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Upstream Ancillary Ingest: Keep Up Best You Can

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ARIA: Advanced Rapid Imaging Analysis

- rapid and large-scale analysis of SAR observations
- processed to higher-level actionable information that can be used by hazards response communities
- ARIA SDS has prototyped generating data products that contain surface displacement maps (from earthquakes, volcanoes), damage maps (from building damage, landslides, fire burn scars), and flood maps
- Uses Hybrid-cloud Science Data System
  - Designed to run on public and on-premise clouds, as well as compute on legacy machines.
  - Mainly AWS and OpenStack
  - Supports cost-effective AWS *spot market*
  - Resiliency and fault-tolerant compute

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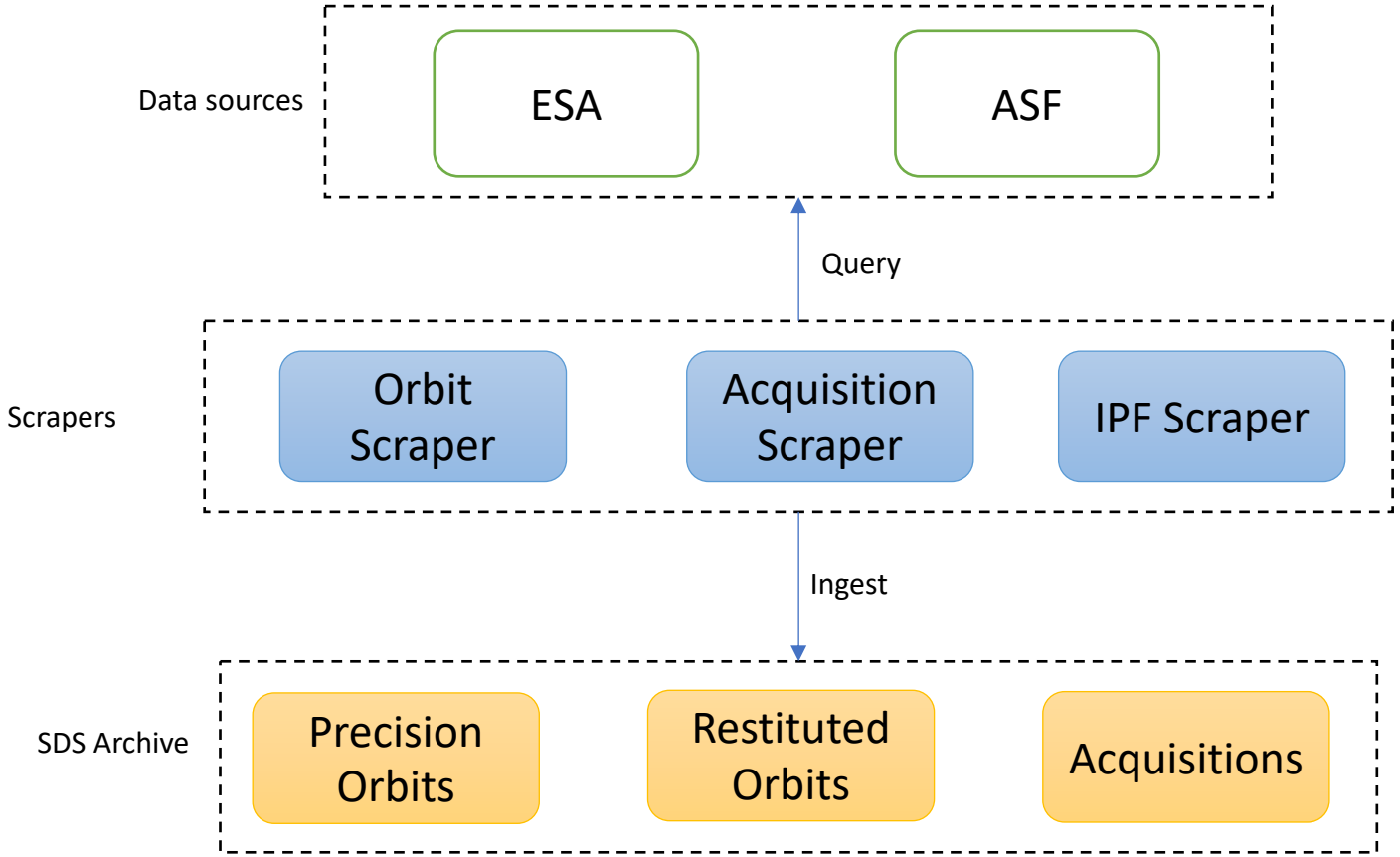
Upstream Ancillary Ingest



