

Michael A. Heroux Salishan Presentation

Title Through the Computational Looking Glass: Fundamentals in Scientific Software Past, Present, and Future

Abstract For decades, scientific software has been the invisible thread stitching together complex simulations and high-performance computations. This talk looks back at three efforts: the Trilinos, Kokkos, and E4S projects. Each project attempts to address fundamental, ongoing requirements that drive continued adaptation to provide sustained value. Together, these efforts illustrate a persistent set of requirements: the need for integrated, flexible, and scalable software ecosystems.

Looking forward, we'll explore how these persistent threads must evolve to support AI-driven workflows and next-generation simulation capabilities. By stepping through the computational looking glass, we can see that what was true yesterday remains essential for tomorrow's scientific computing landscape.

The future demands that scientific software become cloud-native and AI-ready. This means making applications performant on heterogeneous architectures, improving metadata fidelity to support downstream AI inference, retaining rich time-stepped datasets for training, and ensuring that scientific libraries and applications are discoverable and usable in agentic AI workflows. In the talk, we outline how these requirements are not brand new, but are evolutions of the same fundamental principles we've relied on for years and will shape how we engineer and deliver scientific computing solutions in the AI era.

Biography Mike Heroux is a Senior Research Scientist at ParaTools, Inc., Visiting Scholar at Hewlett Packard Enterprise, Research Partner at Hyperion Research, and Scientist in Residence at St. John's University, MN. His research interests include all aspects of scalable scientific and engineering software for new and emerging parallel computing architectures. At ParaTools, Mike leads the [PESO Project](#) to steward and advance scientific software ecosystems for HPC-AI applications and computing systems.

Mike was a senior scientist at Sandia National Laboratories from May 1998 to October 2024 and was the director of software technology for the US Exascale Computing Project from 2017 - 2024. He is the founder of the Trilinos scientific libraries, Kokkos performance portability libraries and tools, the Mantevo miniapps, and HPCG Benchmark, and is presently leading the Ecosystem for Science ([E4S](#)) project in DOE, a curated collection of HPC software targeting leadership platforms.