SYCL for CUDA: An Overview of Implementing PI for CUDA

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LLVM 2020

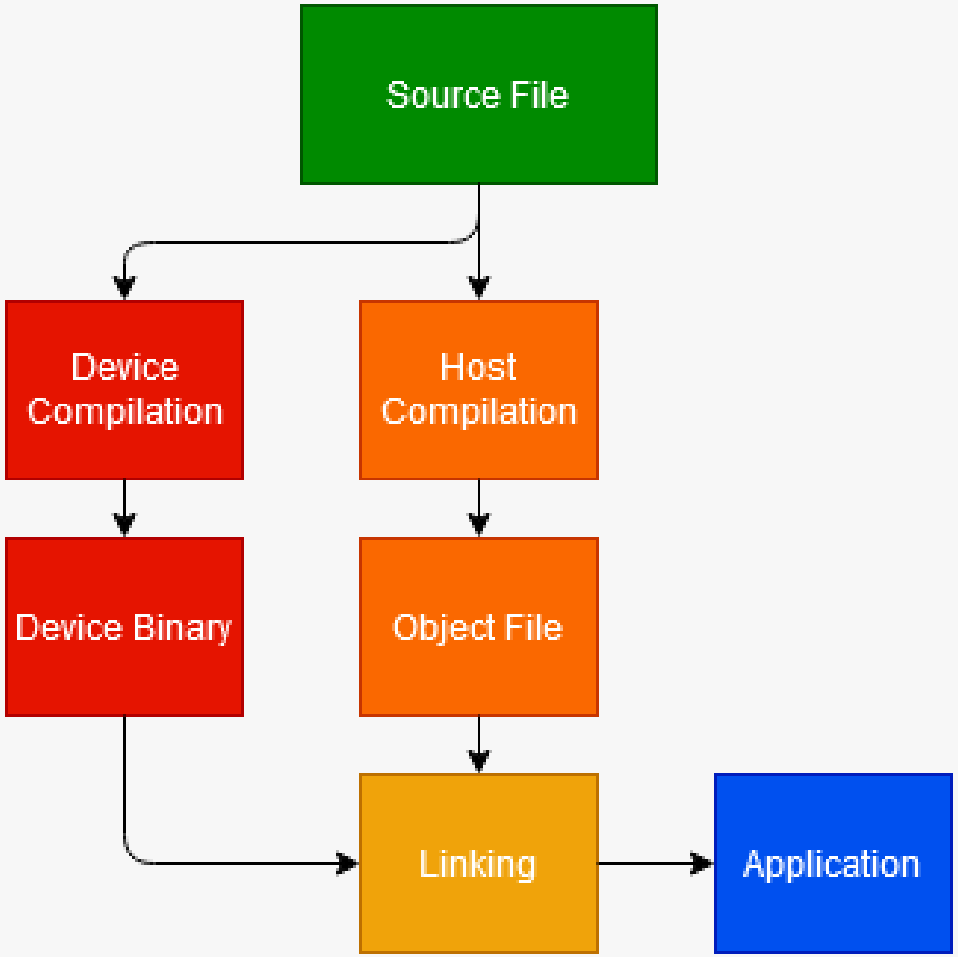
SYCL in a nutshell

- SYCL is a Khronos open standard interface that enables parallel processor architectures
- Standard C++
- Single Source
- Requires a Runtime Library and Device Compiler
- More at https://sycl.tech

Summary

- Driver Modifications
- PI library plugin mechanism
- PI CUDA backend
- Performance

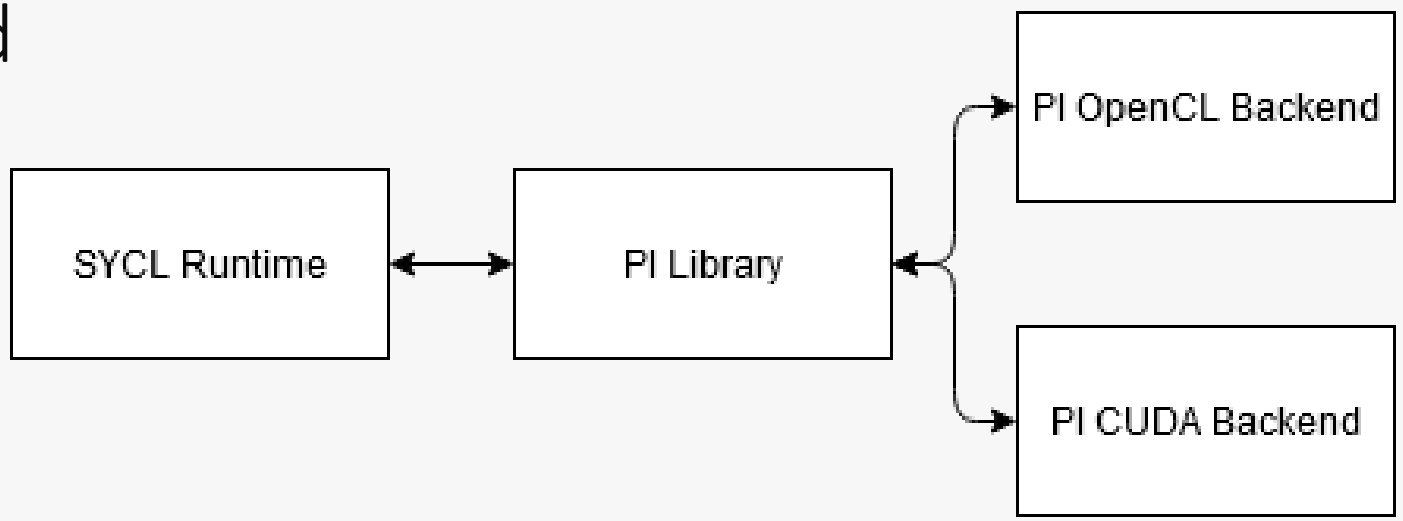
Driver Modifications



- Modified the Device Compilation stage to enable the driver to perform device compilation for NVPTX
- This requires passing the generated NVPTX through NVIDIA SDK tools during the Device Compilation step

