

# User documentation and training at Belle II

Spreading and preserving knowledge in sparse collaboration

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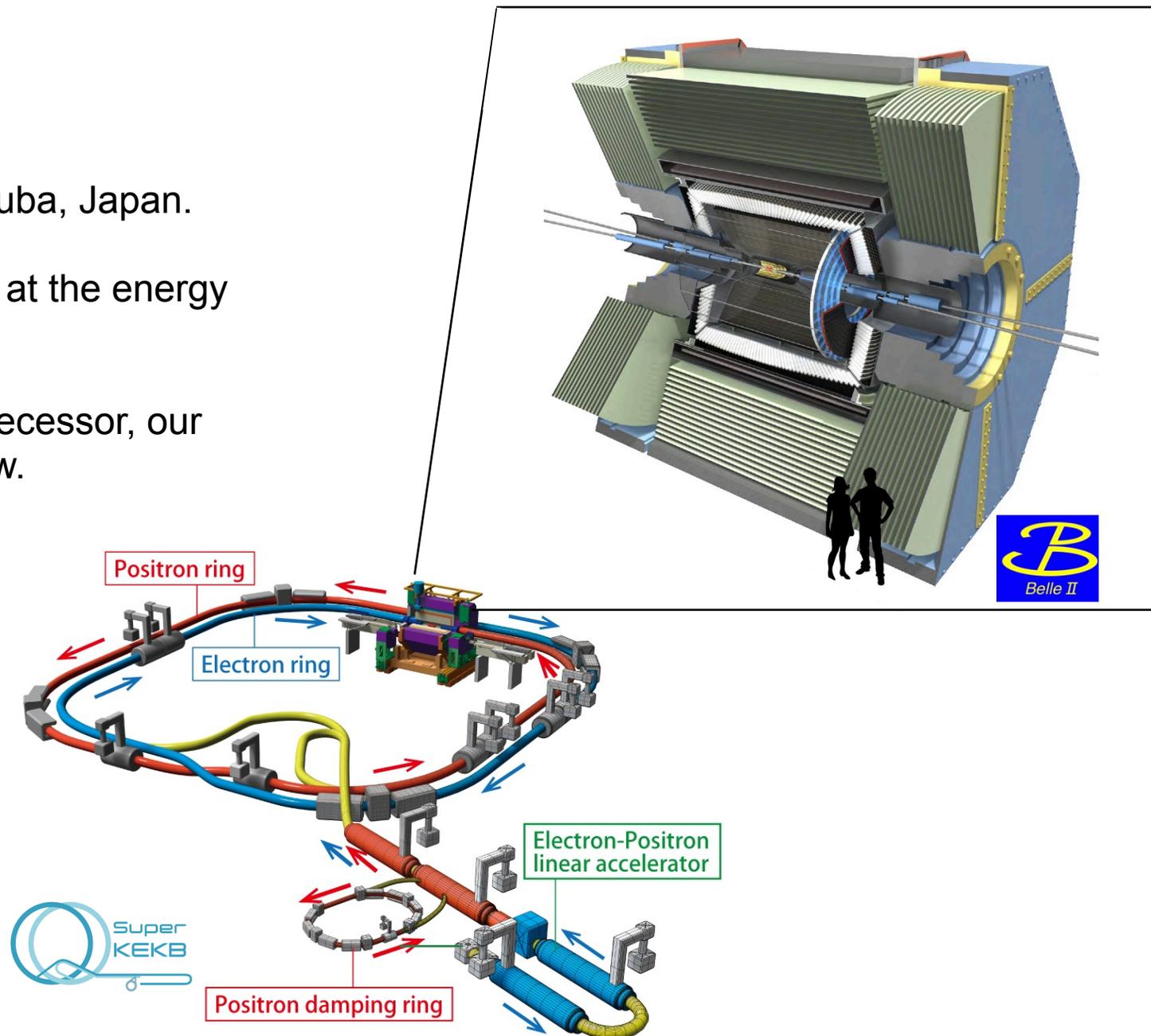
# Meet the Belle II

Belle II is multipurpose detector located in Tsukuba, Japan.

It studies processes occurring in  $e^+e^-$  collisions at the energy of  $\sim 10$  GeV.

While Belle II inherits many things from its predecessor, our software is **not** one of them - it's completely new.

Belle II analysis software (basf2) is C++(17) core with python user interface.

