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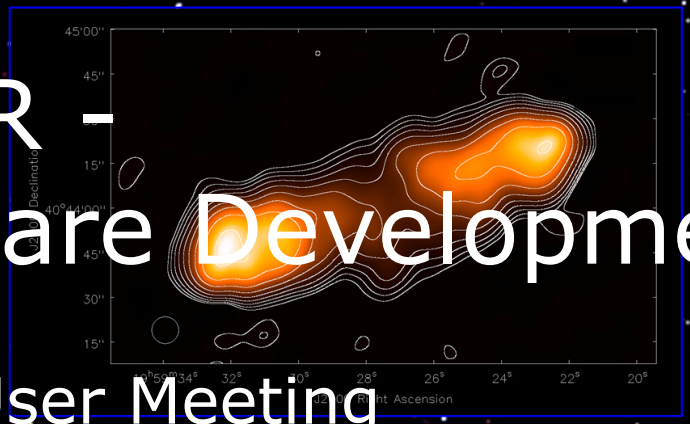
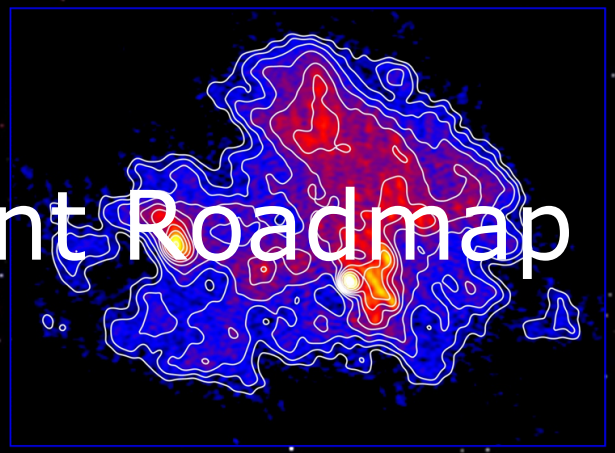
Netherlands Institute for Radio Astronomy

LOFAR - Software Development Roadmap





LOFAR User Meeting
01/06/2015, Hanno Holties

The team: Adriaan Renting, Arno Schoenmakers, Arthur Coolen, Jan David Mol, Jan Rinze Peterzon, Jörn Künsemöller, Jorrit Schaap, Nico Vermaas, Pieter Donker, Ruud Overeem, Stefan Fröhlich, Wouter Klijn + smaller contributions

LOFAR - Software Development Roadmap Outline

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- **Looking back**
  - Challenges
  - Achievements
    - Robustness & Relief
    - Science Capabilities & Responsiveness
- **Looking forward**
  - Up to Q1 2016 (Current scope RRR)
  - Beyond Q1 2016

LOFAR - Software Development Roadmap Challenges

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- **Planning & Resources**
  - Finishing COBALT – Start up RRR, WSRT Tel Ctrl, Apertif
  - Departure Alwin de Jong (November 2014)
  - Start Jorrit Schaap (May 2015)
  - Two cases of extended absence for health reasons
- **Support for Operations**
  - LOFAR System complex, serious robustness challenges
  - Intensive observing/processing programs (e.g. LOBOS)
  - Pipeline robustness & efficiency
- **Support for 'external' developments**
  - Systems: CEP3, Target, Network Reconfiguration, CEP4, …
  - Software integration: Pulsar, SelfCal, Nenufar, …

LOFAR - Software Development Roadmap
Addressing the Challenges

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- **Software Support Engineer**
  - Second line support (after Science Support)
  - Always one person on duty
  - Rotating amongst RO Software Engineers
  - Solve as many issues as possible by person on duty
  - Complex issues folded in to regular planning
- **LOFAR Software Architect**
  - Used to be shared responsibility
  - Appointed Jan David Mol in this role
- **Re-orientation RRR Development plan**
  - Focus on one large software goal at a time
  - Current focus on responsive services

