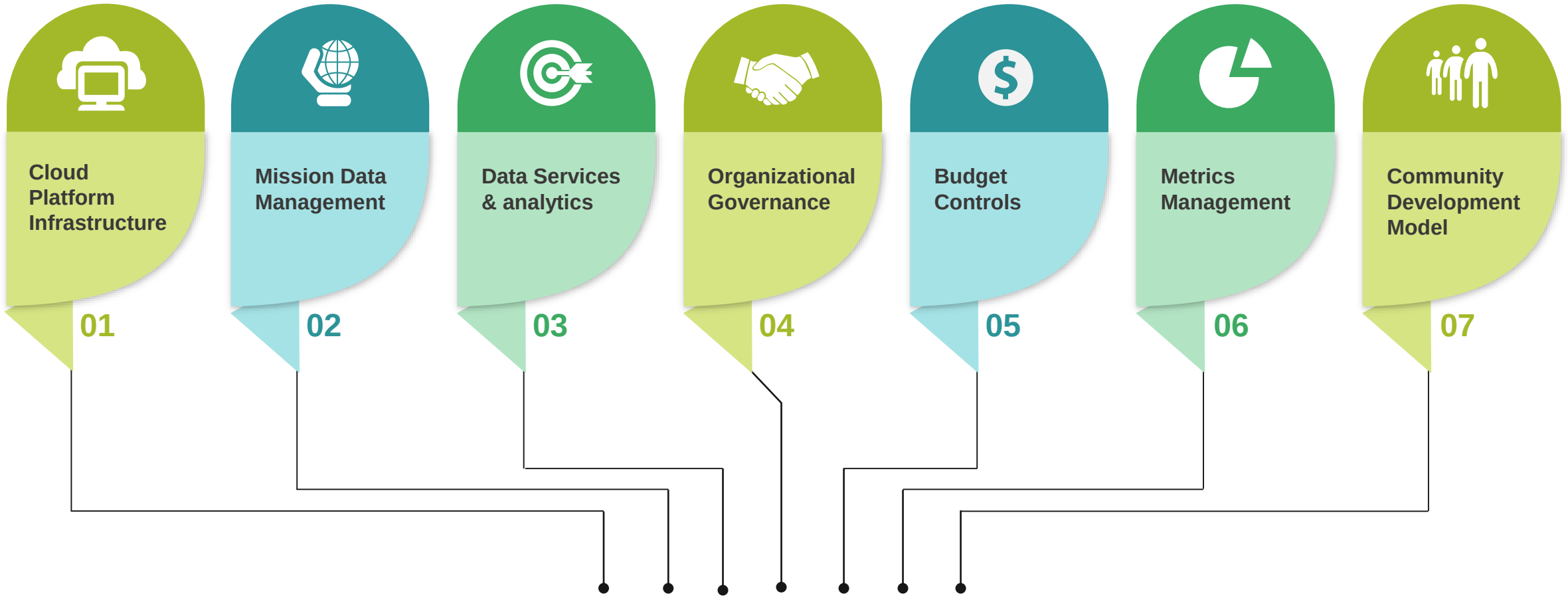
Science Users: Significantly larger data volumes requires **additional ways to access and utilize this data**, with “Data Close to Compute” or Data Lake”. **Bring Algorithms to the cloud**

