Operating the LOFAR2.0 Observatory

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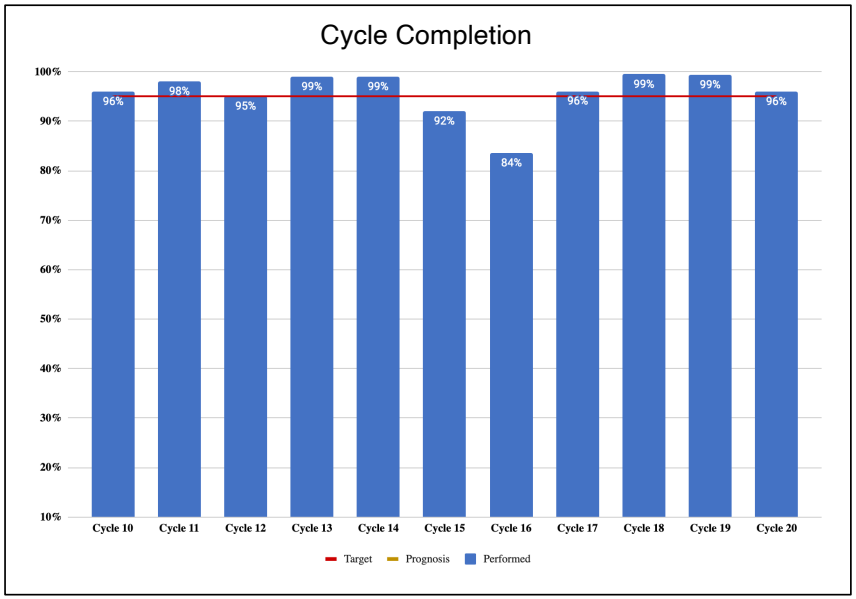
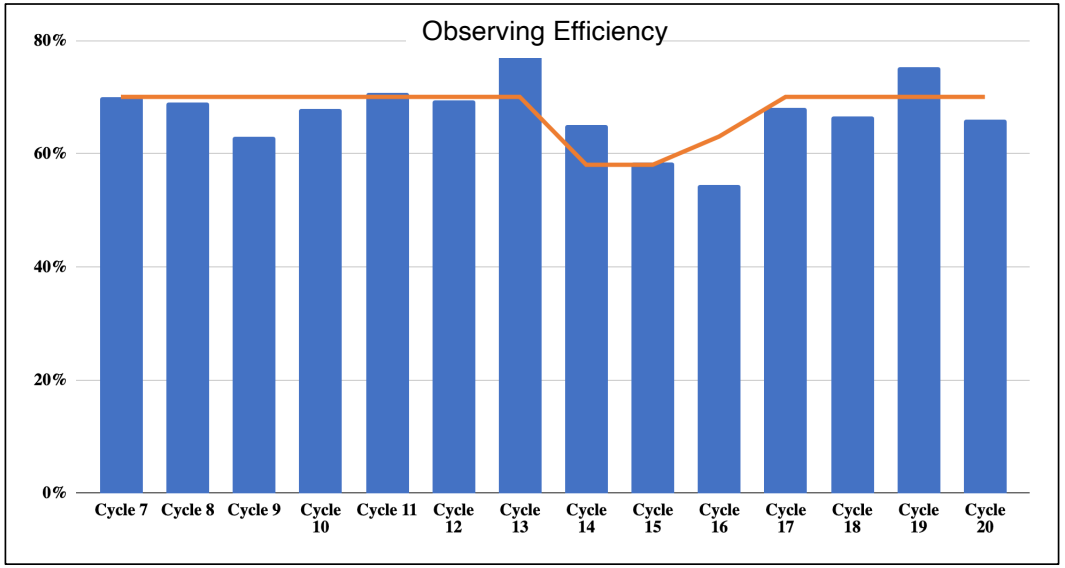
ASTRON
Netherlands Institute for Radio Astronom