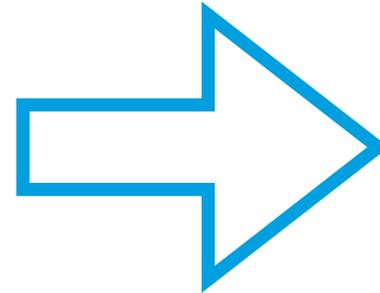


# Tasks of the documentation and training group

And how they evolved

Summer 2017

- **Maintain documentation**
- **Organise software tutorials**
- **Advertise new tools**



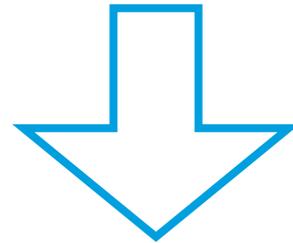
Now

**Provide smooth start for newcomers and effective support for existing users**

# Speed of the software development

## Challenge #1

- **Software develops fast:**
  - We had 814 commits last month
  - We have 2 major releases per year.
- **Major releases break backward compatibility**



- Documentation needs to be permanently updated
- Users need to be taught how and be ready to migrate to the new release.

# Geography of the collaboration

## Challenge #2

### Belle II collaboration is scattered.

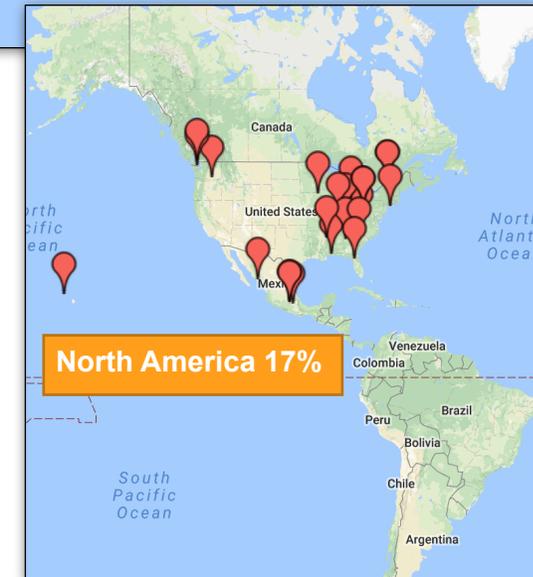
We are 985 members from 118 institutions in 26 countries, most of us reside next to home institute.

- It's often impossible to “knock the expert's door” to ask a question - **documentation** is essential.
- It's hard to **gather people** for training sessions in one place and people who need it most (master students) often don't have travel funds.
- **Inclusion** is something to be always kept in mind.

Europe 44%



Asia 38%



North America 17%

# Training

*a.k.a. B2StarterKits*

# Schedule and Content

**2 workshops/year** attached to the general meetings; **3 days per workshop.**

- We teach Belle II software
- We teach experimental physics
- We teach data analysis
- We teach working in collaboration



