AWS re:Invent

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WPS301

Event-driven data processing with AWS Ground Station

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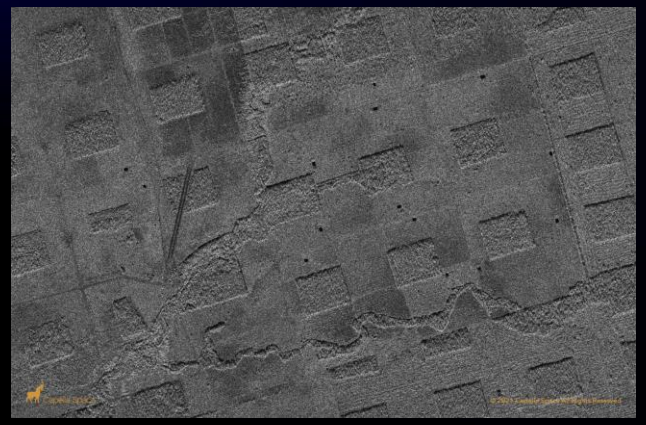
Agenda

- Earth observation data
- Problem set
- How AWS solves
- Workshop – Event-driven architecture for satellite data

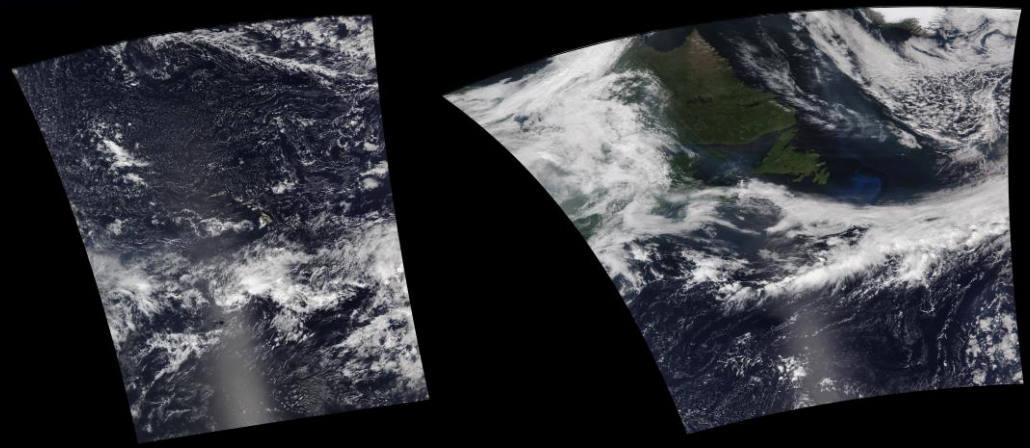
Earth observation (EO) satellite data

- Data about the Earth from remote sensing vehicles (satellites) in various orbits around the planet
- Includes
  - Visual imagery
  - Interpolated imagery (radar, sonar, etc.)
  - Numerical science measurements (temperature, moisture, radiance, chlorophyll)
- Use-cases span scientific research, marketing, national security, logistics operations, property development, financial security, and more

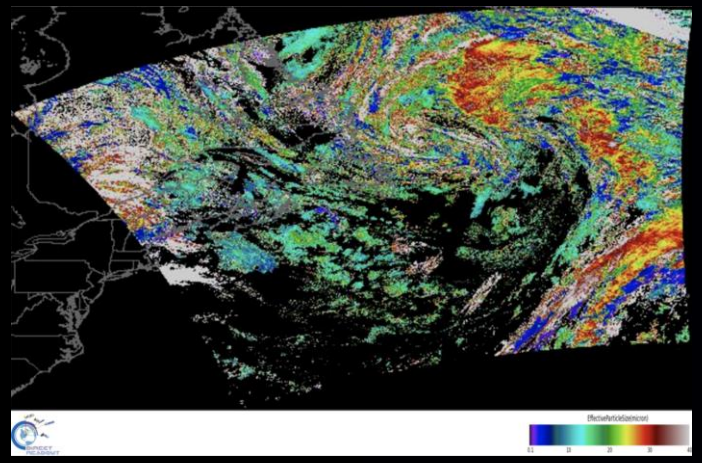
Earth observation satellite data



Capella Space: SAR Imagery Amazon Deforestation, Luna Camba, Santa Cruz, Bolivia[1]



