



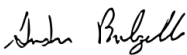
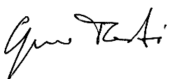
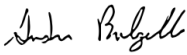
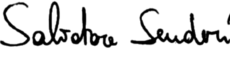
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Authors	BULGARELLI, ANDREA
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ASTRI Mini-Array

Use Cases of the

Power Management System Collector



Prepared by:	Name:	A. Bulgarelli	Signature:		Date:	Nov 29, 2022
Verified by:	Name:	G. Tosti	Signature:		Date:	Nov 29, 2022
Approved by:	Name:	A. Bulgarelli/F. Lucarelli	Signature:	 	Date:	Nov 29, 2022
Released by:	Name:	S. Scuderi	Signature:		Date:	Nov 29, 2022

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	2/14

Main Authors: A. Bulgarelli

Contributor Authors: G. Tosti

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	3/14

Table of Contents

1. Introduction	6
1.1. Purpose	6
1.2. Scope	6
1.3. Content	6
1.4. Definitions, abbreviations and acronyms	6
2. Applicable and reference documents	7
2.1. Applicable documents	7
2.2. Reference documents	7
3. Actors	8
4. Use Cases	9
5.2. ASTRI-UC-9.1.1.6-010: The Central Control system starts the Power Management System Collector	9
5.2. ASTRI-UC-9.1.1.6-020: The Power Management System Collector acquire monitoring points and alarms	11
5.2. ASTRI-UC-9.1.1.6-030: The Central Control system shutdown the Power Management System Collector	13

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	4/14

INDEX OF FIGURES & TABLES

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	5/14

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		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	6/14

1. Introduction

The **ASTRI Mini-Array (MA)** is an INAF project to construct and operate an experiment to study gamma-ray sources emitting at very high-energy in the TeV spectral band. The MA consists of an array of nine innovative Imaging Atmospheric Cherenkov Telescopes that are an evolution of the double-mirror ASTRI Horn telescope successfully tested since 2014 at the Serra La Nave Astronomical Station of the INAF Observatory of Catania. Each telescope will be equipped with the new version of the ASTRICAM Silicon photomultiplier Cherenkov Camera. The main scientific goal of the ASTRI Mini-Array is to perform high-energy ($E > 1$ TeV) observations of galactic and extragalactic sources with a sensitivity better than that reachable by the other Imaging Atmospheric Cherenkov telescopes currently in operation (HESS, MAGIC, VERITAS). Furthermore, the Mini-Array will also perform Intensity Interferometry of a selected sample of bright sources. The nine telescopes will be installed at the Teide Astronomical MA System, operated by the Instituto de Astrofisica de Canarias (IAC), on Mount Teide (~2400 m a.s.l.) in Tenerife (Canary Islands, Spain). The ASTRI MA will be operated by INAF on the basis of a host agreement with IAC.

1.1. Purpose

This document defines the Use Cases of the Power Management System Collector (PMS).

The Use Cases are divided into these main groups following the functional decomposition of the system:

1. PMS Lifecycle
2. PMS acquisition

1.2. Scope

The PMS is part of the Central Control of the Supervisory Control and Data Acquisition System (SCADA), as described in [AD3].

The PMS is a software system that acquires monitoring points and alarms from the Power Management System of ASTRI Mini-Array.

1.3. Content

Sect 4 reports the use cases of the PMS.

1.4. Definitions, abbreviations and acronyms

The definitions and abbreviations used in this document can be found in [AD8] ASTRI-MA Glossary: ASTRI-INAF-LIS-9000-001.