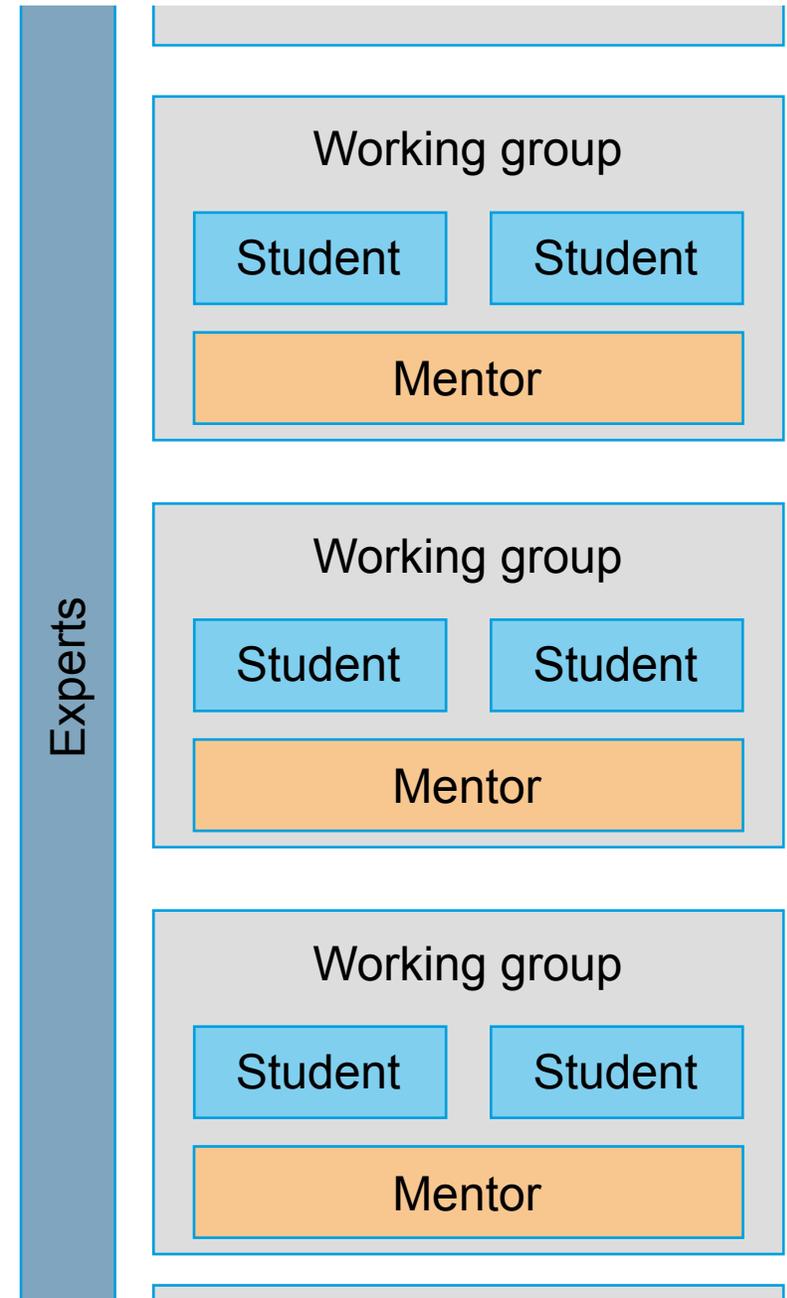
	Day 1	Day 2	Day 3
Morning	Introduction to the software	“Expert” lectures	
Afternoon	Hands-on tutorial	Work in groups	

# Addressing the inclusion

## Through the organisation

Split them in working groups with advanced students being as mentors.

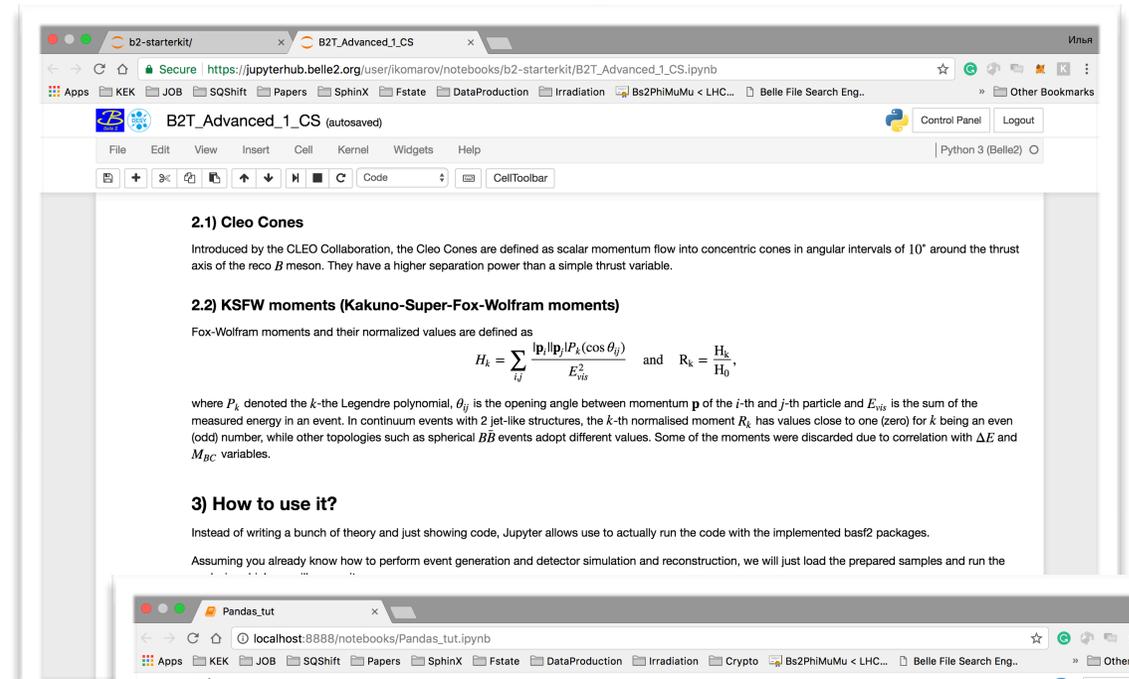
- Mentors take care of technical issues.
- Mentors coordinate analysis in the working group.
- Mentor is the first point of contact for the student.
- Mentors follow the progress of their students and organise discussions.
- If mentor can't help, group asks for the help of the expert.