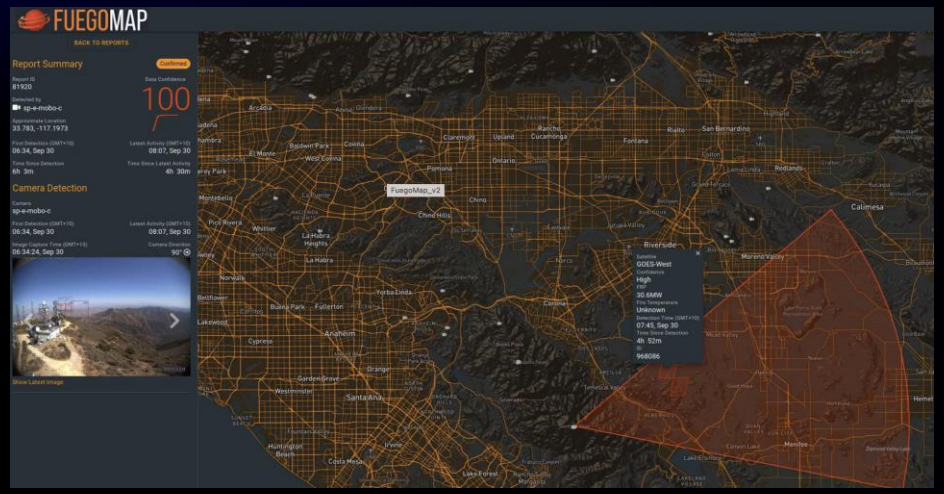
JPSSS-20: True Color Imagery of Hawaii and Newfoundland [recorded/processed by AWS]



SNPP: Cloud Effective Particle Size, N. Atlantic Ocean[2]

Sentinel-1 and Sentinel-2: Composite SAR and True Color Imagery from the European Space Agency (ESA)[3]

Great use-case(s) of satellite data

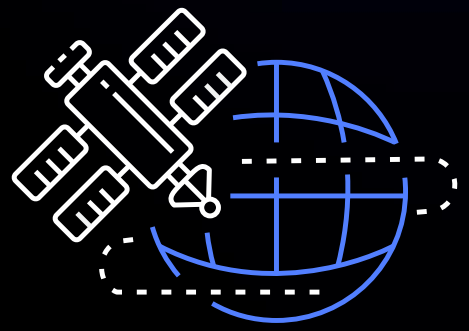


Fireball International, now Exci, AWS Case-Study[4]

Descartes Labs, AWS Summit[5]

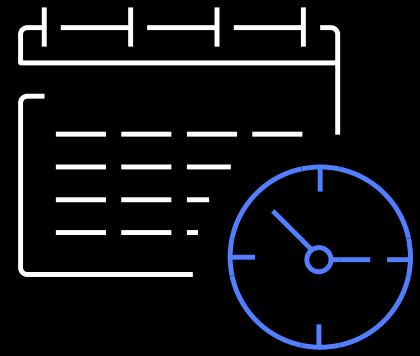
Maxar Technologies, Twitter[6]

