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High-Performance I/O: HDF5 for Lattice QCD

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Practitioners of lattice quantum chromodynamics (LQCD) have been some of the primary pioneer users of the state-of-the-art HPC systems, and contribute towards the stress tests of such new machines as soon as they become available. As with all aspects of HPC, I/O is becoming an increasingly specialized component of these systems. In order to take advantage of the latest available high-performance I/O infrastructure, to ensure reliability and backwards compatibility of data files, and to help unify the data structures used in LQCD codes, we have incorporated parallel HDF5 I/O into the SciDAC supported USQCD software stack. Here we present the design and implementation of this I/O framework. The "out-of-the-box" HDF5 implementation outperforms optimized QIO at the 10-20% level, with room for significant improvement with dataset chunking.

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