

# NASA's Earth Observing Data and Information System (EOSDIS)

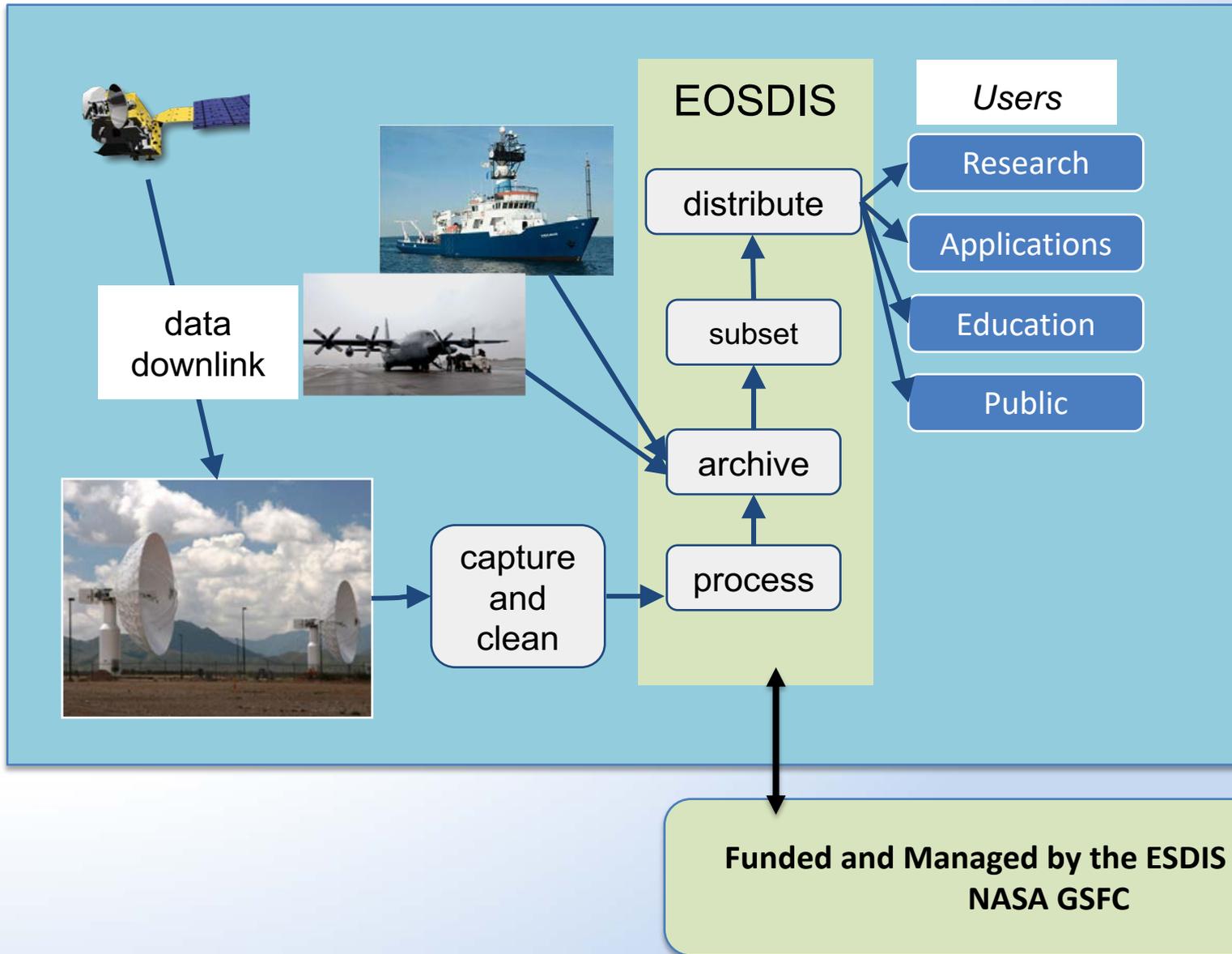


**J. Behnke**  
**NASA GSFC**  
**Library of Congress**  
**Designing Storage Architectures Meeting**  
**September 9, 2019**



