

Online integrated development environment (IDE) for FORM

<https://capp.uni-hamburg.de>

April 13, 2023

Bakar Chargeishvili

II. Institut für Theoretische Physik
Universität Hamburg

Computer Algebra with FORM for Developers
IFT UAM-CSIC, Madrid
12 - 14 April 2023



Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG

International School on Computer Algebra and Particle Physics CAPP 2021

6–10 April 2021
at University Hamburg

The CAPP school combines theory and practice in an advanced environment. It provides education and training of students and young researchers at graduate and Ph.D. level on central topics at the interface of modern computer algebra and particle physics. The courses include exercises and practical hands-on training with modern software.

Lectures and Courses

Thomas Hahn (MPI München)	<i>Mathematica, FeynArts and FormCalc and all that</i>
Vitaly Magerya (KIT Karlsruhe)	<i>Differential equations and sector decomposition</i>
Peter Marquard (DESY)	<i>Introduction to Feynman integrals</i>
Sven-Olaf Moch (Ulf Hamburg)	<i>Introduction to Computer Algebra</i>
Jos Vermaseren (Nikhef)	<i>Introduction to FORM</i>

Organizing Committee: S. Moch (University Hamburg), P. Marquard (DESY), Secretary: E. Merfins Duarte (University Hamburg)
The school fee is 100 Euro. Registration deadline is 20 March 2021.
For more details and in order to register, please go to the school home page <https://indico.desy.de/view/CAPP2021>



- ▶ Two years ago CAPP 2021 was held online for the first time
- ▶ The event was organized in **gather.town**
 - ▶ The platform offered lots of interactive tools to make the event more interesting than a regular Zoom call
 - ▶ **Nothing relevant to particle physics and computer algebra**
- ▶ With the anticipation that CAPP 2023 would have to take place online again the idea of **capp.uni-hamburg.de** was born

International School on Computer Algebra and Particle Physics CAPP 2023

17–21 July 2023
at University Hamburg

The CAPP school combines theory and practice in an advanced environment. It provides education and training of students and young researchers at graduate and Ph.D. level on central topics at the interface of modern computer algebra and particle physics. The courses include exercises and practical hands-on training with modern software.

Lectures and Courses

Bakar Chargeishvili (Uni Hamburg)	<i>FORM Tutorial</i>
Thomas Hahn (MPI München)	<i>Mathematics, FeynArts, FormCalc and all that</i>
Vitaly Magerja (KIT Karlsruhe)	<i>Multi-loop Feynman diagrams on a computer</i>
Peter Marquard (DESY)	<i>Introduction to Feynman integrals</i>
Sven-Olaf Moch (Uni Hamburg)	<i>Introduction to Computer Algebra</i>
Ben Ruijl (ETH Zurich)	<i>Introduction to FORM</i>

Organizing Committee: S. Moch (University Hamburg), P. Marquard (DESY), Secretary E. Morais Duarte (University Hamburg)

The school fee is 150 Euro. Registration deadline is 1 July 2023.

For more details and in order to register, please go to the school home page <https://indico.desy.de/event/CAPP2023>



► capp.uni-hamburg.de is now a part of CAPP 2023

► The registration for the school is still open

► Sign up now:

► <https://indico.desy.de/event/CAPP2023>



The project contains three parts:

1. Online editor and compiler for FORM code
2. FORM exercises and problems with the ability to get an automatic correction
3. Public API access to the compiler

The only technical requirement to use the service:

- ▶ A javascript-enabled browser with the internet access

<https://capp.uni-hamburg.de>

Following RESTful API is being provided:

► Request:

```
curl \  
  -X POST -H "Content-Type: multipart/form-data" \  
  -H "Authorization: Bearer <AUTHENTICATION TOKEN>" \  
  --data-binary @YourFile.frm \  
  "https://capp.uni-hamburg.de/api"
```

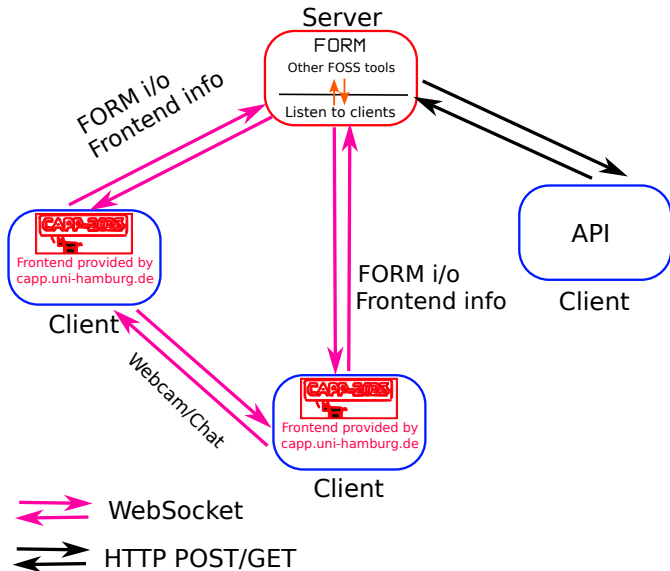
► Response:

```
{  
  "success": <Success status>,  
  "output": <FORM Output>  
}
```

Interactive code snippets for the static webpages:

- ▶ Including the script below in your HTML source enables you to present the FORM code snippets interactively:
 - ▶ <https://capp.uni-hamburg.de/FORM/FORMSnippet.js>

- ▶ Live example at:
 - ▶ <https://desy.de/~bchargei/cappSnippets.html>
 - ▶ Have a look at the HTML source of the page above for more details





- ▶ Single dedicated server located at the university of Hamburg
- ▶ IBM System X iDataPlex dx360 M4 Server
- ▶ Intel® Xeon® CPU E5-2680 v2 @ 2.80GHz (20 cores)
- ▶ 66 GB DDR3 RAM
- ▶ 500 GB HDD
- ▶ No GPU

- ▶ The frontend is written in HTML/CSS, JS
 - ▶ The FORM code editor is based on Ace library
 - ▶ Contains about 3000 lines of code

- ▶ The backend uses Node.js
 - ▶ WebSocket connection is managed using socket.io
 - ▶ The correction of the exercises is done by FORM itself
 - ▶ Contains about 1000 lines of code

- ▶ The source code of the whole project will be available openly soon...
 - ▶ Check capp.uni-hamburg.de/news for the updates.

- ▶ Deal with the security vulnerabilities
- ▶ Implement the pretty printing
- ▶ Include the FORM documentation inside the editor in an interactive way
- ▶ Include lots of FORM exercises in the "capp"-format
- ▶ Using the collected data work towards the implementation of ChatFORM

Thanks for your attention!



Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG