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Improvements of the ALICE HLT data transport framework for LHC Run 2

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The ALICE HLT uses a data transport framework based on the publisher subscriber message principle, which transparently handles the communication between processing components over the network and between processing components on the same node via shared memory with a zero copy approach.
We present an analysis of the performance in terms of maximum achievable data rates and event rates as well as processing capabilities during Run 1 and Run 2.
Based on this analysis, we present new optimization we have developed for ALICE in Run 2.
These include support for asynchronous transport via Zero-MQ which enables loops in the reconstruction chain graph and which is used to ship QA histograms to DQM.
We have added asynchronous processing capabilities in order to support long-running tasks besides the event-synchronous reconstruction tasks in normal HLT operation.
These asynchronous components run in an isolated process such that the HLT as a whole is resilient even to fatal errors in these asynchronous components.
In this way, we can ensure that new developments cannot break data taking.
On top of that, we have tuned the processing chain to cope with the higher event and data rates expected from the new TPC readout electronics (RCU2) and we have improved the configuration procedure and the startup time in order to increase the time where ALICE can take physics data.
We present an analysis of the maximum achievable data processing rates taking into account processing capabilities of CPUs and GPUs, buffer sizes, network bandwidth, the incoming links from the detectors, and the outgoing links to data acquisition.

Tertiary Keyword (Optional)

Distributed workload management

Secondary Keyword (Optional)

High performance computing

Primary Keyword (Mandatory)

Data processing workflows and frameworks/pipelines

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