LOFAR1.0 Operations Halted – Preparing for LOFAR2.0





- Target efficiency: 70%
- Target completion: 95%
- Cycle 20: 96% completed

Similar targets for LOFAR2.0

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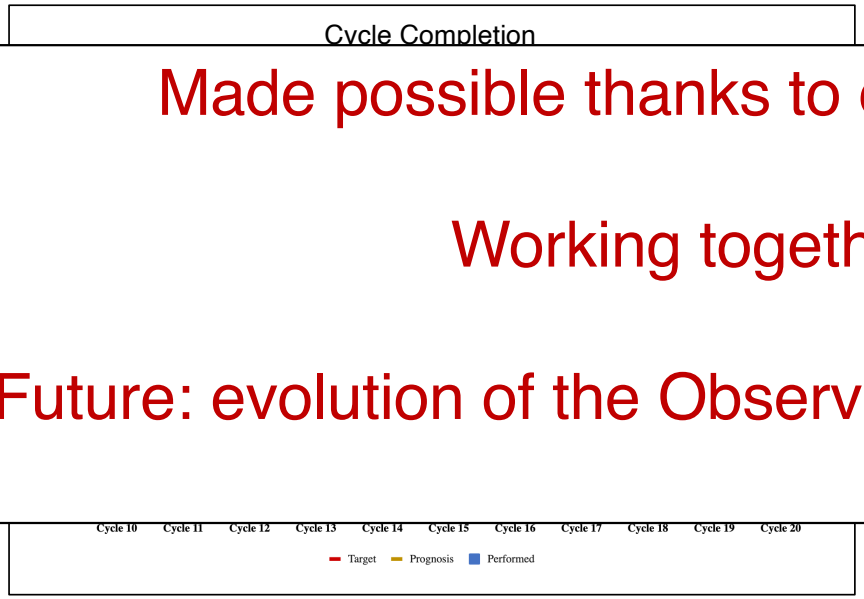

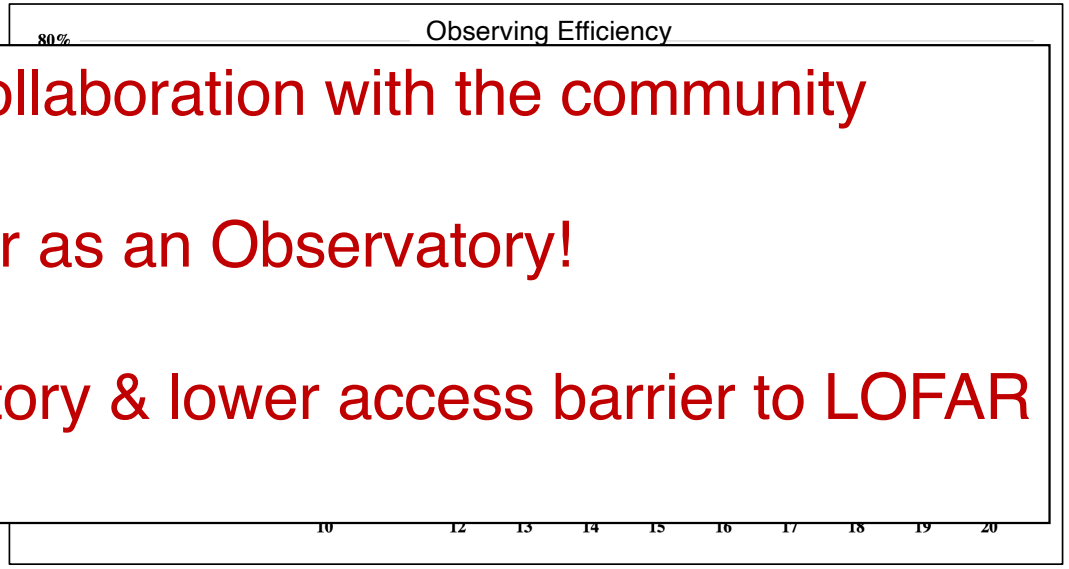

Made possible thanks to collaboration with the community

Working together as an Observatory!

