EOPORT – A near real-time exploitation platform for Earth Observation data

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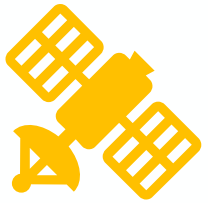
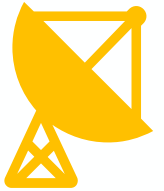
EO in 2022



Growing number of satellite missions

More data made available openly in the cloud



Growing number of platforms for exploiting large satellite data archives

… but getting new data is still slow!

ESA funded the EOPORT platform, allowing us to explore what a
near real-time exploitation platform
might look like.

We want to facilitate increased use of near real-time (NRT) data and services, by enabling service providers to get access to satellite data as fast as possible.

Why does it take so long to get new satellite data?

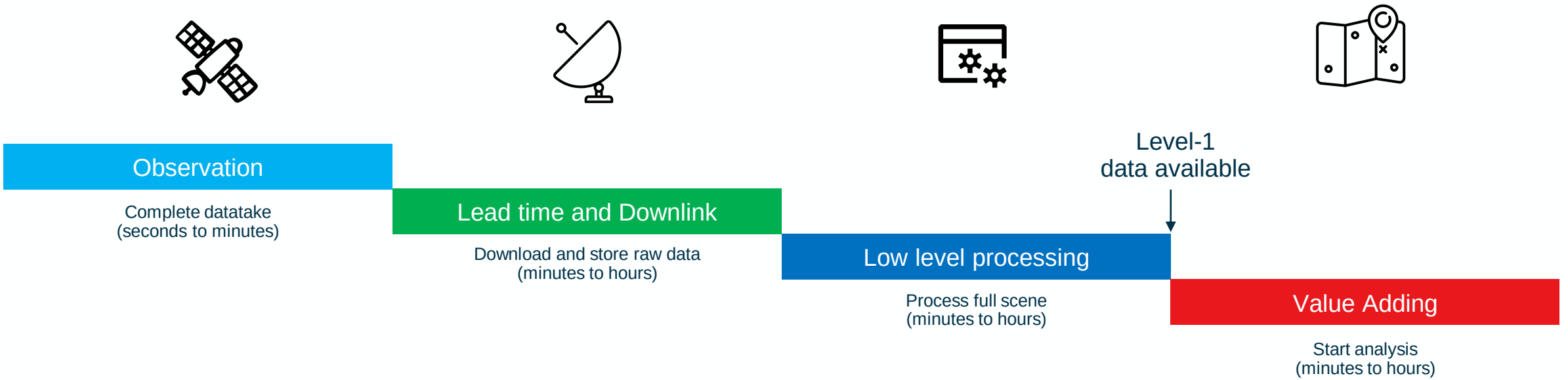
Before measuring

- Feasibility study
- Ordering
- Tasking
- Lead time to observation window

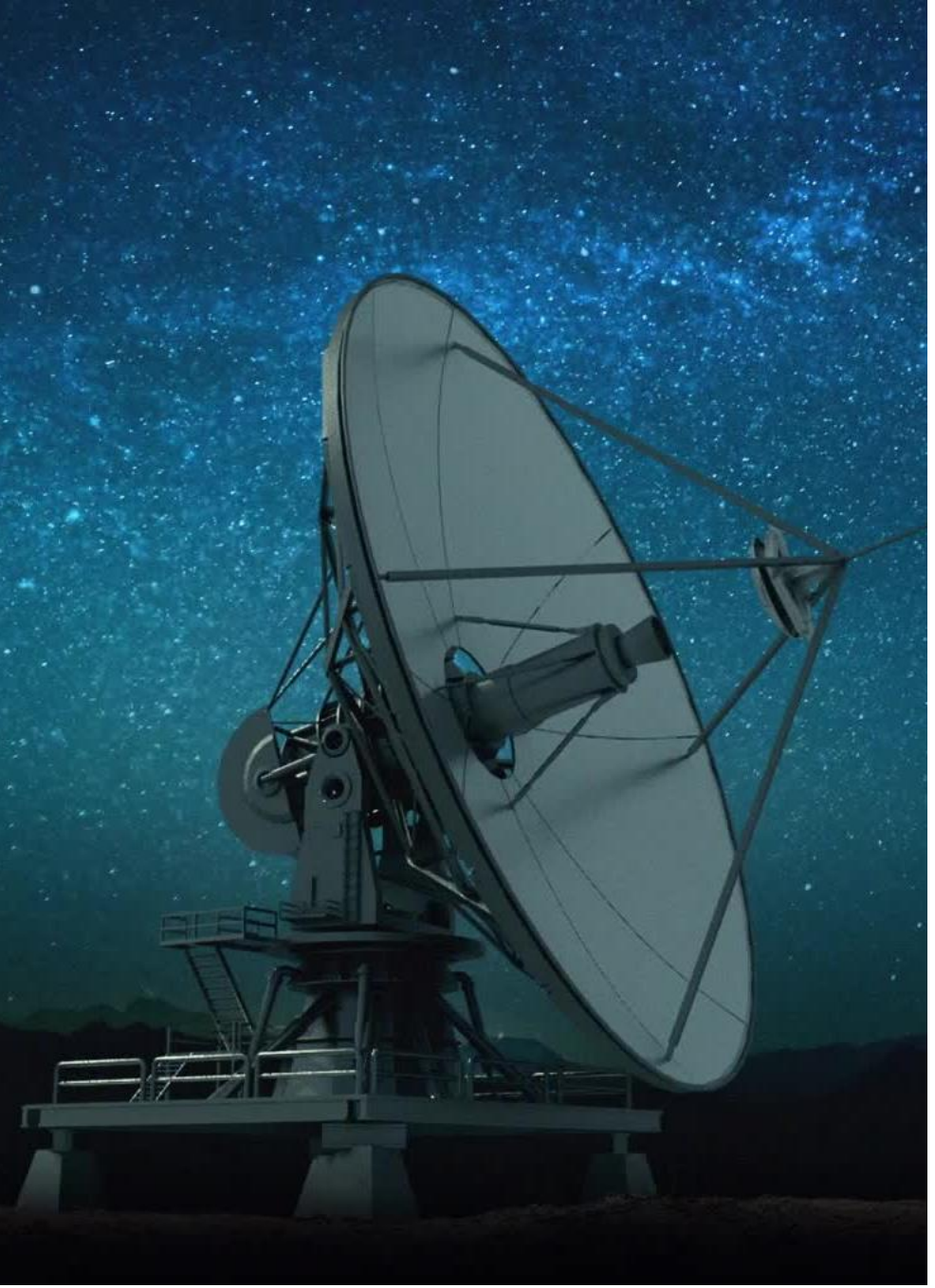
After measuring

- Measurement
- Recording of data
- Lead time to available ground station
