

## Goal

**Goal:** Improve developer productivity, software sustainability and quality as key aspects of increasing overall scientific productivity.

**Strategy:** In collaboration with CSE community:

- **Customize and curate methodologies** to improve software practices of individuals and teams
- **Iteratively and incrementally upgrade software practices** through Productivity and Sustainability Improvement Planning (PSIP)
- **Establish software communities**, who define community policies and build Software Development Kits (SDKs)
- **Outreach and training** in partnership with DOE computing facilities

### Project Team

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- J. David Moulton (LANL), co-PI
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- Katherine Riley (ANL)
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- Jean Shuler (LLNL)
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- Greg Watson (ORNL)
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Historically, the **IDEAS** (Interoperable Design of Extreme-scale Application Software) project began in Sept 2014 as an ASCR/BER partnership to improve software productivity, quality, and sustainability. See <https://ideas-productivity.org/resources>.

### Project Highlights:

**HPC Best Practices Webinar series:** *Software Citation Today and Tomorrow, Modern CMake, Software Licensing etc.*  
<https://ideas-productivity.org/events/hpc-best-practices-webinars>

**WhatIs and HowTo documents:** Concise characterizations and best practices (*What is Version Control?, What is CSE Software Testing?, etc.*)



## User Stories

User stories provide flexible means of specifying and conveying requirements garnered from interviews, PSIPs, and informal interactions.



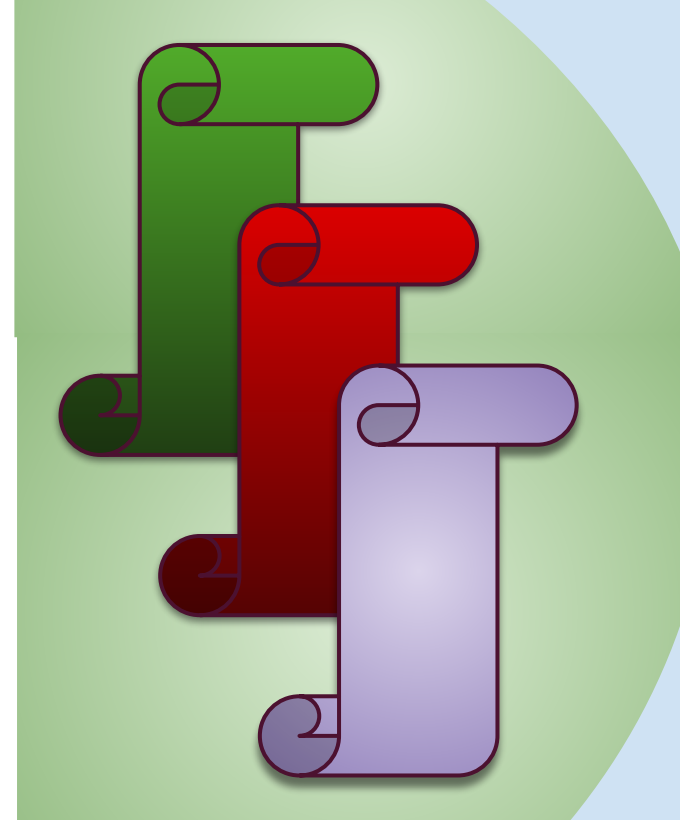
As a casual user of GitHub, I want more GitHub tutorials and tips so that it becomes easier for me to recall the functionality.

Training & Documentation

### Some Tasks for User Story

To be made publicly available (Git, BSSw, tutorials):

- Create a document that details "design patterns for Git workflows"
- Create Transmedia Learning Framework (TLF) template via Git Markdown
- Develop curated content on BSSw and/or wiki page



As an application architect, I want to better understand version control capabilities that allow integration of independently developed components so that we can distribute a coherent software stack.

Software Integration & Testing

As an Exascale Computing Project (ECP) developer, I want training in setting up automated testing for my package as well as using my package testing within a CI system so that I can reliably track compilation of my package branches and pass require tests in all relevant ECP configurations/machines

Software Quality

As a person responsible for software quality and correctness for my project, I want guidance on selecting/implementing coding standards so that we can make our code easy for everyone to read and understand.

Practices & Standards

As a software engineer in HPC, I want to connect test development to software design so that dependencies that get in the way of building stand-alone tests can be minimized.

