



ECCE Software

Joe Osborn
August 5, 2021



ECCE Core Computing Team



- Cameron Dean (LANL) - Simulations
- Jin Huang (BNL) - Simulations
- Cristiano Fanelli (MIT) - AI and ML
- William Phelps (CNU/JLab) - AI and ML
- David Lawrence (JLab) - Computing and Software
- Joe Osborn - Computing and Software
- Christoph Paus (MIT) - Computing and Software
- More welcome! Please contact us for more information and to join the effort

Computing Team

Cristiano Fanelli (MIT)
David Lawrence (JLab)

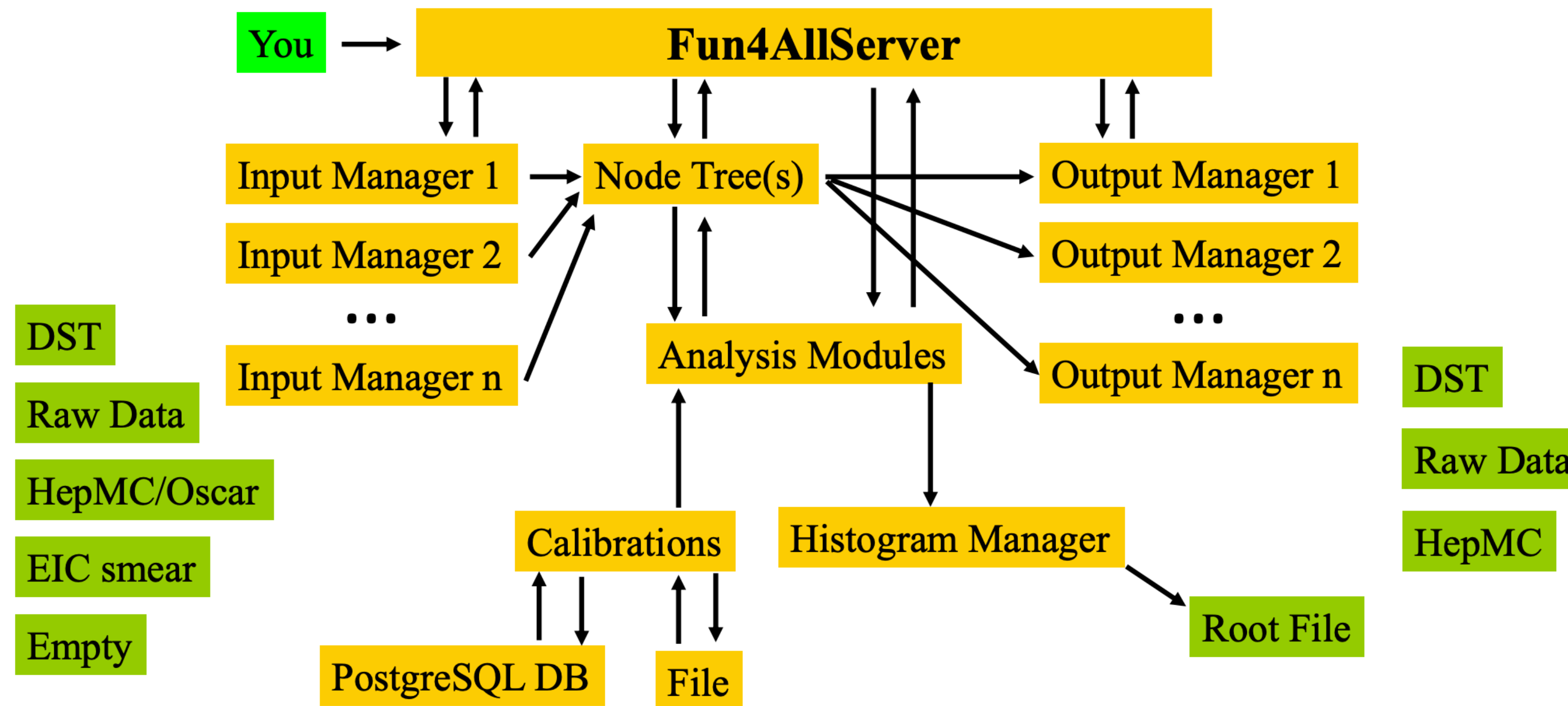
Computing Working Groups:

