



Contribution ID: 329 Contribution code: WED 12

Type: Poster

CppInterOp: Advancing Interactive C++ for High Energy Physics

Wednesday 23 October 2024 16:00 (15 minutes)

The Cling C++ interpreter has transformed language bindings by enabling incremental compilation at runtime. This allows Python to interact with C++ on demand and lazily construct bindings between the two. The emergence of Clang-REPL as a potential alternative to Cling within the LLVM compiler framework highlights the need for a unified framework for interactive C++ technologies.

We present CppInterOp, a C++ Interoperability library, which leverages Cling and LLVM's Clang-REPL, to provide a minimalist and backward-compatible API facilitating seamless language interoperability. This provides downstream interactive C++ tools with the compiler as a service by embedding Clang and LLVM as libraries in their codebases. By enabling dynamic Python interactions with static C++ codebases, CppInterOp enhances computational efficiency and rapid development in high-energy physics. The library offers primitives enabling cppyy(PyROOT), an automatic, run-time, Python-C++ bindings generator. We also demonstrate CppInterOp's utility in diverse computing environments through its adoption as the runtime engine for xeus-cpp, a Jupyter kernel designed for C++.

CppInterOp is a general-purpose library inspired by the developments in the ROOT framework which pushed the frontiers of interactive C++. It aims to extend this approach and serve as an integral component of ROOT, enhancing both speed and resilience. This talk introduces CppInterOp to the HEP community and showcases how it optimizes cross-language execution and computational tasks in high-energy physics, making it a valuable tool for researchers and developers.

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Session Classification: Poster session

Track Classification: Track 9 - Analysis facilities and interactive computing