2023 European HDF User Group (HUG) plugins and data compression summit

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GPU processing of HDF5 data

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HDF5 is the standard data format at most X-ray sources. The ESRF uses this format for both acquisition and processing of data. This contribution highlights the usage of direct-chunk read/write features of the HDF5 library and shows how it can be coupled with GPU processing.

For numerical analysis, GPUs are proven to be ~5 times faster than equally optimized CPU code on equivalent hardware. Compared to CPUs, GPUs benefit from a faster memory and from many more compute units. We present some performance comparisons for azimuthal integration, background extraction and peak localization when data is read from file using the standard HDF5-plugin pipeline or when the data is read via the direct-chunk read and decompressed on the device performing the subsequent analysis.

On the acquisition side, GPUs are now used as part of the LIMA2-framework to perform real-time reduction of data. The compression of data on the GPU can be coupled with direct-chunk write and alleviates the bottleneck of the memory bandwidth observed on computer driving the fastest detectors.

This contribution focuses on the Bitshuffle-LZ4 compression plugin, used by Eiger detectors from Dectris.

Website

https://github.com/silx-kit/pyFAI/blob/main/doc/source/usage/tutorial/Parallelization/GPU-decompression.ipynb

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