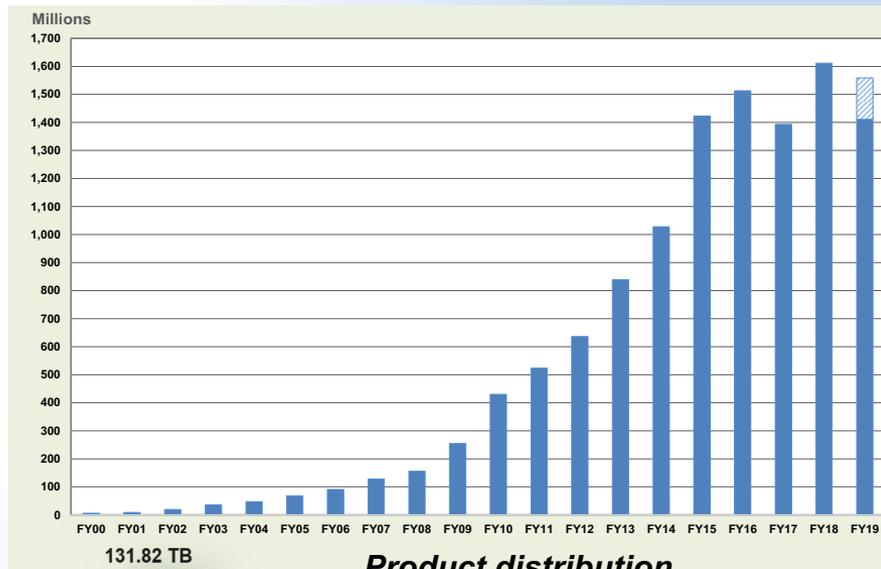
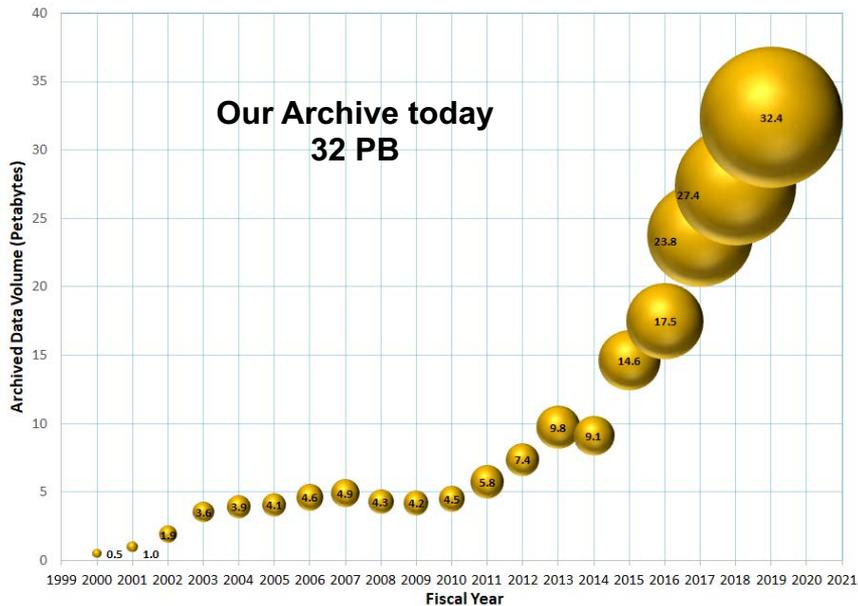


# Earth Observing System Data and Information System (EOSDIS)

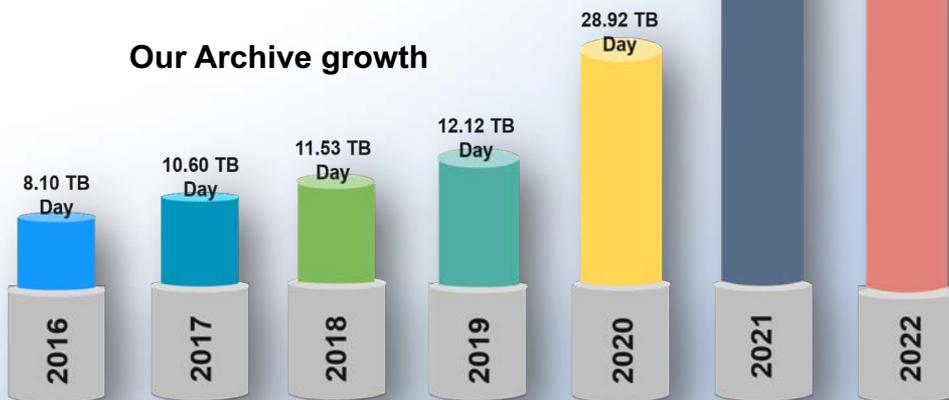




# A Growing Archive and Growing Number of Users



**Our Archive growth**



**Product distribution**  
147.6 M distributed in Jul 2019  
Prediction: 2 Billion products distributed this fiscal year

*In FY2022, predict that the archive will grow by 48PB that year alone*

**Not the first time we have confronted this opportunity**



# EOSDIS Storage Architecture Evolution by Decade

## 1990

Near-line Storage devices used  
Hierarchical Storage Management  
StorageTek silos (Digital Linear Tapes)  
Metrum RSS-600 (VHS)  
3480 18 track tape drives  
9 track tape drives

