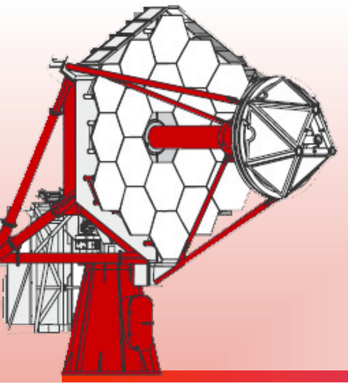

The Online Observation Quality System for the ASTRI Mini-Array

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The ASTRI Mini-Array

The ASTRI Mini-Array is an INAF project aiming to construct and operate an experiment to study gamma-ray sources emitting at very high energy in the TeV spectral band. This project consists of an array of nine dual-mirror Imaging Atmospheric Cherenkov Telescopes. Each telescope will be equipped with the new ASTRICAM Silicon photomultiplier Cherenkov Camera. In addition, the ASTRI-MA will perform a study of interferometry by hosting a Stellar Intensity Interferometer Instrument (SI^3) on its telescopes.

The Online Observation Quality System

The Online Observation Quality System (OOQS) is a software system, part of the Supervisory Control and Data Acquisition system (SCADA), that aims to verify the online data quality during the observations. The OOQS receives input data from the Array Data Acquisition System (ADAS), which is the system designated to acquire and manage the raw data both from the Cherenkov cameras and from SI^3 instruments.

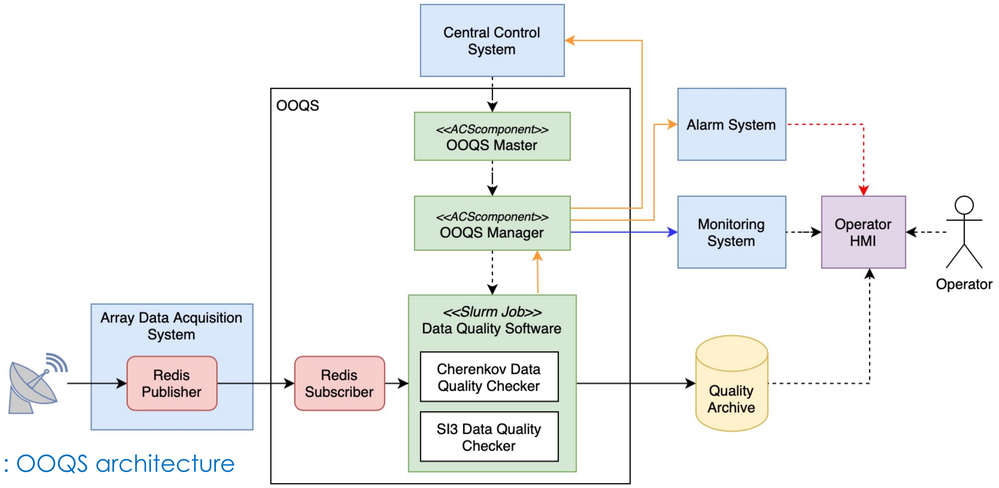

Figure 1: OOQS architecture

OOQS Architecture and Design

The OOQS architecture is described in Fig. 1. It includes the following software components: OOQS Master, OOQS Manager, Cherenkov Camera Data Quality Checker (CCDQC), SI3 Data Quality Checker (SI3DQC). The first two components are implemented with the Alma Common Software (ACS[1]).
The OOQS is controlled by the Central Control System (part of SCADA) that starts and stops OOQS instances for each telescope through the OOQS Master component. The quality checks on the data are performed by the CCDQC and SI3DQC components that receive the input data from the ADAS system through the Redis Pub-Sub[2] service that implements a Publish-Subscribe paradigm.

The data quality software processes are executed outside the ACS framework and are managed with the Slurm[3] workload manager that can schedule and run multiple processes in parallel to optimise the available resources.

The results of the quality checks are saved into the Quality Archive and can be visualised by the Operator through a web Operator Human Machine Interface. Anomaly conditions detected during the quality check analyses are sent to the Alarm System and the Central Control System. The Central Control can execute automated actions to correct the problem. The Alarm System can send an alarm to the Operator, which evaluates the anomaly and choose how to proceed. The OOQS Manager is also interfaced with the Monitoring System to provide information about the software components (e.g the processing time or the status of the analyses).

The software used to perform the quality check, and all its dependencies (e.g. external packages, services etc.) are installed into a Singularity[4] container that can be easily deployed in the on-site data center. The containers are used to implement a continuous integration workflow.

[1]https://www.eso.org/projects/alma/develop/acs/
[2]https://redis.io/topics/pubsub
[3]https://slurm.schedmd.com
[4]https://syslab.io/singularity