Projected Data Volumes

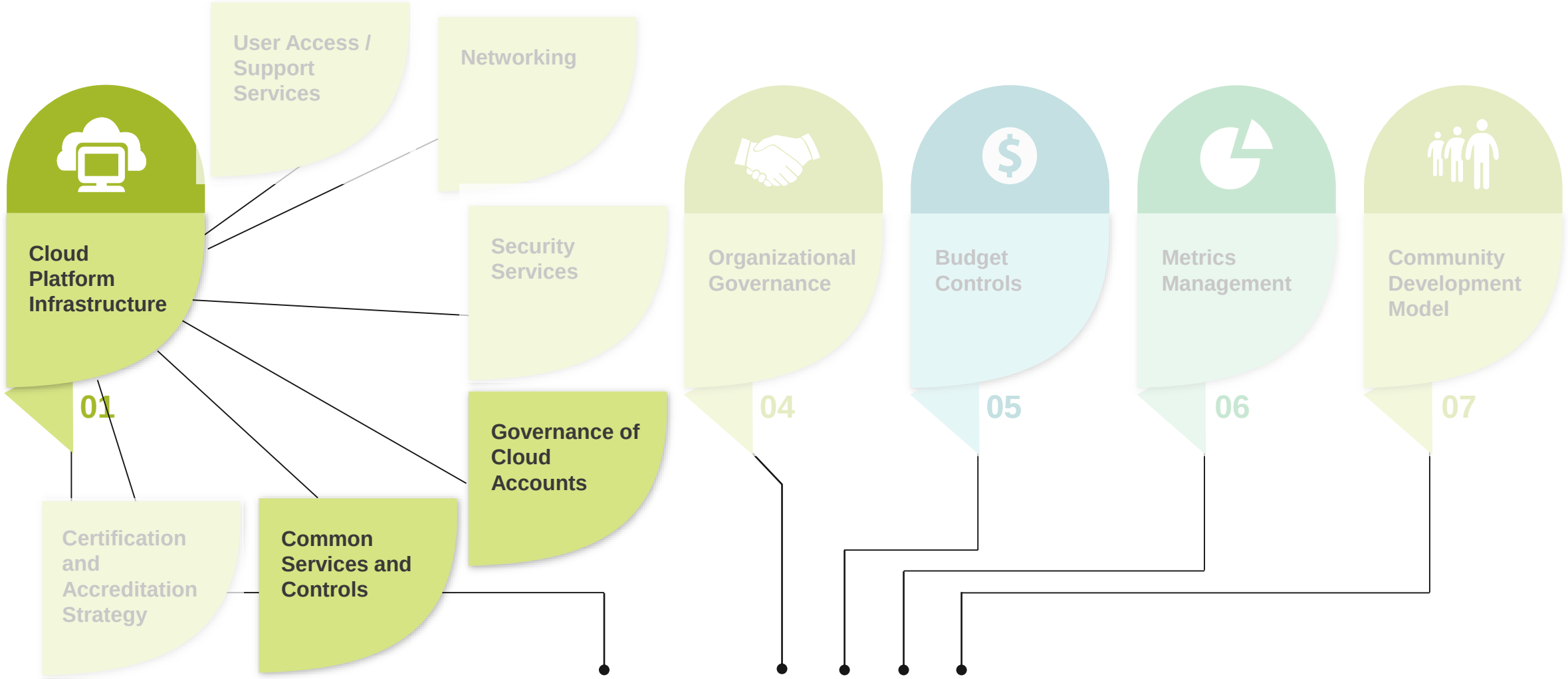


Earthdata Cloud (EDC)

- “Managed” commercial cloud for EOSDIS on AWS
- Improves the efficiency of NASA’s data systems operations – maintaining free/open data policy
- Designed for EOSDIS applications and mission data ingest, archive, distribution
- Increase opportunity for researchers and commercial users to