PMS: Power Management System

PMS: Power Management System Collector

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	7/14

2. Applicable and reference documents

2.1. Applicable documents

[AD1] ASTRI-MA Management Plan: ASTRI-INAF-PLA 1000-001
[AD2] ASTRI-MA Quality Plan: ASTRI-INAF-PLA-3000-0001
[AD3] ASTRI-MA Top Level Software Architecture: ASTRI-INAF-DES-2100-001
[AD4] ASTRI-MA Software Product Breakdown Structure: ASTRI-INAF-DES-2100-002
[AD5] ASTRI-MA Data Model: ASTRI-INAF-DES-2100-003
[AD6] ASTRI-MA Top Level Use Cases: ASTRI-INAF-SPE-2100-001
[AD7] ASTRI-MA Software Development Plan: ASTRI-INAF-PLA-2100-002
[AD8] ASTRI-MA Glossary: ASTRI-INAF-LIS-9000-001
[AD8] ASTRI-MA System Engineering Management Plan: ASTRI-INAF-PLA-2100-002
[AD9] ASTRI-MA Operation Concept: ASTRI-INAF-DES-1000-001
[AD10] ASTRI-MA Risk Management Plan: ASTRI-INAF-PLA-1000-002
[AD11] ASTRI Mini-Array Product Tree: ASTRI-INAF-DES-2000-001

2.2. Reference documents

[RD1]

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	8/14

3. Actors

Human:

- **Operator**
- **Expert Operator**

System

- **Central Control System**
- **Monitoring System**
- **Operator HMI**

4. Use Cases

The list of use cases that must be developed are:

1. The Central Control system starts the Power Management System Collector
2. The Power Management System Collector acquire monitoring points and alarms
3. The Central Control system shutdown the Power Management System Collector

5.2. ASTRI-UC-9.1.1.6-010: The Central Control system starts the Power Management System Collector

Summary and Scope: This UC describes how the **Central Control System** starts and configures the PMSC.

Authors: Andrea Bulgarelli, Gino Tosti

Version: 1.0

Trigger: Start of the Central Control System.

Frequency:

Phase: AIT/AIV, commissioning and nominal phase.

Assumptions:

Actors: Central Control System, PMSC Manager

PRE-CONDITION CONSTRAINTS
- The Central Control System is running.
SCENARIOS
Basic Path. 1. The Central Control System starts the PMSC Manager ACS component. <i>Alternate: 1a, The Expert Operator starts the PMSC manually.</i> 2. The PMSC Manager reads configurations from the configuration files. 3. The PMSC Manager start the PMS Collector 4. The PMS Collector connects with each assembly of the Power Management System Exception: 4a, The PMS Collector cannot connets to some Power Management System assemblies (basic). Rejoins Main Scenario at End. Exception: 4a, The PMS Collector cannot connets to some Power Management System assemblies (final). Rejoins Main Scenario at End.

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	10/14

5. The **Central Control System** checks that the **PMS Manager** is ready to operate and connected with all available assemblies.

Exception: 5a, The Central Control System cannot checks the PMSC status. Rejoins Main Scenario at Step 1.

Exception: 5b, The PMSC Manager cannot send feedback to the Central Control System. Rejoins Main Scenario at End.

Exception: 5c, The PMS Collector cannot connets to some Power Management System assemblies. Rejoins Main Scenario at End.

Alternate. The PMSC is started manually

- The **Expert Operator** starts the **PMS Manager** ACS component.

Exception. The PMSC Manager cannot connets to some Power Management System assemblies (basic).

- The **PMS Collector** excludes the assembly.

Exception. The PMSC Manager cannot connets to some Power Management System assemblies (final).

- The **PMS Collector** retries the connection.
- After N secs the **PMS Collector** sends an alarm to ACS alarm system:
 - notification event is received by the **Central Control System**.
 - alarm is received by the **Alarm System**.
 - the **Operator** HMI display the alarm to the **Operator**
- If the assembly goes online, the **PMS Collector** notify the **Central Control System** and the **Alarm System** that the problem is solved.

Exception. The Central Control System cannot checks the PMSC status.

- The **Central Control System** restart the PMSC.

Exception. The PMSC Manager cannot send feedback to the Central Control System..

- The **PMSC** shutdown itself.

POST CONDITION CONSTRAINT

MINIMAL GUARANTEE

- The **PMS Collector** is running.

SUCCESS GUARANTEE

- The **PMS Collector** is running, configured and connection with the Power Management System

OPEN POINTS

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	11/14

5.2. ASTRI-UC-9.1.1.6-020: The Power Management System Collector acquire monitoring points and alarms

Summary and Scope: This UC describes how the **PMSC** acquire monitoring points from Power Management System and notify events, i.e. a notification that a warning condition or a critical condition (i.e. an abnormal condition or fault) has happened.

