

Operational Processing of DLR's Sentinel-1 Normalized Radar Backscatter Product

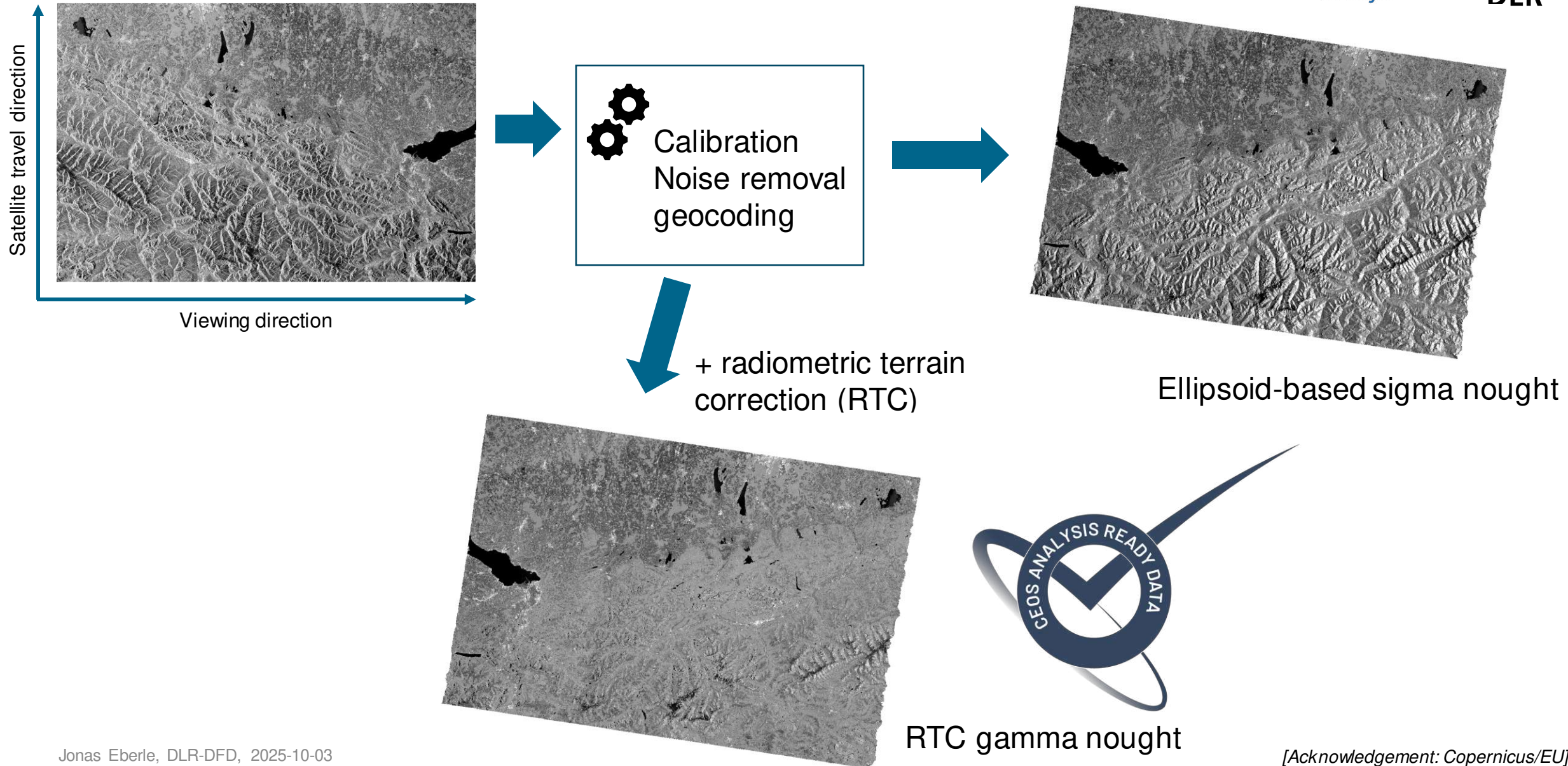
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From SAR to Analysis-Ready-Data



DLR's Sentinel-1 Normalized Radar Backscatter (NRB) based on ESA's NRB prototype and specification



- Product specification

- Exact extent of Sentinel-2 grid cells (based on MGRS)
- 10 m spacing / 100 km tiles
- Cloud Optimized GeoTIFF (COG)
- Compliant to CEOS-ARD SAR specification