access/process petabytes of data quickly without the need for data management.



Components of the Earthdata Cloud



Project Level Components and Core Elements

Common Services and Controls

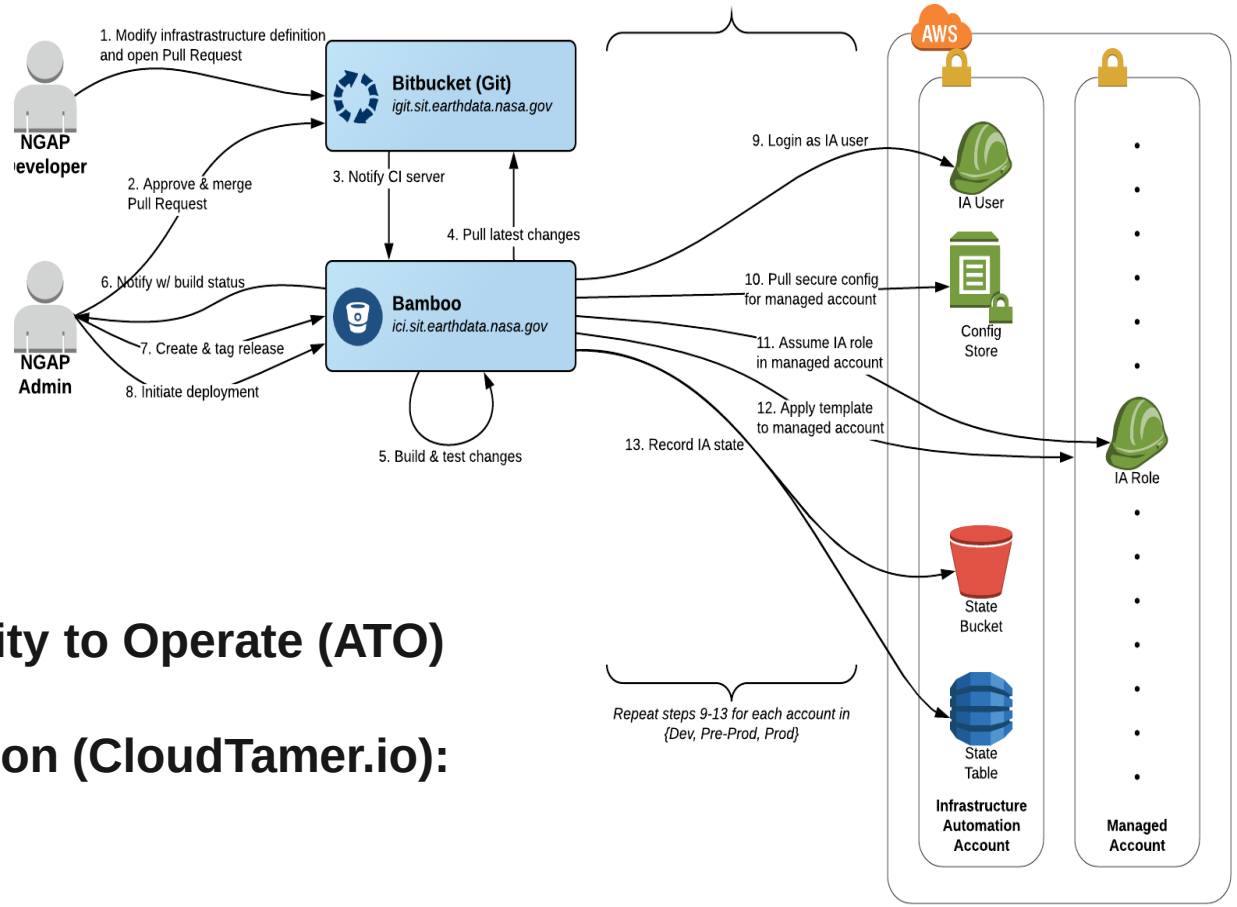
1. **NASA-Approved Amazon Services:** vetted AWS and third- party SAAS services and process to add new. Focus is on using AWS cloud-native services

