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Flexible event reconstruction software chains with the ALICE High-Level Trigger

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The ALICE High-Level Trigger (HLT) is a complex real-time system, whose primary objective is to scale down the data volume read out by the ALICE detectors to at most 4 GB/sec before being written to permanent storage. This can be achieved by using a combination of event filtering, selection of the physics regions of interest and data compression, based on detailed on-line event reconstruction. ALICE's largest detector - the Time Projection Chamber (TPC) - alone can easily reach data rates of upto 15 GB/sec which exceeds the available mass-storage bandwidth. Hence the ALICE HLT is a critical system logically sitting in between the detector readout electronics and the DAQ event building network.

The ALICE HLT has a large high-performance computing cluster at CERN consisting of 2752 CPU cores supported by 64 GPUs and 246 FPGAs. Data-flow in this cluster is controlled by a custom designed software framework. It consists of a set of components which can communicate with each other via a common control interface. The software framework also supports the creation of different configurations based on the detectors participating in the HLT. These configurations define a logical data processing "chain"of detector data-analysis components. Readout data passes through these software components in a pipelined fashion so that several events are processed in the software chain at the same time. An instance of such a chain can run and manage a few thousand physics analysis and data-flow components.

As more detectors participate in the HLT and with the increasing data challenges posed by ALICE, from the computing point of view, it translates into a need to efficiently manage an even higher number of software components communicating with each other and competing for the same resources in the cluster.

In this contribution the experience of running the HLT software and the configuration scheme used in 2011 – with special emphasis on the heavy ion period of ALICE - will be discussed. The current status of the software would be presented and the improvements made, based on past experience of running the software would be reviewed.

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