Research Report
ICRR Inter-University Research Program 2019

Research Subject: Set-up and Commissioning of the onsite data center for CTA north in la Palma, Spain

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Summary of Research Result :

The next generation observatory for very high energy γ-rays will be the Cherenkov Telescope Array (CTA) covering energies from 20 GeV to 300 TeV with unprecedented sensitivity. It will be built on two sites: one in the Northern hemisphere (La Palma, Canary Islands, Spain), the other one in the Southern hemisphere (Paranal, Chile). Four Large Size Telescopes (LSTs) of 23 m diameter and 28 m focal length will be arranged at the center of both arrays to lower the energy threshold and to improve the sensitivity of CTA below 200 GeV. The first LST was inaugurated in Autumn 2018 and is now in the commissioning phase.

The CTA onsite data center in La Palma (procured by the University of Tokyo) is the central analysis facility for the data and Monte Carlo studies. The system consists of 2000 cores and 3PB disk space. This cutting edge technology allows us to process data directly onsite in a very short time. Starting from April 2018 the onsite data center is operated by the ICRR. I am responsible for this data center, i.e. the correct set-up, the coordination and management of the users and the commissioning of the IT center.

During the last year we set up the IT center successfully. In particular the following points were achieved:

- I spent 3 months on La Palma to commission the joined system of LST1 and the IT center onsite.
- Installation of an <u>Automatic Alert Sytem</u> to receive external alerts and send internal alerts to the community: The challenge is to obtain a reliable and fast automated system to take a decision and repoint the telescopes in a shortest possible manner, without any human intervention to save time. This is essential

since the emission of transient astrophysical objects is shown in a dramatic and unpredictable fashion at any energy range and timescale. It is connected with the Real Time Analysis that was also installed during FY2019. Data taken with CTA need to be analyzed through powerful analysis pipelines in the onsite data center to judge quickly about Transients in the field of view to extend observations and alert the community within seconds.

- Fixing of the fire alarm system in the IT container: The fire alarm system was wrongly cabled and gave false alarms. This was fixed.
- The cooling system inside the IT Container was repaired. It took several visits of the responsible company to fix the problems with cooling system completely.
- Installation and set-up of a back-up server with the capacity of 100TB and extendable in future to store sensitive data in the sea level "office" CALP on La Palma. Next step: Establish an automatically back-up procedure.
- Installation of a humidifier in the IT container and connection to a water tank outside the container.
- Individual Pixel Rate Control (IPRC) was implemented: this algorithm regulated the discriminator thresholds automatically depending on the light conditions of the star field we are observing.
- The network structure was improved and prepared for the next telescopes that will be connected to the IT center. Please find a sketch of the current IT onsite structure in Figure 1.

Figure 1: Onsite IT organization