# Containerised approach

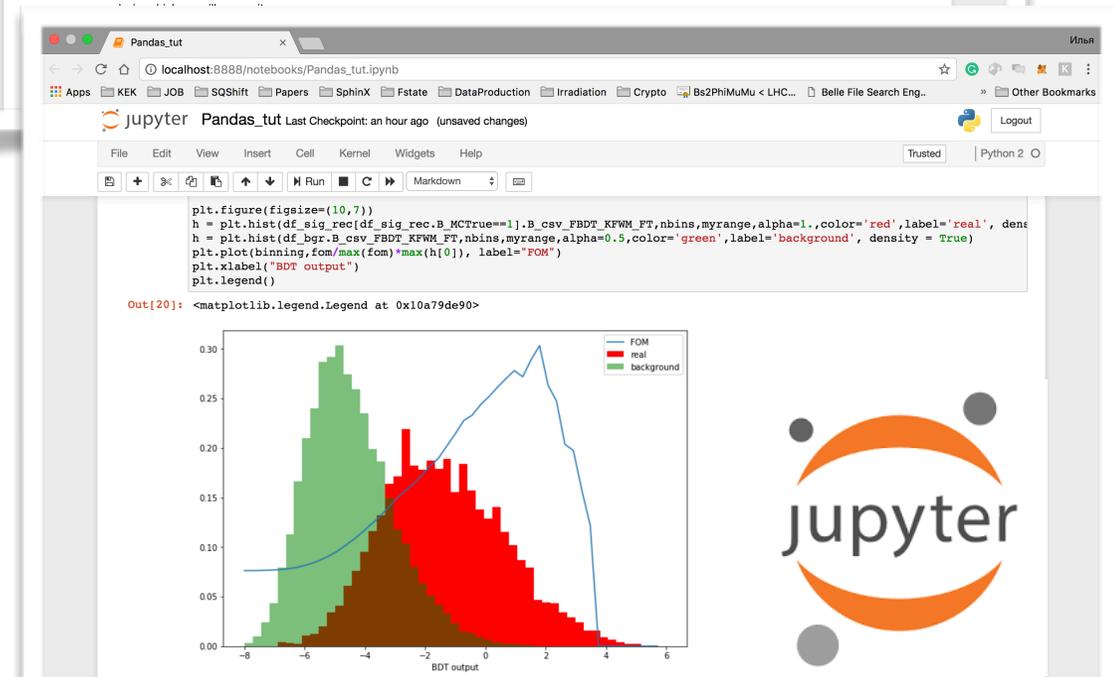
## Reaching those who can't come

- Materials are collected in dedicated repository
- Materials are updated every workshop
- Latest version of tutorials can be reproduced in the browser thanks to jupyterhub server.



The screenshot shows a Jupyter Notebook titled "B2T\_Advanced\_1\_CS" running on a Python 3 kernel. The notebook content includes:

- 2.1) Cleo Cones**: A paragraph explaining that Cleo Cones are defined as scalar momentum flow into concentric cones in angular intervals of  $10^\circ$  around the thrust axis of the reco  $B$  meson.
- 2.2) KSWF moments (Kakuno-Super-Fox-Wolfram moments)**: A paragraph defining Fox-Wolfram moments and their normalized values, followed by the equation 
$$H_k = \sum_{ij} \frac{|\mathbf{p}_i||\mathbf{p}_j|P_k(\cos \theta_{ij})}{E_{vis}^2} \quad \text{and} \quad R_k = \frac{H_k}{H_0},$$
 where  $P_k$  is the  $k$ -th Legendre polynomial,  $\theta_{ij}$  is the opening angle between momenta  $\mathbf{p}_i$  and  $\mathbf{p}_j$ , and  $E_{vis}$  is the sum of measured energy in an event.
- 3) How to use it?**: A paragraph explaining that Jupyter allows users to run code with implemented basf2 packages.



