SC23
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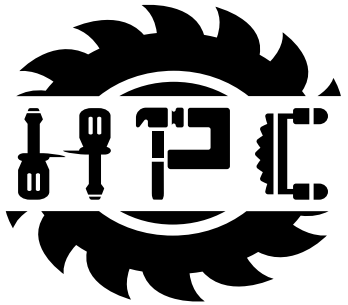
HPC Carpentry: A Scalable, Peer-Reviewed Training Program to Democratize HPC Access

Andrew Reid, Alan O'Cais, Trevor Keller, Wirawan Purwanto, Annajiat Alim Rasel

Nov. 13, 2023



CARPENTRY

HPC Carpentry

A scalable, peer-reviewed training program to democratize HPC access

Lightning Talk — Nov. 13, 2023

10th SC Workshop on Best Practices for HPC Training and Education (BPHTE'23)

The International Conference for High Performance Computing, Networking, Storage, and Analysis (Supercomputing-SC23)

Presenters:

- Andrew Reid (he/him), NIST
- Alan O'Cais (he/him), CECAM
- Trevor Keller (they/them), NIST
- Wirawan Purwanto (he/him), ODU
- Annajiat Alim Rasel (he/him), BRAC U

HPC Carpentry

A scalable, peer-reviewed training program to democratize HPC access

Outline

This is necessarily a brief introduction to our effort

- General overview of the Carpentries
- How HPC Carpentry fits into and builds upon the Carpentries
- Briefly history of the HPC Carpentry effort
- Inventory of lessons and strategic plan

The Carpentries

Motivated by a common problem in research practice – increasingly foundational computational research work was done by a variety of practitioners, often short-timers, with a variety of skill sets, and a variety of practices.

Founded by Greg Wilson starting in the late 1990s, with various structural changes in response to feedback over the years – current umbrella organization (2018) encompasses several sub-organizations – software carpentry, library carpentry, and data carpentry.

Central idea: The skills necessary to demonstrate the value of better practices can be taught in a workshop setting working hands-on with the actual systems – learners build "muscle memory" of having done key steps in the process, and come away with the power to move themselves forward.

- Pedagogically sound – relies on peer-reviewed educational literature
  - Formal instructor training and instructor trainer training
- Open-source – uses instructor and learner feedback to modify lessons
- Inclusive – anyone can contribute feedback, pull-requests

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Common challenges with HPC environment:

- Researchers with HPC requirements often do not have adequate training in operating HPC systems, and struggle to effectively scale up/out their operations even when the hardware resources are available.

- HPC facility operators are frustrated by non-knowledgeable users making inappropriate use of shared resources, disrupting other users, and requiring significant hand-holding before they can become effective.

⇨ Candidate solution: Use Carpentries techniques to build the bridge for HPC users.

Central idea: The skills necessary to demonstrate the value of better practices can be taught in a workshop setting working hands-on with the actual systems – learners build “muscle memory” of having done it, and come away with the power to move themselves forward.

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Some Important Contributions

- Peter Steinbach, “HPC In A Day”
- ComputeCanada contributions
- SC17 BoF
  - Andy Turner, Christina Koch, Tracy Teal, Bob Freeman, Chris Bording
- CarpentryCon 2018 discussions
- SC18 BoF
  - Andy Turner, Christina Koch, Peter Steinbach, Alan O’Cais, Jeffrey Stafford, John Simpson, Daniel Smith, Bob Freeman
- Well-attended informal session at SC19
- CarpentryCon 2020@Home
  - Trevor Keller, Christina Koch, and others
- SC21 BoF – high-value feedback from HPC operators
- Present in the Carpentries Incubator, Winter 2021
- Begin working towards Lesson Program Incubation
- CarpentryCon 2022
  - Lightning talk, sprint, breakout session
- June 2023 – formal acceptance into Lesson Program Incubation

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Our Current Lessons

- HPC Intro (Queuing system basics) (In Carpentries Incubator)
- HPC Shell (Deprecated in favor of the Carpentries UNIX Shell lesson)
- HPC Parallel Novice (Parallelization using Python)
- HPC Workflow†
- HPC Chapel†

Strategic Plan

- Build two two-day workshop tracks
  - UNIX Shell*, HPC Intro, and HPC Workflow† lessons, with Admahl's Law application, for HPC users
  - UNIX Shell*, HPC Intro, and HPC Development†† lessons, for coders to learn parallel frameworks
- Continue to curate and host additional material across a spectrum of candidate users

- Notes: * Software Carpentry. † Under development. †† Planned.

Our principal audience is novice HPC users. Where possible and practical, we are also interested in serving less-novice HPC users, as well as HPC facility operators. The more community participates, the better we can do together!

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Getting Involved

The GitHub Project Page:
`github.com/hpc-carpentry`

The Slack:
`#hpc-carpentry` on **`carpentries.slack.com`**
`( slack-invite.carpentries.org )`

The Topicbox E-mail List:
`carpentries.topicbox.com/groups/discuss-hpc`

The main website:
`hpc-carpentry.org`