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SYCL-based online data processing framework concept for PANDA

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The PANDA experiment has been designed to incorporate software triggers and online data processing. Although PANDA may not surpass the largest experiments in terms of raw data rates, designing and developing the processing pipeline and software platform for this purpose is still a challenge. Given the uncertain timeline for PANDA and the constantly evolving landscape of computing hardware, our attention is directed towards ensuring the future-proofness of the solutions we develop.

The PandaR2 is a concept for a framework handling online data processing in heterogeneous and distributed HPC environments. It utilizes the SYCL programming model as the primary technology for parallelization and offloading. Being a new and standalone entity, PandaR2 also interfaces with the PANDA's original ROOT-based simulation and analysis framework - PandaRoot, connecting the best of both worlds.

This contribution aims to present an overview of the PandaR2 SYCL-centric architecture. We will share experiences with SYCL during the codebase design process, particularly highlighting its portability across various hardware platforms and compilers. Additionally, we will showcase the performance results of the initial algorithms implemented in PandaR2, focusing on the performance portability of SYCL code and comparison with native programming models for accelerators, such as CUDA or HIP.

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