

# 2nd TETIS Workshop



## Report of Contributions

Contribution ID: 1

Type: **not specified**

## Registration

*Thursday 2 February 2023 13:30 (15 minutes)*

Contribution ID: 2

Type: **not specified**

## **Introduction / Greetings**

*Thursday 2 February 2023 13:45 (30 minutes)*

Contribution ID: 3

Type: **not specified**

## The infrastructure for continuous integration and deploying at SKA

*Friday 3 February 2023 09:25 (25 minutes)*

The Square Kilometre Array (SKA) is an international effort to build two radio interferometers in South Africa and Australia forming one Observatory monitored and controlled from global headquarters (GHQ) based in the United Kingdom at Jodrell Bank. SKA is highly focused on adopting CI/CD practices for its software development. CI/CD stands for Continuous Integration \& Delivery and/or Deployment. This paper analyses the CI/CD practices selected by the Systems Team, a specialised agile team devoted to developing and maintaining the tools that allow continuous practices.

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**Session Classification:** Radio and High Energy

Contribution ID: 4

Type: **not specified**

## PLICO: a framework for Adaptive Optics laboratory experiments

*Thursday 2 February 2023 15:55 (25 minutes)*

PLICO (Python Laboratory Instrumentation COntrol) is a framework for developing instrument control applications, such as the devices usually available in a scientific laboratory. It is entirely written in Python and based on a client-server model, typically using zeromq as message dispatcher.

The creation of the framework was a response to the need to use the instrumentation available in the Arcetri laboratories in a quickly and easily accessible format. The software architecture is designed to allow simple expansion of the server libraries with the introduction of new devices. The available packages of the PLICO framework are:

1. plico-camera to control videocameras
2. plico-dm to control Deformable Mirrors
3. plico-dm-characterization for the deformable mirrors calibration and characterization
4. plico-motor to control motor
5. plico-interferometer to control interferometers

We present the status of the project and a few examples of application.

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**Session Classification:** Space and Optical

Contribution ID: 5

Type: **not specified**

## The ASTRI Mini-Array on-site infrastructure startup system, monitoring collectors and the Telescope AIV software

*Friday 3 February 2023 11:25 (25 minutes)*

The ASTRI Mini-Array, consisting of nine Imaging Atmospheric Cherenkov Telescopes of the 4-m class, is an international project led by INAF. The first telescope of the array was installed at the Teide Observatory on Tenerife, in the Canary Islands, the second half of 2022. All needed site infrastructures, to host the telescope and the other eight that will arrive soon, have been built and accepted.

Here we report about the software that has been developed to collect monitoring points from the various infrastructure subsystems (Power, Networking, Computers, Time distribution system, CCTV cameras, Weather Stations, and Telescope Service Cabinets) and to support the AIV phase and the maintenance of each telescope. Finally, an on-site startup system, to switch-on and monitor the critical systems, has also been developed.

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**Session Classification:** Radio and High Energy

Contribution ID: 6

Type: **not specified**

## Monitoring and controlling the PRISMA network

*Thursday 2 February 2023 15:10 (25 minutes)*

The PRISMA network is composed of many camera devices distributed in different parts of Italy detecting fireballs everyday. Each camera produces images that must be synchronized in a server and calibrated daily and monthly. In case of multiple detections (event), another process must be run in order to perform other kinds of analysis. The entire network must be monitored in order to detect faulty devices. This contribution analyses the decision taken for monitoring and controlling the PRISMA network in the server available in Turin.

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**Session Classification:** Space and Optical

Contribution ID: 7

Type: **not specified**

## Commissioning of SHINS, the SHARK-NIR INstrument control Software

*Thursday 2 February 2023 16:20 (25 minutes)*

SHARK-NIR, the new infrared, coronagraphy-driven instrument for LBT, has been installed at its bent gregorian left focus and is facing the commissioning phase.

We present the (ongoing) commissioning activities of SHINS, the SHARK-NIR INstrument control Software.

The development of the control software is taking advantage from these hands-on sessions to reach a stable, advanced phase.

We present the web-based Observation Blocks XML editor based on REST APIs, a simplified version of ESO P2, that we use to create parameters set not only for SHARK observation Templates, but also to recall the large number of AIT tests (flexures, coronagraphic mask alignment, scientific camera performances...).

Taking advantage of the web approach, we decided to expose APIs also for individual device movement and monitoring, as well as for general status. These APIs are then used in the web-based

instrument control and synoptic panel, as well as in an integrated RTC panel to show and control the deformable mirror, the camera, and the related to the closed-loop parameters.

We then summarize the lesson learned at this stage, the critical issues, and the general progress status of the software.