- Artificial Intelligence
William Phelps (CNU/JLab)
- Computing and Software
Joe Osborn (ORNL)

Physics Working Groups:

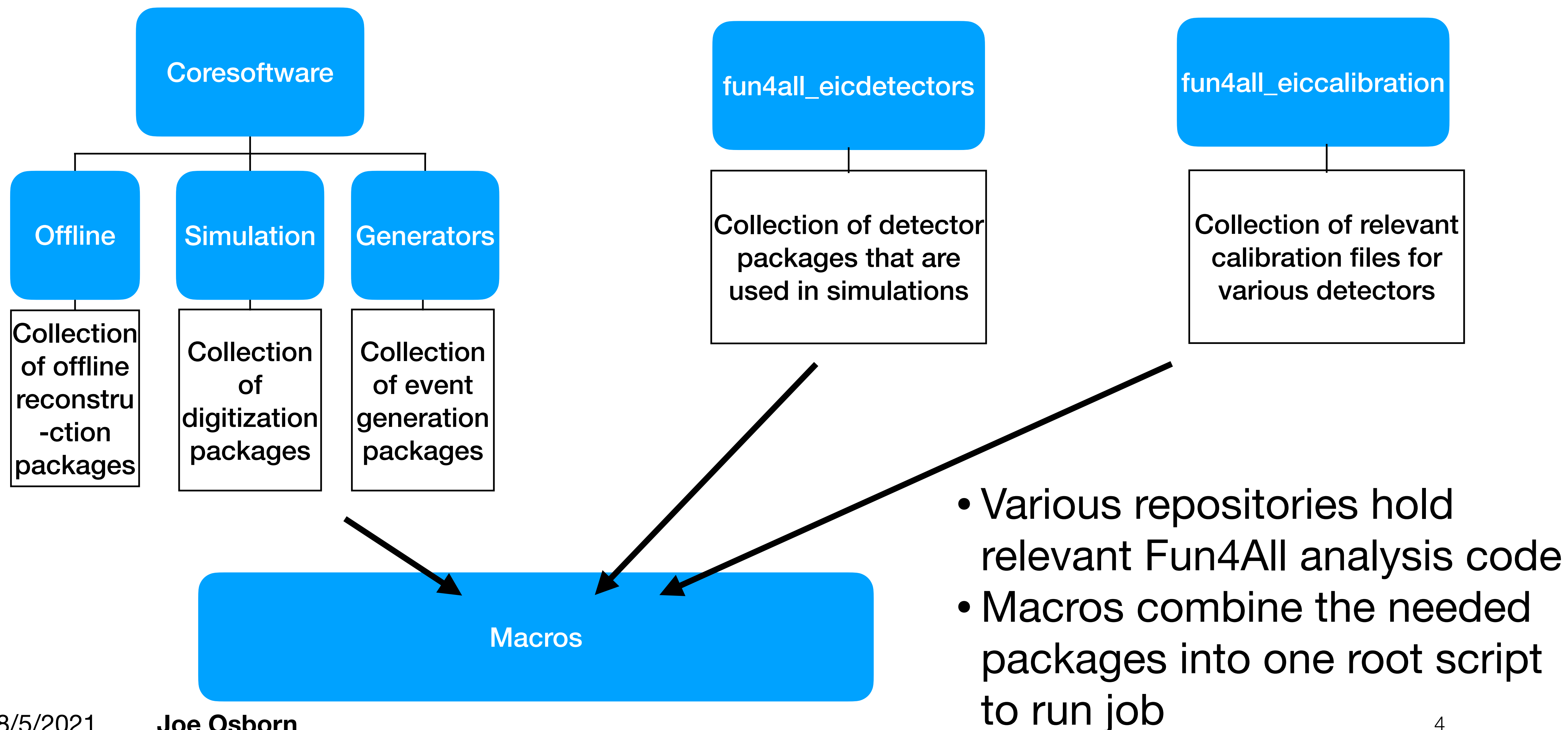
- Simulations
Cameron Dean (LANL), Jin Huang (BNL)