Challenges of using satellite data



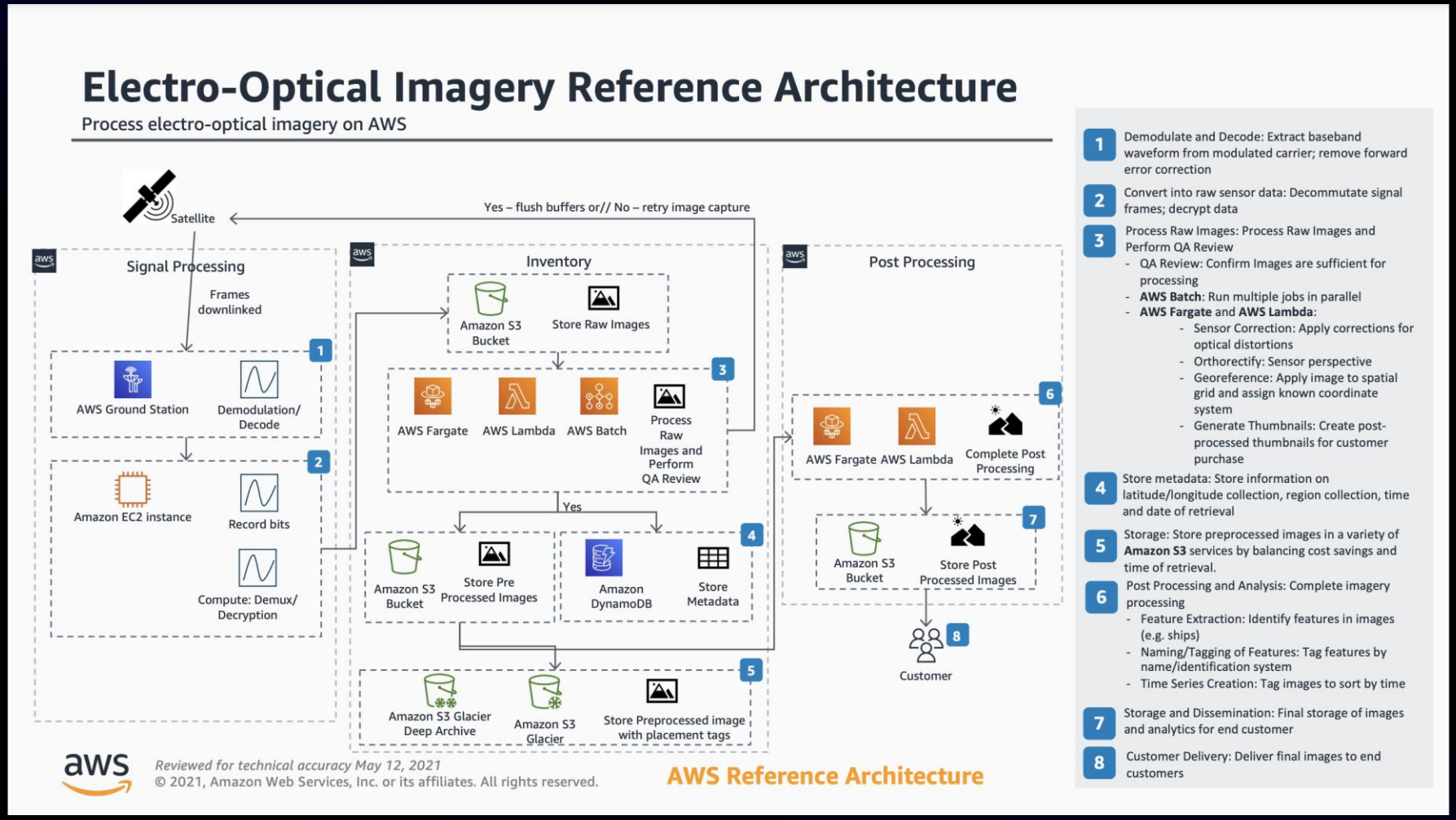
Obtaining the data

Storage/processing



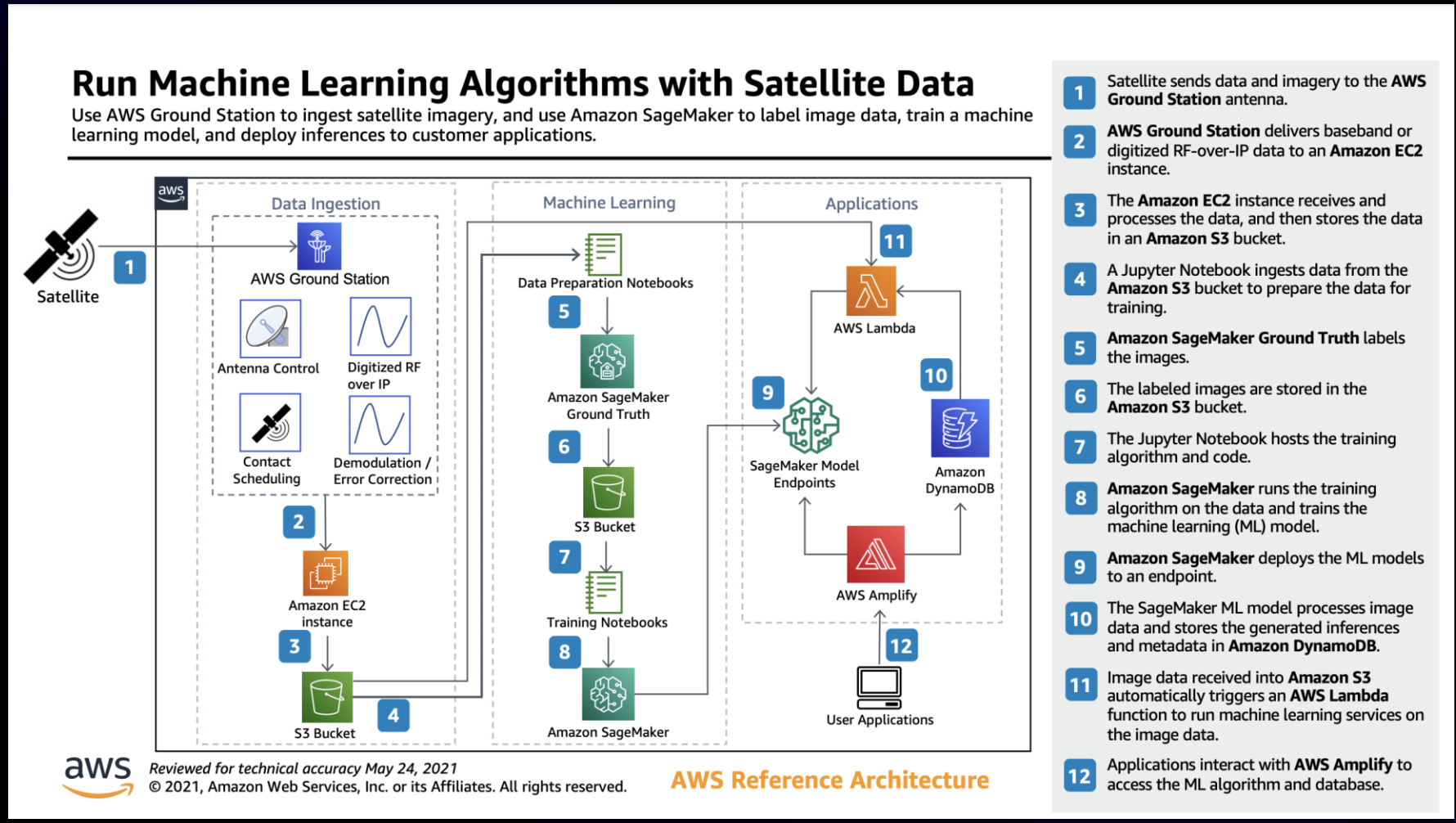
Burst transmissions

How AWS solves



https://d1.awsstatic.com/architecture-diagrams/ArchitectureDiagrams/electro-optical-imagery-ra.pdf?did=wp_card&trk=wp_card

How AWS solves



https://d1.awsstatic.com/architecture-diagrams/ArchitectureDiagrams/run-machine-learning-algorithms-with-satellite-data-ra.pdf?did=wp_card&trk=wp_card

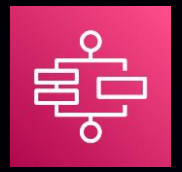
Simplified architecture

AWS Ground Station

Amazon Simple Storage Service (S3)