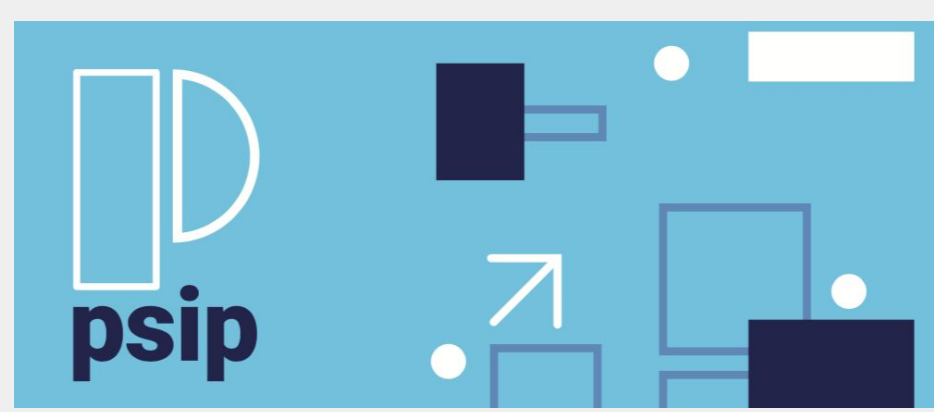
Software Req. & Dev.

As a participant in the CSE software engineering community, I want a documented process for contributing to the bssw.io website so that I can add my knowledge to the site in an efficient way.

Operational

## Software Process Improvement

**Productivity and Sustainability Improvement Planning (PSIP):** lightweight, iterative workflow, where teams identify their most urgent software bottlenecks and work to overcome them ... see the PSIP poster for details.



<https://bssw.io/psip>

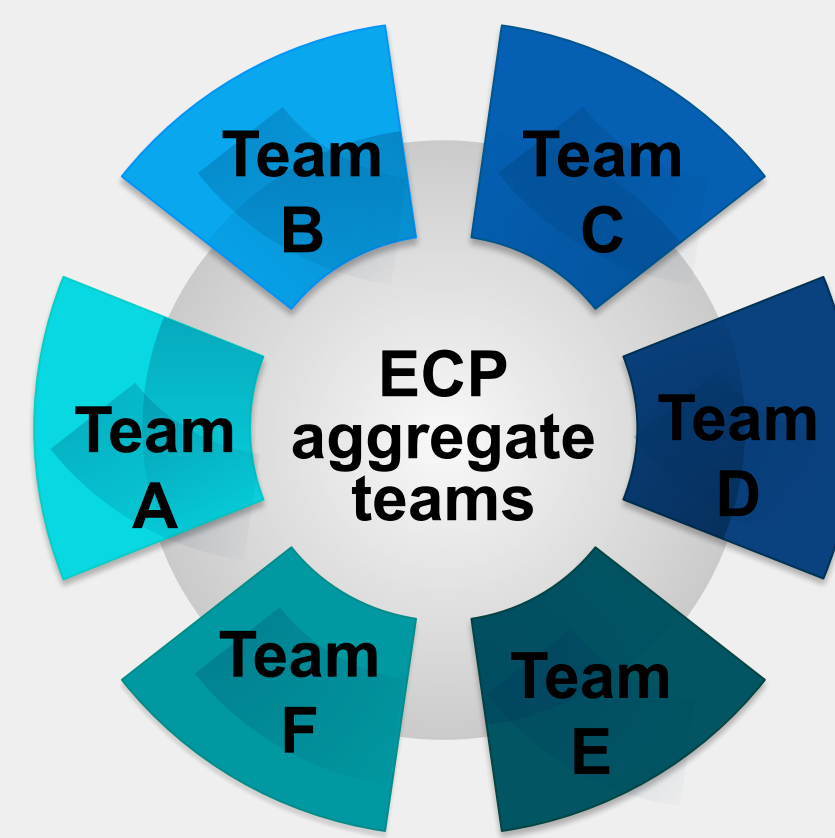
### PSIP interviews

CANDLE, ExaGraph, ExaStar, E3SM-MMF, EXAALT, MARBL, NWChemEx, QMCPACK, SPARC, MPICH, UnifyCR, WDMApp

Many AD and ST projects are **aggregate teams**, composed of multiple successful previously existing teams, where **software is a primary means of collaboration**.

### Crosscutting priorities:

- Intermediate/advanced Git
- Code reviews for identifying defects
- Onboarding new team members
- Agile team management
- Agile workflows for scientific software
- Use of (interoperable) scientific libraries



An IDEAS-ECP priority is **helping aggregate teams collaborate more effectively** through software, a key aspect of improving overall scientific productivity.

**Next steps:** Partner with selected teams to improve productivity and to curate, create, and disseminate new resources through outreach efforts.

## Collaborators and Outreach

**IDEAS-ECP team:** Catalysts for engaging the community on productivity and sustainability issues

- **Partnerships with Exascale Computing Project (ECP) teams in AD and ST**
  - Understand bottlenecks in productivity and sustainability; improve software practices

- **Collaborate to curate, create, and disseminate software methodologies, processes, and tools** that lead to improved scientific software → **BSSw.io** portal



<https://bssw.io>

- **Tutorials**
  - Full-day and half-day variants
  - Recent venues : Supercomputing (2016-2019), ATPESC (2016-2020), ISC (2018-2019)

- **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
- Offered live and archived
- Presented by the community to the community
  - Not just IDEAS
- 29 webinars to date



Webinar Site