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Heterogeneous online reconstruction at CMS

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The CMS experiment has been designed with a two-level trigger system: the Level 1 Trigger, implemented on custom-designed electronics, and the High Level Trigger (HLT), a streamlined version of the CMS offline reconstruction software running on a computer farm. A software trigger system requires a trade-off between the complexity of the algorithms running on the available computing resources, the sustainable output rate, and the selection efficiency.

Industry and HPC have been successfully using heterogeneous computing platforms to achieve higher throughput and better energy efficiency by matching each job to the most appropriate architecture.

The development of a heterogeneous online reconstruction faces some fundamental challenges: the algorithms must achieve the same or better physics performance and processing throughput; they have to be integrated in the experimental reconstruction framework; and it must be possible to run and validate them on conventional machines, without any dedicated resources.

Some of the most time consuming algorithms running in the CMS HLT have been ported to run on NVIDIA GPUs using the CUDA platform; the same algorithms can run on conventional CPUs, with identical results and close to naive performance, leveraging "performance portability" libraries.

This presentation will describe the results of these developments and the characteristics of the system that is aimed for deployment in production starting from Run 3.

Consider for promotion

Yes

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