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Exploring Compression Techniques for ROOT IO

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ROOT provides an extremely flexible format used throughout the HEP community. The number of use cases –from an archival data format to end-stage analysis –has required a number of tradeoffs to be exposed to the user. For example, a high "compression level"in the traditional DEFLATE algorithm will result in a smaller file (saving disk space) at the cost of slower decompression (costing CPU time when read). If not done correctly, at the scale of a LHC experiment, poor design choices can result in terabytes of wasted space.

We explore and attempt to quantify some of these tradeoffs. Specifically, we explore: the use of alternate compression algorithms to optimize for read performance; an alternate method of compression individual events to allow efficient random access; and a new approach to whole-file compression. Quantitative results are given, as well as guidance on how to make compression decisions for different use cases.

Secondary Keyword (Optional)

Storage systems

Primary Keyword (Mandatory)

Data processing workflows and frameworks/pipelines

Tertiary Keyword (Optional)

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