Future: evolution of the Observatory & lower access barrier to LOFAR

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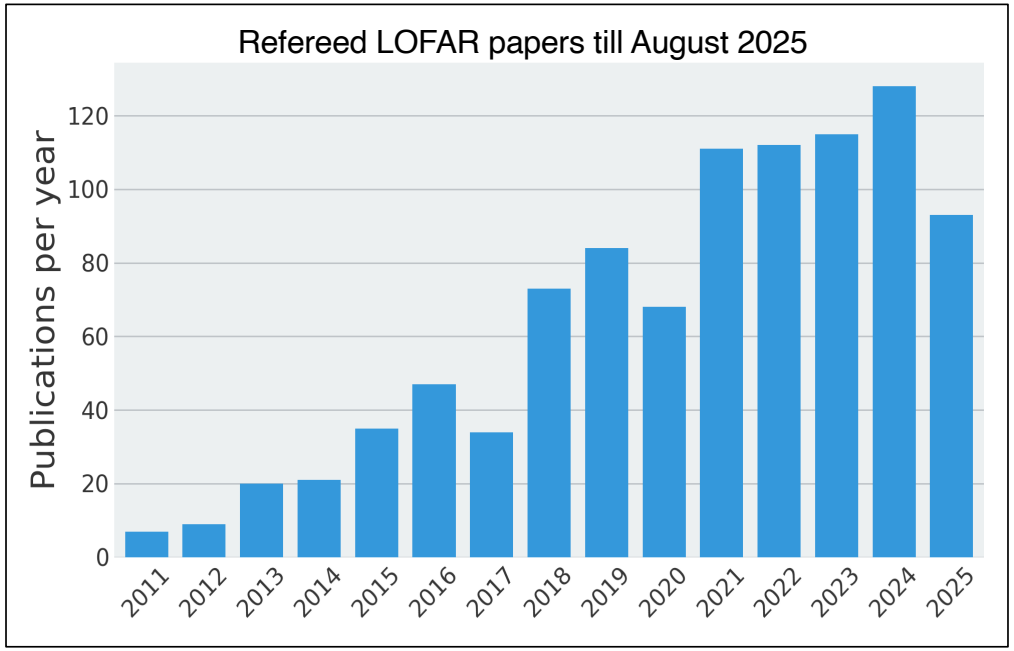
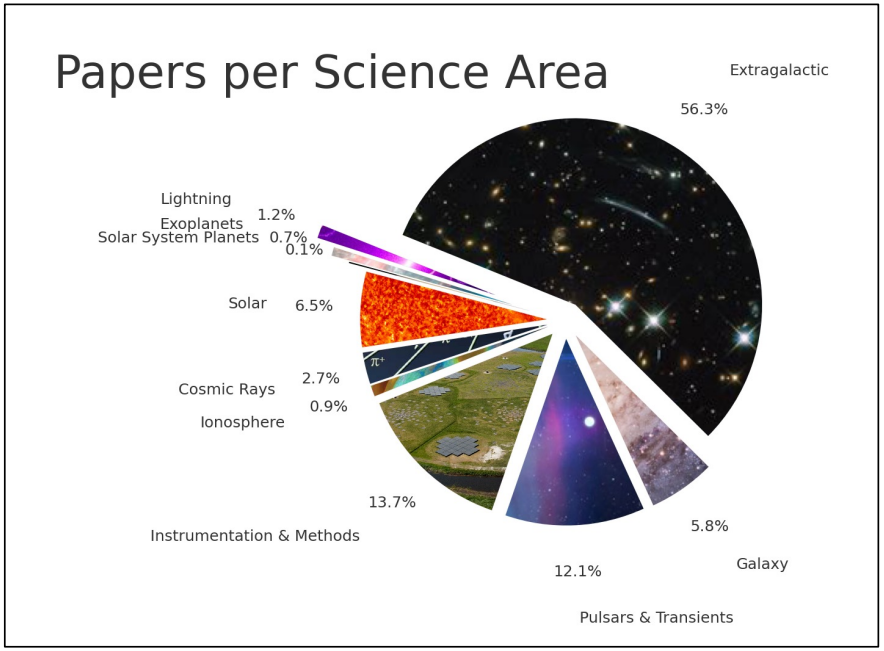
- Target completion: 95%
- Cycle 20: 96% completed