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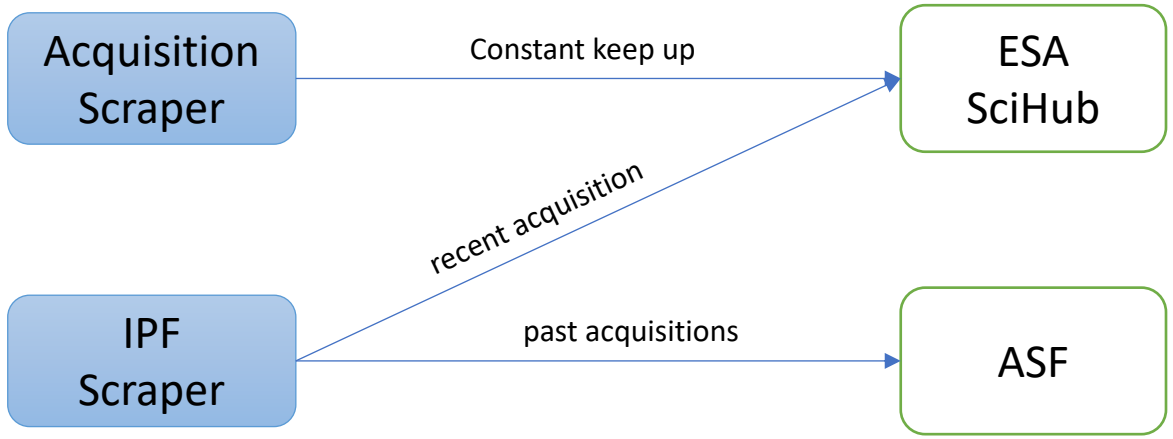
Which data provider should I go to?

- SciHub maintains hot cache and long term archive
- ASF also scrapes SciHub and archives