Authors: Andrea Bulgarelli, Gino Tosti

Version: 1.0

Trigger:

Frequency:

Phase: AIT/AIV, commissioning and nominal phase.

Assumptions:

Actors: ICTSC

PRE-CONDITION CONSTRAINTS
- The Power Management System is reachable. - The PMSC is running.
SCENARIOS
Basic Path. Monitoring points 1. The PMS Collector acquires monitoring points via modbus protocol. Exception: 1a, The PMS Collector cannot connects to some Power Management System assemblies. Rejoins Main Scenario at Step 1. Exception: 2a, A PMS assemblie monitoring point goes outside operative ranges. Rejoins Main Scenario at Step 1. 2. The PMS Collector publish monitoring points to the Kafka topic <i>mon-collector</i> using the AVRO schema. 3. The PMS Collector fill a table with the status of all Power Management System assemblies. 4. The Central Control System gets the table of the status of the Power Management System assemblies from the PMS Collector. 5. The Monitoring System publish a selection of the monitoring points to the Kafka topic <i>mon-collector-ophmi</i>. 6. The Operator checks the selected monitoring points using the Operator HMI.

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	12/14

Alternate: 6a, The **Expert Operator** checks all monitoring points using the **Monitoring System Engineering GUI**.

Basic Path. Event notification

- The **PMS Collector** acquires monitoring points via modbus protocol.

Exception: 1a, The *PMSC Manager cannot connects to some Power Management System assemblies. Rejoins Main Scenario at End.*
- The **PMS Collector** publish notification events from warning or errors to the **Alarm System** and to the **Central Control System**.
- The **Operator** checks the alarms using the **Operator HMI**.

Alternate: 4a, The **Expert Operator** checks the alarms using the **Alarm System Engineering GUI**.

Exception. The PMSC Manager cannot connet to some Power Management System assemblies.

- The **PMS Collector** retries the connection.
- After N secs the **PMS Collector** sends an alarm to ACS alarm system:
 - notification event is received by the **Central Control System**.
 - alarm is received by the **Alarm System**.
 - the **Operator HMI** display the alarm to the **Operator**
- If the assembly goes online, the **PMS Collector** notify the **Central Control System** and the **Alarm System** that the problem is solved.

Exception. A Power Management System assembly monitoring point goes outside operative ranges.

- the **PMS Collector** sends an alarm to ACS alarm system:
 - notification event is received by the **Central Control System**.
 - alarm is received by the **Alarm System**.
 - the **Operator HMI** display the alarm to the **Operator**

POST CONDITION CONSTRAINT

MINIMAL GUARANTEE

- The **PMS Collector** is running.

SUCCESS GUARANTEE

- The **PMS Collector** is running, configured, connected with the Power Management System and acquires monitoring points.

OPEN POINTS

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	13/14

5.2. ASTRI-UC-9.1.1.6-030: The Central Control system shutdown the Power Management System Collector

Summary and Scope: This UC describes how the **Central Control System** stops the PMSC.

Authors: Andrea Bulgarelli, Gino Tosti

Version: 1.0

Trigger:

Frequency:

Phase: AIT/AIV, commissioning and nominal phase.

Assumptions:

Actors: Central Control System, PMSC Manager

PRE-CONDITION CONSTRAINTS
- The Central Control System is running.
SCENARIOS
Basic Path. 1. The Central Control System stops the PMSC Manager Alternate: 1a, The PMSC is stopped manually. 2. The Central Control System checks that the PMSC is shutdown.
Alternate. The PMSC is stopped manually 1. The Expert Operator stops the PMSC
POST CONDITION CONSTRAINT
MINIMAL GUARANTEE
- The PMSC Manager is shutdown.
SUCCESS GUARANTEE
- The PMSC Manager is shutdown.
OPEN POINTS

		ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana					
	Code: ASTRI-INAF-SPE-9100-016	Issue	1.0	Date:	Nov 29, 2022	Page:	14/14