LOFAR - Software Development Roadmap
Achievements – Robustness & Relief

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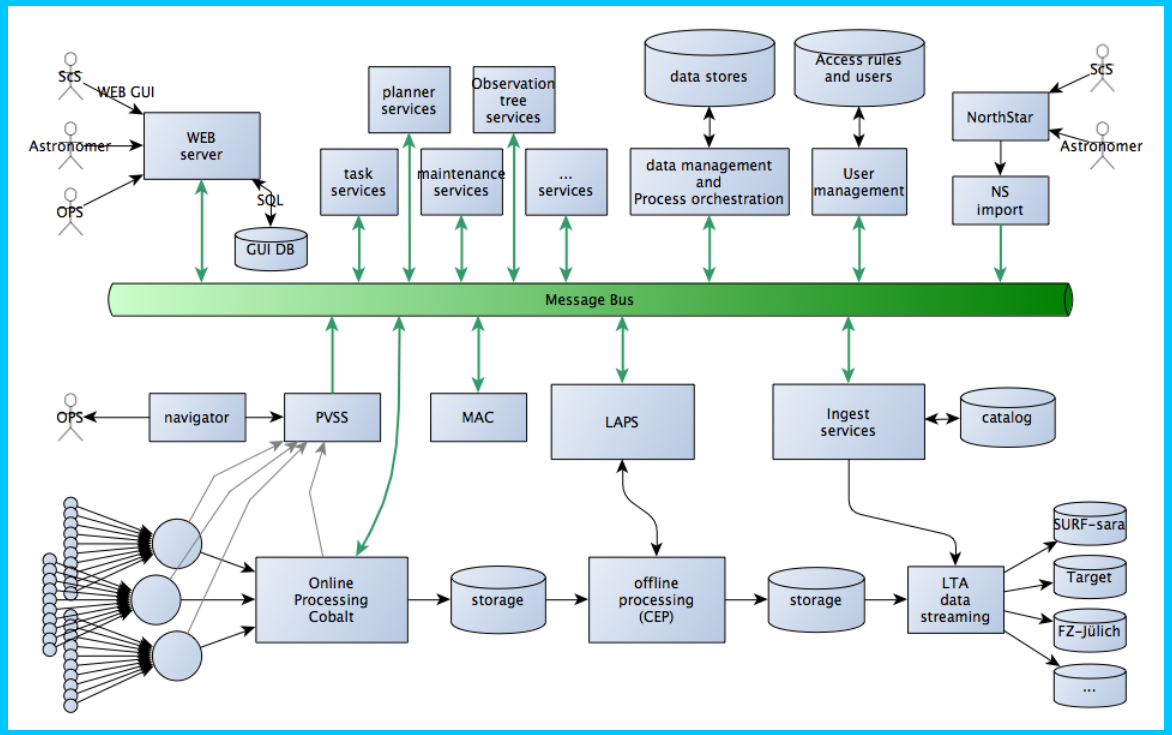
- **Architecture**
- Analyzed (software) systems as is
- Analyzed high level functional requirements
  - Addressing Relief & Responsiveness as well
- High level target architecture
- Identified required technical improvements