Similar targets for LOFAR2.0

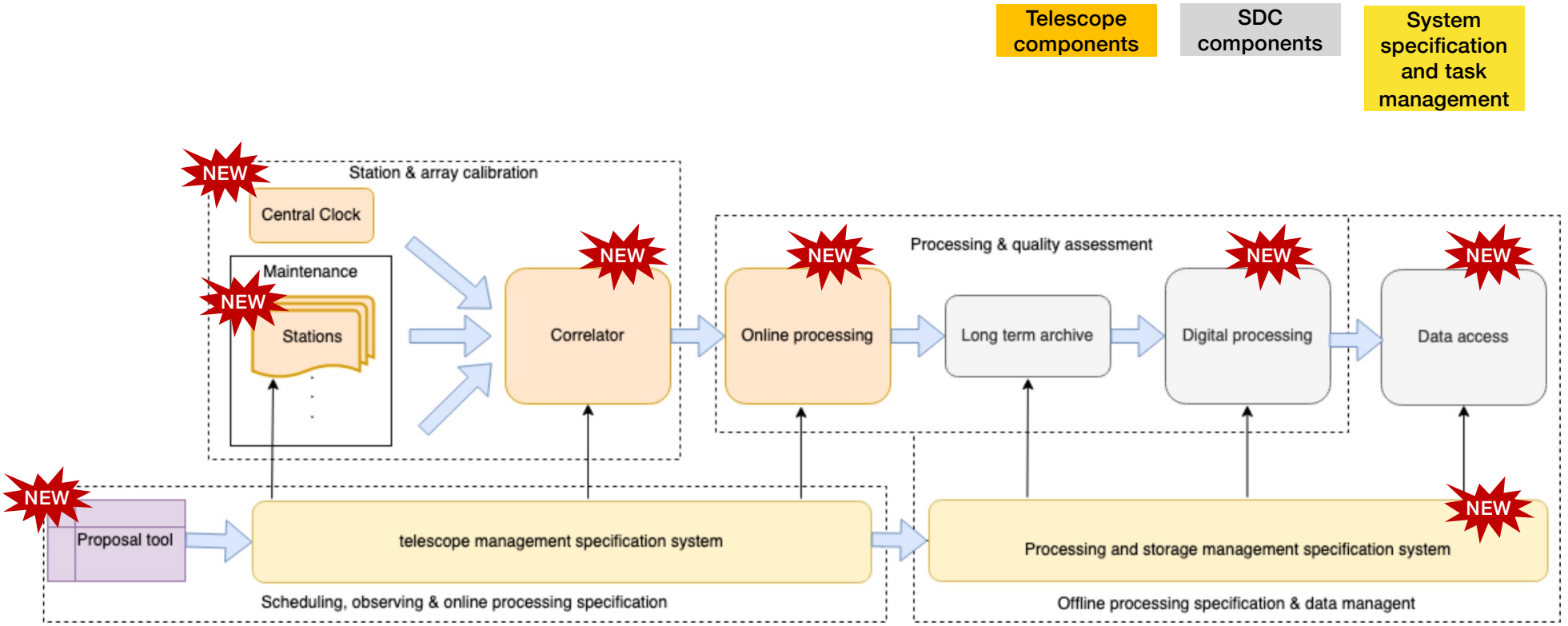
LOFAR Science Output





- ~ 1000 refereed publications
- Publication rate: 2 papers per week – top 10% of all astronomical facilities

