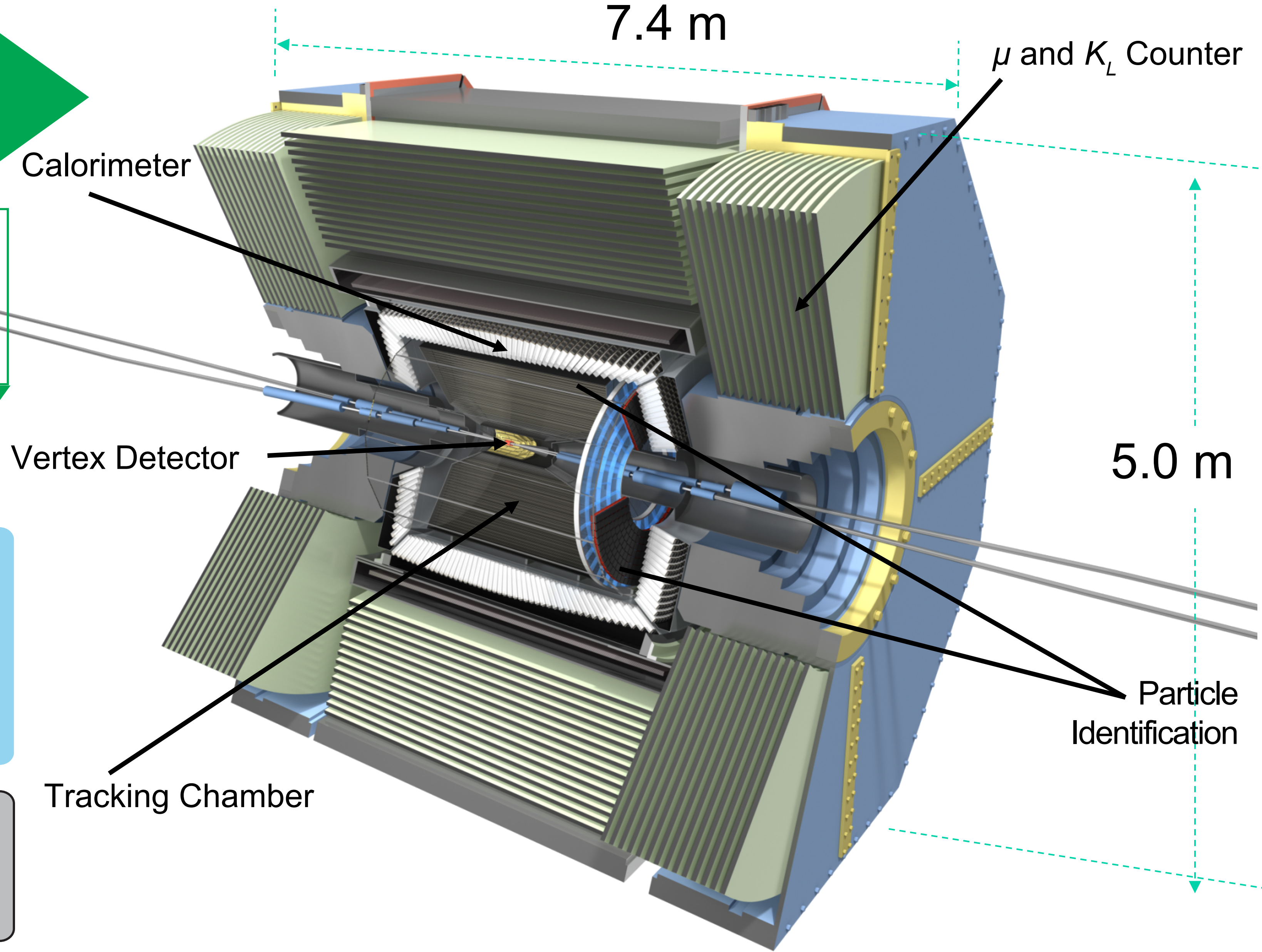




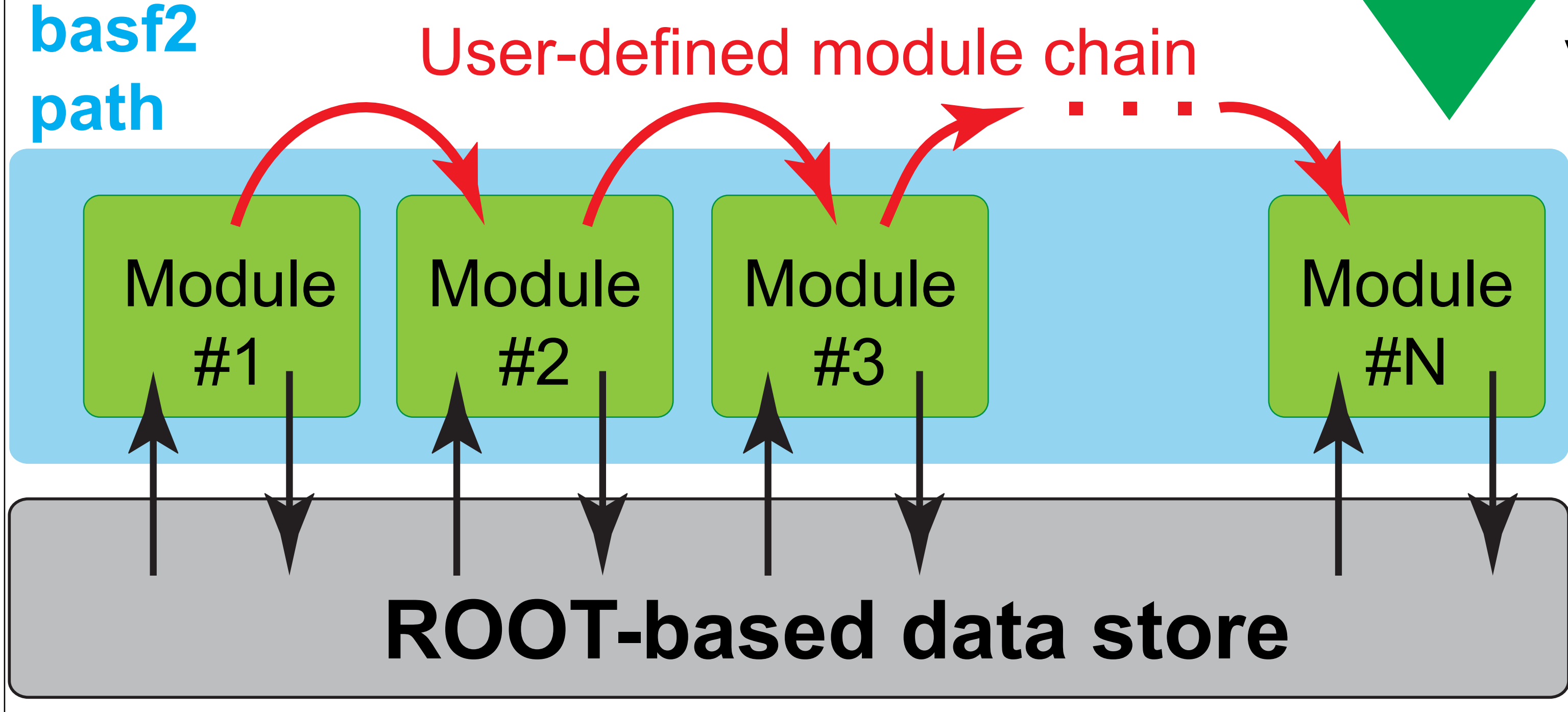
# The Simulation Library of the Belle II Software System

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**The Belle II experiment** at the SuperKEKB colliding-beam  $e^+ e^-$  accelerator in Tsukuba, Japan, will study the behaviour and symmetry properties of heavy quarks and leptons.