- Downlinking the data
- Low level processing
- Value adding
- Delivery to customer

Traditional pipeline



Traditional timeline



How can we speed things up?

Full utilization of the NRT potential requires an optimal combination of

- satellite capabilities
- ground station availability
- a flexible and scalable processing environment
- processing data in chunks
- reducing the necessary computations by intelligent data selection early in the pipeline

Sentinel-1

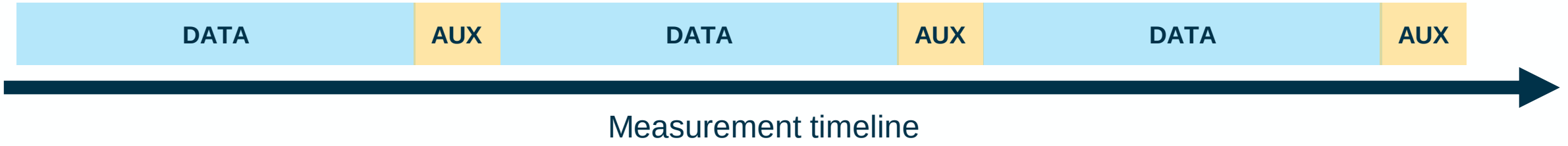
- Users obtaining Sentinel-1 data on the Copernicus Open Access Hub are used to getting data after more than 3 hours (NRT-3h and NRT-24h)

- Over Europe, Sentinel-1 is often operated in passthrough mode (NRT-Direct),
  where data is downlinked to a ground station directly following sensor data capture

- Quick exploitation of passthrough data have traditionally been limited to ground station owners, but EOPORT allows service providers to access the data faster without building expensive infrastructure.