ECCE Software



- Working in the Fun4All framework
 - Modular, adaptable event processing framework developed and used with PHENIX for ~20 years
- Code available on [Github](#) - utilize daily, weekly builds and tagged production releases

Software Framework



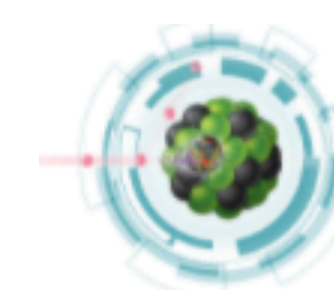
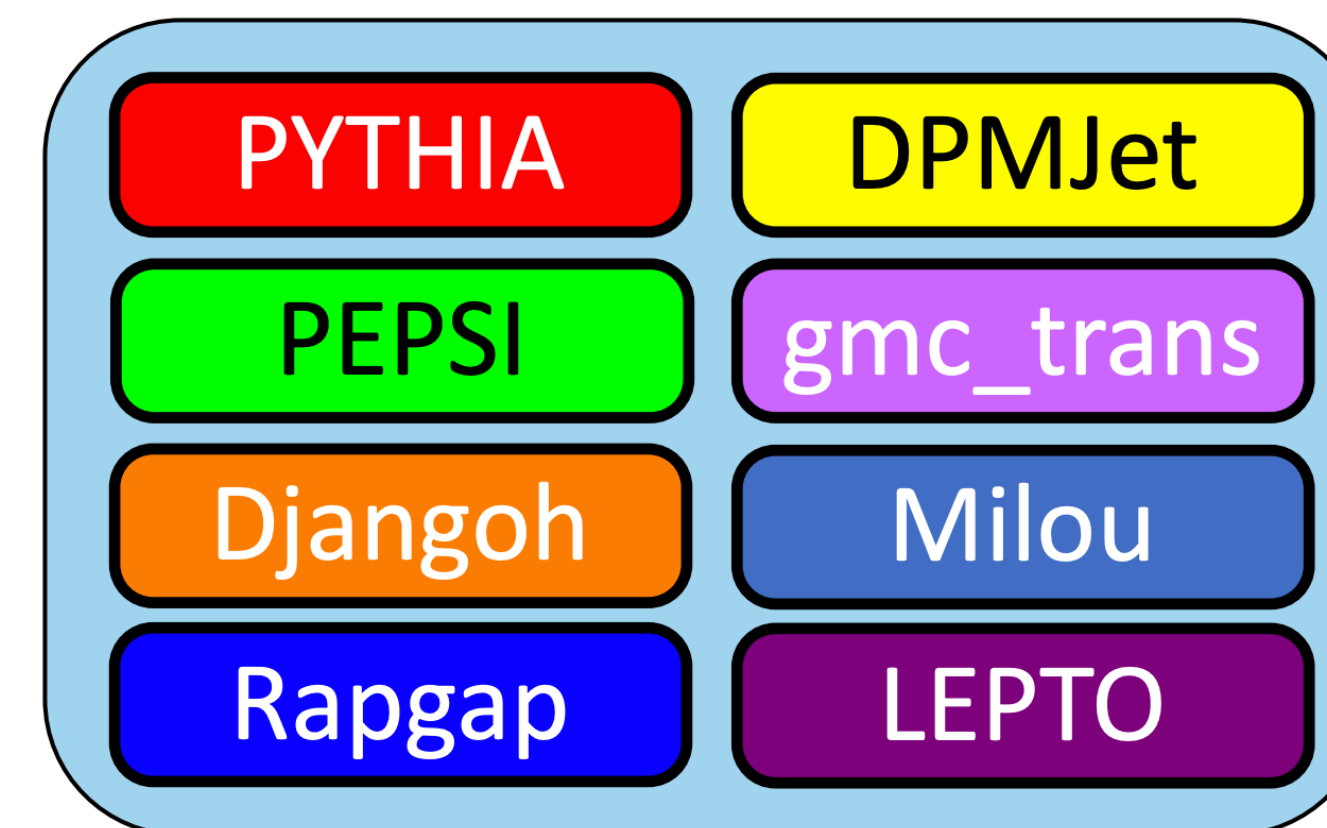
Macros