Workflow improvements Specification & Observing

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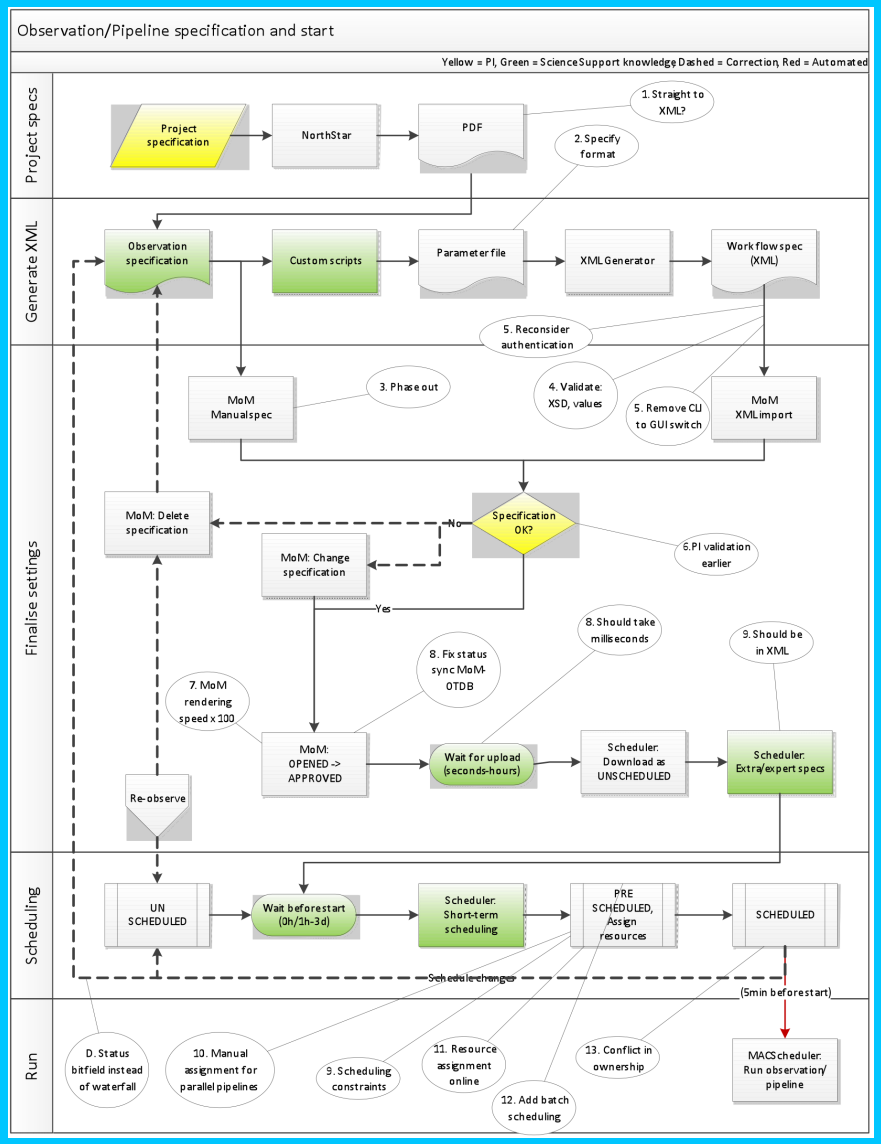
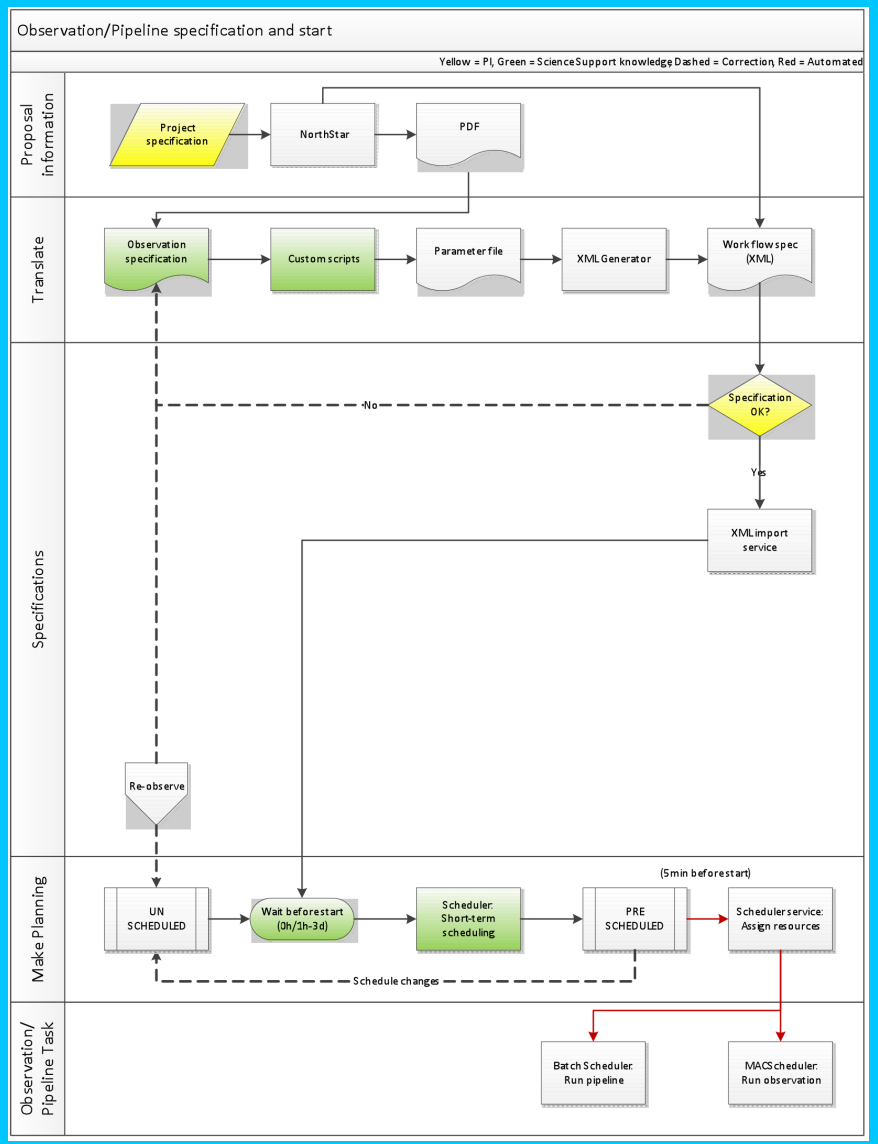