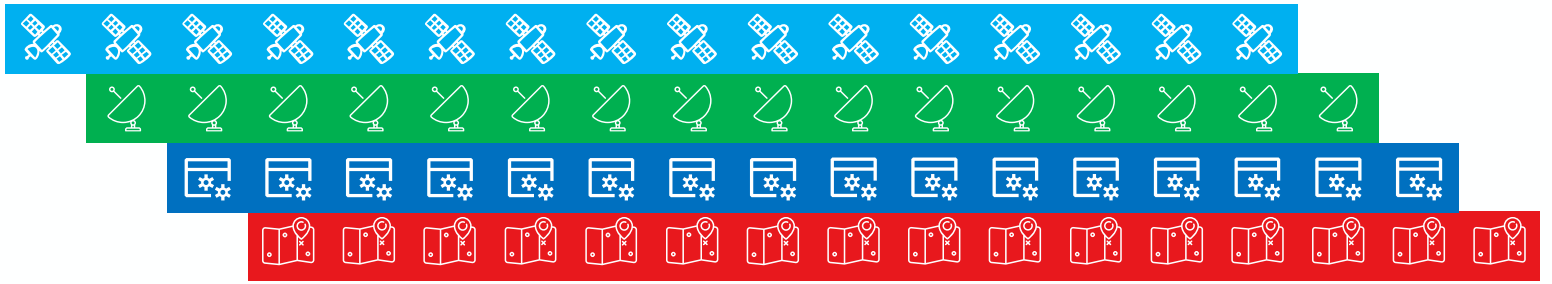
Sentinel-1

- Another key ingredient is that the observation timeline for Sentinel-1 is such that important auxiliary is downlinked in between the instrument measurement packets.



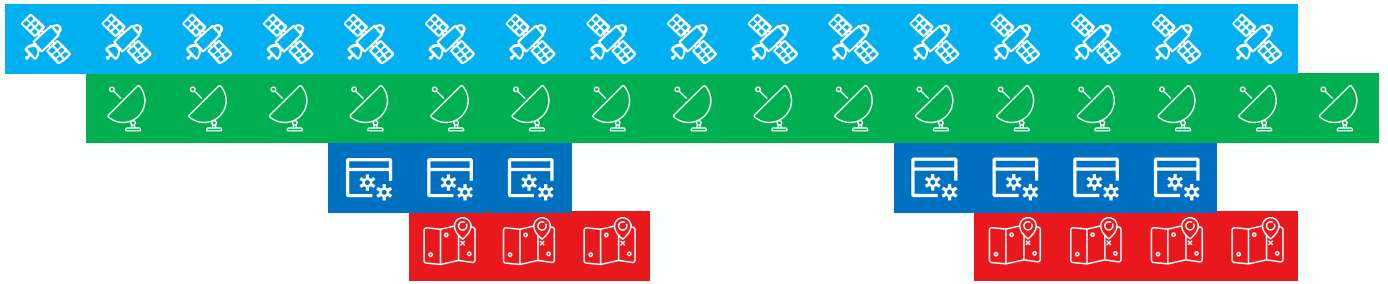
- This is important because it allows us to start processing immediately once we have a sufficient amount of data together with a sufficient amount of auxiliary data (state vectors, attitude information, etc.)