LOFAR2.0: New Challenges

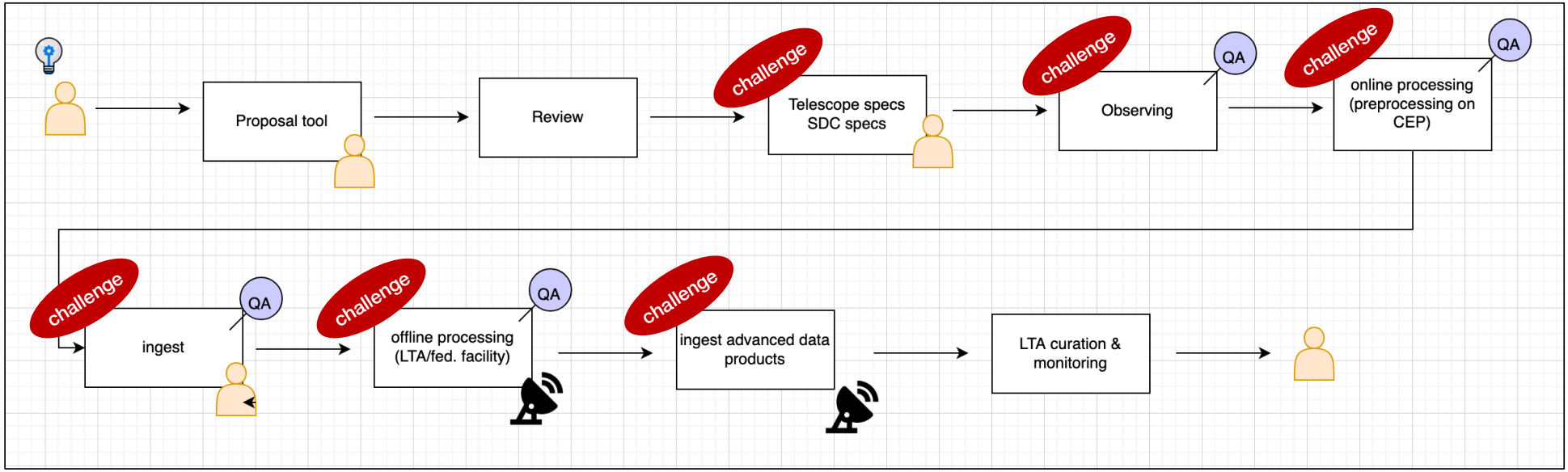


The LOFAR2.0 Data Handling Workflow

Streamlined system specification

efficient dynamic scheduling

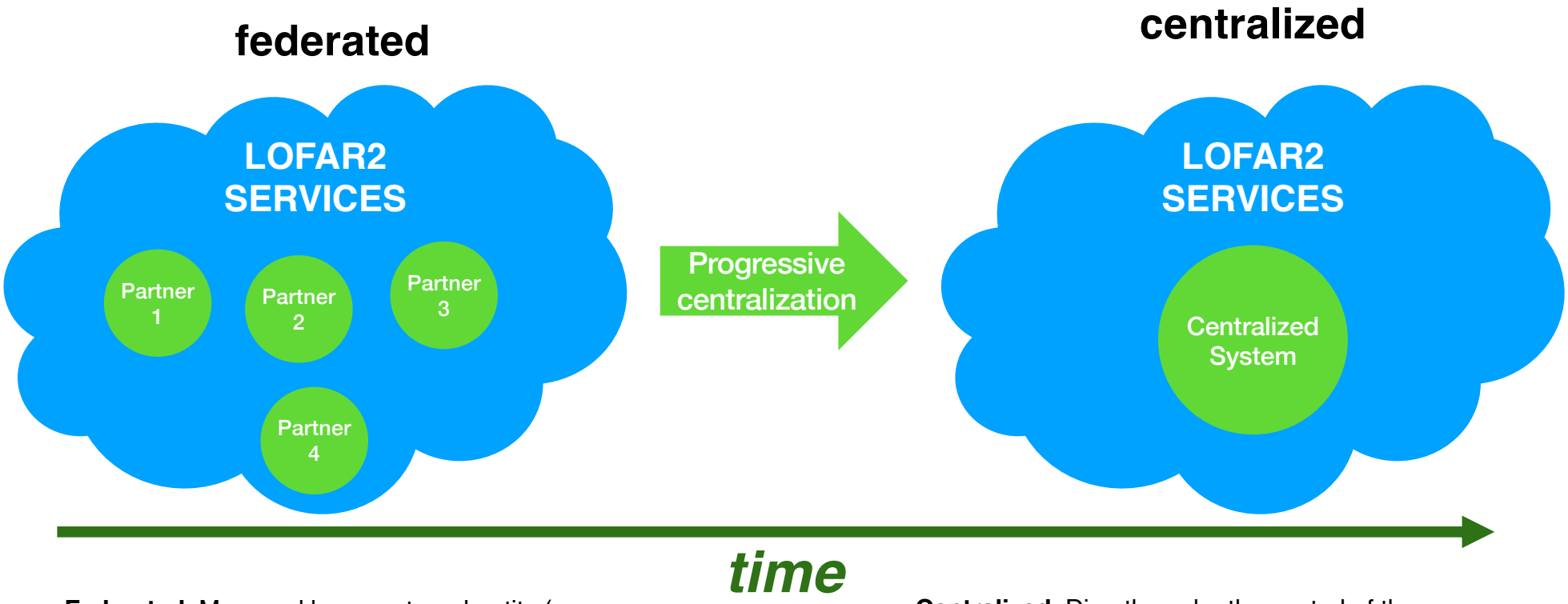
improvement in the full data quality assessment, data acceptance policies



Expanding the current processing infrastructure to match shared operational model

+ resource procurement +definition of science ready data product (legacy product)

Operational Model(s)

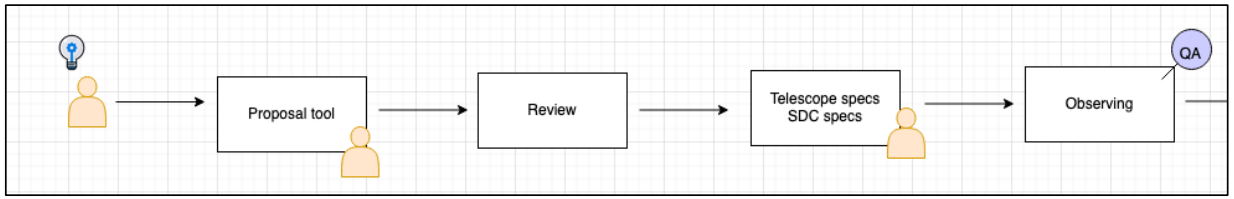


Federated. Managed by an external entity (e.g. a national data centre, a large programme) under agreement with the Observatory/ERIC, using hardware pledged to and allocated by LOFAR ERIC. Data products *must be* returned to the LTA.

