

Logging UnifieD (LOUD) for ASTRI Mini Array

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Context

The ASTRI (Astrofisica con Specchi a Tecnologia Replicante Italiana) Mini-Array (MA) project is an international collaboration led by the Italian National Institute for Astrophysics (INAF). ASTRI MA is composed of nine Cherenkov telescopes operating in the energy range 1-100 TeV, and it aims to study very high-energy gamma ray astrophysics and optical intensity interferometry of bright stars. It is currently under construction, and will be installed at the site of the Teide Observatory in Tenerife (Spain).

Aims

We present the LOGging UnifieD (LOUD) software architecture in the context of SCADA, the software responsible of controlling all the telescope operations.

LOUD Architecture

The LOUD system is responsible for gathering, filtering, exposing and storing logs data, which are needed to record the operational activities of ASTRI MA. LOUD is designed and built exploiting the current most advanced technologies in the field of the Internet of Things (IoT), and it is based on open-source software. It is written in Java programming language and is integrated with the ALMA Common Software (ACS).

The main building blocks of LOUD are five Logging components: Collector, Analyzer, Storage, Manager and Master. The Logging Collector gets logging information from relevant software components and assemblies, which comes from ACS components, OPC UA servers and low-level software. The Logging Collector is composed, in turn, of a set of Log Shippers and of an instance of Log Aggregator. Each Log Shipper is designed to run on a single host and gathers the set of log files produced on that machine. The Log Aggregator processes log events from Log Shippers, and sends them to Logging Storage and Logging Analyzer through a queue mechanism. The Logging Analyzer is responsible to analyse logging data information to trigger further alarms as well as warnings for the technical crew. The Logging Storage stores logging events quantities according to desired log entry level. The Logging Manager component interacts via the Logging Master with the Central Control (CC), which is the SCADA component that manages and administrates all the subsystems. It receives start-up and shut-down commands, and passes them to the LOUD systems. It provides also the LOUD status information to the CC. The Logging Master implements and exposes to the CC a standard state machine that implements the system life cycle in a standardized way, in order to keep track of the health and the activation condition of LOUD, and to simplify the integration with other subsystems. The Logging System allows for filtering at the level of Log Shipper and Log Aggregator, so that log entries with insufficient priority do not get logged, whereas those with high priority get routed promptly to a dedicated high priority queue.

The system architecture has been designed to scale up with the number of devices to be monitored and with the number of software components to be taken into account in the distributed logging system. IoT technology allows to address the data collection from all the devices connected to the telescopes and all the others array elements.