Processing as a stream



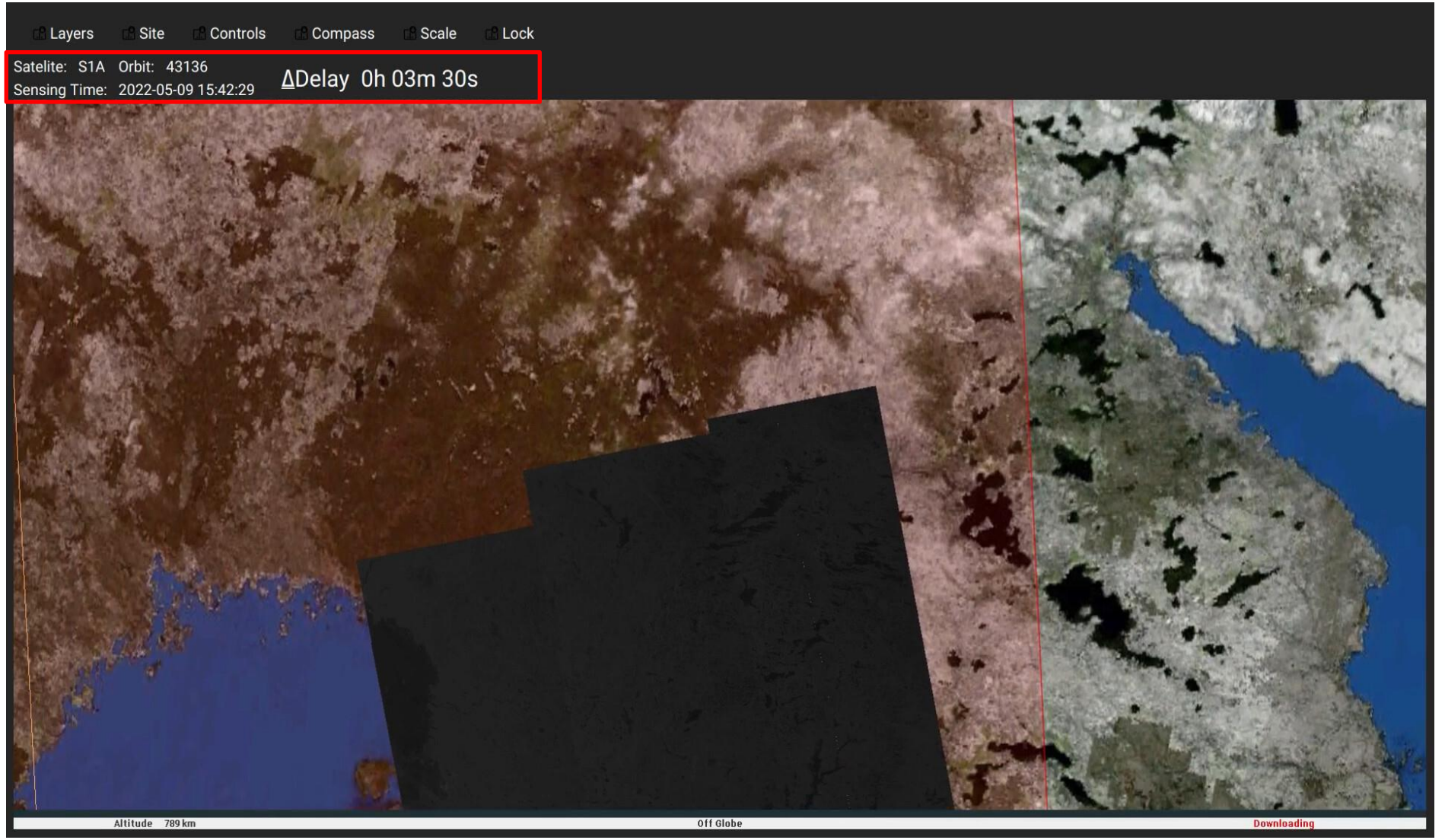