Local Storage for Processing  
Direct attached disk devices  
RAID parallel disks

Backup Tape Devices  
Tape Drive Cartridge Stackers  
4 & 8 mm Tape Drives

Storage for Distribution  
CD-ROM  
4 & 8 mm tapes  
Detachable Disk Drives

## 2000

Reaching Peak Complexity  
14 StorageTek silos at 4 DAACs  
45,580 tapes (3580 format)  
Begin Reducing dependency on  
Near-line storage - removing  
StorageTek

Increase direct and network  
attached commodity disks; more  
RAID devices

Robust backup tape devices  
Data Migrations - Sony DTF;  
LTO-4

Storage for Distribution  
Online Disks support data pools  
Public internet data access  
exceeds orders for data on off-  
line storage units

## 2010

All online storage  
Duplication of data across disk  
farms Use of RAID throughout

Robust backup tape devices  
System backups to tape  
Data backups to offsite disk farm

All data distribution via Internet  
from spinning disk data pools

Begin assessment of  
Commercial Cloud Resources

## 2020

Migrated data on disk farms to  
commercial cloud data lakes  
Migrate to/from vendors as  
necessary to improve efficiency  
and performance  
Copy to additional vendors as  
necessary to improve  
performance

Utilize commercial data backup  
service for secondary archive  
Store tertiary copy of  
irreplaceable data on premises  
on RAID and tape