2. **Code Deployment Services:** DevOps CICD Pipeline to security scan code, build, and deploy into EDC

3. **Use of Infrastructure as Code:** including re-useable template to define a multi-account ecosystem

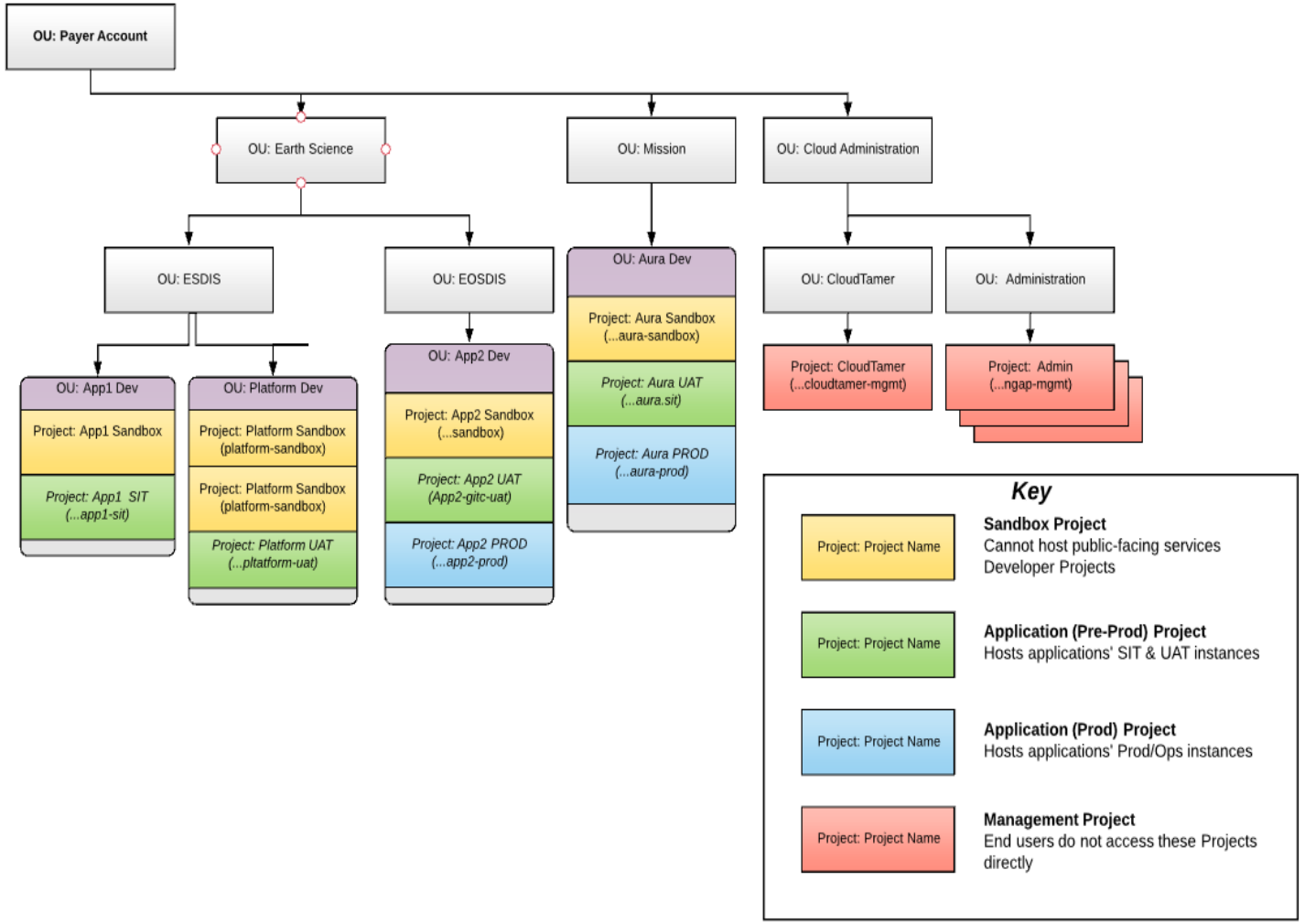
4. **Single System Security Plan (SSP) and Authority to Operate (ATO)**

