Use of commercial cloud for NASA Earth science data

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Overview

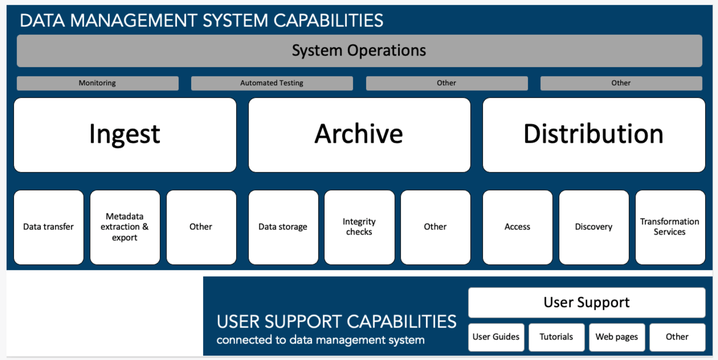
- NASA's Earth Science Data Systems (ESDS) Program is implementing a strategic vision to utilize commercial cloud environments for data management and access.
- The NASA Distributed Active Archive Center at NSIDC (NSIDC DAAC) is supporting this vision by establishing new cloud-based data systems and migrating data to the cloud.
- NSIDC DAAC manages NASA's snow, ice, and related data as one of 12 domain-focused DAACs across the country.

Cloud 101

- "The cloud" refers to servers that are accessed over the Internet, and the software and databases that run on those servers.
- By using cloud computing, users and organizations don't have to manage physical servers themselves or run software applications on their own machines.
- A number of commercial companies provide cloud services to support cloud computing.
- Amazon Web Services (AWS) is the commercial cloud used for NASA Earth science data – called Earthdata Cloud.

More than moving data

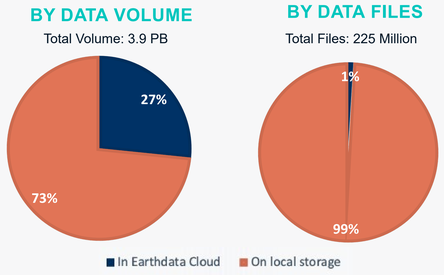
- Utilizing the commercial cloud for NASA Earth science data requires more than moving the data into the Earthdata Cloud.
- NSIDC DAAC must re-establish data management systems ingesting, archiving, and distributing data.
- Because the DAAC manages the authoritative data archive, the systems must:
  - Be robust and operationally reliable
  - Perform data integrity verification
  - Support a wide range of data: satellite, airborne, field measurements, and derived
- NSIDC DAAC must also modify our user support.
  - User support staff must learn new technologies and workflows
  - User resources must be developed or updated



Data management system capabilities which must be established in the NASA Earthdata Cloud

NSIDC DAAC data in the cloud

- Publicly released 34 data products from two NASA satellite missions in the Earthdata Cloud.
  - Ice, Cloud, and land Elevation Satellite-2 (ICESat-2)
  - Ice, Cloud, and land Elevation Satellite (ICESat)
- Additional data will be migrated in the coming months and years.



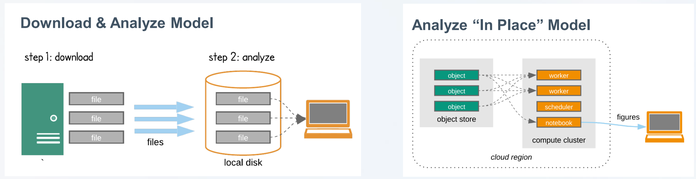
User adoption of cloud computing

- Will occur at different times for different users.
  - Some are already working in cloud computing environments
  - Some will use cloud computing once systems are provided to abstract away technical complexities
  - Some may never use cloud computing
- Requires learning new technologies and changing existing workflows and code
- Involves new cost models which need to be understood, budgeted for, and funded
- NSIDC DAAC is supporting users transitioning science workflows to the cloud through skill-building and community engagement efforts.
  - NASA Openscapes
  - Earthdata Cloud Cookbook (https://nasa-openscapes.github.io/earthdata-cloud-cookbook/)

Why is NASA utilizing commercial cloud

1 Easy access to data

- Data users will be able to access and analyze data directly in the cloud, making the need to download large volumes of data unnecessary.
- Users will continue to be able to freely download NASA data from Earthdata Cloud.



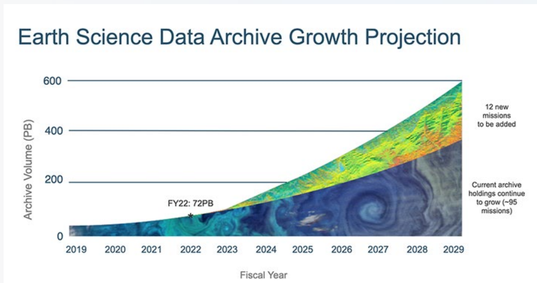
Credit: Open Architecture for scalable cloud-based data analytics. From Abernathey, Ryan (2020): Data Access Modes in Science.

2 Rapid deployment

- Users can bring their algorithms and processing software to the cloud and work directly with the data in the cloud.
- Cloud-managed services can be used to rapidly develop and scale analysis.

3 Scalability

- Earth science is and will continue to experience an exponential growth in data volumes.
- The size and use of cloud-hosted data archives can be expanded easily and rapidly as needed.



4 Reduced redundancy

- The use of a common infrastructure with shared cloud native services will reduce redundant tools and services.

5 Cost effectiveness

- NASA ESDS pays only for the storage and services used.
- Users rent large amounts of compute for short periods of time.