Software design for the control system for Small-Size Telescopes with single-mirror of the Cherenkov Telescope Array

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ABSTRACT

The Small-Size Telescope with single-mirror (SST-1M) is a 4 m Davies-Cotton telescope and is among the proposed telescope designs for the Cherenkov Telescope Array (CTA). From the software point of view, the telescope is abstracted in five device subsystems and made visible to CTA through a dedicated industrial standard server and the Alma Common Software (ACS). Some software is being developed in collaboration with the CTA Medium-Size Telescope project to ensure compatibility and uniformity of the CTA array control. The status of the software development is presented.

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INTRODUCTION

The SST-1M must be made visible to the whole array, which is controlled by the Central Array Control System (ACTL) based on the ALMA Common Software (ACS) framework and connected to the Telescope Data pipeline (Fig. 1). To do so, the telescope abstraction is split in five device subsystems as ACS components.

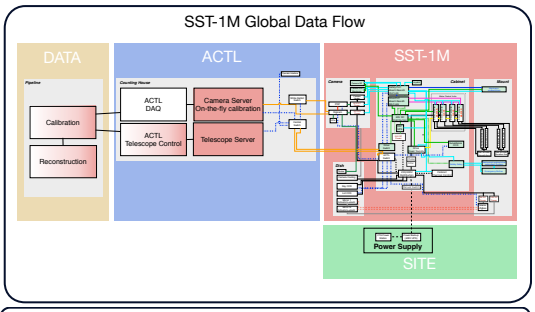

Fig. 1:
The telescope abstraction (red) communicates with the whole array via ACTL (blue), which will deal with the Data pipeline (yellow)

TOOLS

If possible the device subsystem is made visible via a native Open Platform Communications Unified Architecture (OPC-UA) and translated as an ACS component through a Java bridge. If a native OPC-UA is not provided, the device is interfaced directly to the ACS.
When possible, Medium-Size Telescopes software is adapted.
ACS can be written in Java, C++ or Python. `
The software is developed in a common platform chosen for CTA: a virtual machine with a Scientific Linux 6

ACKNOWLEDGEMENTS

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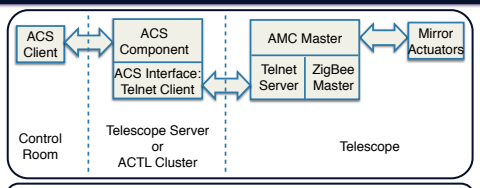

Fig. 2: AMC pipeline

ACTIVE MIRROR CONTROL (AMC)

The AMC is an interactive system to align the 18 mirror facets mounted on the mirror dish. Each facet uses a telnet connection through a ZigBee master to control its two actuators for x and y movement. No native OPC-UA exists and the ACS component has been written in Java language.

CCD CAMERAS

Three different cameras are used on SST-1M: Sky CCD, LidCCD (both for pointing) and Surveillance CCD. For all of them the MST ACS component written in Java is adapted.

CAMERA SERVER (CS)

The CS interfaces the camera readout (DigiCam) to the array data acquisition system and send all the data to the Data pipeline with all the information. No native OPC-UA exists and the software is written in C++ language.

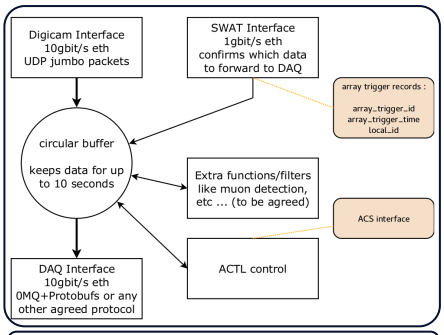

Fig. 3: CS pipeline

CAMERA SLOW CONTROL (CSC)

The CSC manages the Photon Detector Plane and is responsible for reading the signal, temperature and setting the bias voltage for each single Silicon Photomultiplier. No native OPC-UA exists, and the software is written in Python language.

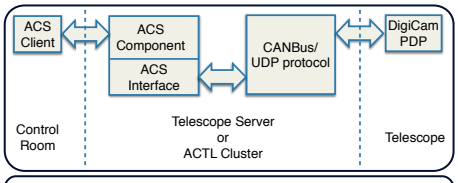

Fig. 4: CSC pipeline

PROGRAMMABLE LOGIC CONTROLLER (PLC)

Two PLC are used on SST-1M: Drive PLC, similar to the one used for the MST, and Safe PLC, a unique SST-1M feature. They both control the telescope movement. Both provide native OPC-UA support and ACS components are adapted from MST.

GUI

A web-based GUI interface as HTML page is under development. The page communicates with the ACS component via a Java client.

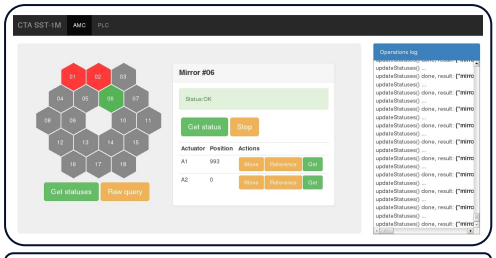

Fig. 5: GUI (AMC example)

SUMMARY OF THE STATUS OF THE DEVICES

- AMC: done and in beta test
- CCDs: MST adaptation by 07/2015
- CS: software by 08/2015, ACS component by 09/2015
- CSC: software by 08/2015, ACS component by 09/2015
- PLCs: software and MST adaptation by 08/2015