The screenshot shows a Jupyter Notebook titled "Pandas\_tut" running on a Python 2 kernel. The notebook content includes:

- A code cell with the following Python code:

```
plt.figure(figsize=(10,7))
h = plt.hist(df_sig_rec[df_sig_rec.B_MCTrue==1].B_csv_FBDT_KFWM_FT,nbins,myrange,alpha=1.,color='red',label='real', density = True)
h = plt.hist(df_bgr.B_csv_FBDT_KFWM_FT,nbins,myrange,alpha=0.5,color='green',label='background', density = True)
plt.plot(binning,fom/max(fom)*max(h[0]), label="FOM")
plt.xlabel("BDT output")
plt.legend()
```
- An output cell showing a histogram plot with the following legend:
  - FOM (blue line)
  - real (red histogram)
  - background (green histogram)



# Documentation

# Keep it up-to-date

## In-code documentation

- Guaranteed up-to-date
- Reviewed changes
- Version control
- Great user interface



**SPHINX**  
Python Documentation Generator

The screenshot shows the Belle2 documentation website. The main header reads "Documentation basf2 framework". Below this is a navigation bar with links for "Belle II", "Wiki", "Git", "Issues", "Development Build", and "Belle". The main content area is titled "Sphinx documentation" and lists several versions: "release-04-00-01 (recommended)", "release-03-02-04", "release-03-01-04", "light-1907-golfo", "light-1906-firebird", and "development". A smaller inset window shows a specific page for "FlavorTagger.html" with a table of categories and targets, and a diagram of decay modes.

Categories	Targets
Electron	$e^+$
Intermediate Electron	$e^-$
Muon	$\mu^+$
Intermediate Muon	$\mu^-$
KinLepton	$e^-$
Intermediate KinLepton	$e^+$
Kaon	$K^-$
KaonPion	$K^-, \pi^+$
SlowPion	$\pi^+$
FastHadron	$\pi^-, K^-$
MaximumP	$e^-, \pi^-$
FSC	$e^-, \pi^+$
Lambda	$\Lambda$
Total= 13	

Fig. 6.5 Underlying decay modes of the flavor tagging categories.