Streaming timeline

Further optimizations

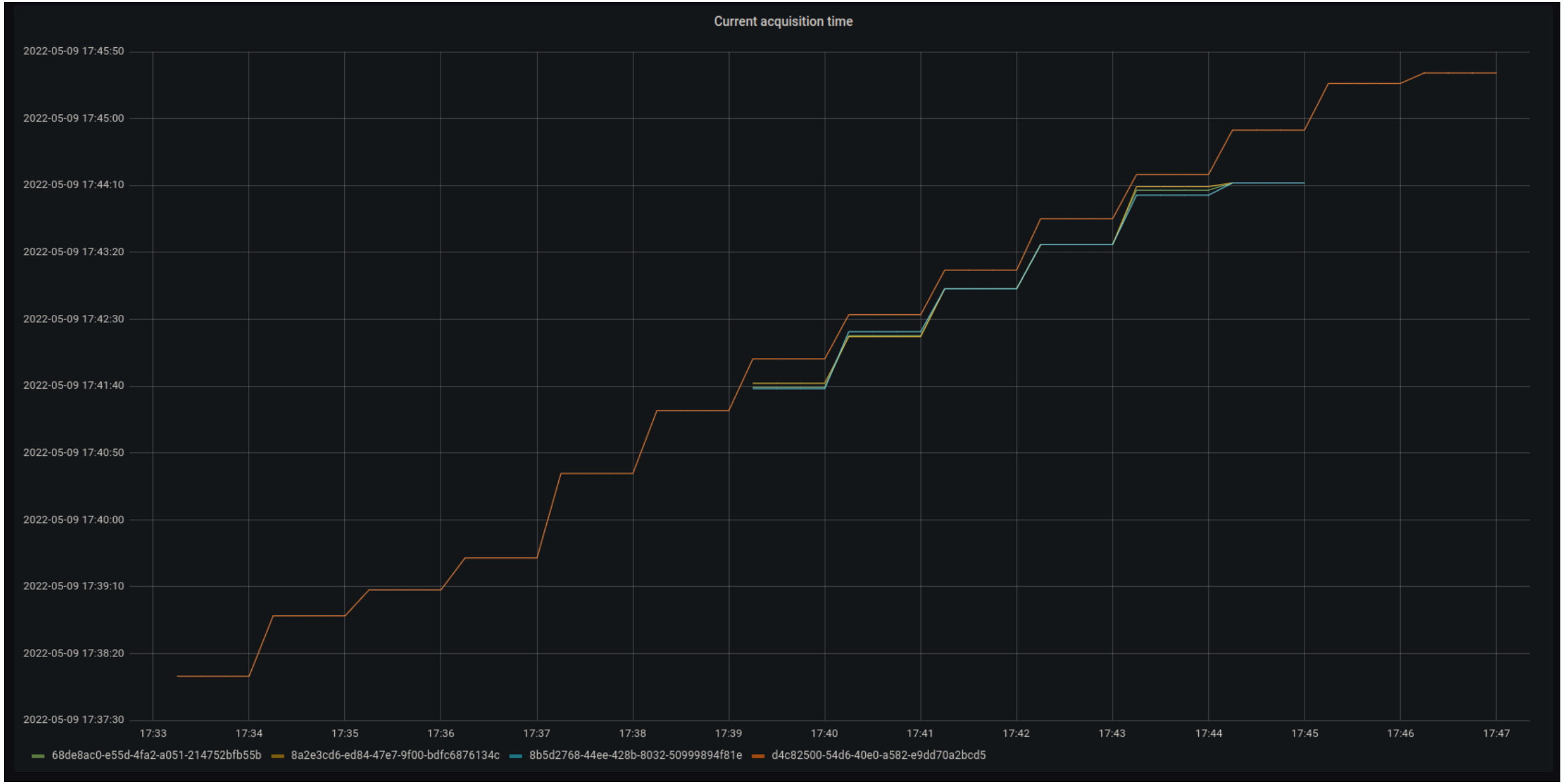