Amazon EventBridge

Amazon CloudWatch



AWS Step Functions

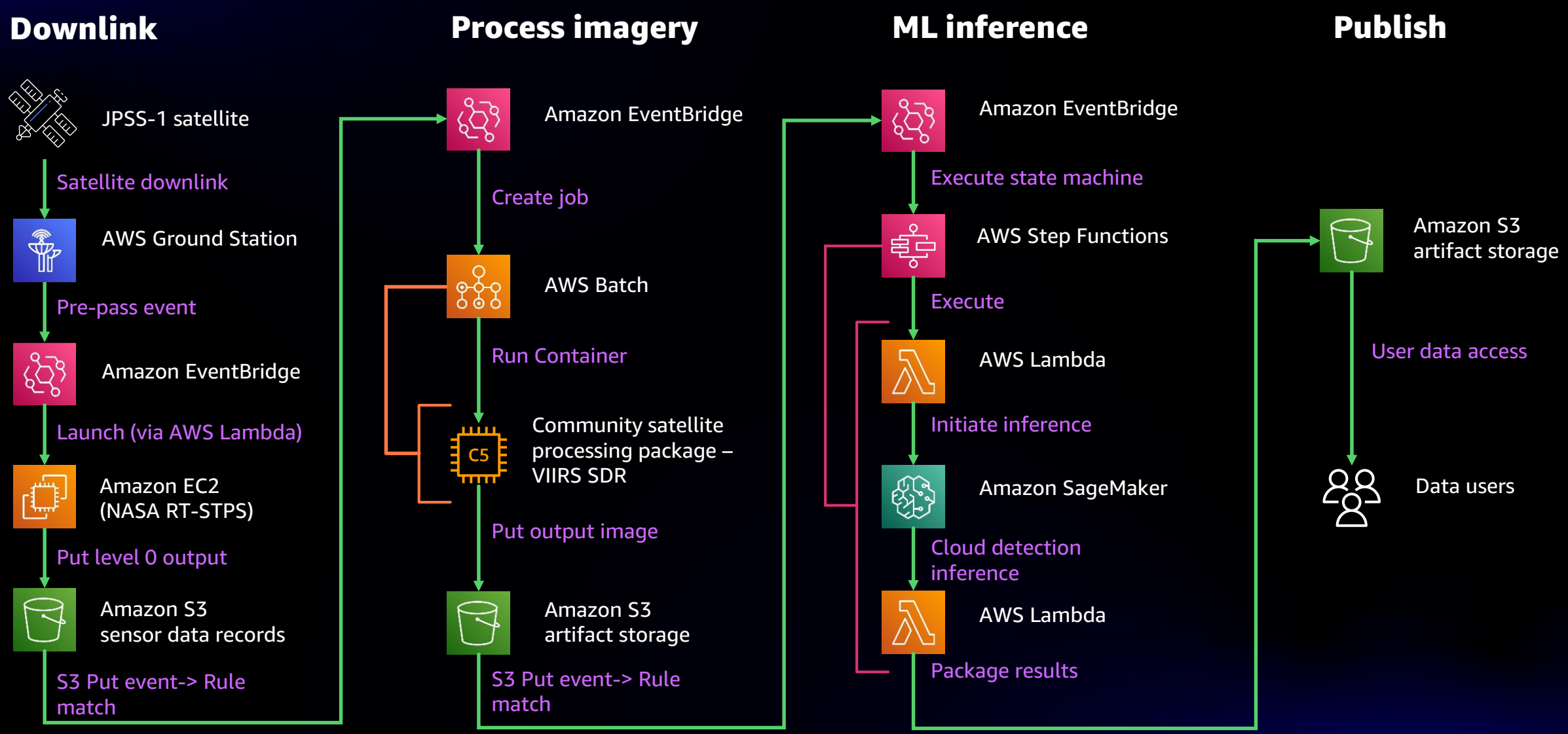