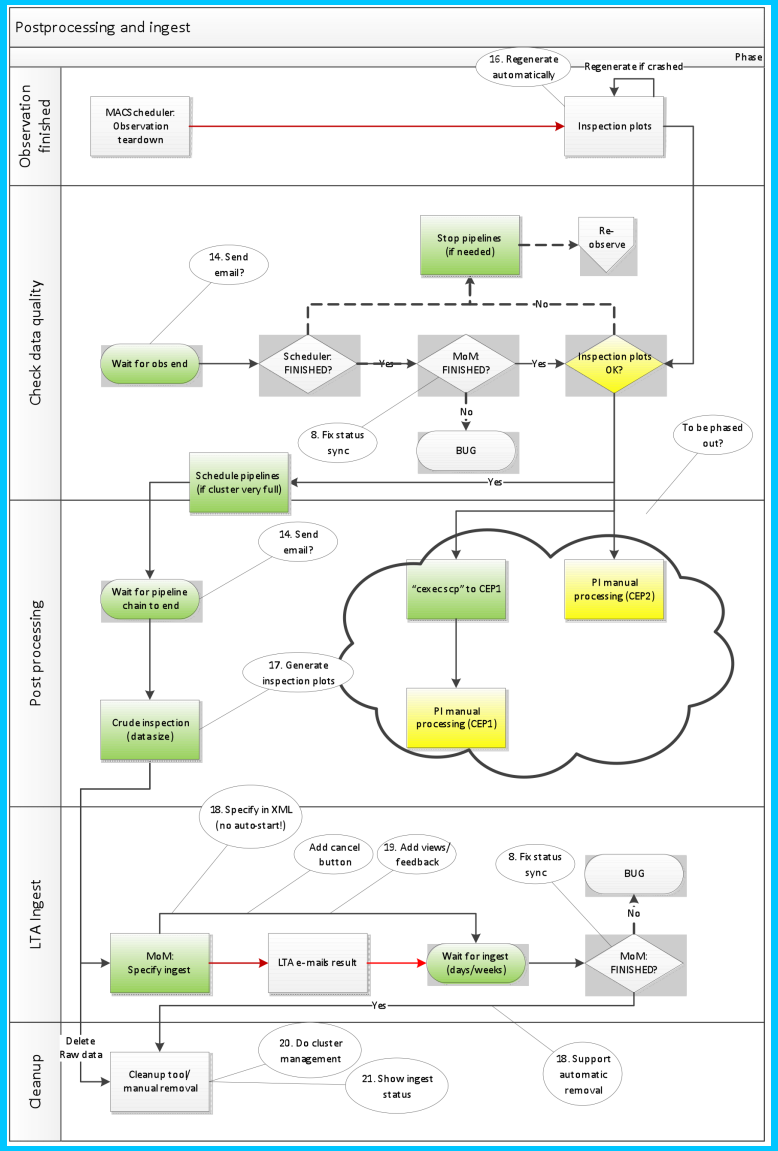
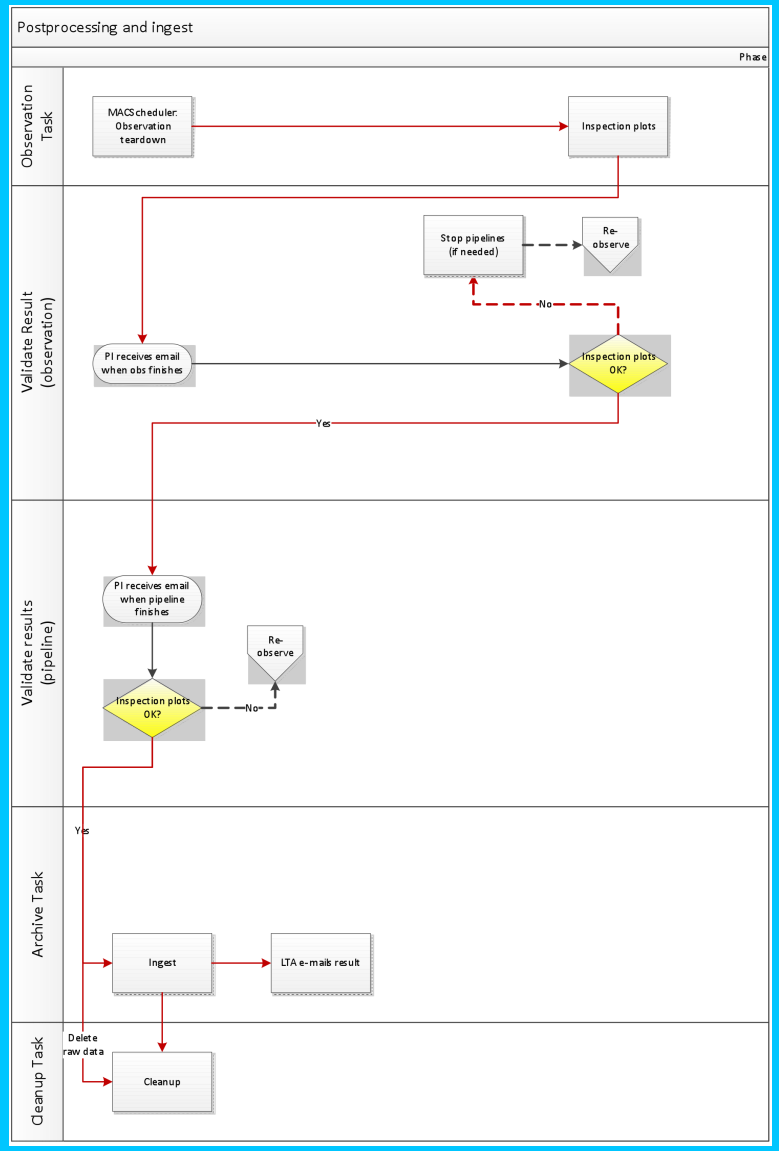


