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Allen: A software framework for the GPU High Level Trigger 1 of LHCb

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As part of the LHCb detector upgrade in 2021, the hardware-level trigger will be removed, coinciding with an increase in luminosity. As a consequence, about 40 Tbit/s of data will be processed in a full-software trigger, a challenge that has prompted the exploration of alternative hardware technologies. Allen is a framework that permits concurrent many-event execution targeting many-core architectures. We present the core infrastructure of this R&D project developed in the context of the LHCb Upgrade I. Data transmission overhead is hidden with a custom memory manager, and GPU resource usage is maximized employing a deterministic scheduler. Our framework is extensible and covers the control flow and data dependency requirements of the LHCb High Level Trigger 1 algorithms. We discuss the framework design, performance and integration aspects of a full realization of a GPU High Level Trigger 1 in LHCb.

Consider for promotion

No

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