- Default macro can run a wide variety of event generators, detector configurations, etc.
- Can pick and choose what to run for your needs - just create the relevant module and register it with Fun4All
- Example - add a clustering algorithm for the EEMC

```
RawClusterBuilderTemplate *ClusterBuilder = new RawClusterBuilderTemplate("EEMCRawClusterBuilderTemplate");  
  
ClusterBuilder->Detector("EEMC");  
ClusterBuilder->Verbosity(verbosity);  
se->registerSubsystem(ClusterBuilder);
```

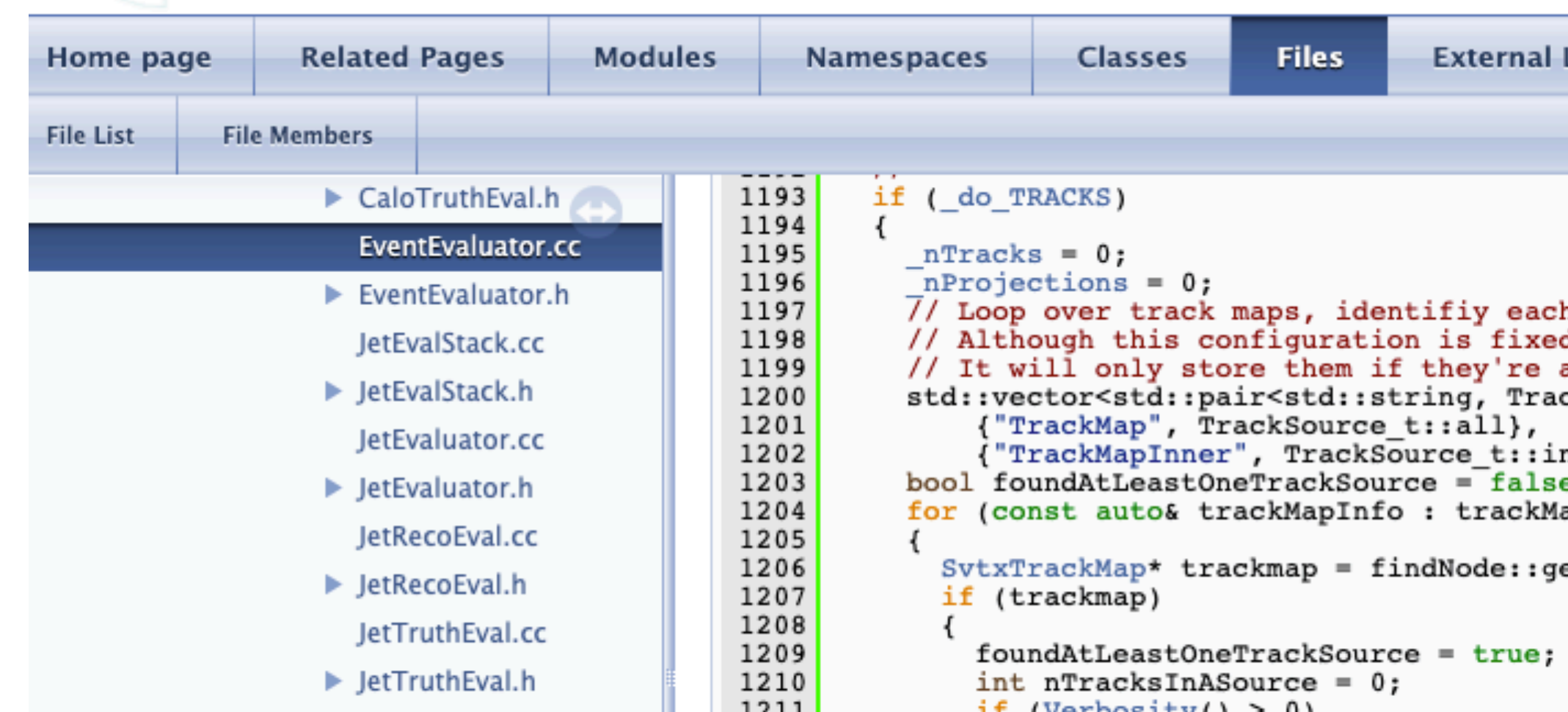
Available Tools

- Wide range of event generators through EIC-smear interface and Fun4All
 - HIJING, PYTHIA, Sartre, single particle...
- Dedicated detector geometry examples
- Available analysis modules
 - Event evaluator, Track/Cluster evaluator....
- All documented through [Doxygen](#) and [Github](#)