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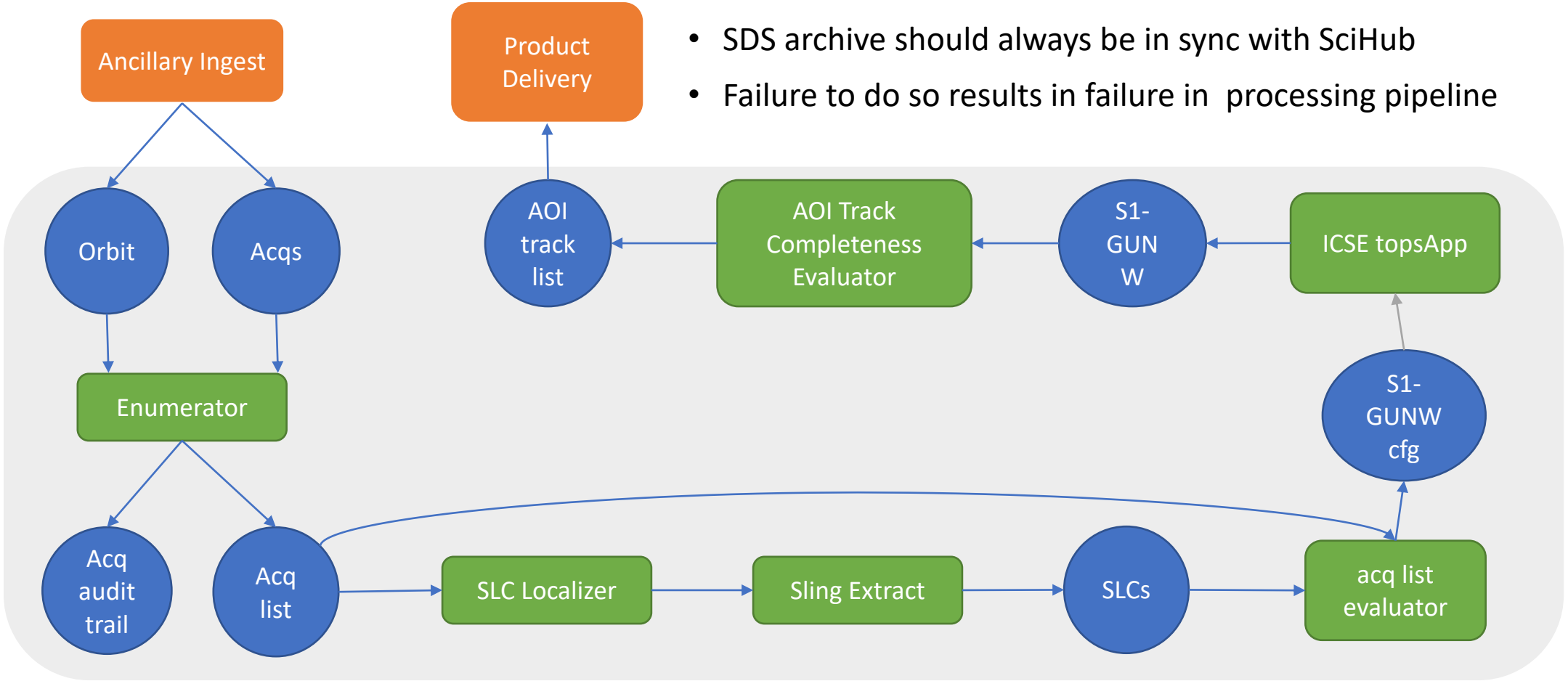
Impact of Ancillary Keep Up



- SDS archive should always be in sync with SciHub
- Failure to do so results in failure in processing pipeline

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Keep Ups and Hold Ups

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Keep Up Mode

- Global acquisition scraper
  - Best Effort Jobs
  - Frequency of runs:
    - Sliding Window Approach
    - Daily – looks back 5 days for new acquisitions
    - Hourly – looks back 5 hours for new acquisitions

- Global IPF scraper
  - Job per acquisition
  - Must succeed
  - Frequency of runs:
    - Sliding window approach
    - Daily – looks back 5 days for acquisitions missing IPFs
    - Hourly – looks back 5 hours for acquisitions missing IPFs

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Reprocessed Acquisitions

- Updated IPFs
- Updated metadata fields
- Slightly different start and end time
- Change in hash