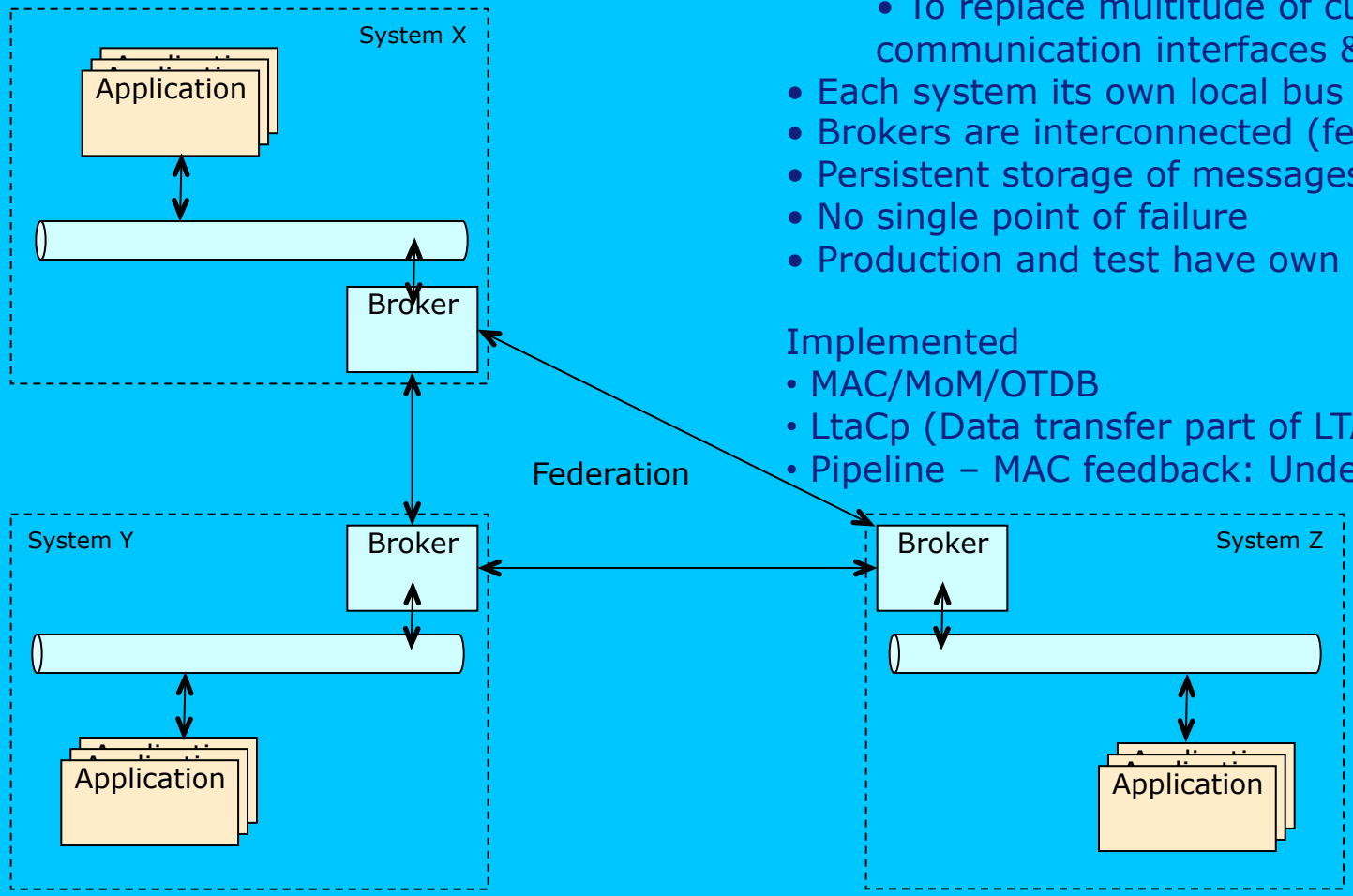


Workflow improvements
Processing & Ingest





LOFAR - Software Development Roadmap
Achievements – Messagebus



Graphic: Ruud Overeem

- Enabling service oriented system
  - Essential for responsiveness
  - Improving Reliability
  - To replace multitude of custom communication interfaces & protocols
- Each system its own local bus
- Brokers are interconnected (federation)
- Persistent storage of messages
- No single point of failure
- Production and test have own federation

Implemented
- MAC/MoM/OTDB
- LtaCp (Data transfer part of LTA ingest)
- Pipeline – MAC feedback: Underway

LOFAR - Software Development Roadmap
Achievements – Science capabilities

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- **Delivered:**
  - COBALT; BG/P phased out
  - Basic Commensal Observing
  - Long Baseline Offline Processing Pipeline
    - Flagging, Calibration, Concatenation, Conversion to Circular Polarization
  - Support for SelfCal loop (finishing stage)
- **Analyzed:**
  - Responsive trigger service (TKP, CRKSP)
  - Parallel observation capabilities
  - Pipeline processing frameworks
  - TBB observing integration requirements (underway)

LOFAR - Software Development Roadmap
Responsive Telescope - Analysis

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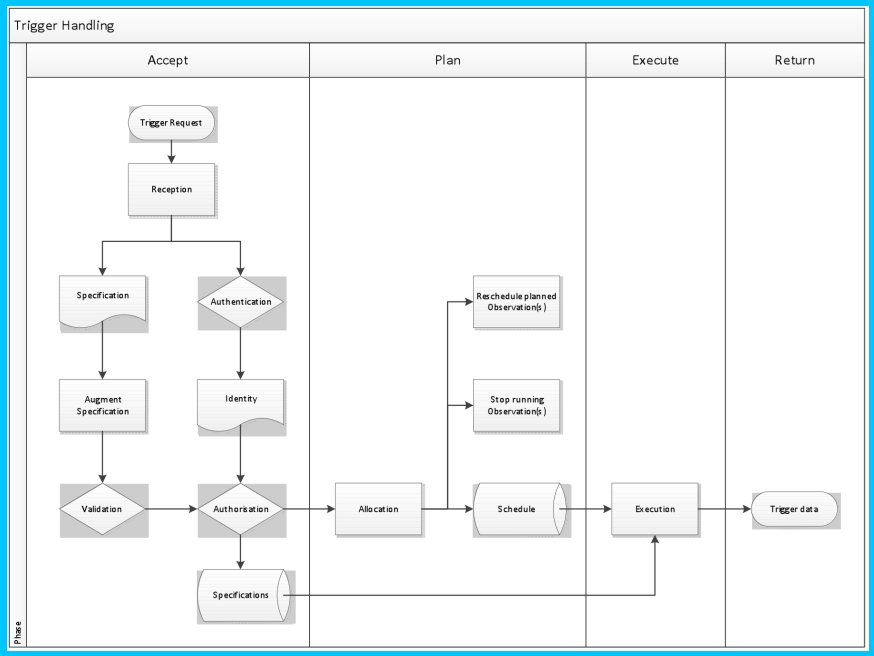
- **Improvements needed:**
  - Trigger & Scheduler services
  - MAC & COBALT (Startup &) Teardown capabilities
  - Workflow automation
  - Priority scheme for observations & pipelines