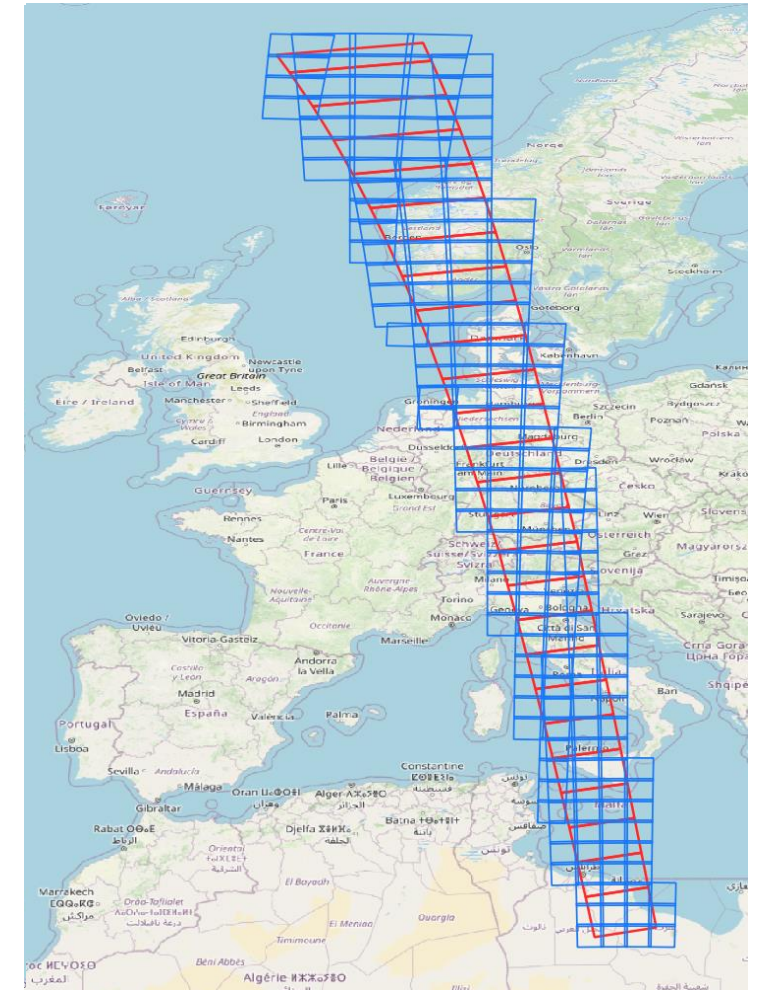
- Input data

- Sentinel-1 GRD: 3.5 Mio scenes with 4.5 PB data volume
- Copernicus DEM 30m

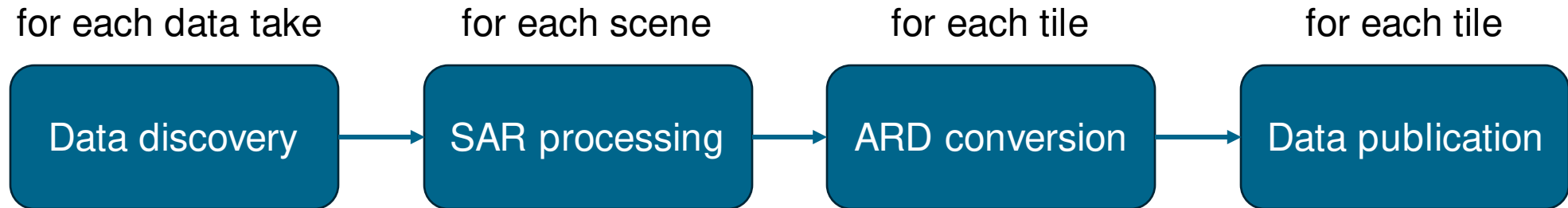
- Output data

- Gamma Nought RTC Backscatter
- Ancillary layers (e.g., data mask, local incident angle, gamma2sigma ratio)
- STAC Metadata
- Data volume: size ratio GRD to NRB approx. 2.3 = 10.5 PB