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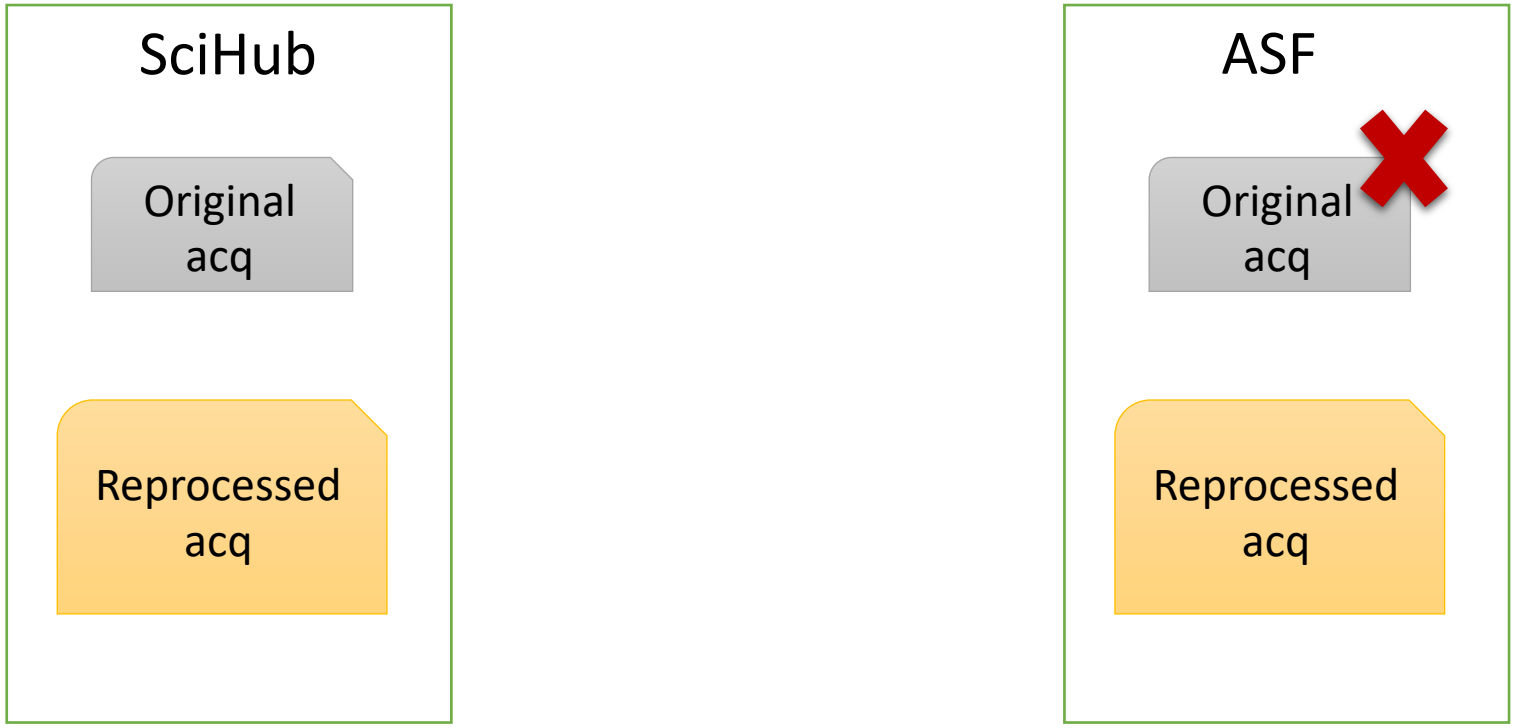
Deprecated Acquisitions



No information on which acquisition was superseded.

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Challenges of Dealing with Deprecated Acquisition

- Cannot retrieve it (immediately) from SciHub if acquisition is older than 2 years
- Fail to get IPF from ASF because it no longer exists
  - ASF gives response with an empty list and 200 status
  - Does an empty response mean Not Found? NO
  - Scenarios for empty response:
    - Issue in querying CMR
    - Acquisition doesn’t exist
      - Deleted
      - Not yet ingested

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Handling Deprecation

- Work in Progress
- Can handle cases where only hash of acquisition changes
- Yet to handle reprocessed acquisition with update timestamps

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Challenges of Running in Cloud Environment