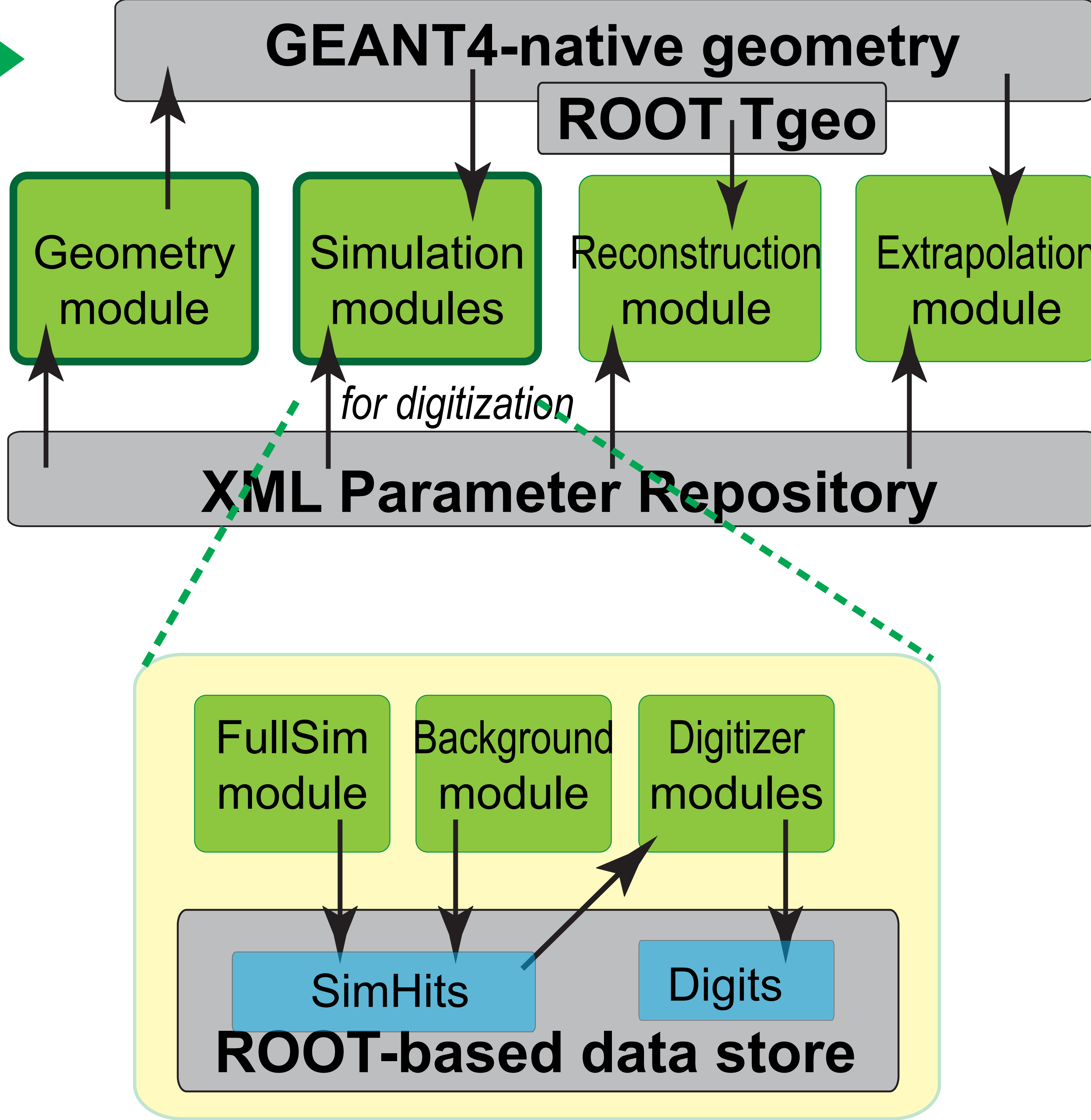


**The Belle II software framework basf2** is a modular framework with Python steering of on-demand dynamically-loaded C++ modules and inherent event-based parallel-processing capability.



**The Belle II simulation** is based on GEANT4.9.6 pl 2.

- \* All geometry parameters are stored in central XML repository.
- \* GEANT4-native detector geometry created by **Geometry** module.
- \* VGM converts to ROOT TGeo geometry for track reconstruction.
- \* GEANT4-native geometry is used for outward track extrapolation.