- **Parallel Observation capability**
  - Analysis indicates it is possible with current system
  - Known limitation: Disjunct antenna fields only
  - ToDo: commissioning/characterization/monitoring

LOFAR - Software Development Roadmap
Processing Pipelines - Analysis

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- **Issues with current situation**
  - Skills required for integration
  - Integration effort (~3 months per pipeline)
  - Portability & Usability
  - Late incorporation of operational requirements
    - Scalability issues
    - Monitoring & troubleshooting capabilities
    - Robustness against subsystem failures
- **Exploratory work**
  - Investigation existing frameworks
  - User requirement workshop
  - Input for development track (fold into SDC related project?)

LOFAR - Software Development Roadmap Planning – Up to Q1 2016

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- Responsive telescope: Main focus for RRR development
- CEP4 & LCU Upgrade: Observatory priorities
- LTA Staging & Retrieval: User demand (JK)
- Pipelines: integration main CITT results (SF, CITT)

LOFAR - Software Development Roadmap Planning – Beyond Q1 2016

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- **Remaining RRR Objectives (At risk)**
  - Online delay Compensation & Superstation Forming
  - UHEP Trigger mode
  - Coherent Dedispersion
  - Reliability & Relief
- **Asterics – Cleopatra (WP5) – Multi Messenger Methods**
  - Alert relaying (signal transient event detections between the facilities)
  - Enabling joint observing programmes (including scientific strategies and methods for joint observing)
- **Towards Science Data Center (Dome, Asterics, Ercet)**
  - Generic pipeline framework
  - Data Archiving, Data Access, VO

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Questions?

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WP3 - OBELICS

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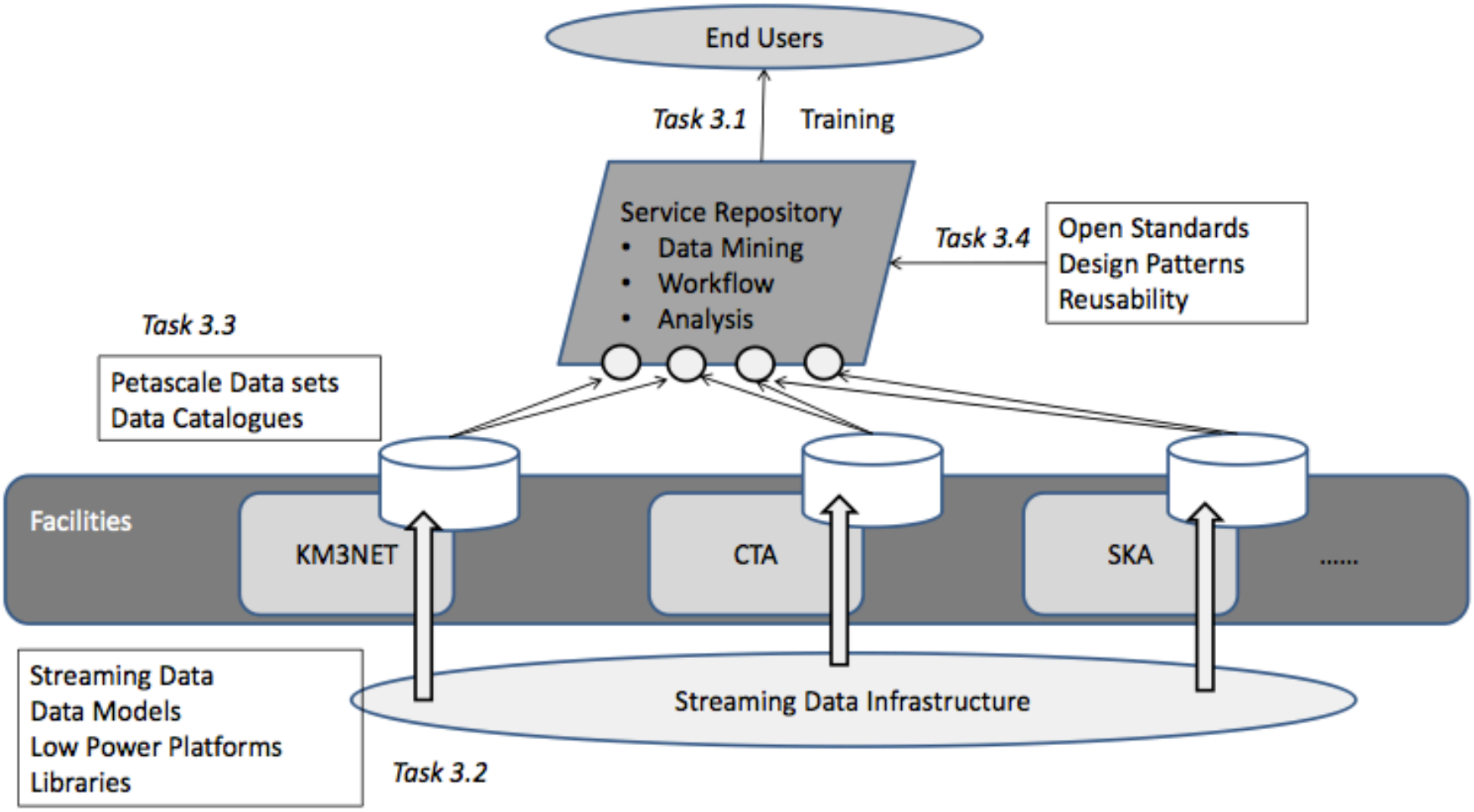