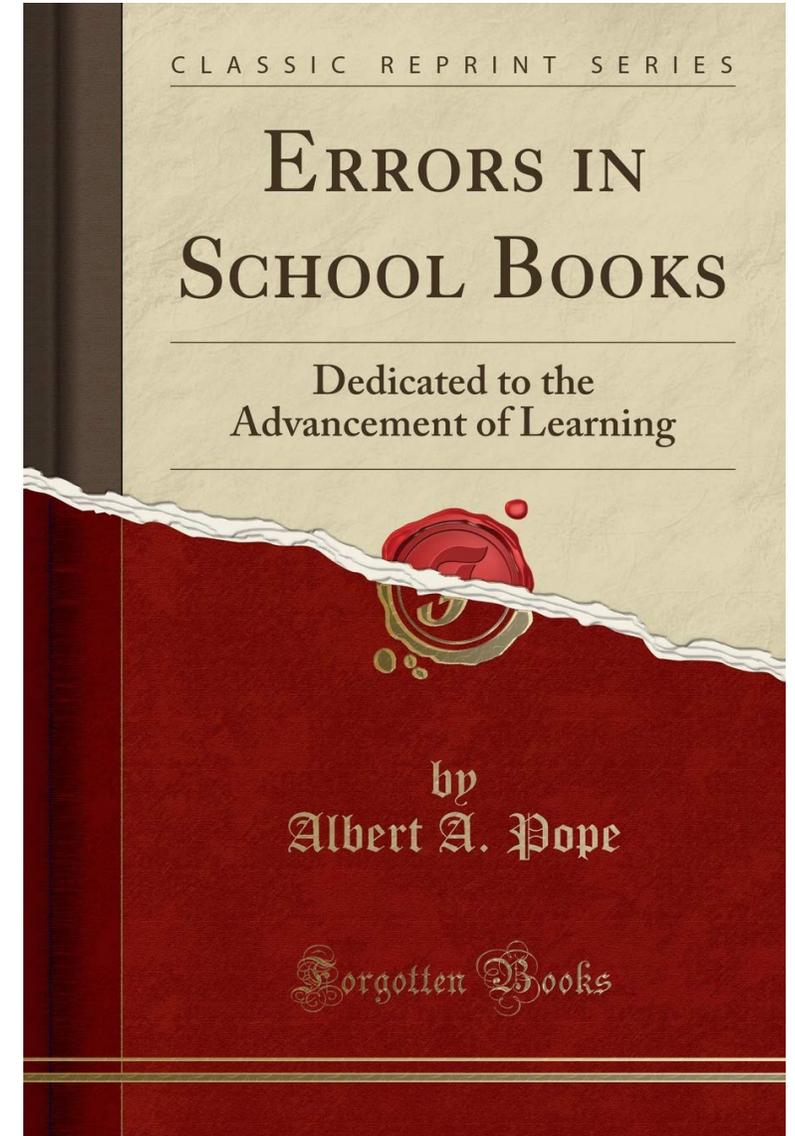
# Keep it up-to-date

## Unit tests to prevent outdates

- **Tutorials** are isolated in code: **high risk of outdate.**
- To cope with than, we covered tutorials with test:

**Build fails if tutorial crashes;**

**No build ⇒ no merge.**



# Availability of training datasets

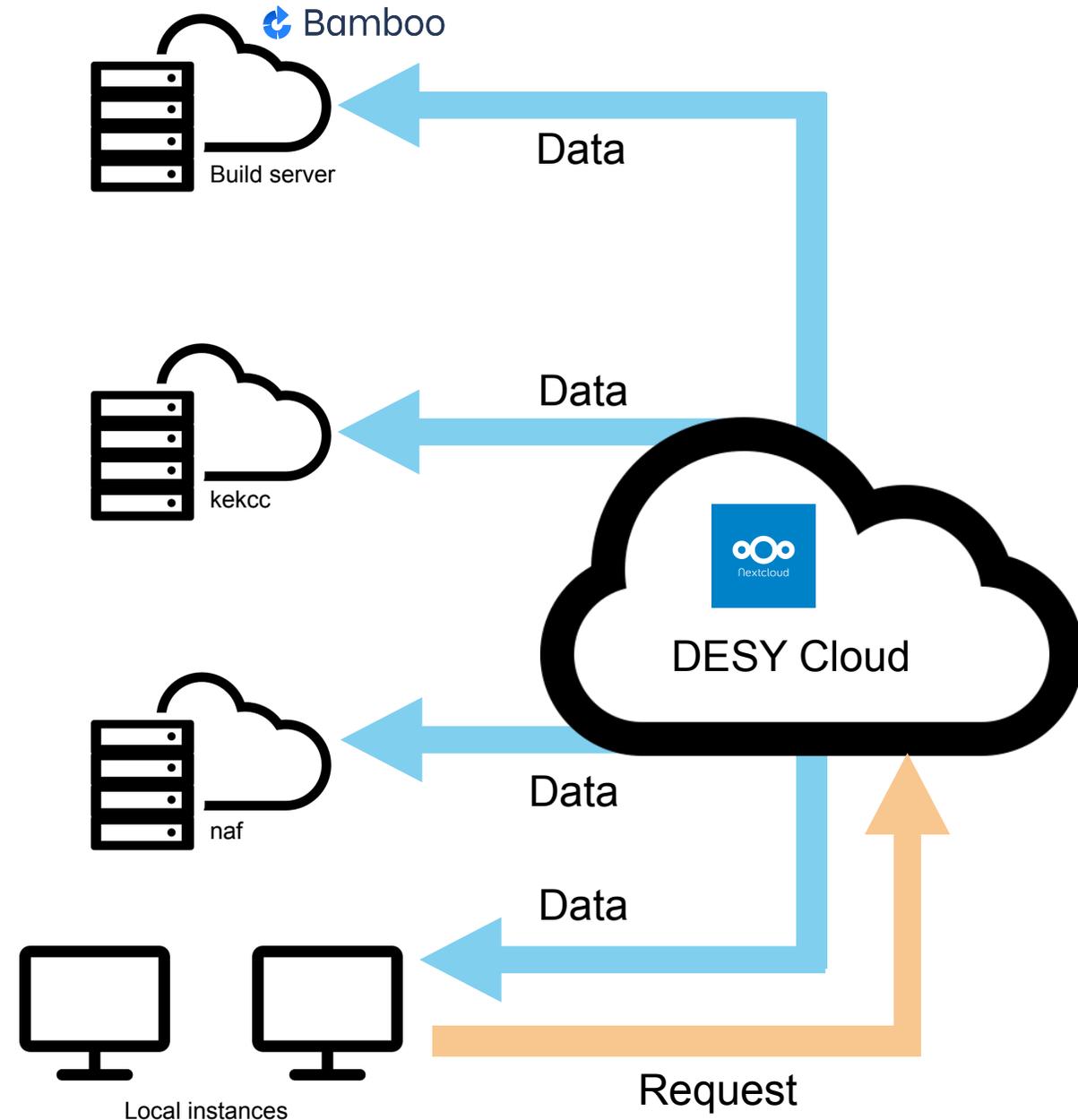
## Cloud solution

Datasets used for trainings:

