HSF Training WG

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EICUG Software Working Group Meeting
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Meet Your Conveners

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Goals

The HSF Training Working Group aims to help the research community to provide training in the computing skills needed for researchers to produce high quality and sustainable software. The group works with experiment training groups, HEP initiatives (such as IRIS-HEP and FIRST-HEP) and organisations like Software Carpentry to coordinate training activities.

The group aims to develop a training program that can be pursued by researchers to achieve the level of required knowledge. This ranges from basic core software skills needed by everyone to the advanced training required by specialists in software and computing.

Partner organizations

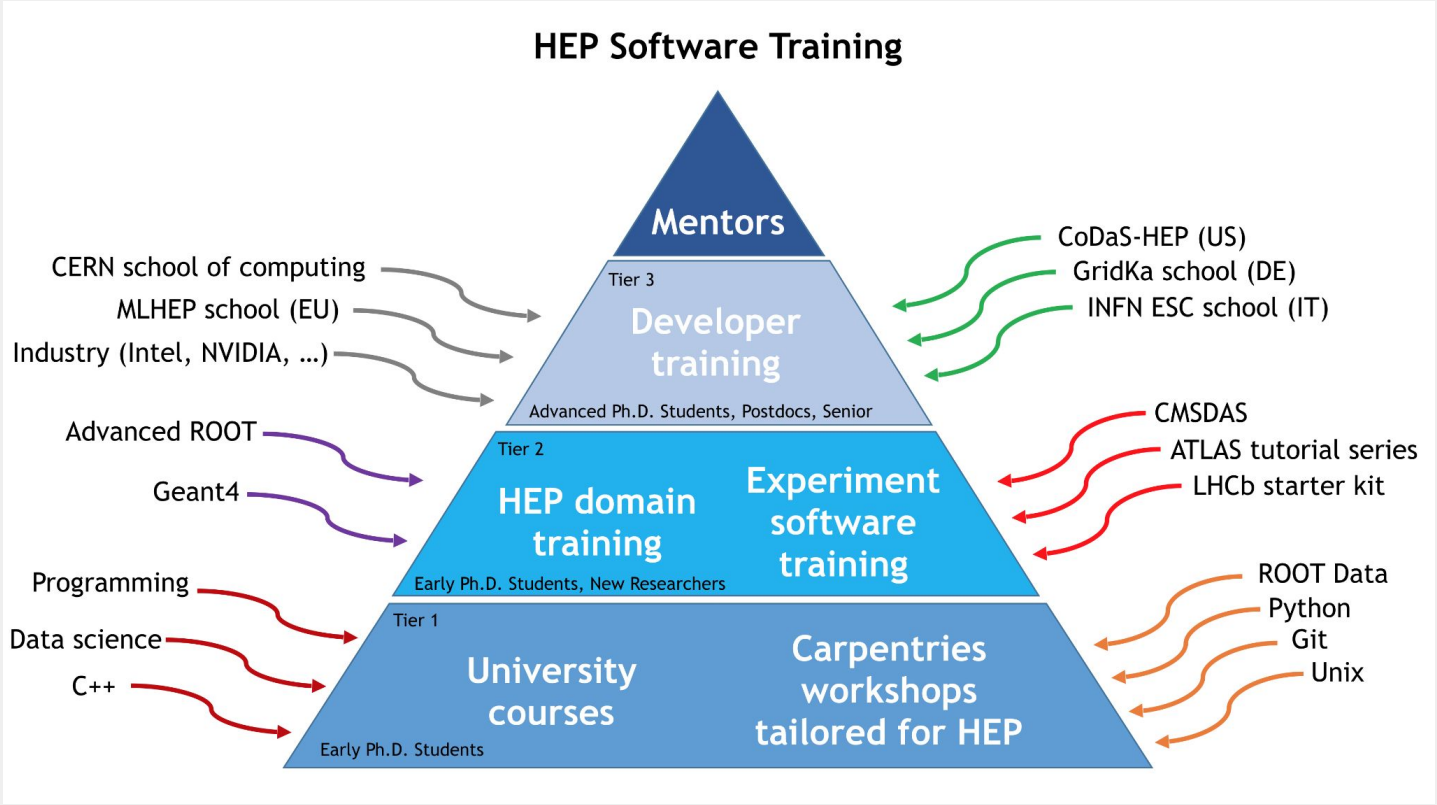
Mission

The software skills required fall into two groups.