PI Plugin Mechanism

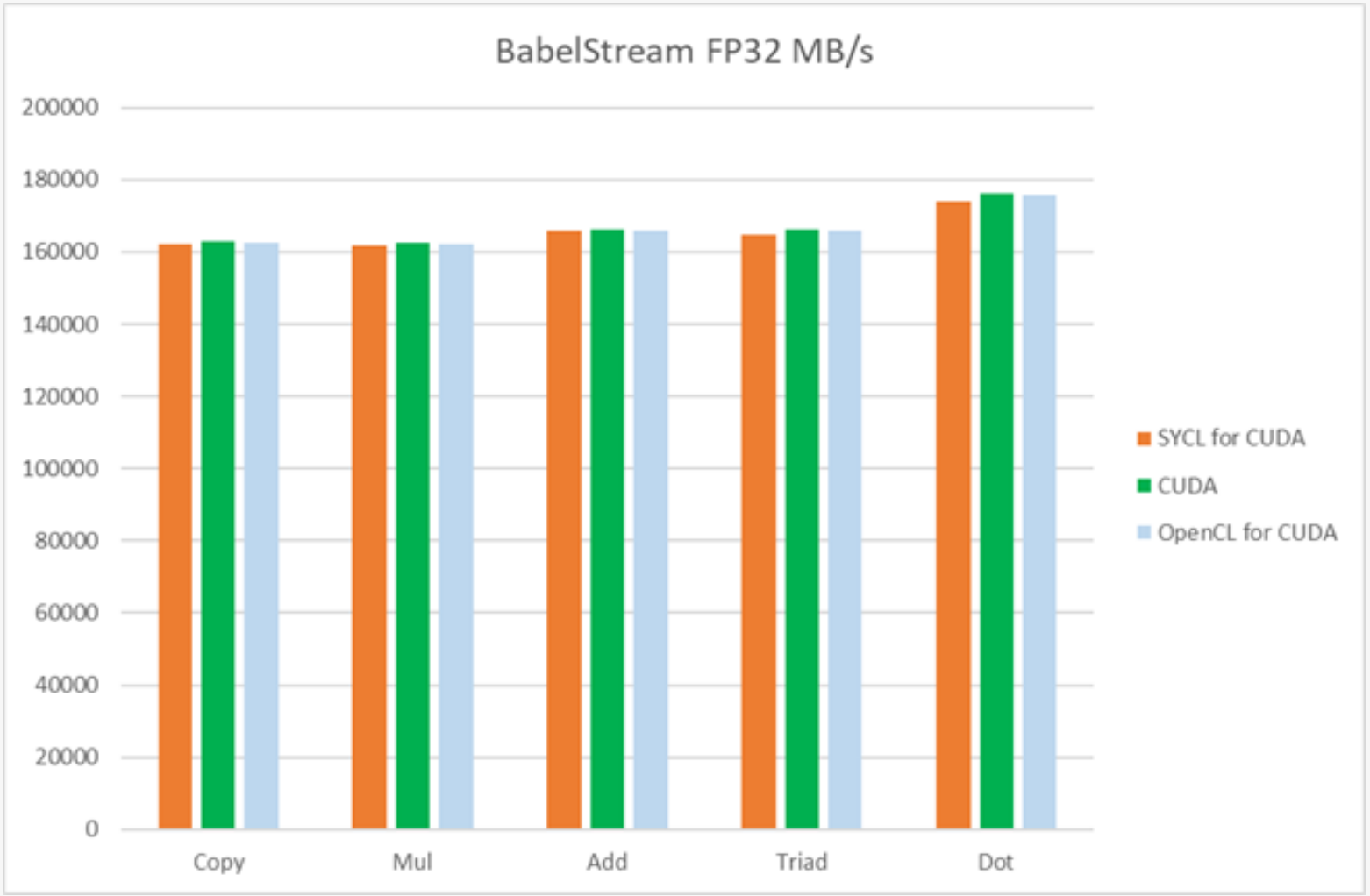
- PI library provides a plugin mechanism for backend libraries
- Each backend must link up to a dispatch table of PI library functions
- An instance of a backend is loaded at runtime when requested



PI CUDA Backend

- Implemented 95 PI library functions with native CUDA calls
- Provided opaque containers to the PI library with CUDA specific information inside
- Implemented all SYCL builtins in libclc as native CUDA calls

Performance



Further Resources

- Get the repo at https://github.com/intel/llvm/
- Getting started guide for the CUDA backend at https://github.com/intel/llvm/blob/sycl/sycl/doc/GetStartedGuide.md#build-dpc-toolchain-with-support-for-nvidia-cuda
- Code examples at https://github.com/codeplaysoftware/SYCL-For-CUDA-Examples

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