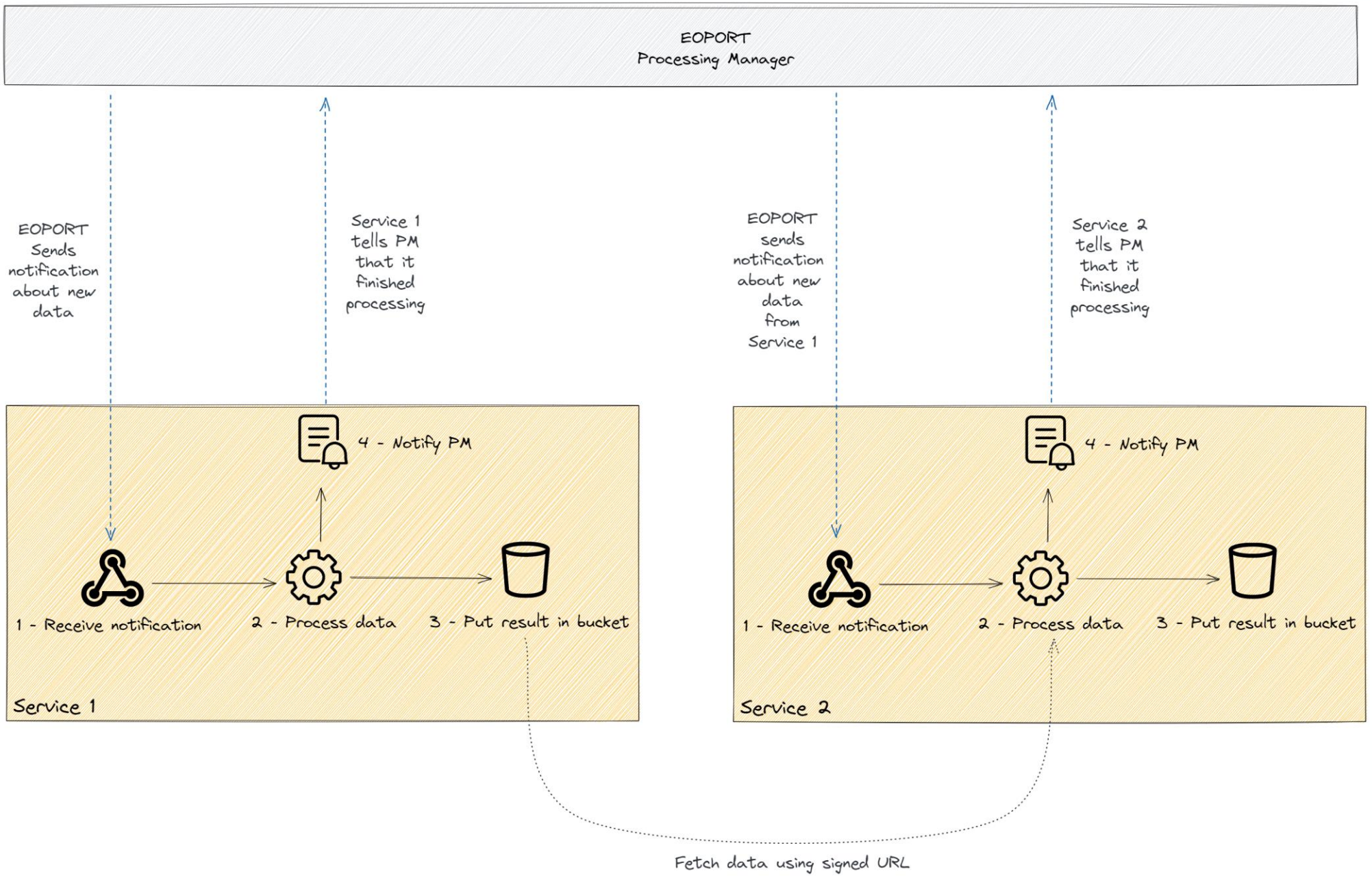
Streaming timeline

How NRT are we?