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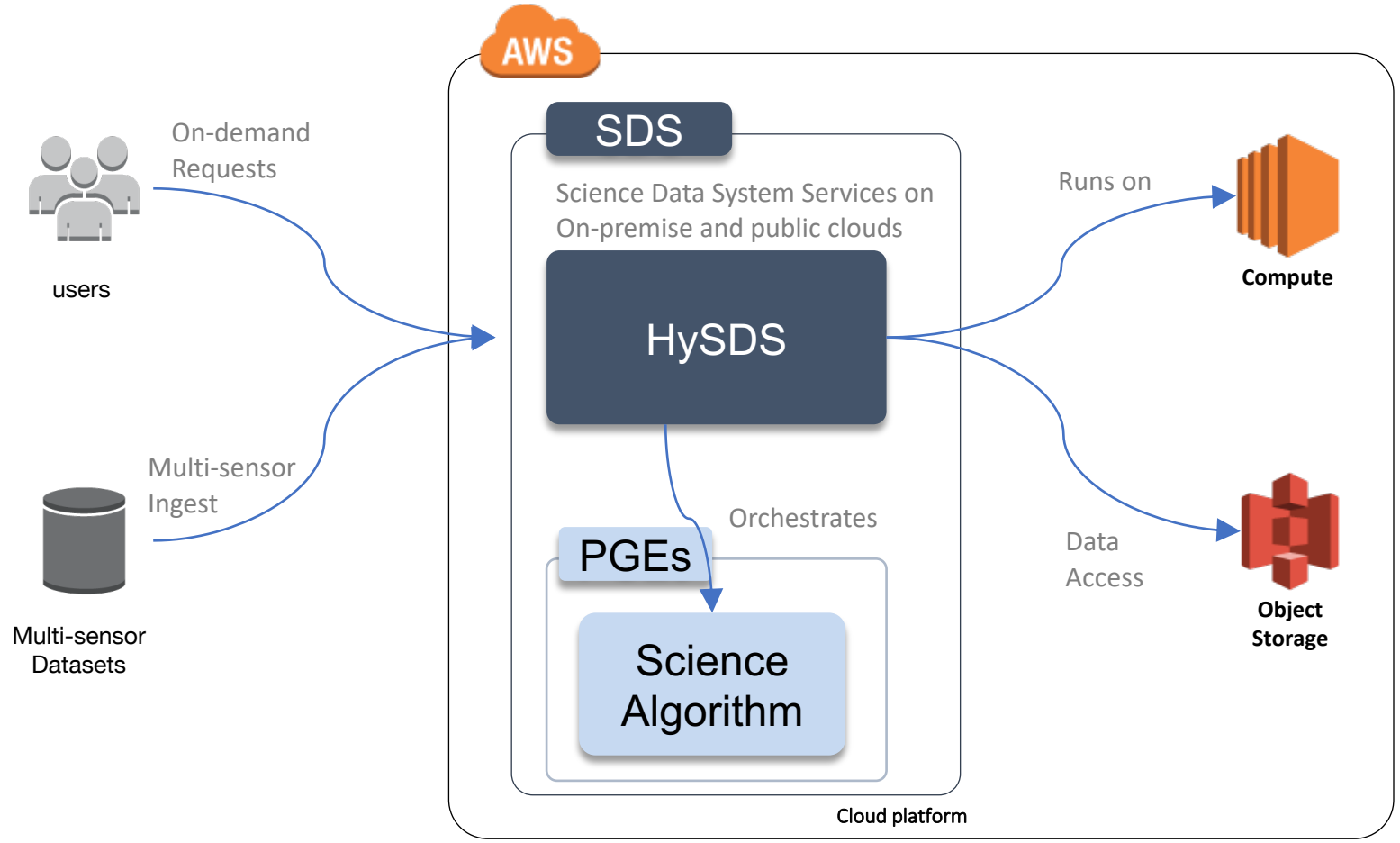
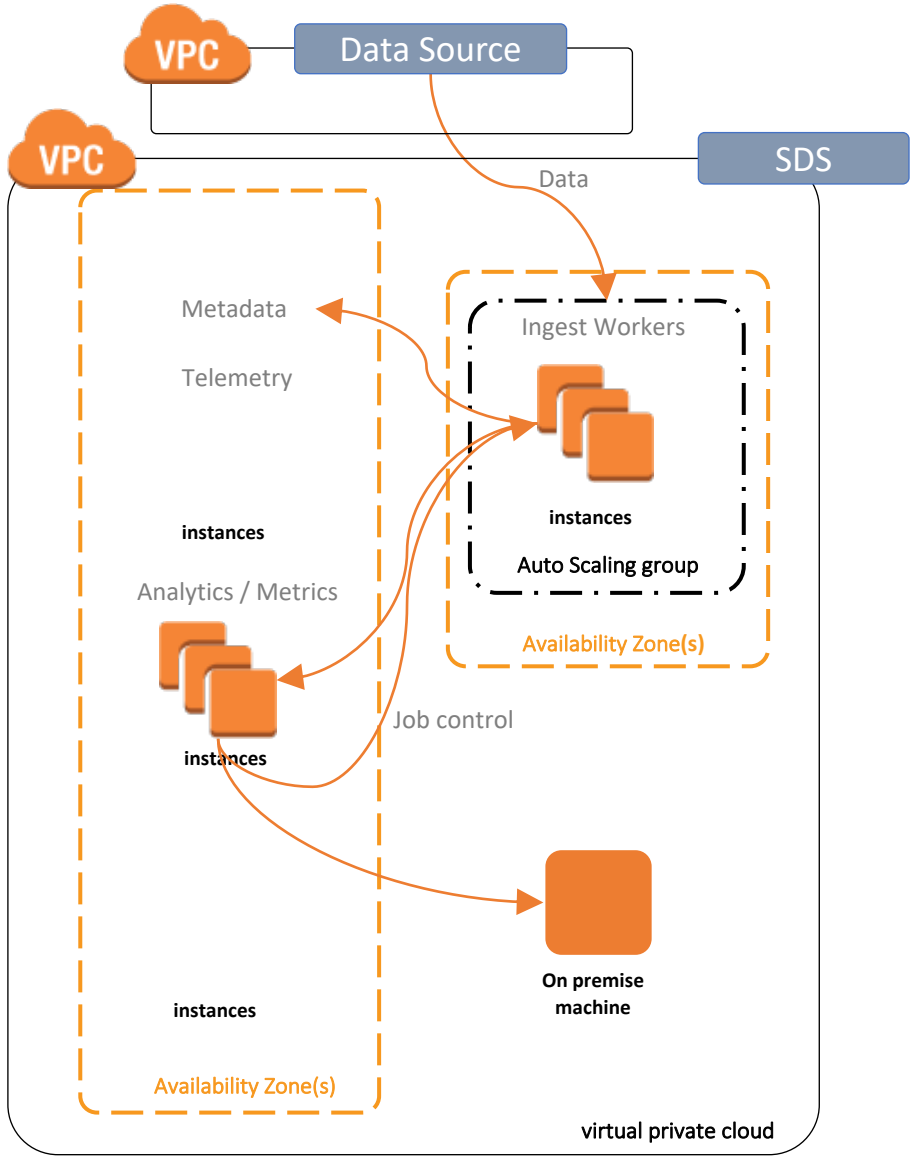
Top-Level Software Components