Nearly all researchers need **basic programming skills** (Python, C++), **basic software engineering skills** (Unix, git/GitHub/GitLab, continuous integration, performance evaluation), and **skills in the core data tools in HEP** (e.g., the ROOT data format and analysis framework).

More **advanced training** is then needed (with domain examples!) in parallel programming, efficient software implementations, performance optimization, and machine learning and data science tools. A workforce trained in this range of software skills is the critical ingredient from which the solutions to the computing challenges can grow.

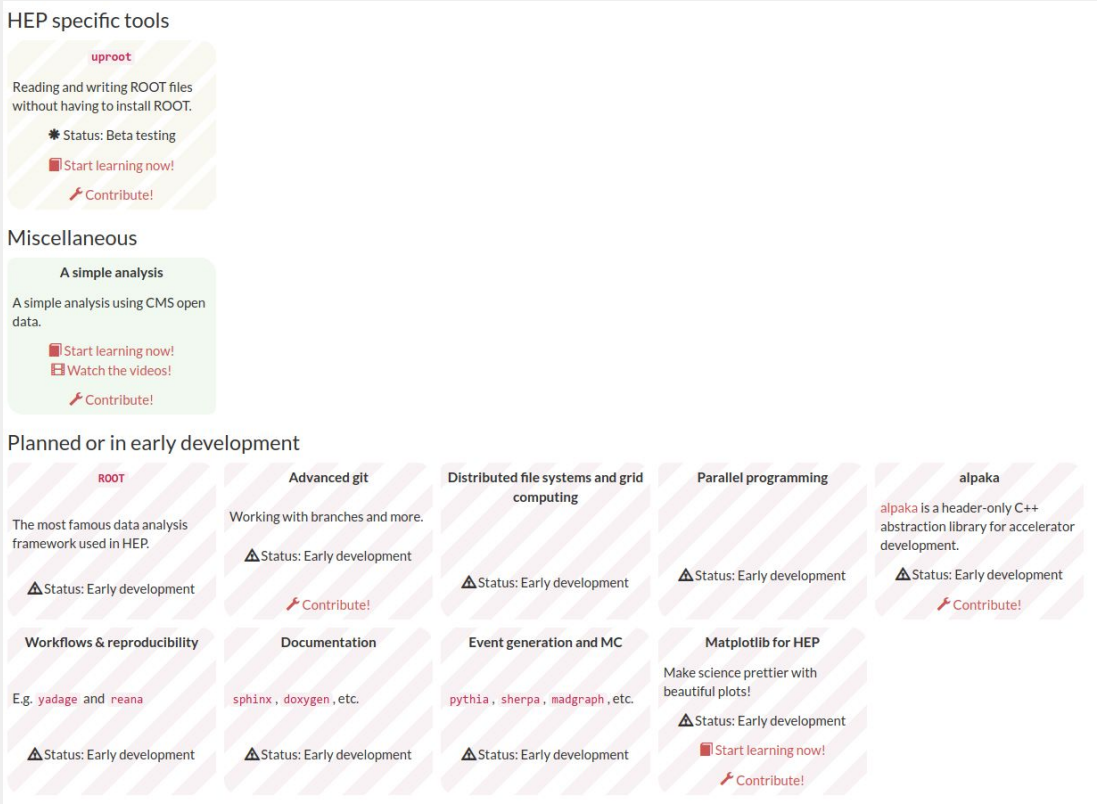
Software Training Pyramid



https://iris-hep.org/ssc.html

Training Curriculum: The Basics

Training Curriculum: Advanced and In Development



Typical Carpentries Training Layout

	Setup	Download files required for the lesson
00:00	1. Introduction	What is C++? When is C++ the right language? How do I get started in C++?
00:10	2. Core Syntax and Types	What are the basic syntactical elements of C++ What are C++ types and which basic types exist
00:30	3. Arrays and Vectors	How can I create collections of things in C++ How can I get and set values in a collection? If I don't know the size of the collection in advance, what do I do?
01:10	4. Basic C++ operators	What is specific in basic C++ operators ?
01:20	5. Compound datatypes	How do we combine existing types into new types that are greater than the sum of their parts? What are classes, and how do we define and use them?
01:20	6. Functions	How to define a function ? What are the different ways to pass input arguments ? What are the different ways to get back the results ?
01:30	7. References	How do we use references in C++?
01:40	8. Control Instructions	How do I execute certain lines of code but not others? How do I reuse code and execute it many times?
02:10	9. Headers and Interfaces	What is an interface? Why separate some of the code into header files?
02:20	10. Templates	How to factorize the code of similar functions and classes, where only few types and sizes are changing ?
02:40	11. Type inference	Should I repeat again and again the obvious type of everything ?
02:50	12. Classes	What are classes, how do they differ from structs, and how do we build them?
02:50	13. Sum types	How do sum types differ from product types?

Upcoming Workshops

- **15 Mar - 17 Mar 2022** - 4th HEP C++ Course and Hands-on Training - The Essentials
- **28 Mar - 30 Mar 2022** - Software Carpentry (Virtual) HSF
- **1 May - 7 May 2022** - Thematic CERN School of Computing on *“Scientific Software for Heterogeneous Architectures”* - **Deadline:** 23 Jan 2022
- **19 Jun - 25 Jun 2022** - Thematic CERN School of Computing on *“Security of Research Computing Infrastructures”* - **Deadline:** 13 Mar 2022