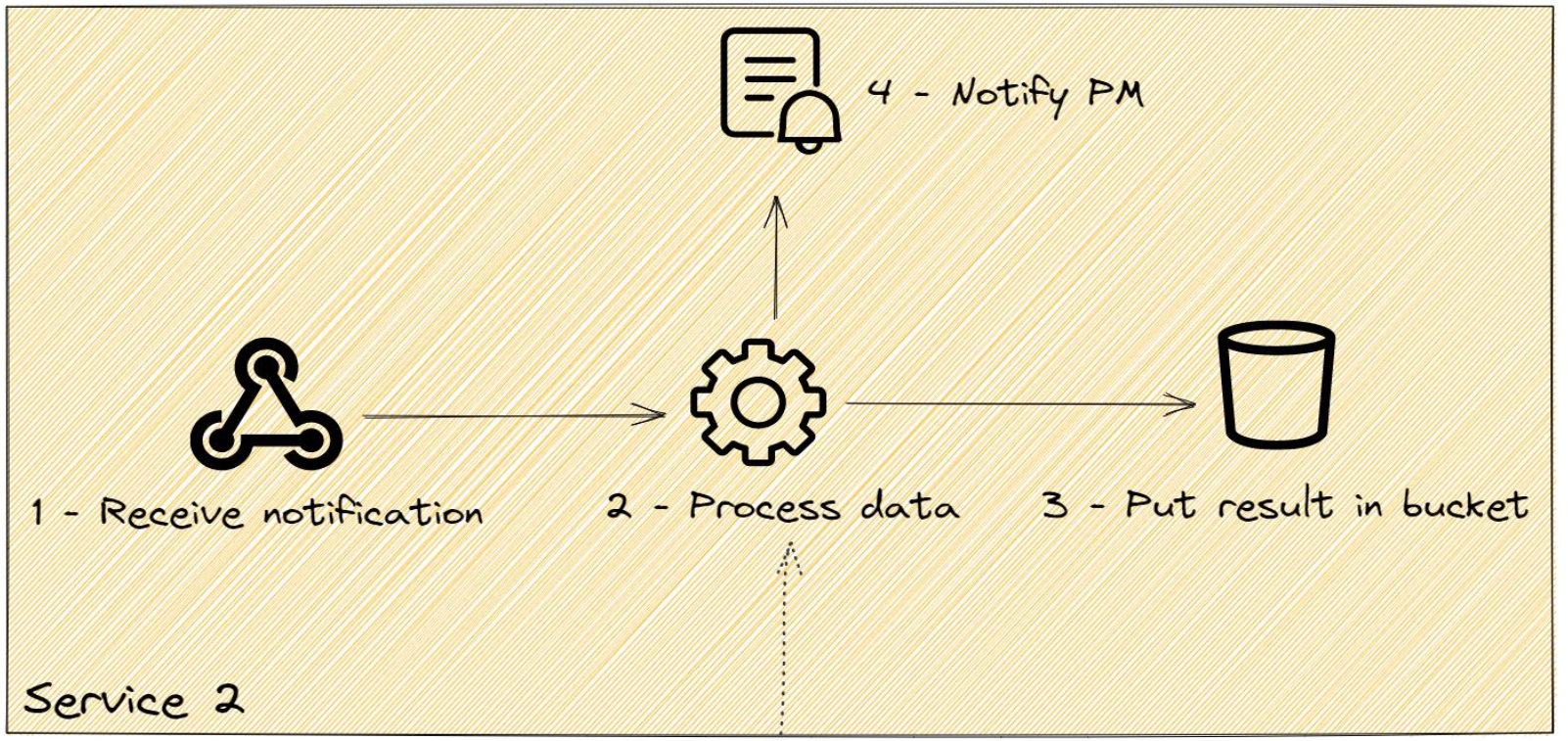


How does this scale?




EOPORT
Processing Manager
EOPORT
Sends
notification
about new
data
Service 1
tells PM
that it
finished
processing
EOPORT
sends
notification
about new
data
from
Service 1
Service 2
tells PM
that it
finished
processing
4 - Notify PM
1 - Receive notification
2 - Process data
3 - Put result in bucket
Service 1
4 - Notify PM
1 - Receive notification
2 - Process data
3 - Put result in bucket
Service 2
Fetch data using signed URL

Anatomy of a service on EOPORT



Challenges when processing as a stream

```
{
    "objectURIs": {
        “image”: “https://...”
    },
    "metadata": {...},
    "dataType": “...",
    "mission": "S1A",
    "taskID": "f694c10f-2ca5-abdf-f43c-9c84576a168b",
    "taskFinished": true,
    "partCounter": 0,
    ...
}
```

Part: 5 Finished: No	Part: 4 Finished: No	Part: 6 Finished: Yes
Part: 1 Finished: No	Part: 3 Finished: No	Part: 2 Finished: No

Summary

- When everything from the sensor to the value adding supports near real-time processing, we can deliver imagery and analyses extremely fast.
- Unfortunately, this is not the norm (and not always possible), but we would like to encourage new mission operators to design with NRT in mind.
- Our approach to service implementation in support of the NRT use case is slightly different from many other approaches focusing on batch processing of large amounts of archive data.
- For those who are interested, there is a small classroom session at 12:15 in room H-1-03

What would you do with access to satellite data in minutes?

Let us know in the classroom or the KSAT booth (we're in the back)!