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WP4 - DADI

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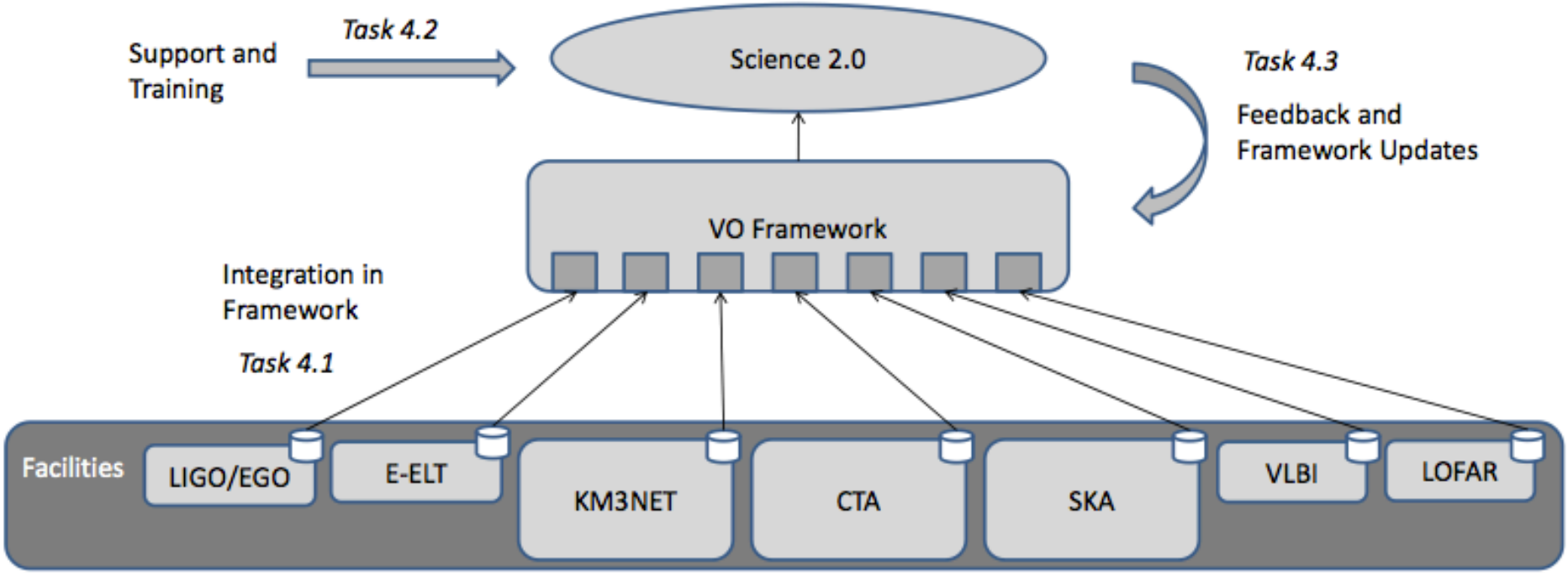

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WP5 - CLEOPATRA

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