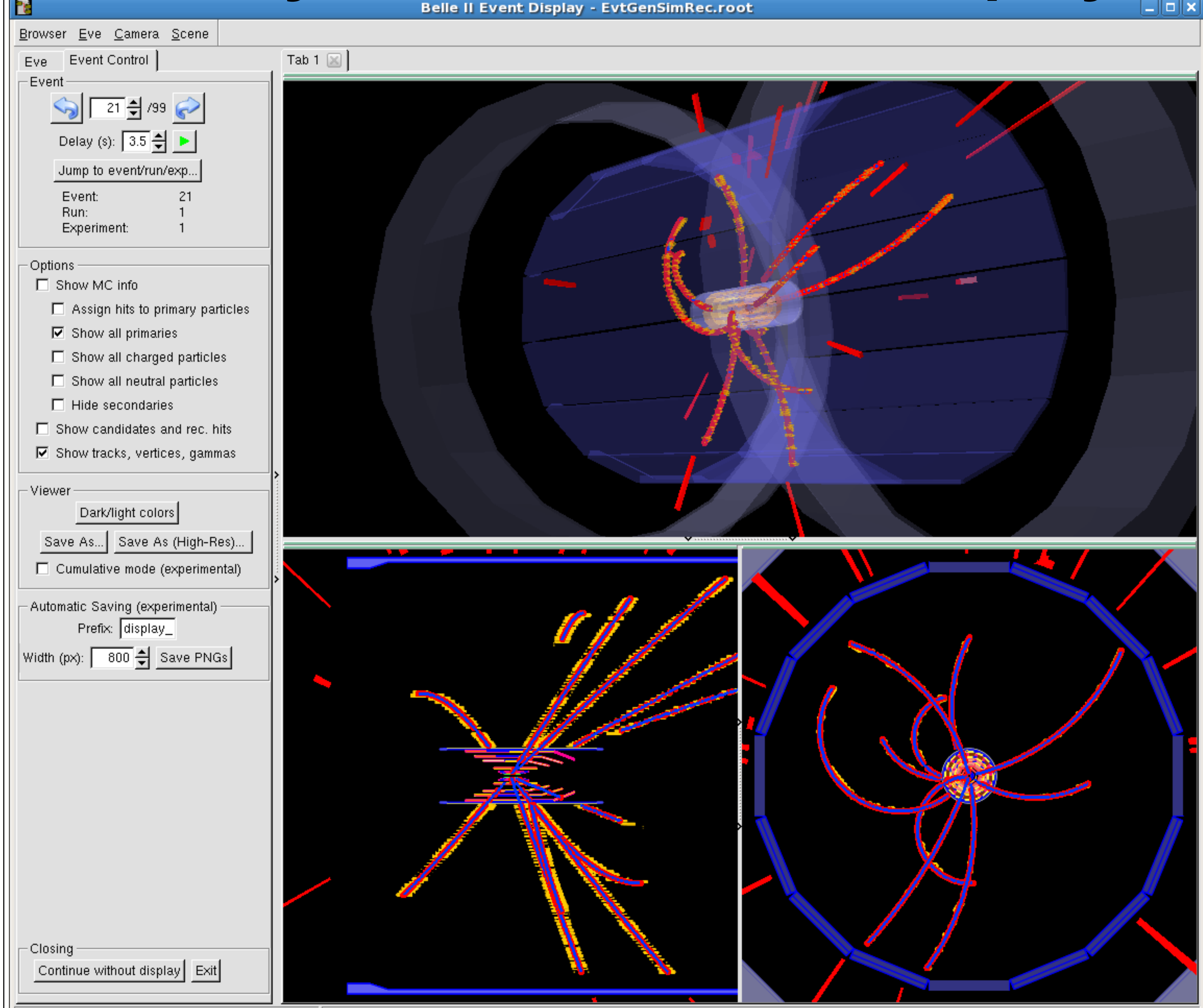
```

Main Steering File
from basf2 import *
main = create_path()
# event meta data
main.add_module(event_meta_demo)
# generator (evtgen, particle gun, etc.)
...
# simulation
...
# reconstruction
...
# output
...
process(main)

Simulation Steering File
from basf2 import *
# geometry parameter database
...
# detector geometry
...
# detector simulation
...
# background mixing
...
# PXD simulation (digitization, clustering)
...
# SVD simulation (digitization, clustering)
...
# Other sub-detectors here.
...

```

## Geometry browser & event display



**Background-hit mixing** adds pre-simulated minimum-bias hits to the event's SimHits. These hits arise from Touschek, radiative Bhabha, beam-gas, beam-wall and other background processes.

- Several event generators are supported:**
- \* EvtGen 1.3.0 with TAUOLA and PYTHIA8 interfaces
  - \* PHOKHARA 9.1 and KKMC for radiative electron-positron annihilation
  - \* BHLUMI and BHWIDE for radiative Bhabha scattering
  - \* BabayagaNLO for QED processes including two-body final state
  - \* KORALW for four-body final states
  - \* AAFH for two-photon physics
  - \* MADGRAPH for dark-photon and other exotic studies
  - \* SGCosmic for cosmic-ray tracks
  - \* ParticleGun for debugging