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Optimization of HLT2 selection algorithms at the LHCb experiment

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The computational challenge posed by Large Hadron Collider(LHC) experiments is a formidable one, and with the advent of the High-Luminosity LHC upgrade, there is an increasing demand for efficient utilization of computational resources. The High-Level Trigger 2(HLT2) at the LHCb experiment is the CPU-based second step of the trigger chain that selects physics objects at offline-quality for long-time storage. A significant fraction of the computational cost(30%) is spent on selections of the physics objects in the trigger lines. The nature of LHCb's physics program necessitates exclusive implementation of algorithms that implement similar selection criteria. This leads to combinations of input particles being iterated over multiple times in separate algorithms. In response to this inefficiency, an optimization framework have been created that identifies combiners with similar inputs, combine them together to remove the duplicate computations and with current work being done towards optimizing the process for best performance. This work represents an important step towards ensuring that the computational resources deployed in the LHCb experiment are effectively implemented to meet the growing demand of High-Luminosity LHC operation.

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