Helping You Improve Software Sustainability and Development Productivity:
An Overview of the IDEAS Productivity Project

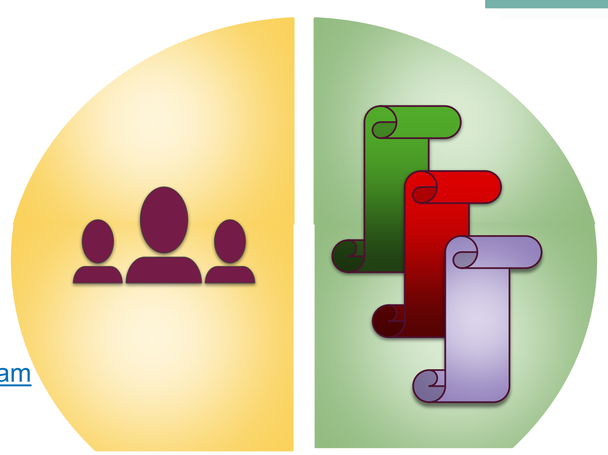
Roscoe A. Bartlett (SNL), **David E. Bernholdt (ORNL),** Anshu Dubey (ANL), Rinku Gupta (ANL), Michael A. Heroux (SNL), Lois Curfman McInnes (ANL), Reed Milewicz (SNL), Mark C. Miller (LLNL), Elaine Raybourn (SNL), Greg Watson (ORNL), James Willenbring (SNL), *and the rest of the IDEAS Productivity Team*

Introduction and Call to Action

- IDEAS = Interoperable Design of Extreme-Scale Application Software
- **IDEAS-ECP (2017-present)**
  - **Funded by Exascale Computing Project (ECP)**
  - **Work with the ECP community to improve developer productivity and software sustainability as key aspects of increasing overall scientific productivity**
- IDEAS-Classic (2014-2017)
  - Funded by DOE / ASCR + BER Terrestrial Ecosystem Modeling
  - Improving interoperability of key DOE numerical libraries
- **Fundamental goals**
  - **Increase the awareness of, and attention to, software development, productivity, and sustainability throughout the HPC/computational science and engineering (CSE) software community**
  - **Engage with…**
    - **Research sponsors and other stakeholders**
    - **Specific software development teams**
    - **Broader HPC/CSE community**

We're not a Community without You

- **Be part of the community talking about and acting on software development, productivity, and sustainability!**
- **Join us for software-related events at SC19 and other conferences**
  - Tutorial: Floating-Point Analysis and Reproducibility Tools for Scientific Software (Sunday)
  - Tutorial: Better Scientific Software (Monday)
  - Tutorial: Managing HPC Software Complexity with Spack (Monday)
  - BOF: Spack Community BOF (*proposed*)
  - BOF: Software Engineering and Reuse in Computational Science and Engineering (*proposed*)
- **Organize software-focused events** – on your own, or join with us!
- Follow the **IDEAS Productivity Project:** https://ideas-productivity.org/
  - **Join us** for events, including: **HPC Best Practices Webinar Series**, tutorials, minisymposia, posters, birds of a feathers, etc.
  - **Tell us** what topics you'd like hear (or present) in a webinar or a tutorial
  - **Co-organize** a workshop or minsymposium with us
  - Announcement mailing list: http://eepurl.com/cQCyJ5 (~1-2/month)
  - Email Us: IDEASProductivity@gmail.com
- Use and contribute to **Better Scientific Software:** https://bssw.io/
  - **Contributing:** https://bssw.io/contributes/new
  - Mailing list: https://bssw.io/pages/receive-our-email-digest (~1/month)
  - Contact Us: https://bssw.io/contact
- Apply for the **BSSw Fellowship:** https://bssw.io/pages/bssw-fellowship-program
  - Fosters and promotes practices, processes, and tools to improve developer productivity and software sustainability of scientific codes.
  - Application window for 2020 Fellowship: 12 Aug-15 Oct 2019

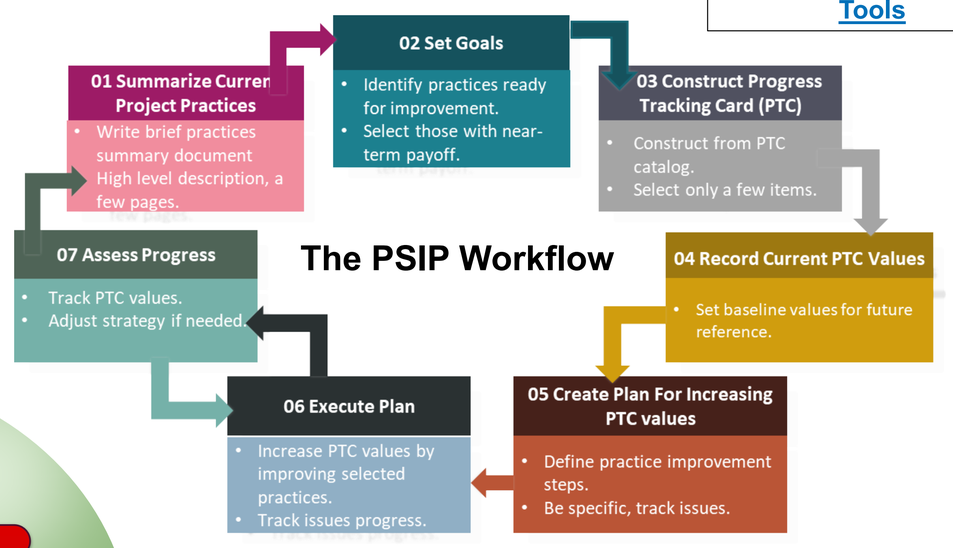


Improving the Development Experience

Productivity and Sustainability Improvement Planning (PSIP)