Nearline, offline  
On premise

Nearline, Direct  
Access  
On premise

Direct Access  
On premise

Direct Access  
On and off  
premise

Access in  
Hours/Minutes

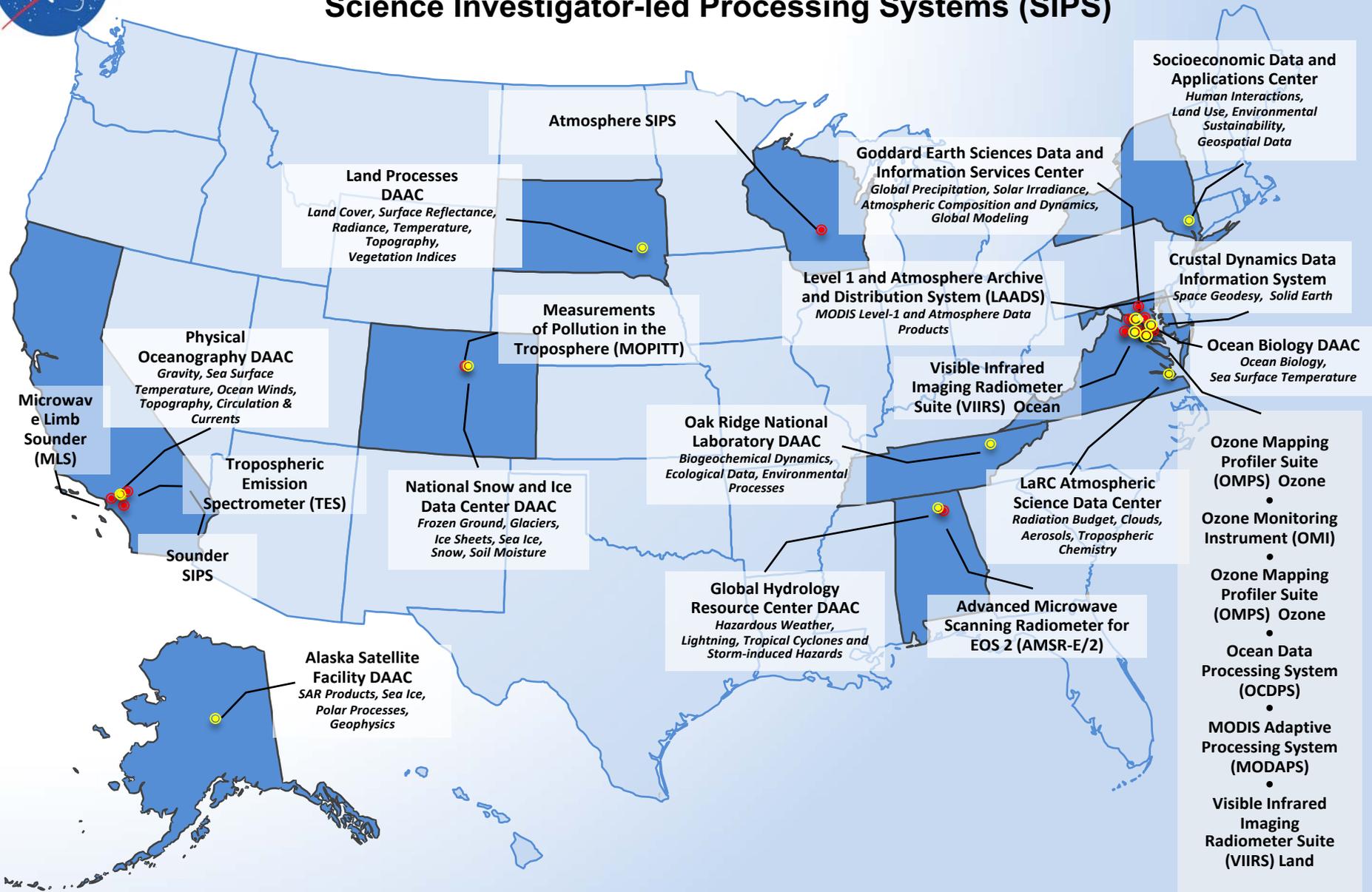
Access in  
Minutes/Seconds

Access in Seconds

Access in Seconds/  
Milliseconds



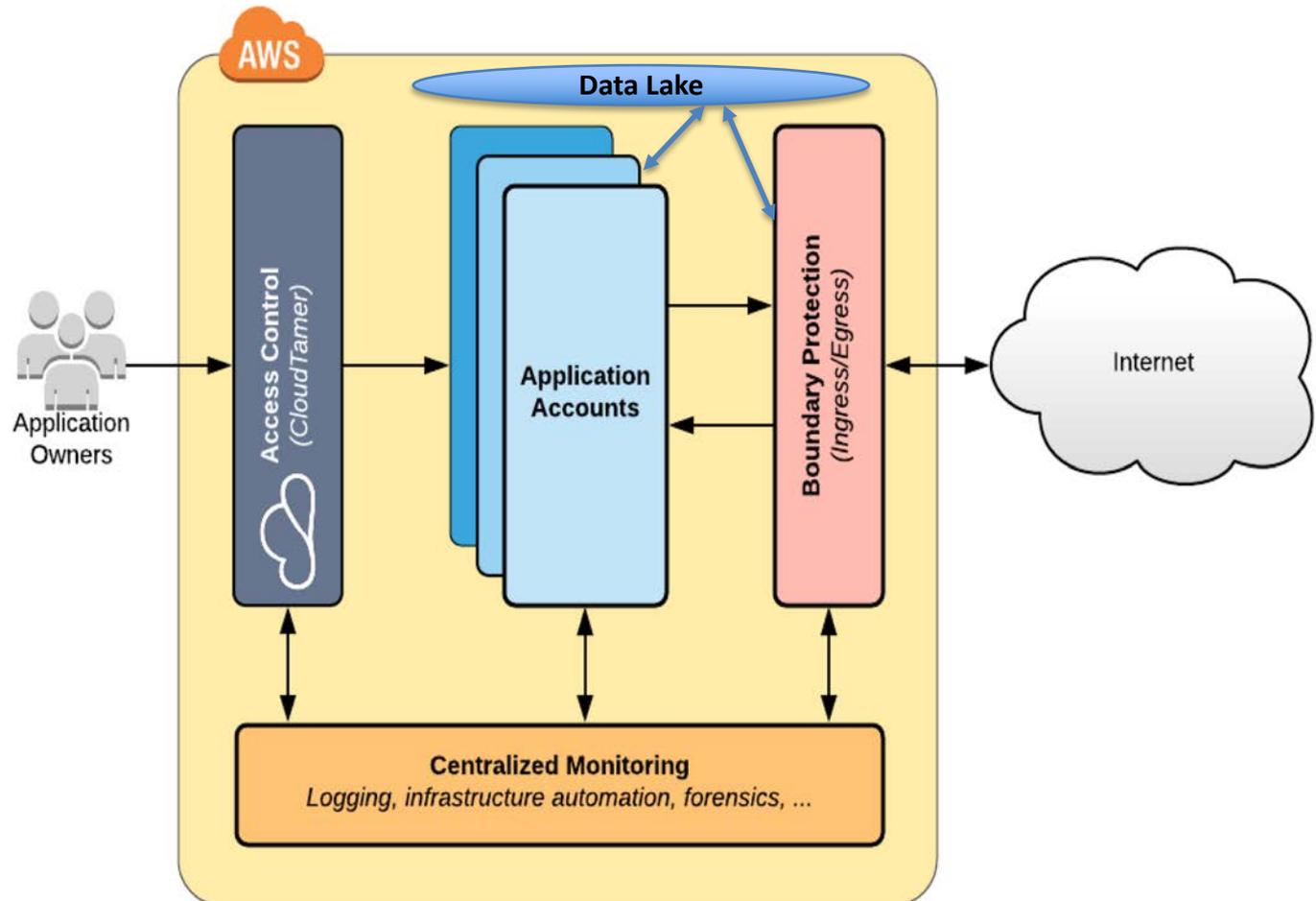
# EOSDIS Distributed Active Archive Center (DAACs) and Science Investigator-led Processing Systems (SIPS)