26 scenes, 198 NRB products



Processing steps

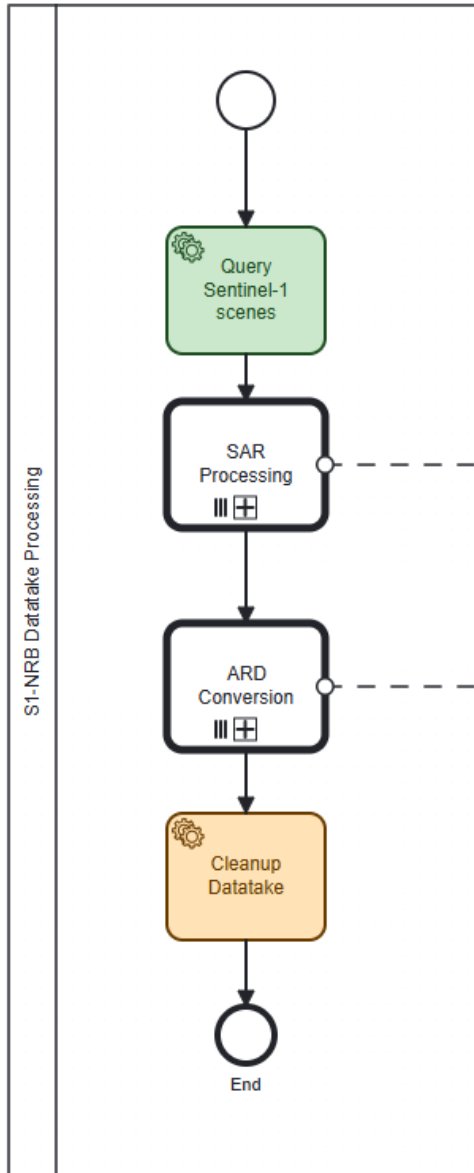


Tasks with different resource requirements:

- | | |
|-----------------------------------|-------------------------------------|
| • CPU and RAM intensive jobs: | SAR processing & ARD conversion |
| • Data read/write intensive jobs: | Data validation, transfer & cleanup |
| • Low resource tasks: | Data discovery & STAC registration |