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**Session Classification:** Space and Optical



Contribution ID: 8

Type: **not specified**

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

*Friday 3 February 2023 11:00 (25 minutes)*

The ASTRI ("Astrofisica con Specchi a Tecnologia Replicante Italiana") and Mini-Array project 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. These telescopes will be sensitive to gamma-ray radiation at energies above 1 TeV. The Mini-Array

is under construction at the Teide Observatory (Canary Islands). The ASTRI Mini-Array Information and Communication Technology (ICT) is distributed between the "on-site" (Teide) segment,

to support the development, installation and on-site operations of the ASTRI Mini-Array, and the "off-site" (Rome, Italy) segment for data archiving and user support activities (see the companion contribution at this meeting).

In this contribution it is described the design of the "on-site" ICT infrastructure, which includes various subsystems that can support various software components and how are foreseen all related implementations. The design of the virtual system for controlling telescopes, the data acquisition and data storage as well as the computing system are described too. All these components are connected together so a particular attention to the network topology is also given in order to guarantee nominal runtime together with the required data transfer throughput to the off-site long term archive facility.

Finally, it is introduced and described the mini-ICT, which is a reduced version of main on-site ICT

infrastructure, currently installed in the ASTRI-MiniArray site to ensure the preliminary operation and validation of the subsystems and technologies adopted for the first three telescopes installed, before the final ICT infrastructure is in production.

Finally the m-ICT has proved to be not only a workaround to compensate for the lack of the final ICT, but revealed to be fundamental in validation and testing of subsystems like the optical fiber network and Internet connection as well as the SCADA software integration.

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**Session Classification:** Radio and High Energy

Contribution ID: 9

Type: **not specified**

## The ASTRI Mini-Array Supervisory Control and Data Acquisition software system

*Friday 3 February 2023 11:50 (25 minutes)*

The ASTRI Mini-Array is an international collaboration led by INAF and devoted to imaging atmospheric Cherenkov light for very-high  $\gamma$ -ray astronomy. The project is deploying an array of 9 4-m class Imaging Atmospheric Cherenkov Telescopes at the Teide Observatory on Tenerife, in the Canary Islands, most sensitive to  $\gamma$ -ray radiation above 1 TeV. The Supervisory Control and Data Acquisition (SCADA) system controls all the operations carried out on-site, from the execution of an observing plan to the acquisition of scientific data. SCADA provides monitoring and online observations quality information to help assess data quality during the acquisition. Moreover, the system provides automated reactions to critical conditions. SCADA handles the automated data transfer to the Data Center at the Observatory in Rome through a high-speed networking connection, allowing us to operate the array remotely from different locations. In this contribution, we describe the software architecture of the SCADA system, the team organisation, the software engineering development approach and the software quality management.

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**Session Classification:** Radio and High Energy

Contribution ID: 10

Type: **not specified**

## Special devices on ELT-SW: lessons learned on FORS1

*Thursday 2 February 2023 17:10 (15 minutes)*

The ELT Instrument Framework Software (IWS), although in its pre-release phase, has reached a significant maturity and is already being used to implement the control software of new VLT instruments (such as FORS1 and CUBES). In this talk I will present our experiences in developing the so-called “special devices” (i.e. devices lacking a standard, commonly adopted implementation) for the FORS1 instrument control software. In particular, I will present a few solutions which are not yet discussed in the ELT documentation.

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**Session Classification:** Space and Optical

Contribution ID: 11

Type: **not specified**

## The monitoring, logging and alarm system of the ASTRI Mini-Array

*Friday 3 February 2023 12:15 (25 minutes)*

The ASTRI Mini-Array is an international collaboration led by INAF devoted to the construction and operation of an array of nine 4m-class, dual-mirror Imaging Atmospheric Cherenkov telescopes located at the Teide Observatory (Canary Islands), sensitive to gamma-ray radiation at energies above 1 TeV. Large volumes of monitoring and logging data result from the operation of an array of Atmospheric Cherenkov telescopes. In the last few years, several “Big Data” technologies have been developed to deal with such volumes of data, especially in the Internet of Things (IoT) framework. The ASTRI Mini-Array Monitoring Logging and Alarm (MLA) system provides an unified and coherent environment that aims at supporting the analysis of scientific data and improving the operational activities of the telescope facility. MLA is also designed to enable remote monitoring, predictive maintenance, software interoperability as well as an efficient organization of alarms and alerts.