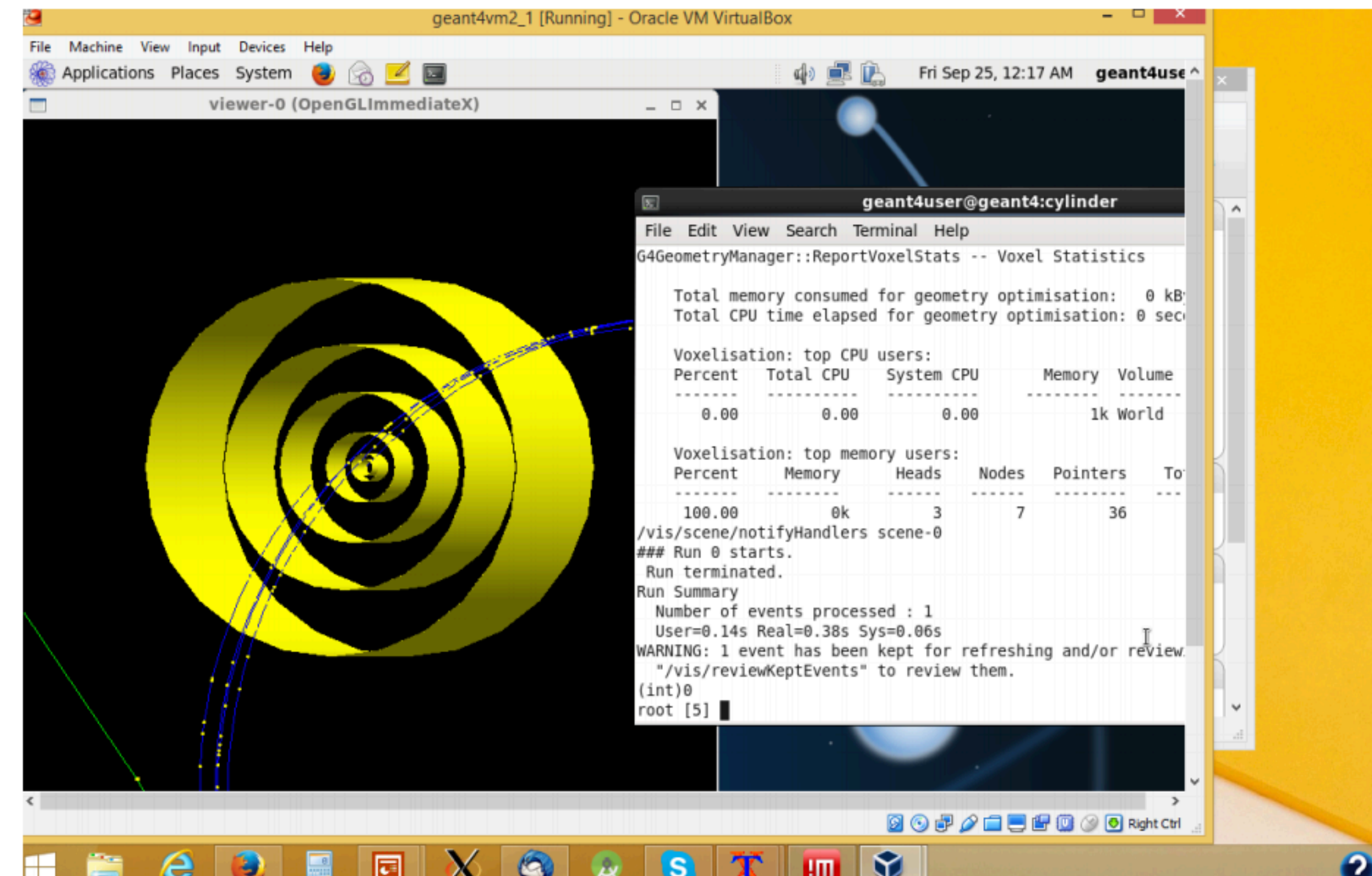
ECCE @ EIC Software

Reference for ECCE @ EIC simulation and reconstruction software on GitHub



ECCE Containers

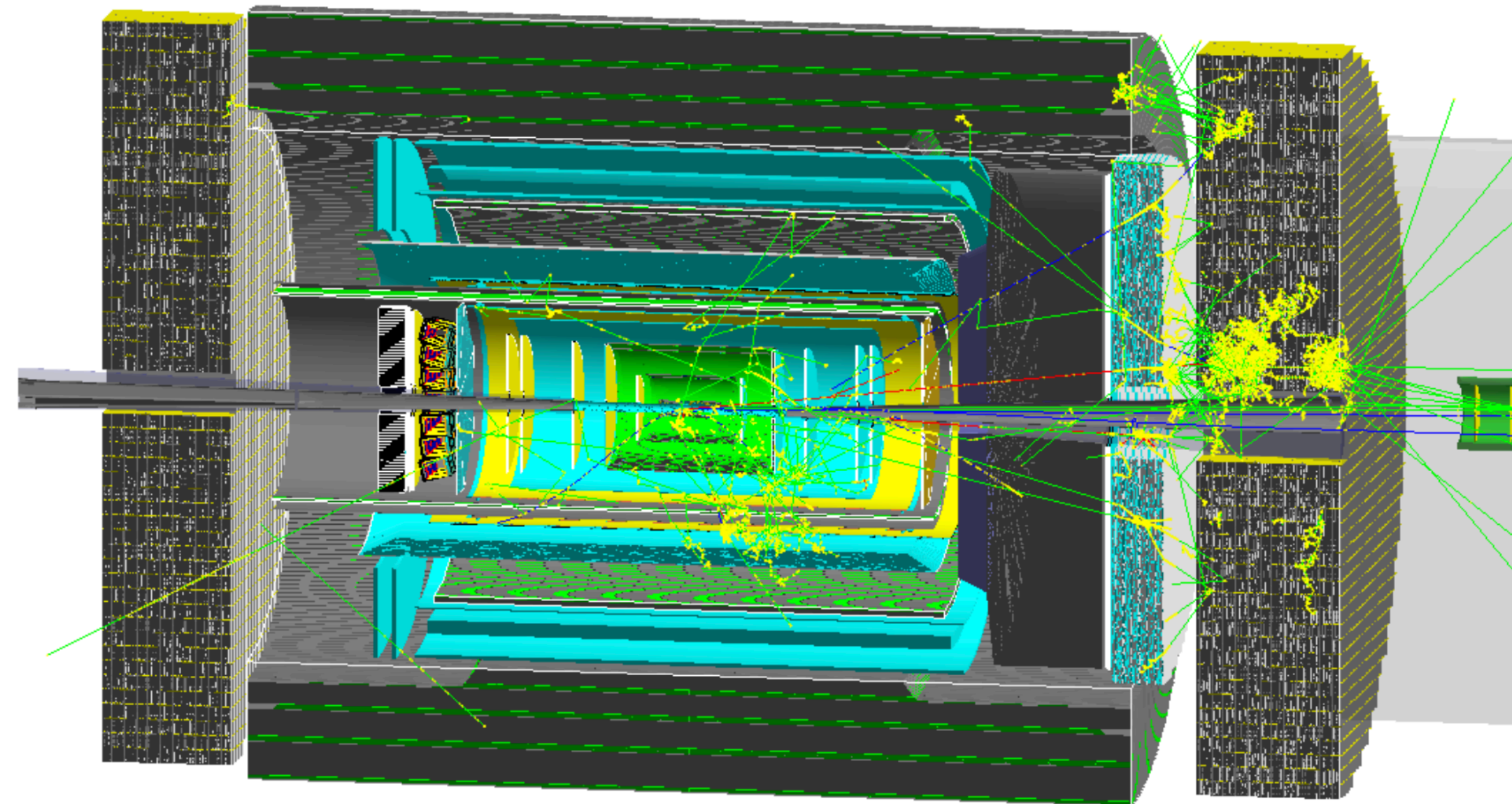
- Distribute Singularity container nightly for software access anywhere, no account required
- Containers are used to run jobs on the Open Science Grid, your home computer, HPC (e.g. CADES at ORNL)
- Install virtualbox and you can be up and running, [tutorials](#) and instructions available