Limits on Connections

- No limit in number of connections to ASF
- Limited to 2 accounts per worker per account



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IPF Common Errors

Scenario	Error	
Exception: Got code 503 (scihub, exceeding concurrent connections to scihub)	Exceeding max concurrent SciHub connections.	→ Retry later
Scihub 202 Response	Acquisition moved to Long Time Archive	→ Query ASF instead
Retrieved IPF value is null	Got null IPF	→ Retry job
Empty Response from ASF	Acquisition not found at ASF	→ Hope next hourly will catch it
Null XML Manifest	IPF not found in XML	→ Transient Error, retry

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Duplicate Jobs in System

Problem

- The retry rule keeps re-queuing failed IPF scrape jobs.
- HySDS has a feature to detect duplicate jobs
- It does not “dedup” against failed job
- The global IPF scrape submitter would submit jobs for the same acquisition every hour
- Multiple IPF scrape jobs for same acquisition
- Introduces race condition since it runs on auto scaling instances

Duplicate Jobs in System

Solution: Short Circuit Jobs

Every time the job runs, there are several checks:

- Is the IPF still null for the acquisition? then proceed else exit.
- Query Job Manager for duplicate jobs. Check if current job has the highest retry count. If YES, then short circuit. Other duplicates with lesser retry attempts exist in the system.
- Make sure to check if IPF is filled and not a null retrieved value before calling document update

Take away: Robustness and Resilience

- Make system robust enough to custom handle specific failures (i.e trigger rules)
- Make jobs resilient to external changes and unreliable responses.
- Use sliding window approach to account for service downtimes
- Use domain knowledge and experience to mature your jobs (handling to edge cases)
- To handle duplicate jobs, use short circuit logic such that the last man standing successfully finishes the job

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Questions?