

PERSEUS - Automating workflows within a scientific HPC center

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Scientific High-Performance Computing (HPC) centers operate in highly dynamic environments shaped by evolving scientific demands, administrative structures, and rapidly changing technological infrastructures. Managing workflows, data processes, and operational tasks in such settings is challenging, particularly because many centers lack dedicated software development resources and rely instead on system administrators for operational tooling. As a result, existing workflow solutions often struggle to remain sustainable, adaptable, and sufficiently tailored to the needs of HPC operations.

PERSEUS addresses this gap by introducing a modular, open-source software framework designed specifically for the management and automation of processes in scientific HPC centers. Its core objective is to unify data management, workflow management, and automation within a single extensible system that can evolve alongside the center's requirements. Instead of enforcing rigid process structures, PERSEUS enables HPC centers to model their own workflows through independently developed and interchangeable modules, allowing for flexible adaptation to local organizational and technical contexts.

The system is developed based on real-world requirements derived from the Paderborn Center for Parallel Computing (PC2) at the University of Paderborn, serving as a representative example of HPC center operations. This ensures that PERSEUS is grounded in practical needs rather than abstract assumptions.

By adopting a modular architecture and open-source distribution model, PERSEUS aims to lower the barrier for adoption across different HPC centers, enabling rapid integration into existing infrastructures. The system is designed to improve operational efficiency, reduce manual overhead, and support the professionalization of HPC center management without requiring extensive software engineering expertise from its users.

In addition, PERSEUS provides an add-on called Andromeda, which is a self-service HPC user portal and allows for a variety of features users can access. It helps minimizing the workload of the support staff by directly interacting with PERSEUS and its database.

PERSEUS represents a step toward more sustainable and adaptable HPC center management, offering a practical foundation for future automation and workflow standardization across scientific computing infrastructures.