

DOE ASCR Workshop on Software Productivity for eXtreme-scale Science (SWP4XS) Position Papers

In preparation for the upcoming DOE ASCR Workshop on Software Productivity for Extreme-Scale Science (January 13-14, 2014), the organizing committee is soliciting position papers. The goal is both to prepare topics for discussion at the workshop and to identify content to include in the workshop report.

Workshop participants will assess the needs of computational science software in the age of extreme-scale multicore architectures, examine scientific software lifecycle and infrastructure requirements for large-scale code development efforts, and explore potential contributions and lessons learned that software engineering can bring to HPC software at scale. In addition, participants will identify short-term and long-term challenges of scientific software that must be addressed in order to significantly improve the productivity of emerging multicore-based extreme-scale computing systems through effective scientific software development processes and methodologies. The workshop will also explore scalable metrics for measuring the productivity of large scientific software systems.

Instructions: The workshop will identify research directions for software productivity in extreme-scale science. With that goal in mind, position papers should describe a research and development approach or plan of action that would address key software productivity challenges associated with scientific computing on current and future extreme-scale systems. The questions below are intended to provide examples of issues that a software productivity R&D program might address. These questions are not meant to be limiting; many other questions are relevant. However, please avoid reintroducing topics that are already well-established in other research programs (such as XStack, SciDAC, and RXSolvers, or developing new compilers, DSL's, etc.), unless there is a compelling software productivity perspective that is being overlooked by those programs.

Bridging the gap between computational research and science codes

- What are key challenges in achieving, automating, and measuring performance portability on extreme-scale architectures?
- What aspects of extreme-scale platforms hinder performance portability for large-scale scientific codes?
- What barriers prevent science codes from adopting math/CS algorithmic patterns that could improve productivity?
- How do we develop science codes that can adapt to disruptive computer architecture trends over time?

Transforming science codes for extreme scale: patterns and best practices

- How can we identify practices, metrics, and repeatable patterns for successful large-scale science projects over their lifecycles?
- What productivity challenges arise when integrating data analysis into large-scale simulations?
- How is the lack of end-to-end software practices (e.g., testing and V&V discipline) hindering productivity and performance?
- What tools and processes could accelerate the development and transformation of codes, and how should success be measured?

Ensuring effective software engineering (SE) for extreme-scale computational science

- What are challenges in adopting commercial SE practices for extreme-scale scientific software engineering? What practices should we avoid?
- What features of extreme-scale computational science software can be exploited to most easily improve software productivity?
- What are key challenges in identifying, measuring, disseminating, and rewarding successful SE practices across the extreme-scale computational science community?
- What inhibits sustained, high-quality software collaborations between domain scientists and computational scientists?

Instructions for submitting position papers:

1. Position papers must be submitted in PDF format, maximum of 2 pages, inclusive of all supporting references and tables/figures (use no smaller than 10-point font and at least 1-inch margins). There is no limit to the number of position papers that an individual or group can submit. Each position paper should provide contact information (name, institution, email address) for a single, corresponding author.
2. Topics should be directly relevant to the workshop (see above).
3. Position papers will be accepted through Tuesday, December 3, at the following page:
<https://www.easychair.org/conferences/?conf=swp4xs>

Submitted position papers will be reviewed by the organizing committee. Accepted papers will be used by the committee to help organize the workshop discussions and will be made available to participants as input to the workshop.