5. **Single Identity and Access Management Solution (CloudTamer.io):**
   - Rotate AWS access keys
   - Apply session limits
   - Provide role-based access control
   - two-factor authentication



Account Structure

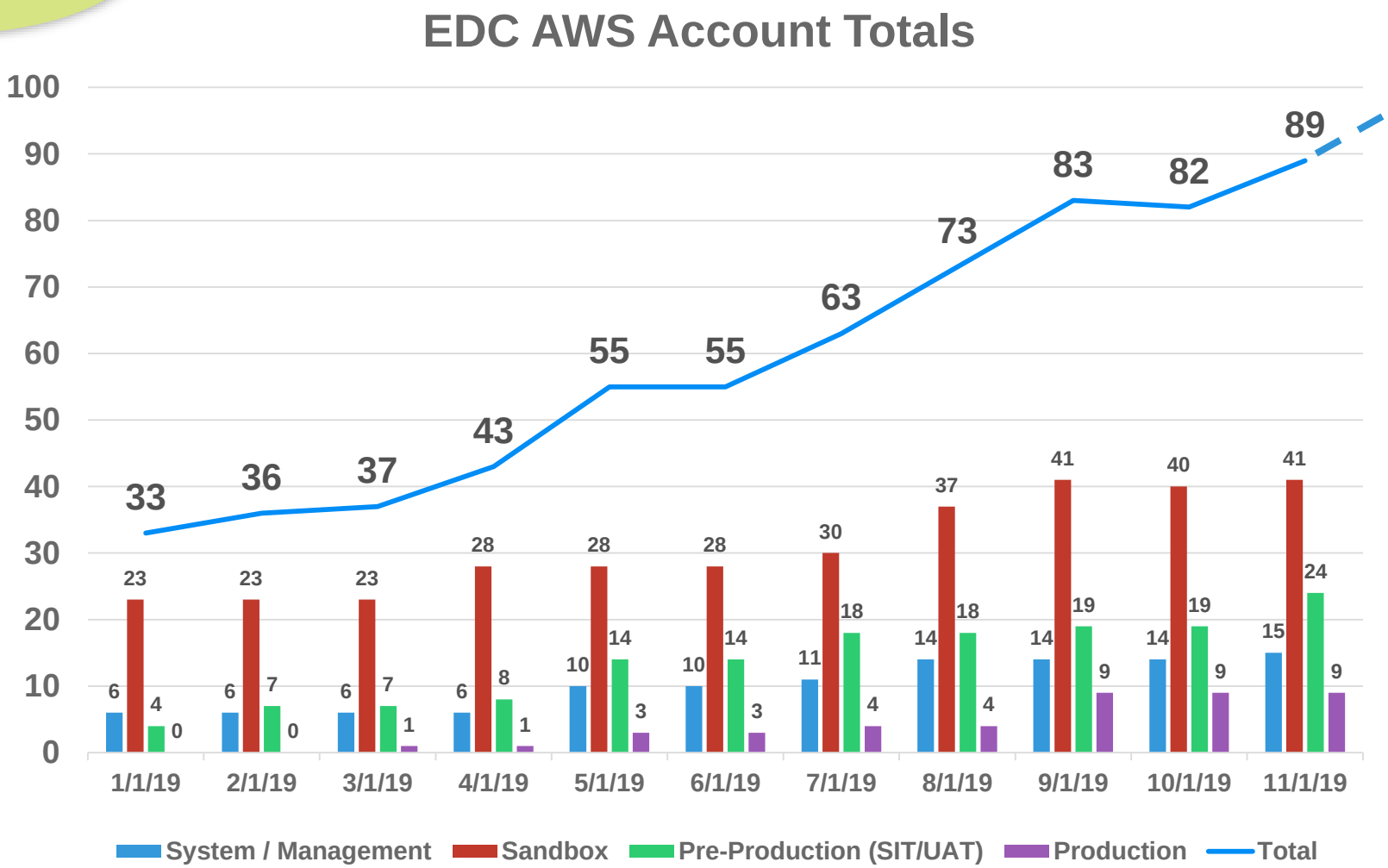
- Single Payer Account using AWS Organization and Consolidated billing
- Multi-Account structure divided into NASA / Mission-defined organizational units
  - Isolation based on organizational units
  - Isolation based on application development, test, and production accounts
  - Isolation of Management and Security accounts from end user environment
  - Track AWS expenses to NASA organizations and funding sources



