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Leveraging LLVM for Lattice QCD calculations

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The Low Level Virtual Machine (LLVM) compiler infrastructure is a promising platform for development of code that features performance portability across a wide variety of architectures. It's widely embraced by HPC industry and academia and high performance code generating backends are available and supported for many relevant architectures such as CUDA, X86-64, PowerPC64 including extensions for the A2Q processor.

The QDP-JIT/LLVM library leverages the source- and target-independent code representation known as the LLVM intermediate representation (IR) to generate LQCD kernels from a high level C++ API. Optimizer passes transform the IR in a suitable way for the target platform.

We present the QDP-JIT technology and performance numbers resulting from Chroma HMC for a variety of architectures including the new BG/Q support.

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