Centralized. Directly under the control of the Observatory Operations team, on hardware provisioned at an LTA site (SURF, FZJ, PCSS… potentially UK, IT, others).

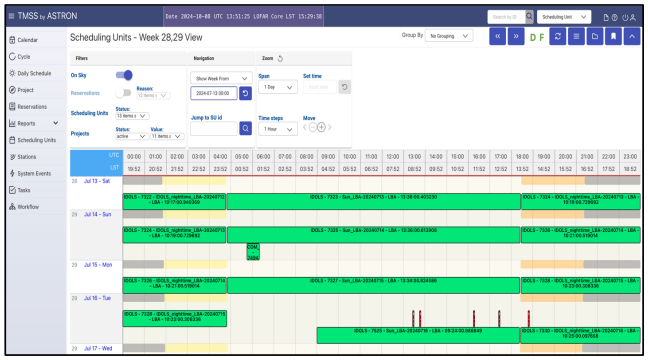
Services: bulk processing capabilities, storage, execute processing workflows, support, etc.

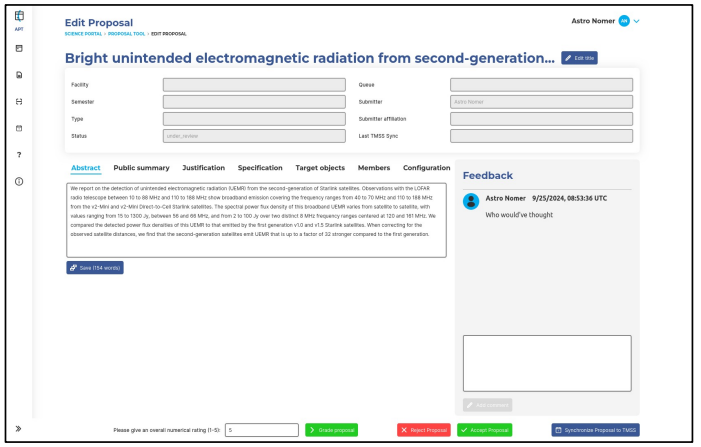
Proposing & Observing: TULP & TMSS



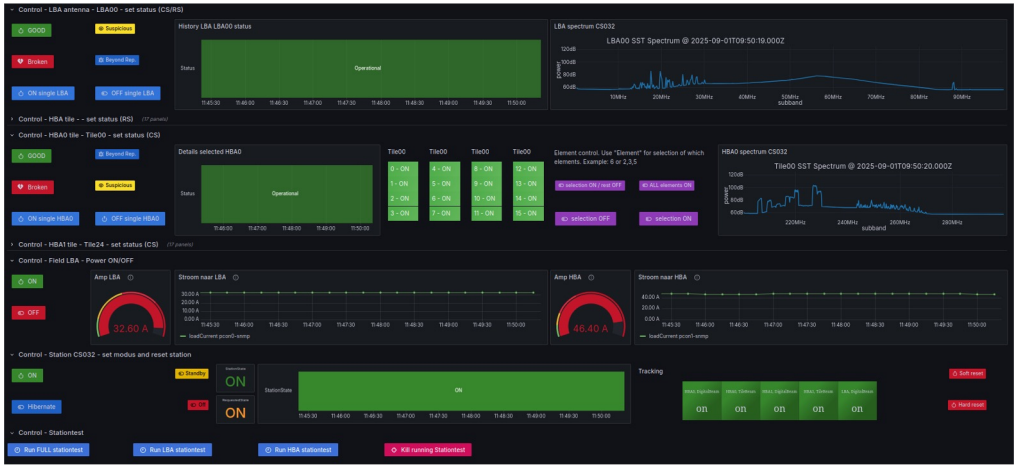
- TULP (NorthStar successor) under development and being commissioned
  - Support proposal creation and experiment specification
  - Support review process
  - Transfer technical specs of allocated projects automatically to facility management systems (LOFAR & SDC)
  - Integrate with FAAI

- TMSS:
  - gateway for the interaction with the PIs
  - Automation:
    - Interaction with TULP
    - Dynamic scheduling to be further enhanced
    - Data quality assessment and acceptance





LOFAR Monitoring: Helicopter view on the full observing system



- Easy view on the whole array at various levels
- Hardware- / Software- / Firmware- / Spectrum alerts
- Health monitoring of LBA / HBA (RTSM, station test, live spectrum plots)
- Bulk actions on the system