- Should be regularly updated
- Too big to be part of a framework

Cloud solution:

- All training datasets are kept at Nextcloud instance
- Cron job synchronise datasets “known” servers (build server, kekcc (Japan), naf (Germany))
- Copy to local machines by request



# Questions

## Prompt responses

- We have an instance of **Askbot** providing collaborative Q&A service.
- It works quite well:
  - 1233 questions asked in 15 month
  - 83% of them answered
  - Response time is <1 day.
- Adoption is enforced by developers:

*Mail to developer's mailing list:*

Dear experts,  
I have a problem...

*Answer:*

Dear user,  
Please ask at  
**questions.belle2.org**

# Askbot - create your Q&A forum.

The screenshot shows the Askbot forum interface for Belle II. The top navigation bar includes the Belle II logo, user information for 'ikomarov' (karma: 552, badges: 7, 36, 55), and links for 'sign out', 'settings', 'widgets', and 'help'. Below the navigation bar, there are tabs for 'ALL', 'UNANSWERED', and 'FOLLOWED', along with a search bar and an 'ASK YOUR QUESTION' button. The main content area displays a list of questions with their respective statistics (votes, answers, views) and tags. The questions listed are:

- b2bii: How to avoid double counting FSPs?** (29 views, 2 answers, 4 hours ago by stottler)
- How to get pi0/eta probability distribution** (21 views, 1 answer, 13 hours ago by chanbeak)
- Is it necessary to use pi0:mdst type in b2bii framework? When using pi0:mdst, getting zero entries.** (14 views, 1 answer, 14 hours ago by scunliff)
- How does one include continuum suppression variables in an Y4S tree?** (21 views, 1 answer, 16 hours ago by scunliff)
- b2bii: How to pass additional parameters to fix\_mdst - eg. HadronA, Level4passed, Smear\_trk** (22 views, 2 answers, 19 hours ago by stottler)
- b2bii: BeamParameters from database different from converted ones** (8 views, 1 answer, 31 hours ago by capid)

On the right side, there are sections for 'Contributors' (a grid of user avatars), 'Interesting tags' (with an 'add' button), and 'Ignored tags' (with an 'add' button). At the bottom right, there is a 'Show only questions from' section with radio buttons for 'show all tags', 'exclude ignored tags', and 'only interesting tags', and a 'Tags' section showing 'b2bii x8' and 'basf2 x3'.

# One tool to rule them all: cross-source search engine

Sphinx, questions and wiki heritage

Log out

## Amazing Belle2 Search Tool

Collections

Select a release

release-04-00-01 (recommended)

Go!

1. Enter the query

2. Select release

3. Get results

### Results from [questions.belle2.org](http://questions.belle2.org)

How does one include continuum suppression variables in

<p>Hi,</p> <p>When using Continuum Suppression, how does one write out the B c  
We are trying to reduce the number of trees we have in the output to prevent huge fil  
possible.</p> <p>Thanks in advance!</p> ...

Answers: 1

tags: continuum suppression variables tree

### Results from [Sphinx](http://Sphinx)

[variables.collections](#)

Python module, in 6.3.1. VariableManager

### Results from [confluence.desy.de](http://confluence.desy.de)

# Conclusion

# Documentation and training

## At Belle II

Belle II Documentation and Training group works hard to establish smooth start for beginners and effective support for existing users.

- The core of training efforts are **B2StarterKit** workshops. We don't only teach software, we teach doing analysis in Belle II, from means of communications within collaboration to industry-standard tools for data analysis.
  - Centrally organised workshops
  - Jupyterhub instance with tutorial materials
  - Materials are available for local events
- We developed and adopted new documentation strategy. Instead of wikis and mailing lists, we use:
  - **Sphinx** instance for core user documentation
  - **Askbot** instance for Q&A service

Books and a bookcase, **Esei Keisai**, XIX c.

