

A Discussion on the Integration of Agora Software and FCCSW

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Agora physics and detector meeting

Sept. 2nd, 2026

FCC-ee Software Stack Overview (1)

- ❖ **k4geo** — DD4hep geometry repository for FCC-ee detectors

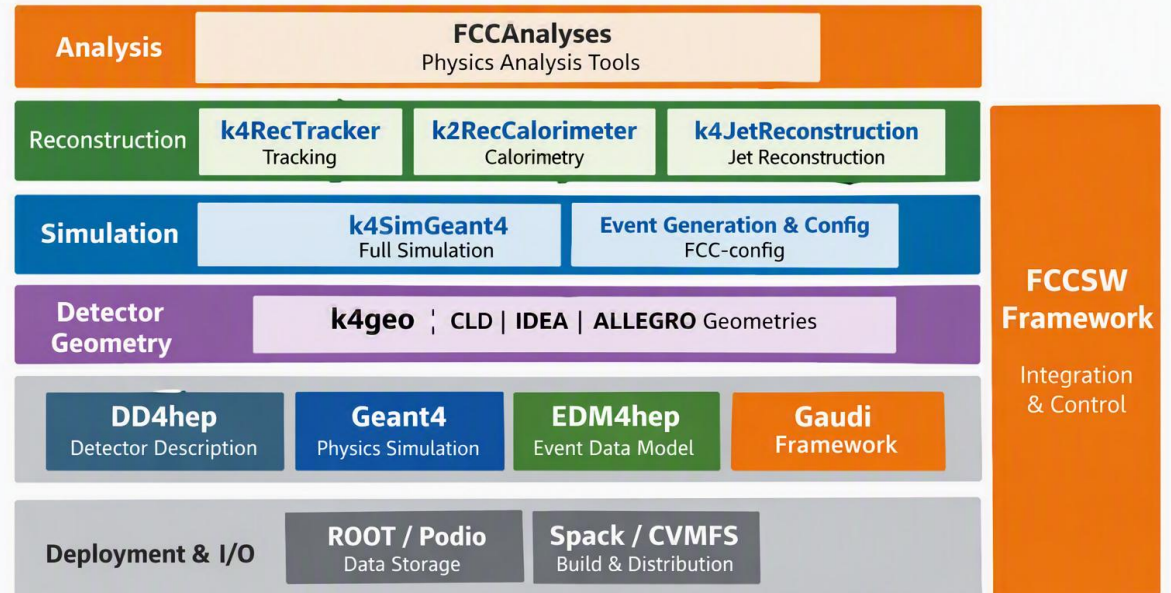
- CLD
- IDEA
- ALLEGRO

This layer provides the full detector description used by simulation and reconstruction.

- ❖ EventProducer — event generation utilities
- ❖ **k4SimGeant4** — DD4hep → Geant4 conversion and full simulation

This layer handles particle transport, hit generation, and digitization

FCC-ee Software Stack



- ❖ **k4RecTracker** — full tracking chain
- ❖ **k4RecCalorimeter** — calorimeter clustering and energy reconstruction
- ❖ Jet Reconstruction
 - **k4JetReconstruction** — FastJet interface
 - **TrackToPFOConverter** — tracks → PFOs

This layer transforms simulated hits into physics objects (tracks, clusters, PFOs, jets).

FCC-ee Software Stack Overview (2)

❖ Analysis Layer

- FCCAnalyses — official analysis framework for FCC physics studies

This layer provides tools for physics object selection, event-level analysis, and plotting.

❖ FCCSW — FCC-specific software framework

- orchestrates geometry loading
- configures simulation and reconstruction
- manages data flow between Key4HEP components

FCCSW is the glue that binds the entire FCC-ee software stack together.

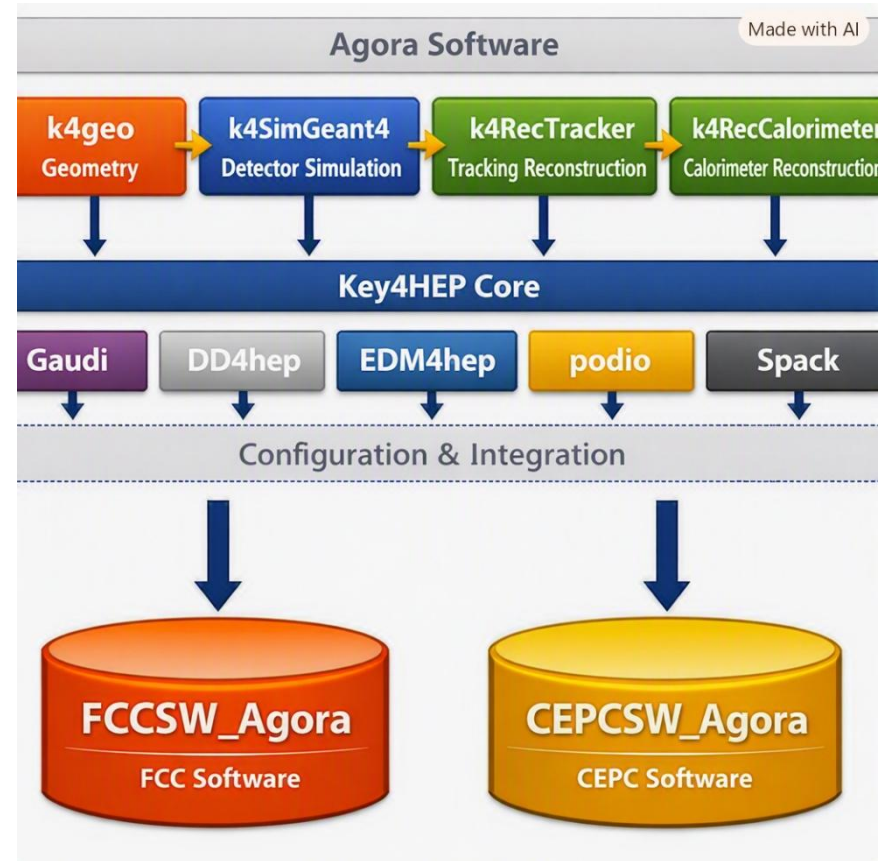
A proposal for integration

❖ Module-to-Component Mapping

- CEPCSW Geometry → k4geo — built on DD4hep for detector description.
- CEPCSW Simulation → k4SimGeant4 — connects Geant4 with DD4hep geometry.
- CEPCSW Tracking → k4RecTracker — uses Gaudi algorithms and EDM4hep tracks.
- CyberPFA → k4RecCalorimeter or CyberPFA → k4CyberPFA — reconstructs calorimeter hits and clusters.

❖ Experiment software

- Key4HEP Core → Configuration & Integration — orchestrates module linking and experiment setup.
- Configuration → FCCSW_Agora or CEPCSW_Agora — glues components into experiment software.



Strategies and comments

- ❖ We will divide the current CEPC software into several parts. Since the geometry access, simulation, and reconstruction [interfaces differ between FCC and CEPC](#), the software will need to be adjusted during this process.
- ❖ Firstly, we will [begin with one sub-detector as an example](#) and build the simulation and reconstruction chain within the FCCSW framework to create a prototype. To accelerate the development of this prototype, we will use AI to assist the process.
- ❖ Once the prototype is in place, colleagues can follow this example and begin [working on other sub-detectors in parallel](#).
- ❖ Finally, we will [put the new software components into the Key4HEP Git repository](#). Before doing that, we need to discuss with both the FCC and Key4HEP teams and obtain their permission.
- ❖ The entire transition may take quite some time. During this period, we will [continue maintaining the current CEPCSW software](#), and physics analyses will rely on it to produce MC samples and perform analysis.

Thank You !