AWS Lambda

AWS Batch

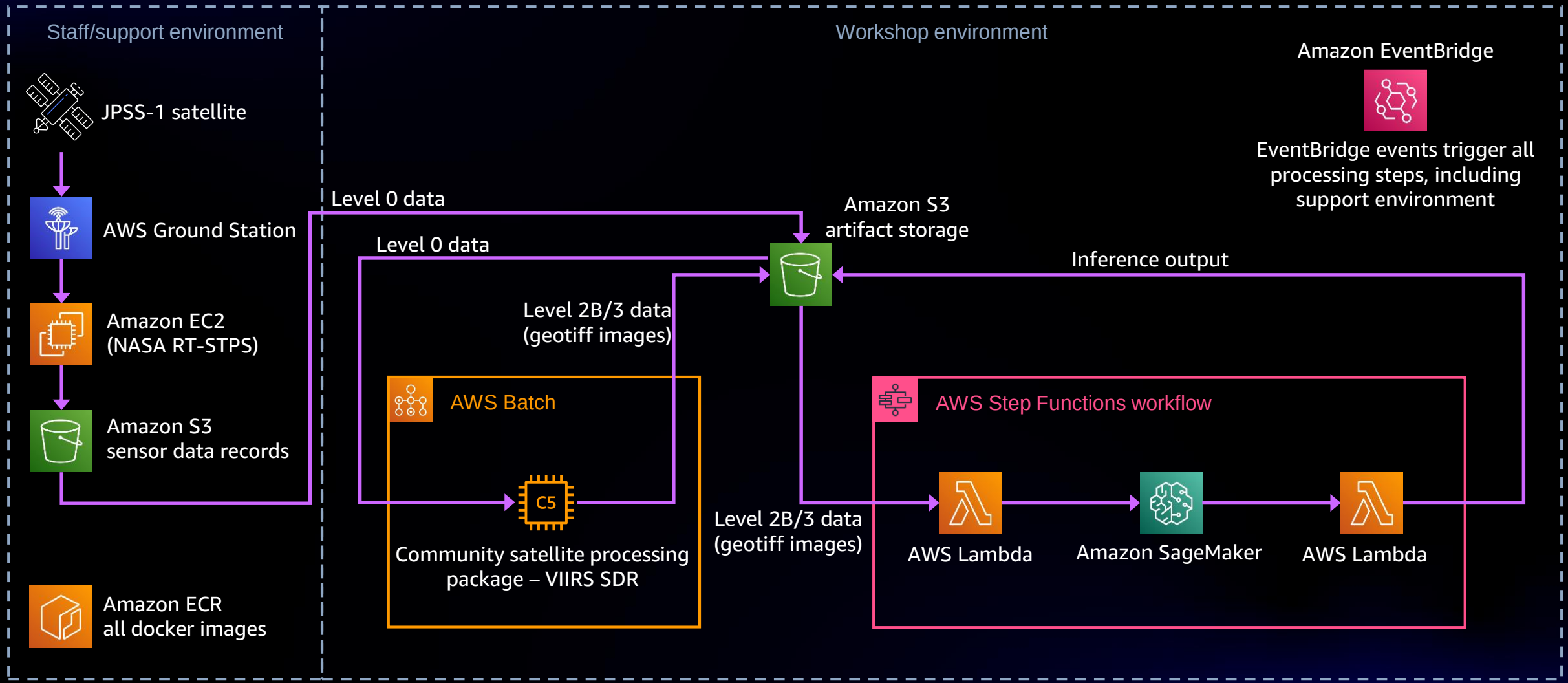
Amazon Elastic Compute Cloud (EC2)