Grafana screens – Telescope Operations

Central Processing: Cobalt3 & CEP6

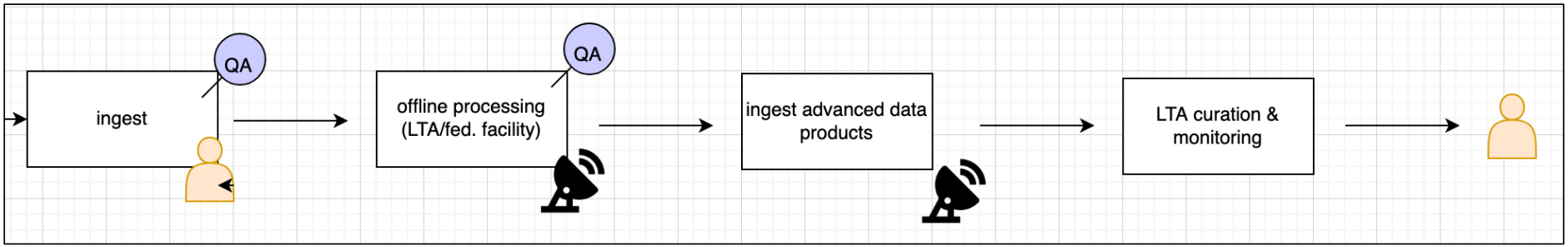
- Cobalt2 → Cobalt3
  - GPU hardware with TensorCore software
  - Transition 1 March 2026
- CEP4 → CEP6
  - Experimental & operational part
  - Phased upgrade, first part up Oct 2025
- Network upgrade
  - Multicast
  - 1.6Tbs link from stations to CEP
- Improved energy efficiency