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**Session Classification:** Radio and High Energy

Contribution ID: 12

Type: **not specified**

## **SQA for EUCLID NISP DPU ASW: implementation, possible evolution and impact on the development of an SQA infrastructure for ground-based instruments**

*Thursday 2 February 2023 14:20 (25 minutes)*

The Data Processing Unit (DPU) is the scientific core of the EUCLID NISP instrument where data processing is, for the first time on this type of instrument, performed in flight. The SQA process for its ASW (Application Software) is described here: the standards, the quality targets, and the tools used during the software lifecycle. A possible evolution of this framework using exclusively open-source tools is under scrutiny and is also described. Lastly, as ESO/ELT instruments are reaching complexities comparable to space-based instruments and ESO itself is keen to apply ECSS standards, we describe how SQA for ESO/ELT instruments is going to profit from NISP DPU ASW experience.

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**Session Classification:** Space and Optical

Contribution ID: 13

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## **Taranta: the web-based approach adopted by SKA. And not only.**

*Friday 3 February 2023 09:50 (25 minutes)*

The use of the graphical user interface in a control system is the challenge of every control room and is often dominated by standalone applications. Web technologies allow us to overcome some limitations of standalone applications, but also involve some obstacles. With Taranta we are discovering a trend that prefers web technologies.

Taranta suite is a web-based toolset jointly developed by MAX IV Laboratory and the SKA that allows the fast development of graphical user interfaces connected to TANGO devices, based on a set of predefined widgets and a drag-and-drop mechanism and therefore without the need to write any additional code.

During the presentation, it will be presented the Taranta general architecture and the main widgets currently available, it will be described how the Taranta suite is deployed in the SKA integration environment and explained the process used to collect feedback from the SKA community to define the roadmap for the future development of the tool.

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**Session Classification:** Radio and High Energy

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## PLCs within ESO ELT framework

*Thursday 2 February 2023 17:25 (25 minutes)*

After an introduction to Beckhoff PLCs and their development environment, I will describe low-level software programming within the ELT framework. I will illustrate how standard and special ESO devices are configured and conclude by briefly describing Siemens PLCs and their characteristics.

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**Session Classification:** Space and Optical



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## ELT Framework: the MAVIS and MORFEO use cases

*Thursday 2 February 2023 16:45 (25 minutes)*

MAVIS (MCAO Assisted Visible Imager and Spectrograph) is a new instrument being built for the ESO's Very Large Telescope.

MAVIS is currently approaching the Preliminary Design Review (end of Mar 2023) and it is composed of a multi conjugate adaptive optics module and two scientific channels, both operating in the visible range.

MORFEO (Multi conjugate adaptive Optics Relay For ELT Observatory) is the adaptive module for ESO's Extremely Large Telescope.

They will be both among the first ESO instruments that will use the new ESO's ELT-SW framework, under development at ESO.

We present the current status of their control software. We give an overview of their preliminary architectural design, focusing on the functions under software control and the main differences between the two instruments. Then we show how we intend to set up the first functional "skeleton" of both the instruments, which will be the first short-term objective of the design phase.

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**Session Classification:** Space and Optical

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## TANGO for LOFAR 2.0: an overview of the LOFAR Station Control software

*Friday 3 February 2023 10:15 (25 minutes)*

Since 2020, ASTRON has chosen the TANGO Controls framework for the development of the Monitor and Control Station software for LOFAR 2.0, a major upgrade regarding both software and infrastructure facilities. INAF is currently involved in the Station software development both in the Station Control team and in the Telescope Manager team, recently merged as a single team.

The present overview covers the general system architecture, the hierarchy among TANGO devices, the software tools used in the system and shows some representative use cases and technical challenges. Moreover, the Station Control team is developing new software extensions to

the PyTango framework in order to possibly overcome some technical difficulties and add specific missing features.

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**Session Classification:** Radio and High Energy

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## SRTC presentation

*Friday 3 February 2023 09:00 (25 minutes)*

A brief introduction to Morpheus and the RTC and where the SRTC fits in with respect to both. We will discuss the methods with which we are facing the problem of its realization and the techniques used up to now with particular attention to the analysis of the RTC toolkit provided by ESO. We will also analyze the current state and where it's headed in the future.

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**Session Classification:** Radio and High Energy

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## Control Software at OATo: from stratosphere to space

*Thursday 2 February 2023 14:45 (25 minutes)*

In INAF-OATo we are consolidating our experience in design and development of control SW for different scientific instrumentation.

We are mainly focused on space missions, among them, Euclid in its final rush before launch, Athena and Ariel; but we are also involved in a stratospheric balloon-based experiment.

In order to capitalize previous experiences and to optimize the effort facing so many challenging projects, the need arises for common tools, both for modelling and for sw development.

On the other hand, lessons learnt in space missions can be usefully rescaled in the design of a smaller experiment.

In this presentation, I will share our experience, with an highlight on common needs between projects that are setting the roadmap of our research.

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**Session Classification:** Space and Optical

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## ECCS?

ECCS?

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## Discussion

*Friday 3 February 2023 12:40 (30 minutes)*