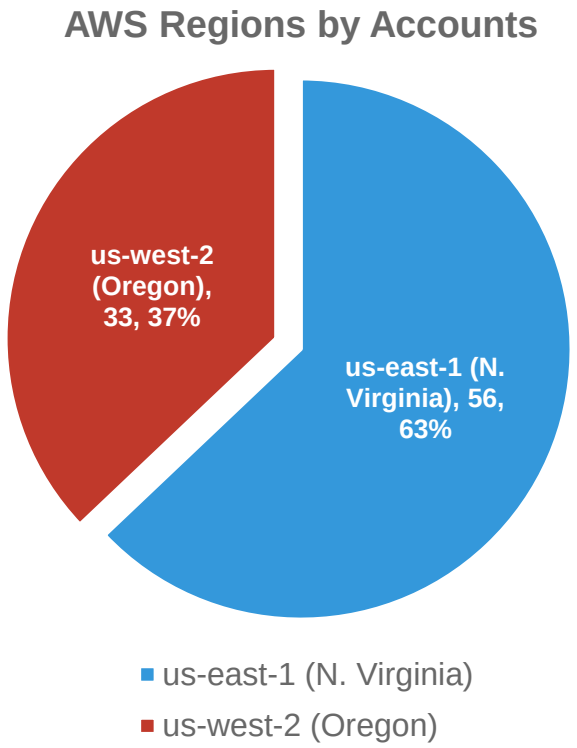
Cloud Platform Infrastructure

AWS Account Metrics

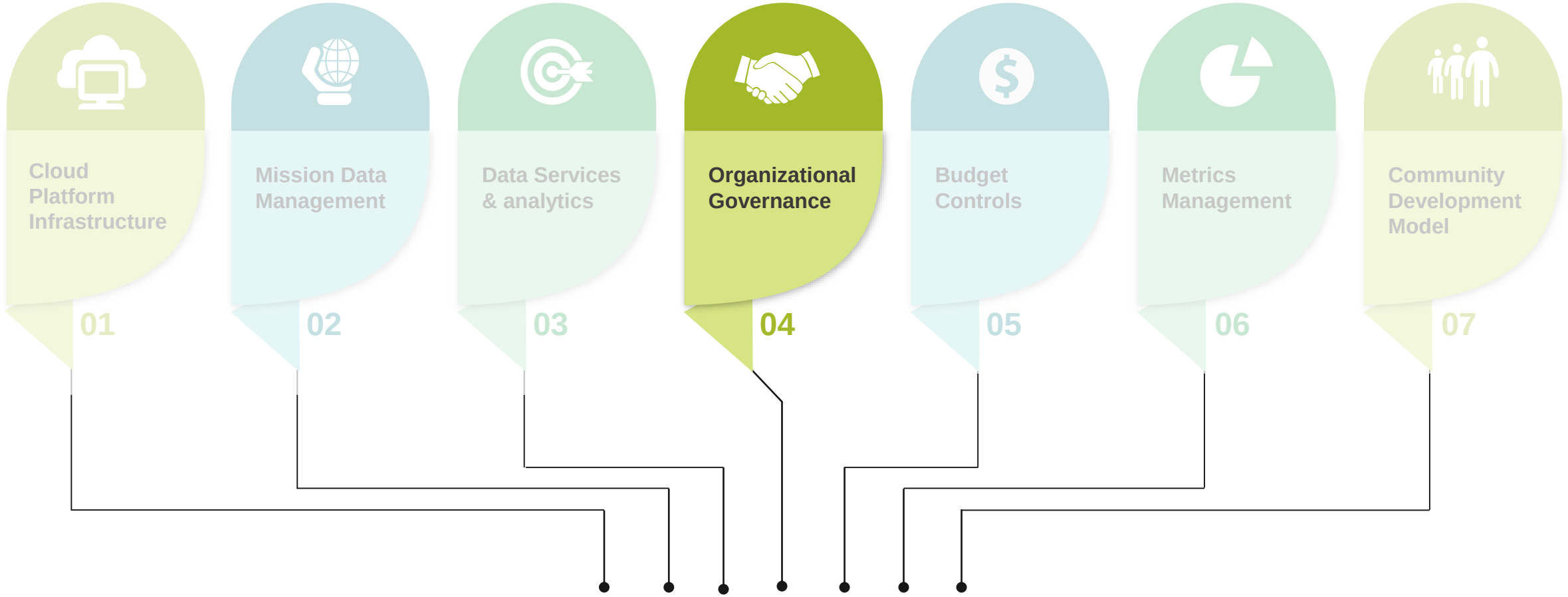
Current AWS Account Structure



Est 200 AWS Accounts Fall 2020

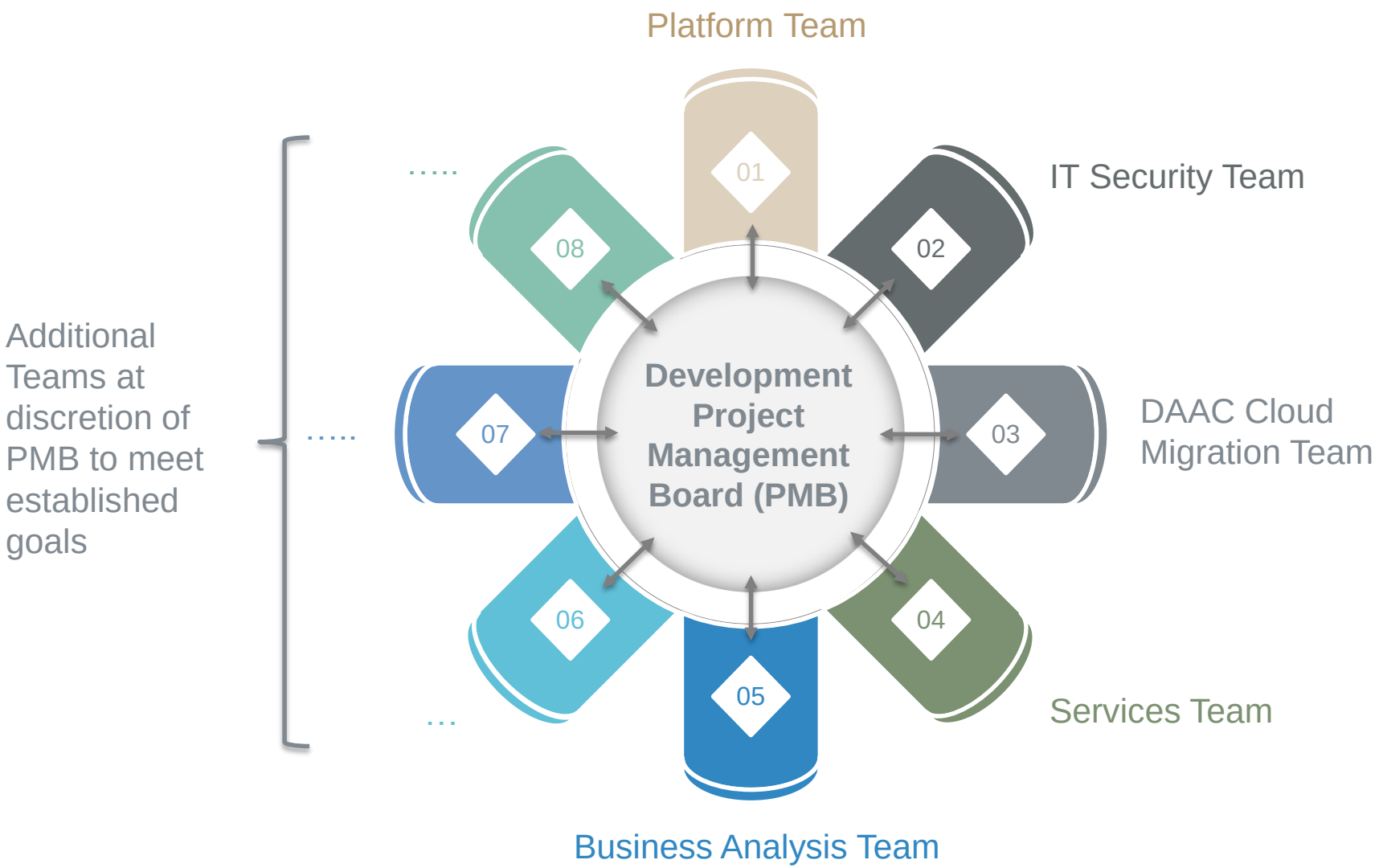


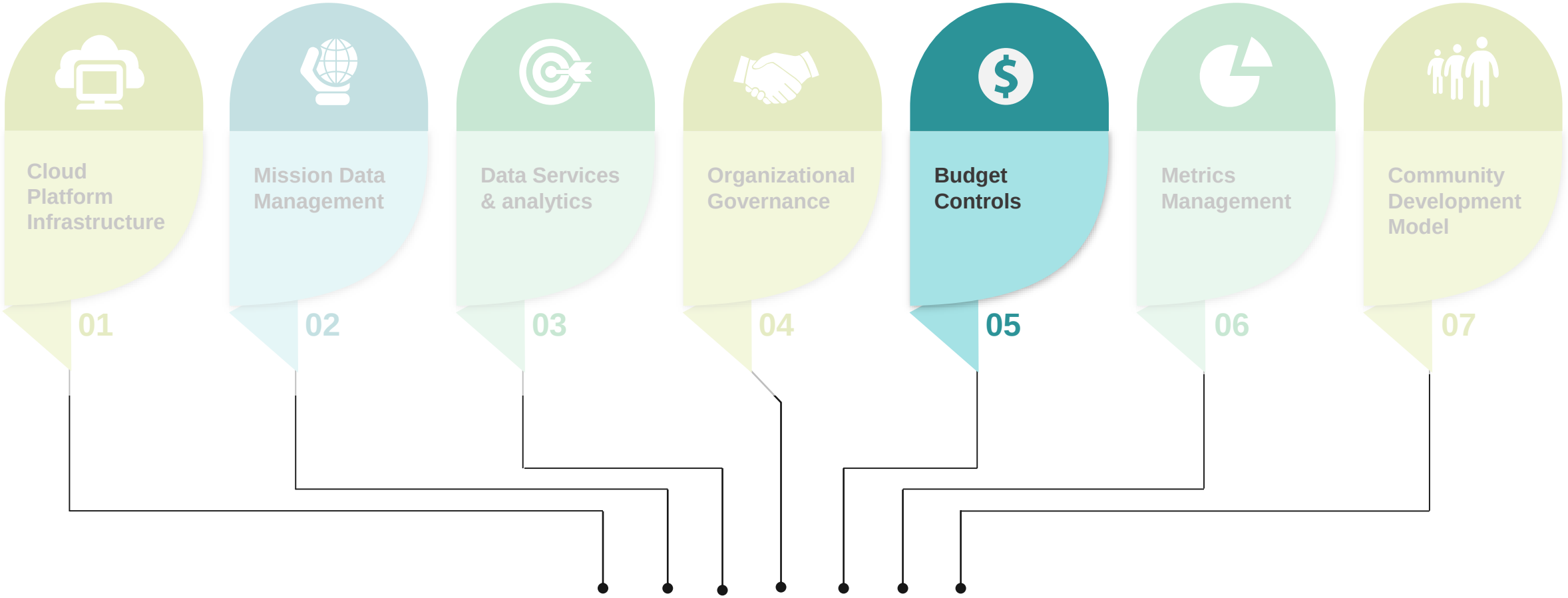
155 Unique Users with 200 Roles



Components of the Earthdata Cloud

Development Project Management Board Framework





Components of the Earthdata Cloud

Budget Controls

The Antideficiency Act (ADA) and Pay-as-You-Go

The ADA act prohibits federal agencies from obligations or expending federal funds in advance or in excess of an appropriation, and from accepting voluntary services.

Federal employees who violate the Antideficiency Act are subject to two types of sanctions: administrative and penal. Employees may be subject to appropriate administrative discipline including, when circumstances warrant, suspension from duty without pay or removal from office. In addition, employees may also be subject to **fines, imprisonment, or both**.

EOSDIS today has over
30 Petabytes
of accessible Earth science data

EOSDIS delivered over
1.6 Billion data products
to over 3.1 Million
science users from around the world