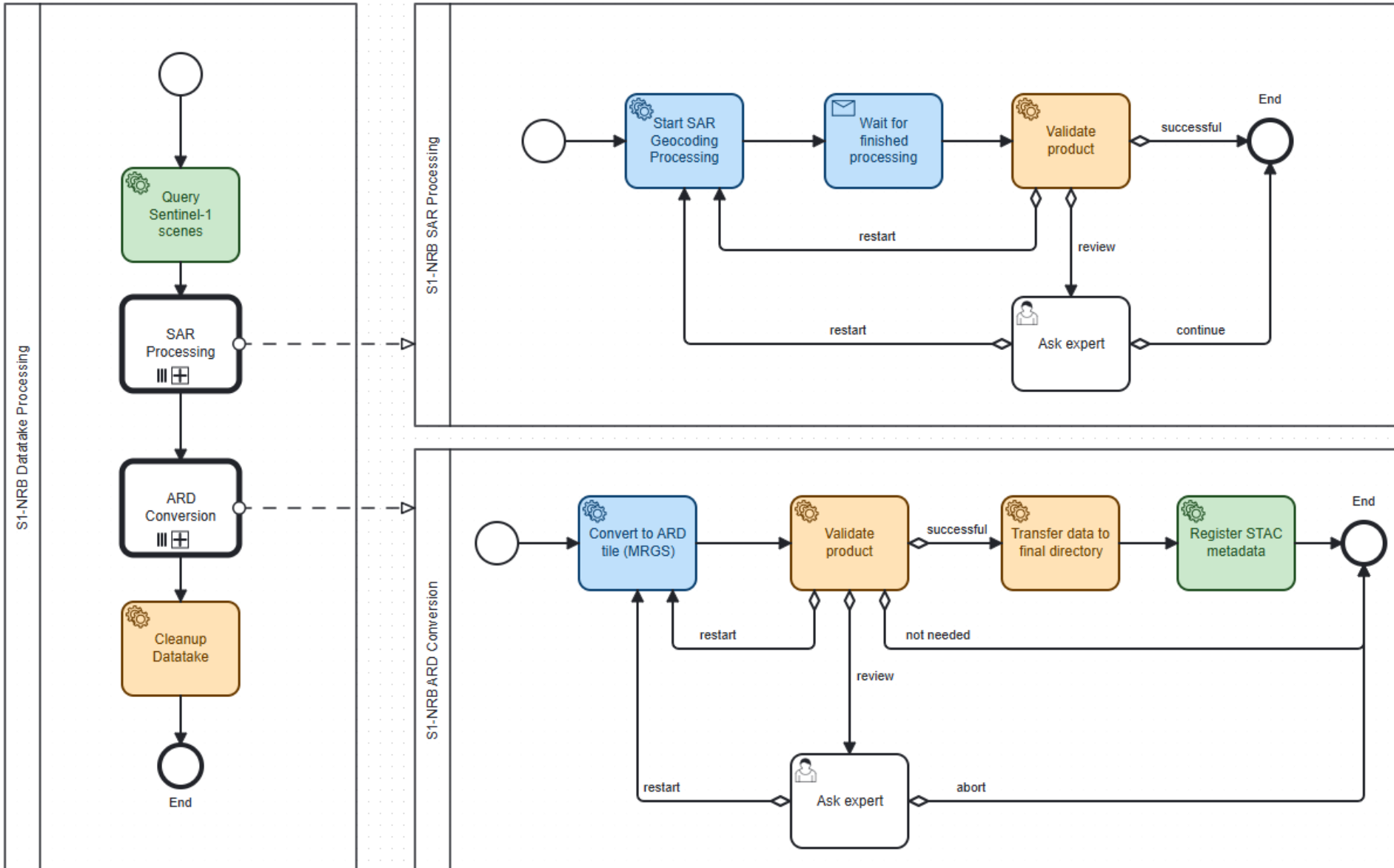
Workflow orchestration

Business Process Modeling & Notation (BPMN)



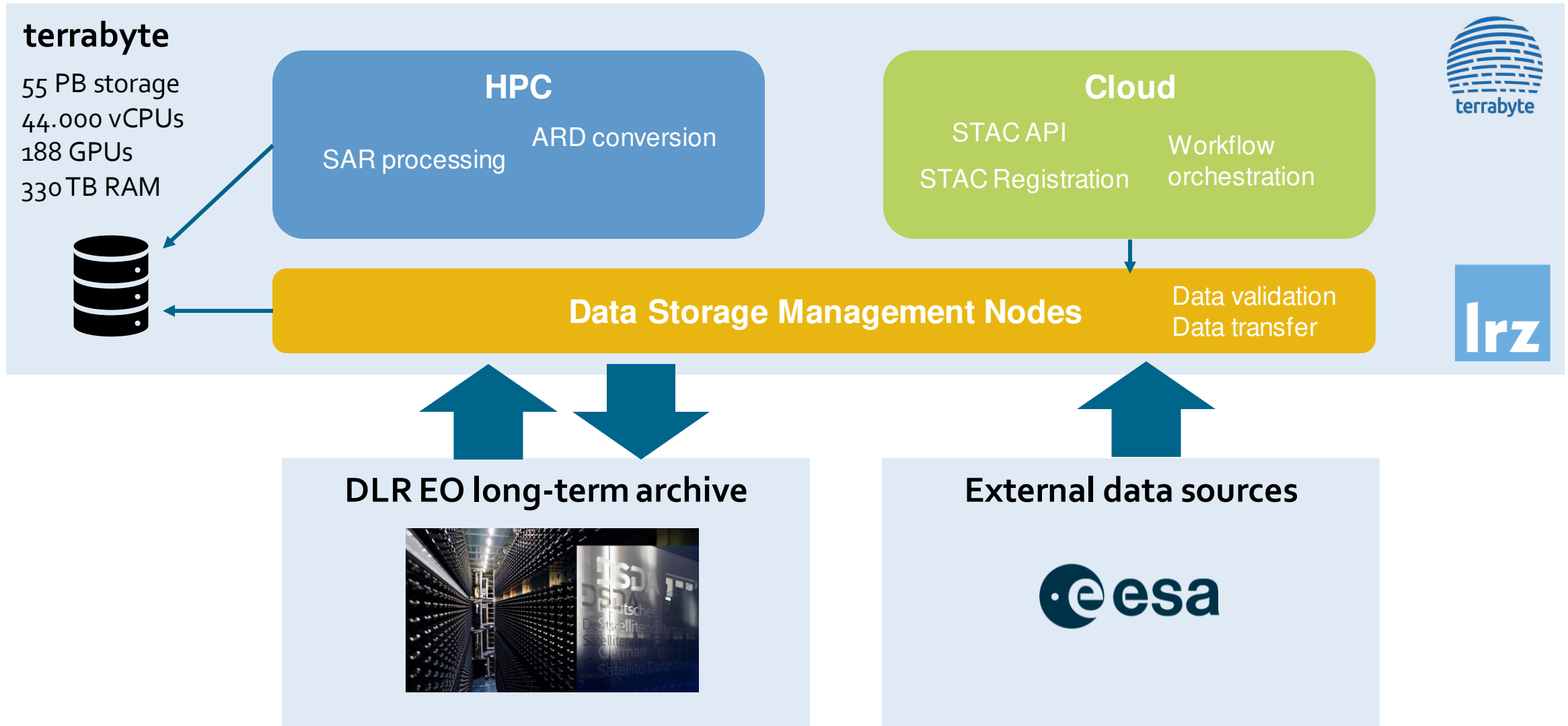
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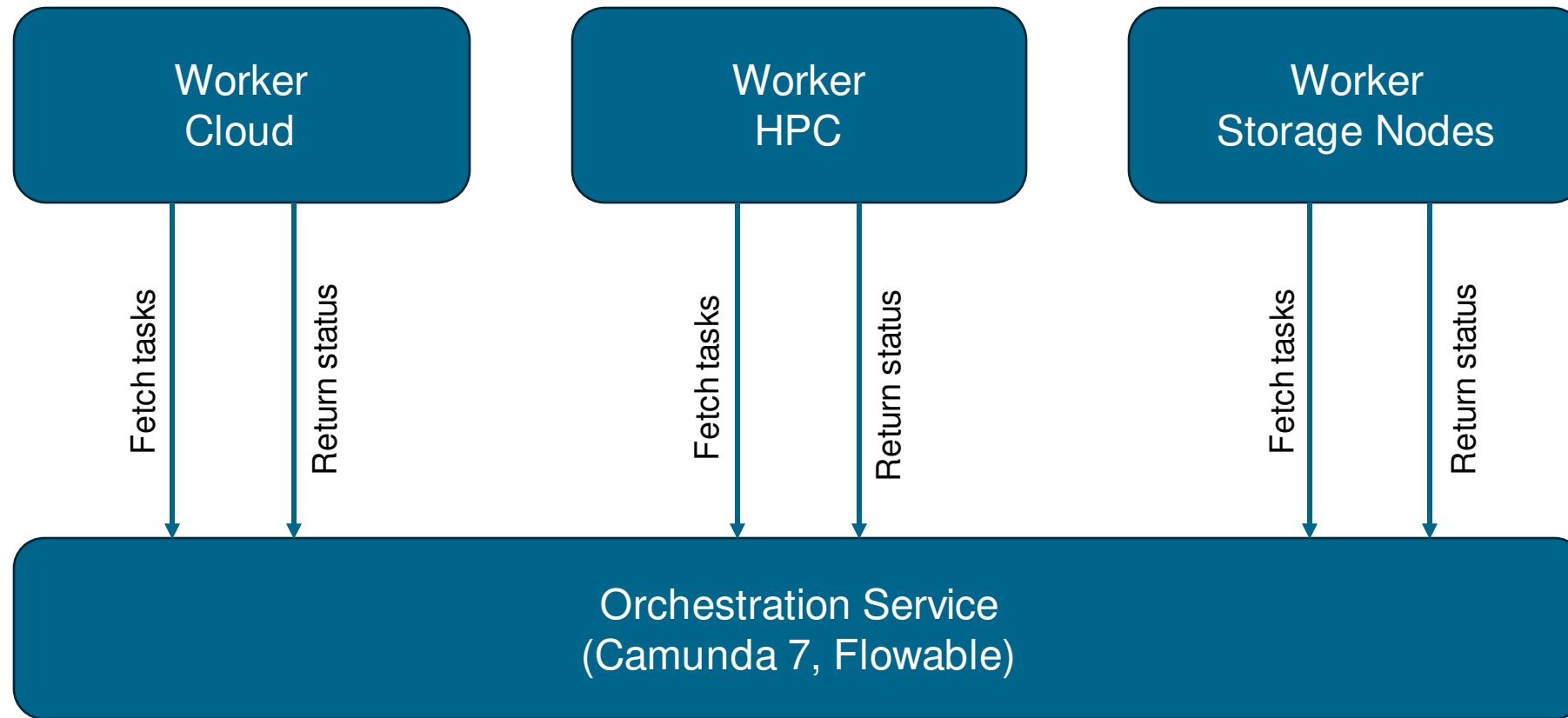
DLR/LRZ terrabyte

EO Exploitation & High Performance Data Analytics Platform



Workflow orchestration

Service and distributed workers



How to scale up?

Grafana based monitoring of available and used resources



Monitor the CPU resources of the HPC cluster:

- Launch fixed number of processing jobs with high priority.
- Launch processing jobs for resources not used!



Monitor the CPU resources used by NRB processing:

- Control the maximum resources used for processing.

Challenges & next steps



- Sentinel-1 SLC instead of GRD
 - Lower processing complexity due to non border noise effects
 - SLC data needs to be put online partwise (too big)

- Performance of SAR geocoding software
 - ESA SNAP = 16 vCPUs, 60 - 90 minutes runtime
 - GAMMA = 8 vCPUs, 45 - 70 minutes runtime
 - ~1 hour per scene using 8 CPU cores
 - 3.5 Mio scenes = 28 Mio CPU core hours
 - ~39.000 vCPUs one month (90% of terrabyte CPU resources)
 - ESA EOPF open source processor (when available)



Thank you for your attention!