Amazon SageMaker

Data flow/sequence



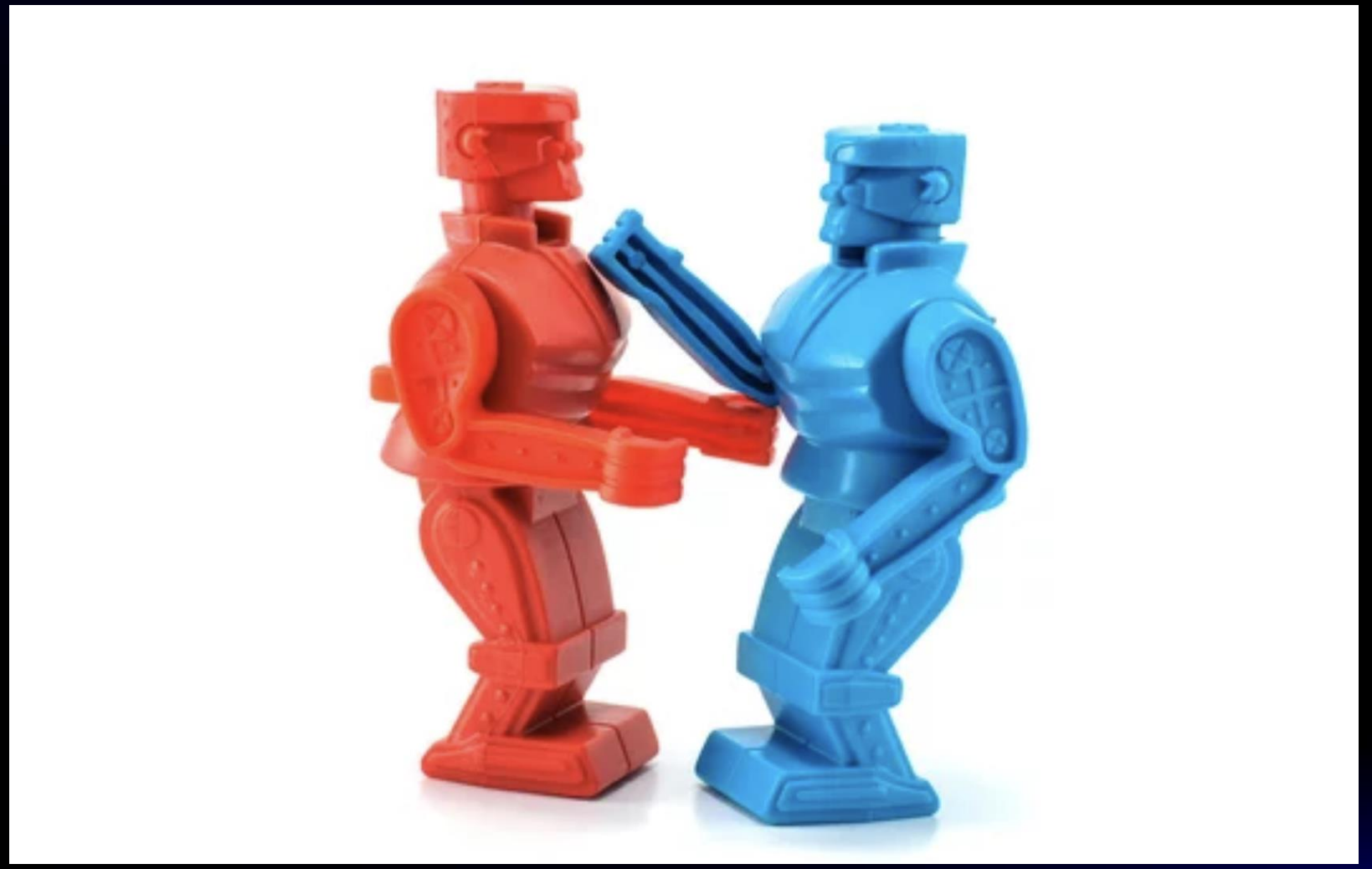
Workshop architecture diagram



Why this architecture?

- AWS Ground Station enables customers to transfer satellite data from their satellites to AWS cloud in near real time
- AWS-managed compute solves performance data processing – The processing software available to us is monolithic; Amazon EC2 C5 instances provided the memory and core count to enable timely processing of our data; using AWS Batch means we don’t have to scale it ourselves
- Event-driven workflow efficiently handles our bursting workload – AWS Batch, AWS Step Functions and AWS Lambda all enable us to scale up when we need to process imagery, and scale back down when we don’t