… with over
438 Million
Science data files in the repository

Budget Controls

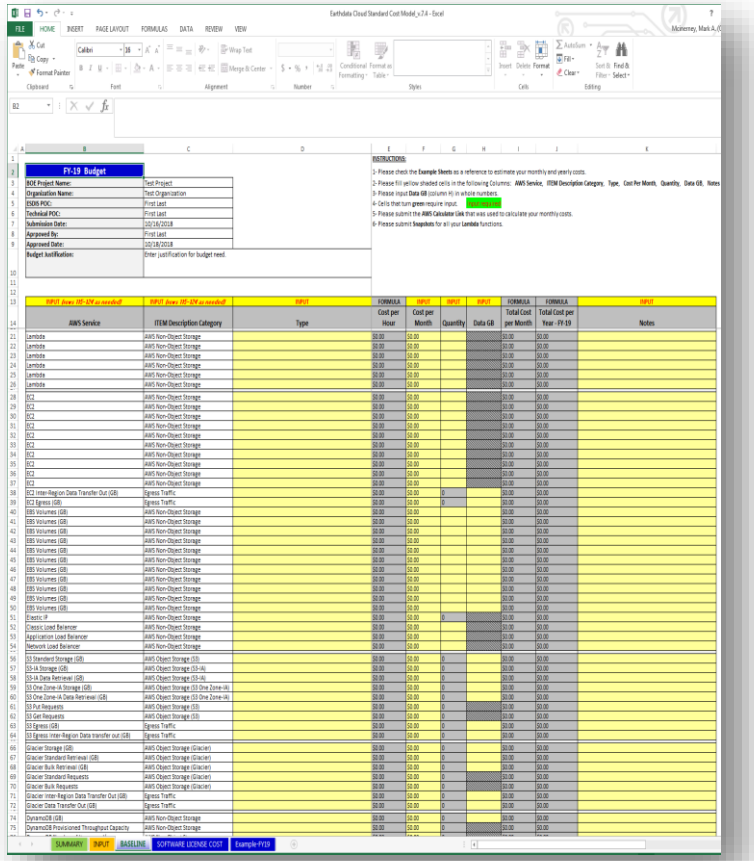
Cost Accounting

Cloud Resource & Cost Model

Cost accounting begins with first capturing individual mission/application level required AWS resources and cost for execution year and out to year 5.

Used to:

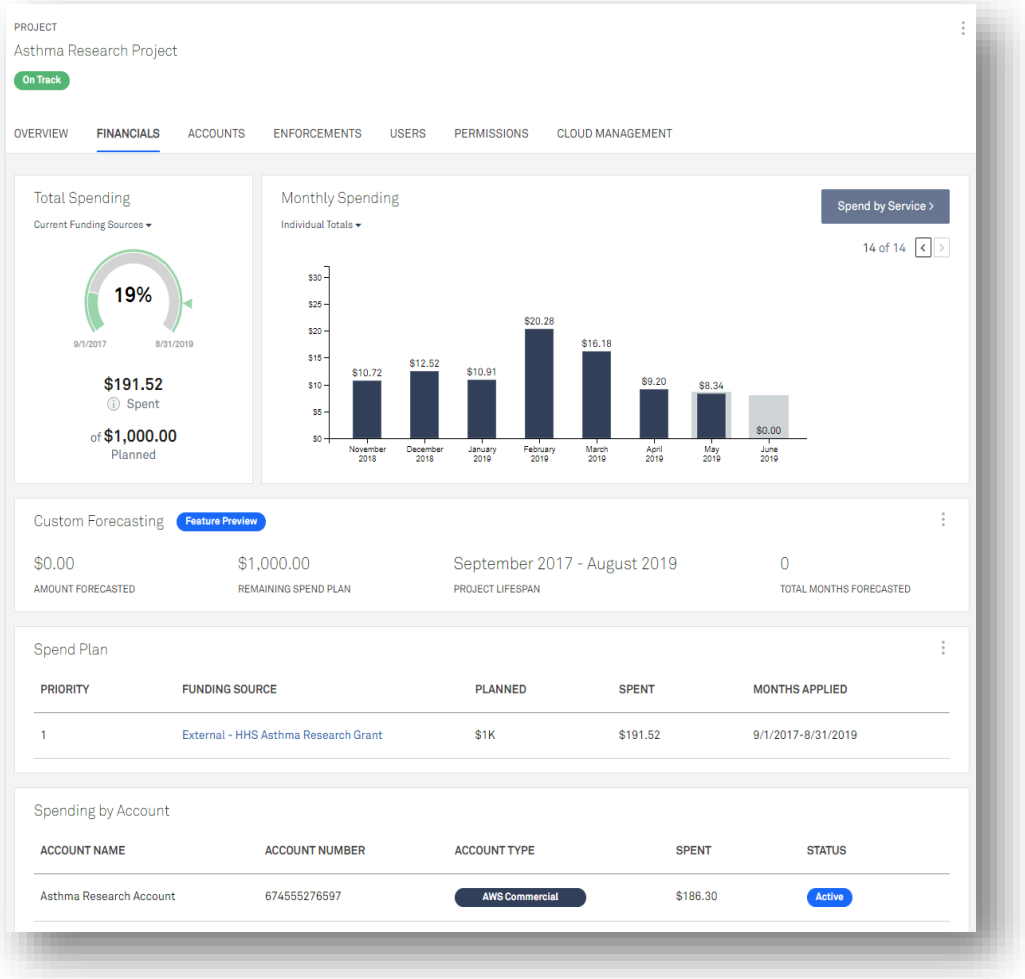
1. Project level cloud resource and cost capture
2. Feed NASA's Planning, Programming, Budgeting and Execution (PPBE) 5 year budget request / cycle
3. Input into execution year "cost phasing plan" for each account to manage account level CloudTamer budget caps
4. Support performance and cost optimization processes, routine cloud account auditing
5. Initial capture of AWS service needs, vetting for availability and metrics for reserved instance discounts



Budget Controls

The cloudtamer.io account-level view

- Tool to push & fund individual AWS accounts under a single AWS payer account
- Enforces individual AWS account-level budget through “budget caps”
- Provides account alert spend monitoring and budget & egress control actions
- Allows for flexible access levels:
  - Top-level view for management & business teams
  - Account view for local managers & Developers



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