ECCE Detector Geometry



- ECCE “June 2021” concept detector geometry fully implemented into Geant4
- Changes for second and final simulation campaign ongoing (“July 2021” concept)
- Detectors can be easily added/removed/tested within the Fun4All framework



Data Distribution

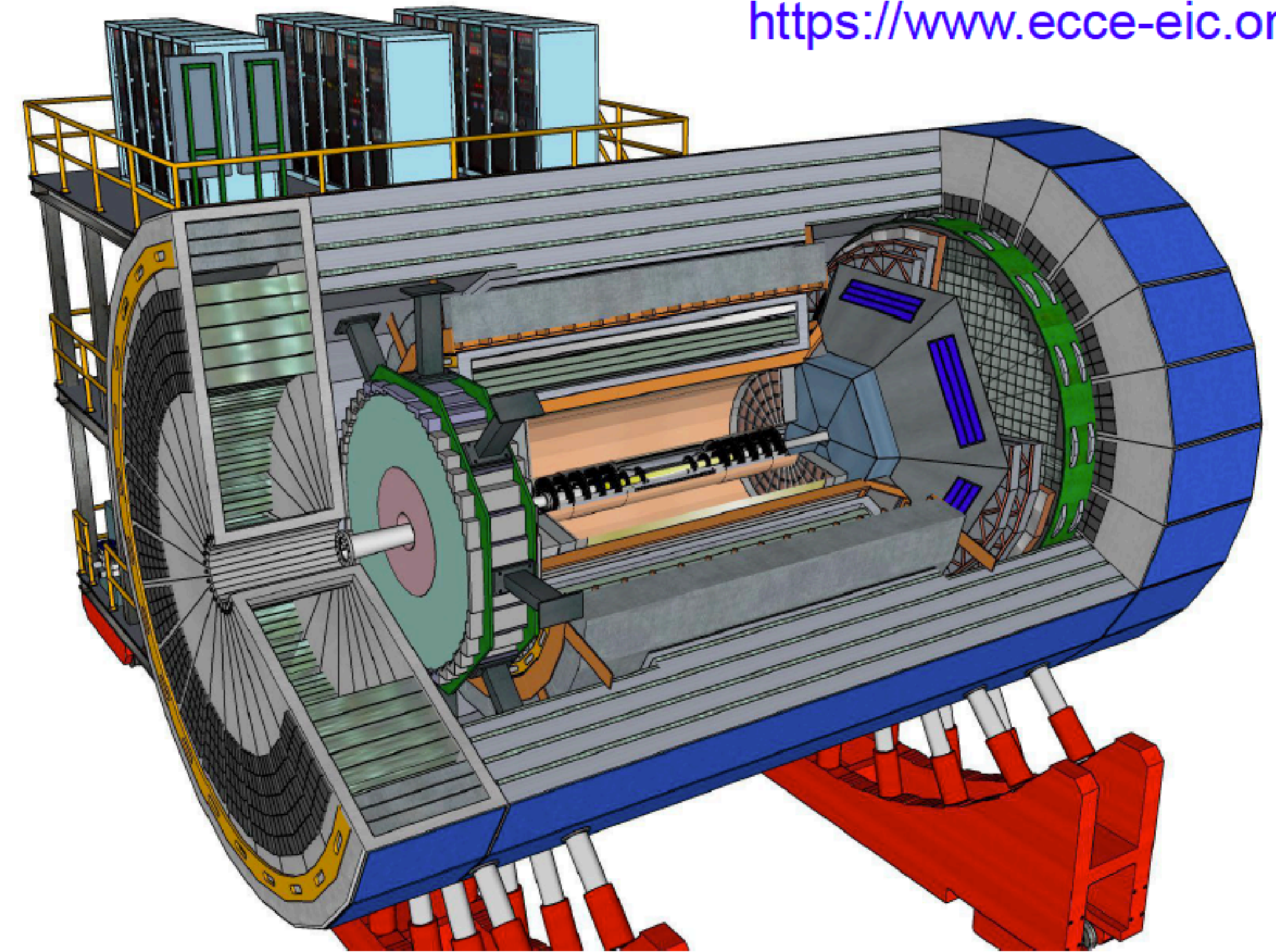
- First simulation campaign with June 2021 concept almost finished
 - ~150M events on disk, ready to analyze
- Data is distributed through S3 at BNL and XRootD at JLab
- No account needed, can run terminal commands to download data (e.g. ntuples, please ask us about DSTs) directly to your computer
- [Wiki](#) page has information about how to access data and what production data is already available.
- [Tutorial](#) available to start from scratch to analysis in ~20 minutes

Machine Learning and AI



- Dedicated ML/AI working group within ECCE that is highly active
- Detector design with AI/ML
 - Tracking detectors
 - DIRC for PID
 - Calorimetry with e.g. clustering
- Ongoing developments with
 - e.g. track finding, pattern recognition

<https://www.ecce-eic.org>



See dedicated ML/AI talks this week for more information

Workshops, Tutorials, Documentation

- Three simulation [workshops](#) with many recorded tutorials
 - Analysis modules, accessing data, building a detector...
- Other tutorials and documentation available on our [website](#) and GitHub [repository](#)
- Weekly office hours with computing experts for additional help, see e.g. [here](#)
- Mattermost and Discourse channels available for discussion with developers and other users

Conclusions

- ECCE software stack has many available tools ready to use for Monte Carlo generation, full simulation, and analysis
- ~150M events from first ECCE simulation campaign are available for analysis
- Tutorials, recorded workshops, and documentation available to help you get started quickly
- Please let computing team know if you have questions! Available on email, mattermost, [discourse](#), etc. Please contact me or others for more info