NASA'S EARTH OBSERVATION DATA

FOSS4G 2018, Dar es Salaam

Introduction



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development SEED

NORTHAMERICA

Pacific Ocean

OUTH AMERICA

Team of engineers and designers HQ in DC, distributed across the globe

Arctic Ocean

Building tools to ingest, process and store earth observation data Using earth observation data, machine learning and human mappers to solve development challenges



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Some earth observations

- Dar has beautiful beaches...
- But bad traffic

Some earth observations

- Dar has beautiful beaches...
- But bad traffic
- People see the world differently

FOSS4G Takeaway

- **Objective + subjective** earth observations = Earth insights
- Remote + human earth observations = Earth insights
- Satellites + field data earth
 - observations = Earth insights







development **SEED**



EOSDIS BIG DATA EVOLUTION

- NASA is gathering new data from upcoming NISAR and other satellite missions to better understand climate change
- These new satellites will collect data using Cumulus
- Cumulus is software for building and configuring data ingest, process, and archive workflows in the AWS cloud
- NASA has a number of ways for you to get involved

What is NISAR?

What is NISAR? NISAR = NASA-ISRO Synthetic Aperture Radar A satellite being launched in 2022 A joint mission between NASA and the Indian Space Research Organisation

NISAR's Key Science Objectives

- Interaction between the ice sheets, sea ice and climate change
- Determine likelihood of volcanic eruptions, earthquakes and landslides
- Aid future resource and hazard management

Formulation Implementation Primary Ops Extended Ops



Sentinel-6A/B (2020, 2025) Earth Science Instruments on ISS: RapidScat, (2017) CATS, (2020) LIS, (2016) SAGE III, (2016) TSIS-1, (2018) ECOSTRESS, (2019) GEDI, (2018) OCO-3, (2018) CLARREO-PF, (2020) TSIS-2 (2020)

NASA Earth Science Missions: Present through 2023

MAIA (~2021) TROPICS (~20 EVM-2 (~2021)

Suomi NPP

(NOAA)

Landsat 8 (USGS) (12)

JPSS-2 (NOAA) GRACE-FO (2) (2018) ICESat-2 (2018) CY GNS S (2016) ISS SORCE, (2017 NISTAR, EPIC (2019) CTE (NOAA) (NOAA'S DSCOVR) QuikSCAT (2017) 1 Landsat 7 (2017)SMAP Terra Agua(>2022) CloudSat (~2018)

.

Landsat 9

PACE

SWOT (2021)

InVEST – In-Space Validation CubeSats:

RAVAN (2016) HARP (2016) ICeCube (2016) MIRATA (2017) RainCube (2017) TEMPEST-D (2018) OTRS (2012) CUBERT (2018) CIRAS (2018) LMPC (160)

EOSDIS Big Data Evolution



year 2022 → EOSDIS ingests 47.7 PB / year >10x increase

2022 \rightarrow NISAR produces 7.2 PB /

 $2017 \rightarrow EOSDIS ingests 3.9 PB / year$

NASA's Cloud Initiative

"To prepare for this tremendous growth and efficiently provide access to these data, EOSDIS ... is testing how EOSDIS data collections can be archived collectively and disseminated in the cloud.

As befitting the cloud environment, **this prototype is** called Cumulus."

https://earthdata.nasa.gov/eosdis-cumulus-project

What is Cumulus?

Cumulus is a collection of resources for deploying and configuring a **data pipeline in the cloud**.

Cumulus Major System Components

A lightweight framework consisting of:

<u>**Tasks</u>** a discrete action in a workflow, invoked as a Lambda function or EC2 service, common protocol supports chaining</u>

Orchestration engine (AWS Step Functions) that controls invocation of tasks in a workflow

Database store status, logs, and other system state information

<u>Workflows(s)</u> file(s) that define the ingest, processing, publication, and archive operations (json)

Dashboard create and execute workflows, monitor

system





Who uses Cumulus and how?

DAACs

DAACs are NASA's Distributed Active Archive Centers. They ingest and disseminate NASA's satellite data.

DAACs is now using Cumulus to discover, ingest, process and manage their data products.





Everyone!

- Cumulus is open source
- Cumulus Core Repository \rightarrow

https://github.com/nasa/cumulus

• Cumulus documentation \rightarrow

https://nasa.github.io/cumulus

- \bigcirc How to deploy
- Example workflows

How can you get involved?





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AUG 01, 2018

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NEXRAD on AWS

The Next Generation Weather Radar (NEXRAD) is a network of 160 highresolution Doppler radar sites that detects precipitation and atmospheric movement and disseminates data in approximately five minute intervals from each site. NEXRAD enables severe storm prediction and is used by researchers and commercial enterprises to study and address the impact of weather across multiple sectors.

Image from NEXRAD data

Learn More

How can you get involved?

- NASA ARSET
- NASA SOLVE
- NASA DEVELOP
- AWS Earth on AWS

Thanks!



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