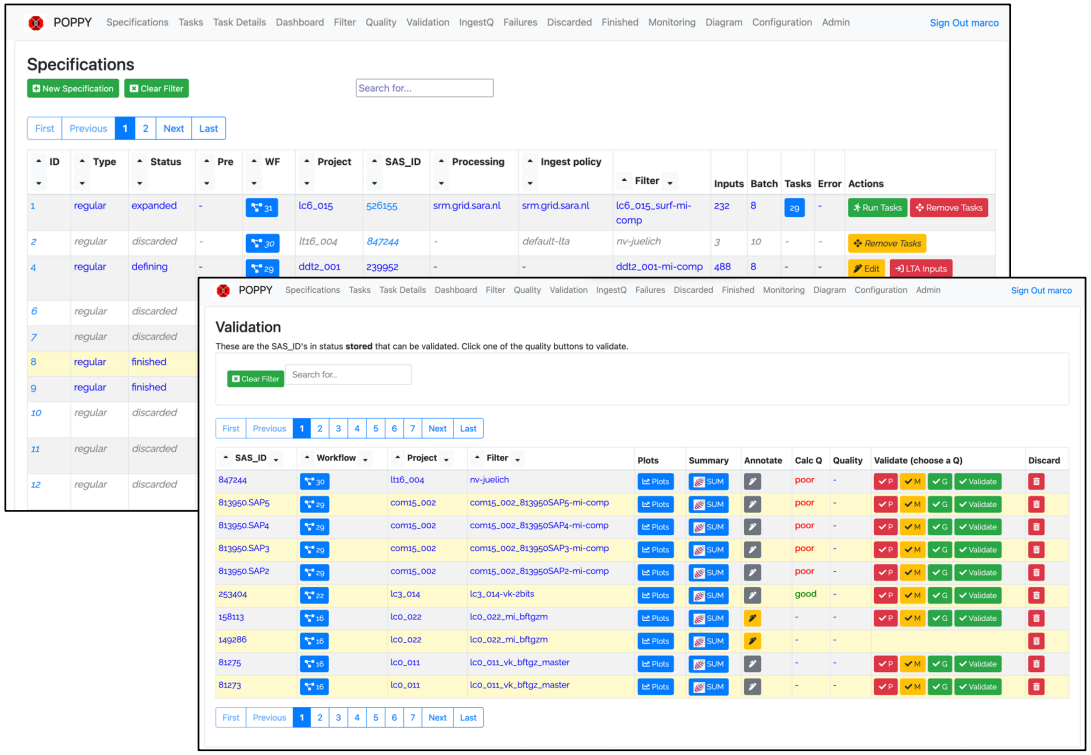

Smitsborg at RuG

New CEP6 cluster delivery and install

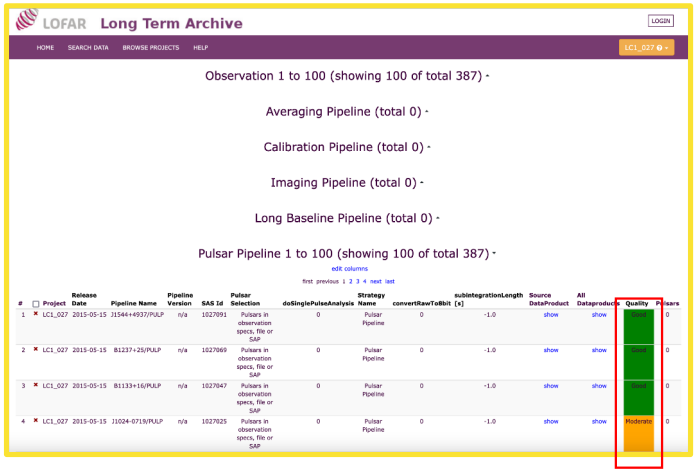
see CEP poster by LOFAR2.0 team for more information

Generating Science-Ready Data Products: LTA Operations

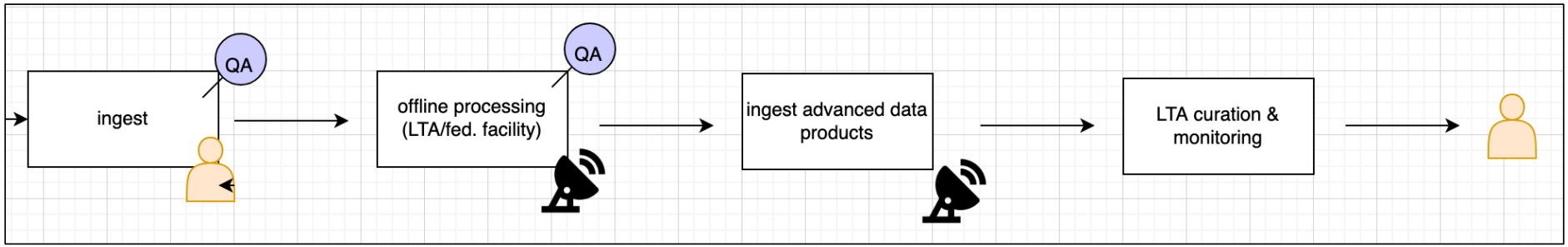




- Explored via LOFAR Data Valorization (LDV)
- Critical part of the data chain – build the model
- Two steps to generate science-ready data products:
  - Building the infrastructure
  - Define the policies



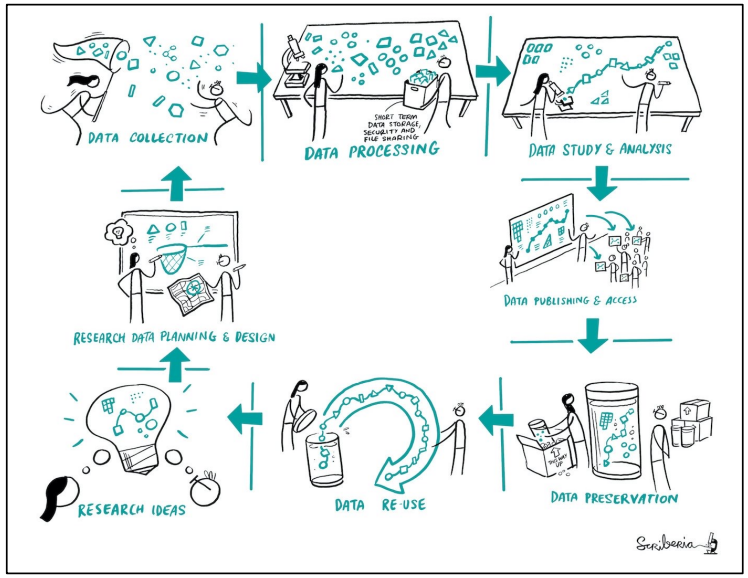
Data Ingest and Curation



- To guide the development and commissioning activities:

  1. Definition of LOFAR2.0 data products to be supported, with associated documentation
  2. Definition of Data Management Plans for L2LPs:
     - Products to be delivered, processing to be executed, advanced products generated, data releases & publication plan, requested support

- Tools under development to put in practice the LOFAR ERIC data policy:
  - Proprietary → public
  - Legacy products kept indefinitely
  - Intermediate data to be retired after a period



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Conclusions

- Operating LOFAR2.0 means operating a NEW OBSERVATORY.
- Challenges at various steps of the data chain. Key will be automation.
- Operations will rely on a new set of tools, functionalities, procedures.
- Aim is to achieve at least similar operational performance as for LOFAR1.
- Active developments also involving the community to build the LOFAR2.0 Observatory.