# Development of the Earthdata Cloud

- Earthdata Cloud Platform is a multi-account, Infrastructure-as-a-Service (IaaS) cloud platform operating on Amazon Web Services (AWS) under a single ESDIS owned top level “payer account”, providing shared cloud services and controls to EOSDIS.





# Common Services & Controls

## 1. Single Contract into Commercial Cloud Services

EOSDIS operates under multiple contracts & partner Agencies. Centralized cloud contract through NASA's Enterprise Managed Cloud Computing (EMCC) program provides seamless access to cloud.

## 2. User Access to Earthdata Cloud Development

Secure PIV/Token login, NASA Agency-based account provisioning,

## 3. NASA Approved Amazon Services

Vetted AWS and 3<sup>rd</sup> party SAAS services, with process to add new services

## 4. Code Deployment Services

Through the use of Bamboo, code is security scanned, built, and deployed into Earthdata Cloud.

## 4. Data Recovery Services

Developing a service to backup collection in lower cost cloud resource; but also keeps 'golden' copies on premise.

## 4. Budget Distribution and Enforcement

Our components in the Earthdata Cloud operate their environment, EOSDIS gets the bill. EOSDIS Capability to capture intended costs, distribute approved budgets into project level accounts, monitor, and protect against inadvertent cost overruns or bad actors.

# How the users look at information/data in the Storage Systems

The screenshot displays the Earthdata Sentinel-1B interface. At the top, the search criteria are: "Sentinel-1B", "Start: 2019-06-16 00:00:00", "Stop: 2019-06-16 23:59:59", and "Rectangle: SW: 30.480468750000004,-1 NE: 35.2265625,-114.36328". A map of the United States shows a green rectangular selection box over the West Coast. Below the map, the interface shows "SENTINEL-1B\_RAW" with a "View details" link. The search results are sorted by "Start Date, Newest first" and show 5 granules. A table lists the granules with their IDs, start, and end times. A "Download All" button is visible. A file dialog is open, showing the selected file: "...16T014930\_20190616T015002\_016715\_01F75E\_5805.zip" (1.5 GB) from an AWS S3 bucket. The dialog offers options to "Open with Archive Utility (default)", "Save File", or "Do this automatically for files like this from now on". A "MONTH" timeline at the bottom shows the search period from January to June 2019.

| Granule ID  | START               | END                 |
|---|---------------------|---------------------|
| S1B_IW_RAW__OSDV_20190616T014955_20190616T015027_016715_01F75E_F158 | 2019-06-16 01:49:55 | 2019-06-16 01:50:27 |
| S1B_IW_RAW__OSDV_20190616T014930_20190616T015002_016715_01F75E_5805 | 2019-06-16 01:49:30 | 2019-06-16 01:50:02 |
| S1B_IW_RAW__OSDV_20190616T014905_20190616T014937_016715_01F75E_3B54 | 2019-06-16 01:49:05 | 2019-06-16 01:49:37 |
| S1B_IW_RAW__OSDV_20190616T014840_20190616T014912_016715_01F75E_DF87 | 2019-06-16 01:48:40 | 2019-06-16 01:49:12 |
| S1B_IW_RAW__OSDV_20190616T014815_20190616T014847_016715_01F75E_CEDF | 2019-06-16 01:48:15 | 2019-06-16 01:48:47 |

Current Earthdata search and access to science data in the cloud

Highlights selected collection, observation time, granule location

Downloads from S3 bucket archived in AWS commercial cloud



# THANKS!

**You can contact:**

**Jeanne.Behnke@nasa.gov**

**Worldview**

**<https://worldview.earthdata.nasa.gov>**

**Earthdata Search**

**<https://search.earthdata.nasa.gov>**

**Youtube Webinars:**

**<https://www.youtube.com> *and search for NASA Earthdata***