# The Monitoring, Logging, and Alarm system for the Cherenkov Telescope Array

**Authors:** Alessandro Costa (presenter), Kevin Munari, Federico Incardona, Pietro Bruno, Stefano Germani, Alessandro Grillo, Igor Oya, Eva Sciacca, Ugo Becciani and Mario Raciti for the CTA Consortium

**Context**

The Cherenkov Telescope Array (CTA) will be the largest and most advanced ground-based facility for detection of very-high-energy electromagnetic radiation, from 20 GeV to 300 TeV. When entering the atmosphere, this radiation generates secondary charged particle cascades that can be detected directly or, as in the case of CTA, through the Cherenkov radiation they emit. Since the area hit by this light is wide, in the order of $10^5$ $m^2$ multiple telescopes are required to intercept it all, and to reconstruct the properties (energy, direction) of the primary gamma-ray who generated the cascades.

**Aims**

We present the current development of the Monitoring, Logging and Alarm subsystems in the framework of the Array Control and Data Acquisition System (ACADA) for the CTA. The Monitoring System (MON) is the subsystem responsible for monitoring and logging the overall array (at each of the CTA sites) through the acquisition of monitoring and logging information from the array elements.

The Array Alarm System (AAS) is the subsystem that provides the service that gathers, filters, exposes, and persists alarms raised by both the ACADA processes, and the array elements supervised by the ACADA system. It collects alarms from the telescopes, the array calibration, the environmental monitoring instruments and the ACADA systems.

**Methods**

In the framework of CTA ACADA we expect about 200.000 monitoring points sampled between 1 and 5 Hz for a maximum data rate for writing operations of 26 Mbps for the monitoring system including the alarms. A maximum rate of about 1 Gbps has been estimated for storing log information. Being the data produced by the monitoring and logging system characterized by an high volume and rate in writing operations, Cassandra NoSQL database was selected as the most suitable and solid database solution for our purposes. The system was designed and built considering the current software tools and concepts coming from Big Data and Internet of Things. The software stack is based on open source software.

**Results**

A unified tool for monitoring data items and alarms from the telescopes and other devices deployed at the CTA array sites. Data are immediately available for the operator interface and quick-look quality checks and stored for later detailed inspection.