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ASTRI Mini-Array On-Site Information and Communication Technology infrastructure

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ABSTRACT:
The ASTRI ("Astrofisica con Specchi a Tecnologia Replicante Italiana") is a collaborative international effort led by the Italian National Institute for Astrophysics (INAF) for developing an array of nine 4m-class dual-mirror imaging atmospheric Cherenkov telescopes (IACTs)sensitive to gamma-ray radiation at energies above 1 TeV. The array is placed at the Teide Observatory in Tenerife, in the Canary Islands. In order to support the development, installation, and operations of the ASTRI Mini-Array, an on-site Information and Communication Technology (ICT) Infrastructure has been designed.
This presentation describes the design of this ICT infrastructure, which includes various subsystems dedicated primarily to host the Supervisory Control And Data Acquisition (SCADA) software whose aim is to control and monitor the array of telescopes and to perform data acquisition and data quality control.
For each subsystem, the best technology solutions were chosen. A dedicated Virtual System based on ProxMox for telescope control, to ensure the easy control and management combined with high reliability and continuity of service was implemented. To ensure the throughput of tens of MB/s the data acquisition and dispatch operations were realized bare metal from the camera and frontier server, combined with a dedicated BeeGFS-based storage system to ensure the necessary performance and provide a distributed, shared and concurrent filesystem.
The high performances of the online data quality control and of the Monitoring System are guaranteed by a Kubernetes Technology approach, which also improves the automation, the scaling and deployment.
These subsystem and ASTRI telescopes are interconnected by the high-performance network, so special attention has been focused on the network topology to ensure both reliability and data transfer throughput, both in the local network and for transmission to the remote archive facility in Rome where the data are transferred as soon as they are available.
The entire ICT infrastructure was engineered to have no Single Point Of Failure (SPOF) and to ensure high availability, because there will be no one dedicated to its maintenance on-site at Teide and during the night. Therefore, all the most critical systems have been designed in hot redundancy, that is, capable of withstanding a failure without service interruption.

Summary of Abstract
The ASTRI (Astrofisica con Specchi a Tecnologia Replicante Italiana) program, led by the Italian National Institute for Astrophysics (INAF), is developing nine 4-meter Imaging Atmospheric Cherenkov Telescopes (IACTs) to detect gamma-ray radiation above 1 TeV at the Teide Observatory in the Canary Islands. To support this project, an on-site Information and Communication Technology (ICT) Infrastructure has been designed.
This presentation describes the design of this ICT infrastructure, which includes various subsystems dedicated primarily to hosting the Supervisory Control And Data Acquisition (SCADA) software.
The ICT architecture was divided into subsystems dedicated to specific functions: telescope control; acquisition and storage; data quality control; fast transmission to data archiving; and monitoring of the entire Observatory.
All these ICT components are interconnected, so special attention was paid to the network topology to ensure the necessary throughput and reliability of the connections.

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