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Stress testing Ethernet Switches for NectarCAM in the Cherenkov Telescope Array with a synchronous UDP frame generator

Saturday 1 August 2015 15:30 (1 hour)

The Cherenkov Telescope Array (CTA) will be the next generation ground-based gamma-ray instrument. It will be made up of approximately 100 telescopes of at least three different sizes, from 4 to 23 meters in diameter.

The previously presented prototype of a high speed data acquisition (DAQ) system for CTA has become concrete within the NectarCAM project, one of the most challenging camera projects due to its 40-Gbps average output rate on 265 Ethernet 1000baseT links, bundled to 40Gbps on four optical links and reduced to 10Gbps after event-building. Design constraints include procurement of a maximum of components as commercial off-the-shelf products for an operation period of at least 30 years. Hence the results of the generic hardware characterisation are supposed to serve as a reference for similar setups.

Tests of single components and the whole data acquisition chain have been carried out with standard network analysing tools as well as a purpose-built Single-Board-PC cluster providing 320 physical gigabit Ethernet ports. In order to mimic the total synchronicity (some nanoseconds) of the 265 camera front-end modules, we implemented a light-weight version of the IP standard Precision Time Protocol, which can synchronise the outputs of all boards to an average of $O(10^2)$ns. A multi-purpose system with FPGA boards delivering Ethernet packets on 48 ports with the same characteristics as the real front-end has completed specific aspects of our test. We will present the results of all tests that could be performed ahead of the delivery of the first complete real camera hardware foreseen for 2015.

Collaboration

CTA

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