Architecture trade-offs

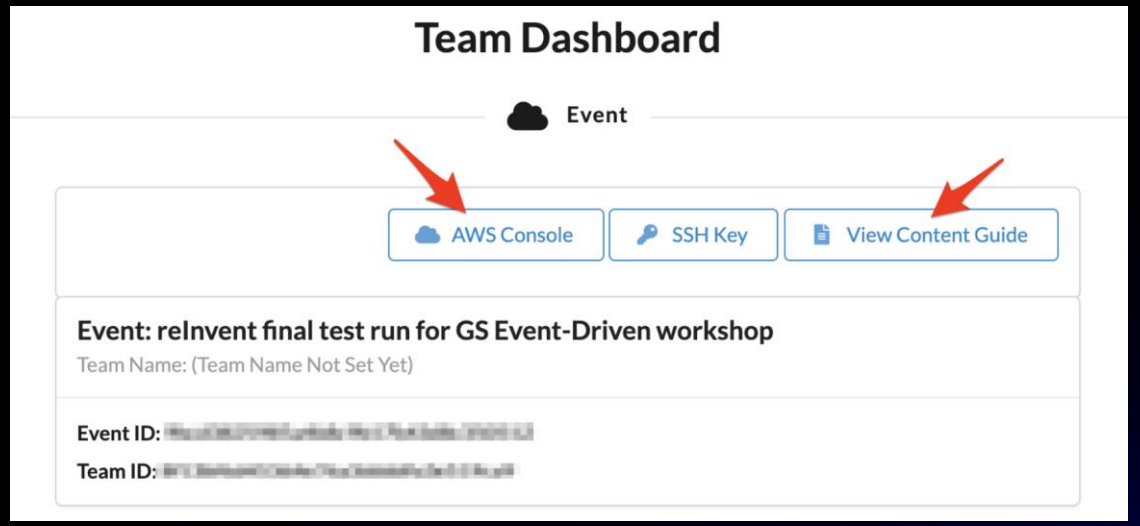


Goals of workshop

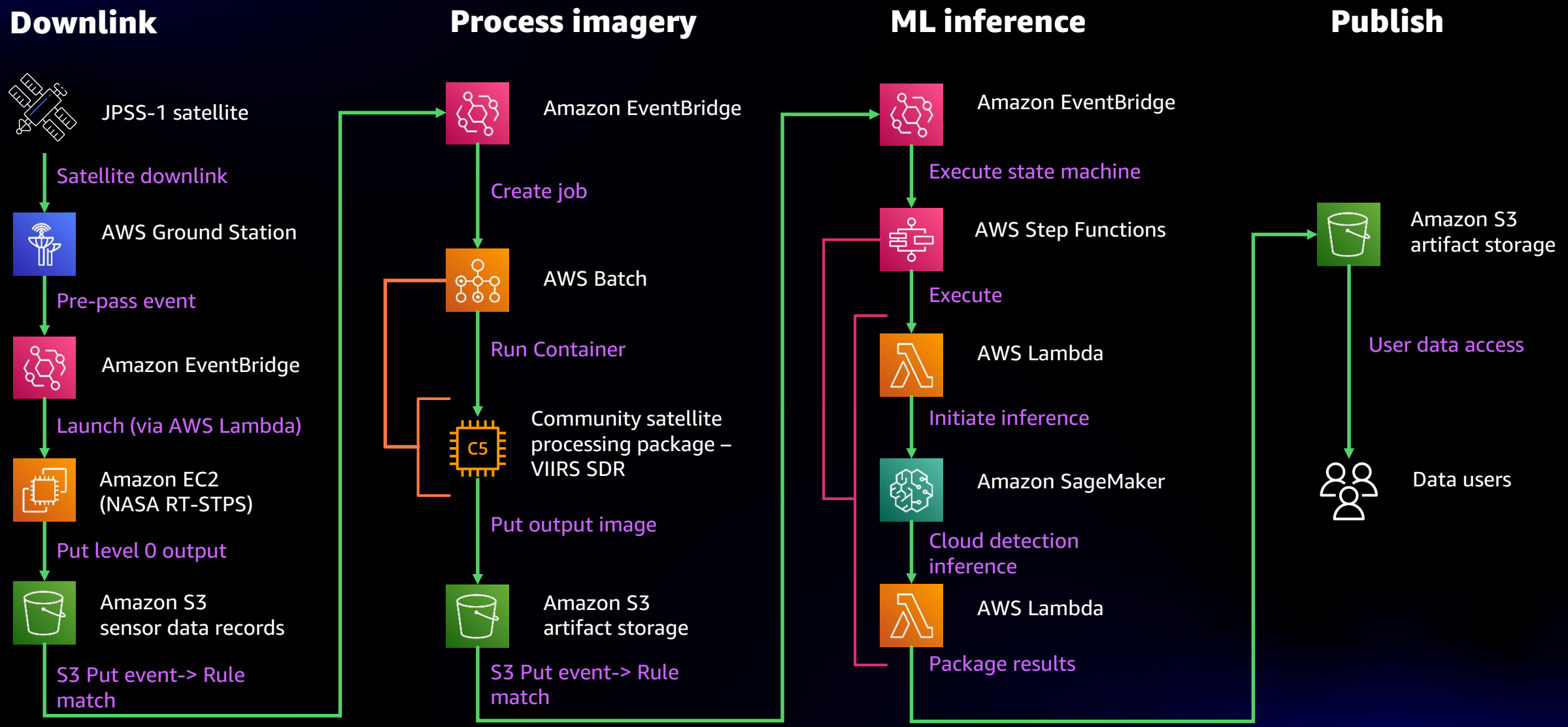
- Learn how AWS can help the challenges associated with EO data
- Obtain hands-on experience deploying an event-driven image processing architecture
- Use AI/ML to automate cloud detection
- Obtain your own satellite imagery product
- Work hard; have fun; make history

Next steps

- Log in to Event Engine at the following: https://dashboard.eventengine.run/ Event hash: 1219-18d1e71184-7c
- Obtain emailed one-time password
- Click **View Content Guide**



Reminder: Data flow/sequence



Sources

- (1) Capella Space, “Capella Space Opens its SAR Data to the Public,”14 September 2021, https://www.capellaspace.com/capella-space-opens-its-sar-data-to-the-public/; accessed 10 Oct 2021
- (2) Direct Readout Laboratory, “Recent Data Products,” 21 October 2021, https://directreadout.sci.gsfc.nasa.gov/?id=dspContent&cid=159; accessed 21 October 2021
- (3) Space.com, ”Integrating diverse satellite images sharpens our picture of activity on Earth (op-ed),” 23 Mar 2021; https://www.space.com/satellite-imagery-advance-expert-voices; accessed 20 Oct 2021
- (4) AWS Case-Study, ”Fireball International Shortens Wildfire Detection to 3 Minutes Using AWS,” 2021; https://aws.amazon.com/solutions/case-studies/fireball-international-case-study/; accessed 20 Oct 2021
- (5) Descartes Labs, 2021 AWS DC Summit, “Addressing planetary problems with satellite data”; 28 September 2021; https://www.youtube.com/watch?v=DCJ36R8mGSc; accessed 28 Nov 2021
- (6) Maxar Technologies [@Maxar], Twitter, 29 Mar 2021, https://twitter.com/maxar/status/1376551006125879297?lang=en; accessed 10 Oct 2021

Thank you!

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