- A simple methodology to help improve software development practices
- Focus on small, measurable improvements over a short time frame (months)
- Numerous incremental improvements add up over time
- IDEAS Productivity project members assist ECP software teams
  - Interview to document current practices and challenges
  - Assistance selecting target for improvement and tracking progress
- Can be implemented without outside help
- Leverage available resources to learn new techniques (see Outreach and Better Scientific Software sections below)

The ***PSIP Tools*** GitHub repo is a collection of documents that enable the adoption and use of PSIP for a software team: https://github.com/betterscientificsoftware/PSIP-Tools



Common Challenges

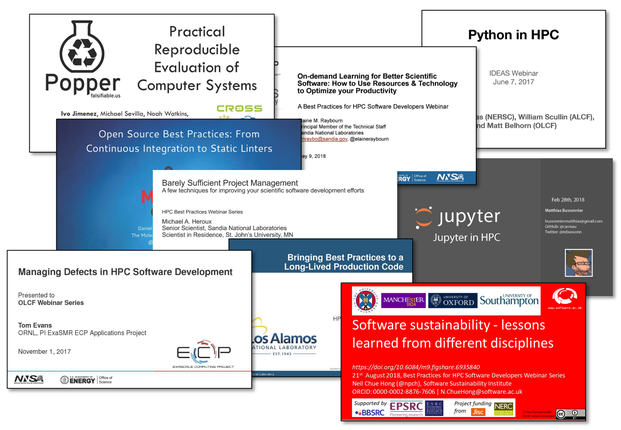
- Implementing or expanding testing
- Onboarding and offboarding of team members
- Making better use of modern language features
- Improving and maintaining documentation
- Understanding performance and opportunities for improvement
- Ensuring citation and credit for software
- Bringing best practices to long-lived codes
- Version control workflows
- Effective, but lightweight management of development

Outreach

Tutorials

- Full-day and half-day variants
  - Hands-on in full-day
- Recent venues
  - ATPESC (2016-2018)
  - ECP Annual Meeting (2017-2018)
  - ISC (2018-2019)
  - SIAM CSE17
  - Supercomputing (2016-2018)
- Current tutorial modules
  - Overview of Best Practices for HPC Software Developers
  - Git Workflows
  - Better (Small) Scientific Software Teams
  - Improving Reproducibility through Better Software Practices
  - An Introduction to Software Licensing
  - Verification and Refactoring
  - Code Coverage and Continuous Integration

Best Practices for HPC Software Developers Webinar Series (HPC-BP)



- Monthly series, since May 2016
  - Traditional time slot is 1-2pm ET on a Wednesday
  - Which Wednesday varies
- Offered live and archived
- Presented by the community to the community
  - Not just IDEAS
- 29 webinars to date
  - 77 attendees per webinar on average
  - 1702 attendees total, to date
- **Series info, archives, and mailing list for announcements**
  - https://ideas-productivity.org/events/hpc-best-practices-webinars/

Webinar Site

Technical Meetings and Birds of a Feather Sessions

- We help create opportunities to talk about software development, productivity, and sustainability in more "academic" environments
  - https://ideas-productivity.org/events/
- Birds of a Feather sessions
  - Software Engineering and Reuse for Computational Science and Engineering
    - SC15, SC16, SC17, SC18, ISC 2019
    - See http://bit.ly/swe-cse-bof
- Minisymposia
  - SIAM Computational Science and Engineering (2015, 2017, 2019)
  - PASC (2018, 2019)
- Thematic poster sessions
  - SIAM CSE (2017, 2019)

BOF Site

SIAM CSE19 Miniposterium posters, archived on FigShare

Better Scientific Software

Building an Online Community

- **A community-based resource for scientific software improvement information exchange**
- A central hub for sharing information on practices, techniques, experiences, and tools to improve developer productivity and software sustainability for computational science & engineering (CSE)

better scientific software
https://bssw.io

Goals

- Raise awareness of the importance of **good software practices** to scientific productivity and to the quality and reliability of computationally-based scientific results
- Raise awareness of the **increasing challenges** facing CSE software developers as high-end computing heads to extreme scales
- Help CSE researchers **increase effectiveness** as well as leverage and impact
- **Facilitate CSE collaboration via software** in order to advance scientific discoveries

Site users can…

- **Find information** on scientific software topics
- **Contribute new resources** based on your experiences
- Create content tailored to the unique needs and perspectives of a focused scientific domain

Types of content on BSSw

- **Blog articles**: success stories, perspectives, opportunities, and more
- **Curated content:** short pointers to useful material already hosted elsewhere
- **Original content:** content primarily hosted on BSSw
- **Events:** increase awareness of events related to better scientific software
- **Community Landing Pages:** provide an perspective on BSSw resources tailored to a particular technical community

BSSw Monthly Email Digest

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