- **28 Aug - 10 Sep 2022** - CERN School of Computing 2022 - **Deadline:** 17 Apr 2022

Achievements & Lessons from 2021

- **Virtual events have been beneficial for training.**
  - A large number of participants from all over the world, no travel costs
  - Over 300 participants trained, 50 mentors/instructors/facilitators
  - 3 Training Events (not including C++ training)
  - First Software Training paper published in Springer Computing and Software for Big Science
  - Two presentations about Software Training - vCHEP2021 and ACAT2021
- **Successful organization of Software Carpentries Workshops**
  - Feedback collected. Surveys are a highly valuable input.
  - Events have being improved with each iteration.
  - The sustainability of the event depends on keeping a pool of instructors.
- **The C++ training events have been driven by the momentum of the community**
  - 2 C++ events, 150 participants, 35 mentors/instructors/facilitators
  - Monthly meetings for material development
- **A community built around training**
  - Active community of members from HEP and Nuclear Physics.
  - Time dedicated on voluntary basis, great dedication and enthusiasm

Plans for 2022

- **Sustainability of the training model.**
  - Software Carpentries training 3-4 times per year
  - Future training events depend on keeping a pool of instructors.
  - Ensure the reward of participating as mentor. Exposure outside experiments.
  - Contact participants from previous workshops and invite them to contribute to coming events.
  - Advertise the opportunities to grow professionally.
- **Scale up efforts to collect feedback before and after training events**
  - After basic courses, collect more information on what people are interested in. Use it for prioritize development of training modules.
  - Take the results of surveys and prepare a publication with the outcome.
- **Strength the communication with other WGs for training topics**
  - HSF Simulation group & reconstruction group?
- **Conference and Publications**
  - Look for conference to advertise training efforts
  - Publish papers on data collected during surveys

Ongoing Activities

- **Instructor training**
  - With support from IRIS-HEP: training of up to 20 new HSF training instructors
  - Up to 4 members of EIC (JLab & BNL) community will be included
- **Development of new trainings**
  - matplotlib (in early testing)
  - singularity (in early development)
  - spack (planned, with HSF Dev Tools & Software Packaging)

Stay Informed or Get Involved

- **Enroll on our mailing list to find out about training events**
  - https://groups.google.com/g/hsf-training-wg
- **Attend weekly working group meetings**
  - Monday 16:00 CET weekly
  - https://indico.cern.ch/category/10294/
- **Contribute to training materials**
  - https://github.com/hsf-training
  - Pull requests to training materials are enthusiastically invited