## **Come formare al software i giovani Fisici:** la soluzione di LHCb, ALICE e SHiP

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#### ALICE

- Base analysis task is a C++ class based on ROOT
- Central analysis repository on GitHub with daily tags on CVMFS
- Organized via Analysis Trains
- Software stack needs to be built on user laptop

- Most analysts configure software with Python
- Core software stored on GitLab and distributed with CVMFS
- Individual analysis repositories
- Analysis done locally with C++ macros or Python

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## Overview

#### LHCb

#### SHiP

- Most user-facing code is Python, plus C++ internals; based on ROOT
- Both on GitHub and GitLab
- Still under heavy development
- Software stack needs to be built on user laptop using same ALICE tool





## Separate teaching activities

### ALICE

- Since 2014. Focus: Physics analysis
- 3 times a year: one full day at the end of ALICE Weeks at CERN
- How to run your analysis from coding to the Grid (hands-on)
- Thematic lectures on specific topics
- Illustrate new official tools and procedures (e.g. plain git → GitHub)

### LHCb

- TWiki lessons replaced by Starterkit
- Each Starterkit: two parts, each ran annually at CERN
- Courses on C++/framework during the 5 upgrade hackathons each year
- 4 "Startertalks" about physics a year
- Presentations in meeting to major changes (e.g. svn → git)



# Starterkit origins in LHCb

- Started in 2015 by a small group of "young" people in LHCb
- 5 day workshop based at CERN
  - Plus a 3 day Impactkit (advanced topics + hackathon)
- Participants are encouraged to help in the next year
  - 1 year in: Participants started teaching
  - 2.5 years in: Participants started organising



**June 2015** 

**May 2016** 

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Nov 2016



Estd. 2015

#### **Oct 2017**

May 2017







- Social event on Day 4 10 important for networking!
- General computing lessons: • teachers and students shared between ALICE, LHCb and SHiP
- Instructions on preparing user environment are sent beforehand to save time

## **Skills taught**









• General HEP: Ihcb.github.io/analysis-essentials Publicly available • LHCb specific: Ihcb.github.io/starterkit-lessons on the Web • ALICE specific: alice-doc.github.io/alice-analysis-tutorial

- Source on GitHub and tested/deployed via 😥 Travis Cl

  - Code snippets extracted from the doc and tested daily: ensure the instructions/examples always work!
- Material is never more than a year out of date
- This is the main source of documentation for both experiments
- Last day: session fixing minor issues in the lesson

## Material





Anyone can contribute via Pull Requests: always reviewed by somebody else





- 1 teacher + 3 helpers per room (all three experiments always represented)



- 2 Organisers (same since 2014), now 1
- ~25 participants
- Various ages

- 2 Organisers (always) different each year)
- ~45 participants •
- > 50% new members

## Organisation

• Minimise costs: hosted at CERN, just 25 CHF fee for coffee, biscuits, social event • Three teaching rooms: ALICE, LHCb and SHiP students spread randomly across them

### LHCb

- 3 Organisers
- 12 participants



NEW IN 2018!



# **Remote participation**

#### ALICE

- Vidyo available
  - More geographically diverse
  - Less travel opportunities
- Extremely high remote attendance
- Lower engagement

### 2017-2018 joint strategy

- Webcast with remote mics muted required by ALICE
- Mattermost channel: questions filtered/reported to teachers
- ~30 people connected though few questions asked

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#### LHCb

- Not available in the past so we can
  - Provide personalised support
  - Give networking opportunities
  - Help with other problems
- May risk lower attendance?



#### ALICE

- Mostly students with some experience to consolidate
- Even some well known, not-soyoung members attended!
- Second edition featured, as teachers, some students from the first edition!

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#### LHCb

- Students have < 1 year experience
- Experienced students attend as helpers: gain experience teaching

#### SHiP

• All students are young and with some experience already





- Every participant is given a post-it\*:
  - Green: I'm ready to continue
  - Red: I need help
- Allow discreet communication
- Helpers ensure everyone keeps up (even when no post-it is displayed)
- Borrowed from Software Carpentry software-carpentry.org

## **Ensuring engagement**

#### Other brands are available



- Students really like the one-to-one help
  - Also with solving other issues they have
- Generally well paced
  - Some rare cases almost require personal assistance
  - Even advanced students learn new tricks
- Students would like longer classes
- Enjoyed networking between ALICE, LHCb and SHiP •



## Feedback and outcome

#### Starterkit feedback

Which experiment are you from? \*

ALICE

O LHCb

Who was your teacher during this session?

Your answe

What was being taught?

Your answe

What was one thing you liked about the session?

Your answe

What was one thing you didn't like about the session?

Your answe

Never submit passwords through Google Forms

• ALICE summer students: only 6-8 weeks of permanence Special event for them on day 0: able to start contributing from day 1









## Advice for others

#### Material

### Teaching

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• Writing is hard, but maintaining is harder • Pull Requests make contributors more comfortable • Regular workshops help keep the material fresh

• Need a mixture of experience levels to teach well: • Young people know what is initially difficult • Experienced people understand the subtleties Encourage interactivity instead of lecturing • Helpers are key to keeping everyone up to speed



# How to properly recognize teaching?

- Find suitable teachers: able and capable
- Review and refresh the teaching material
- Have a coherent message and know the hard bits

## **Teaching is** time-consuming

- Your boss is not happy if teaching takes too much of your time
- Teaching may not be rewarding for your career
- Recognising it as a service task may help?

**Too often** regarded as a side task

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# **Extending the engagement**

- HEP Software Foundation events on training • Managed to get SHiP on board • So far, more appealing to small experiments

### Advertise the format

- denominator, which is rather large already (e.g. Git) involved parties are eager to seek compromise
- Experiments are different: focus on the common • No hierarchy "imposing" what/when to teach:

## **Keep it** lightweight

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# Sustainability

### **Build a community** of teachers

**Documentation is a common resource** 

**Reach out** 

and engage

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• Organization and maintenance are time consuming • Engage students: mention "next year" during the session Motivate and encourage to help building teaching confidence

• Documentation belongs to everyone, not the authors • Ensure continuity when teachers leave • Share common documentation across experiments

• Decentralised Starterkits: off-site TEDx-like events? Provide for communities and experiments away from CERN Would allow for more frequent Starterkits













## Thank you!

