

Welcome to...



What All Codes Should Do: Overview of Best Practices in HPC Software Development

Anshu Dubey, Michael Heroux, Jared O'Neal

1:30pm-5:00pm, Tuesday 6 February 2018

Tutorial Instructors

- Anshu Dubey, ANL
- Mike Heroux, SNL
- Jared O'Neal, ANL

Members of the IDEAS Scientific Software Productivity Project: www.ideas-productivity.org

- **Focus: Increasing CSE software productivity, quality, and sustainability**



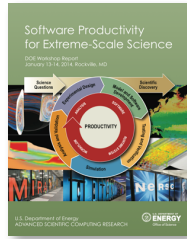
Interoperable Design of Extreme-scale Application Software (IDEAS)

Motivation

Enable **increased scientific productivity**, realizing the potential of extreme- scale computing, through **a new interdisciplinary and agile approach to the scientific software ecosystem**.

Objectives

Address confluence of trends in hardware and increasing demands for predictive multiscale, multiphysics simulations.
Respond to trend of continuous refactoring with efficient agile software engineering methodologies & improved software design.

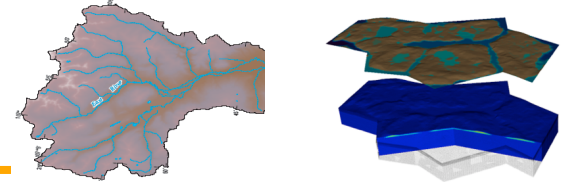


Project History

IDEAS began in 2014 as a DOE ASRC/BER partnership to improve application software productivity, quality, and sustainability. In 2017, the DOE Exascale Computing Project began supporting IDEAS to help application teams improve developer productivity and software sustainability while making major changes for exascale.

Impact on Applications & Programs

Terrestrial ecosystem use cases tied initial IDEAS activities to programs in DOE Biological and Environmental Research (BER). The Exascale Computing Project (ECP) supports a broad portfolio of applications furthering science, energy, national security, and economic competitiveness.



Approach

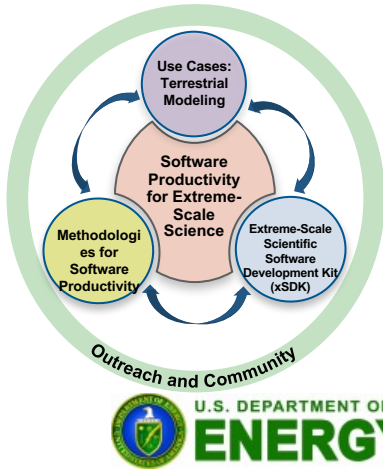
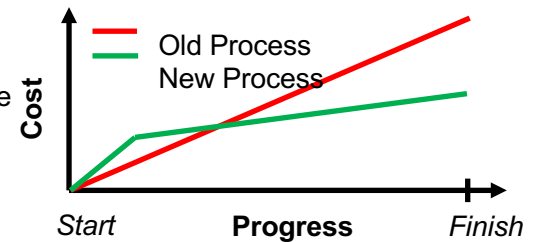
Interdisciplinary multi-institutional team (ANL, LANL, LBNL, LLNL, ORNL, PNNL, SNL, U. Oregon) with broad experience in scientific software development

Close partnerships with applications teams ensures impact on science

Identification, documentation and dissemination of **best practices** for BER and ECP software teams and the broader community

Catalyzing **software process improvements** through tailored engagement with individual projects

Working to bend the curve of software development costs downwards



Office of
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Tutorial objectives

Overview of best practices in software engineering explicitly tailored for CSE

- **Why:** Increase CSE software quality, sustainability, productivity
 - Better CSE software > better CSE research > broader CSE impact
- **Who:** Practices relevant for projects of all sizes
 - **emphasis on small teams**, e.g., a faculty member and collaborating students
- **Approach:**
 - Information, examples, exercises, pointers to other resources
 - Not to prescribe any set of practices as “must use”
 - Be informative about practices that have worked for some projects
 - Emphasis on adoption of practices that help productivity rather than put unsustainable burden
 - Customize as needed for each project

Agenda

Time	Topic	Speaker
1:30pm-2:15pm	Why effective software practices are essential for CSE projects	Anshu Dubey, ANL
2:15pm-2:45pm	Better (small) scientific software teams	Michael A. Heroux, SNL
2:45pm-3:00pm	Improving Reproducibility Through Better Software Practices	Michael A. Heroux, SNL
3:00pm-3:30pm	Break	
3:30pm-4:15pm	Testing HPC Scientific Software: Introduction	Jared O'Neal, ANL
4:15pm-4:45pm	Verification, and Evaluating Project Testing Needs	Anshu Dubey, ANL
4:45am-5:00pm	Code Coverage and CI	Jared O'Neal, ANL