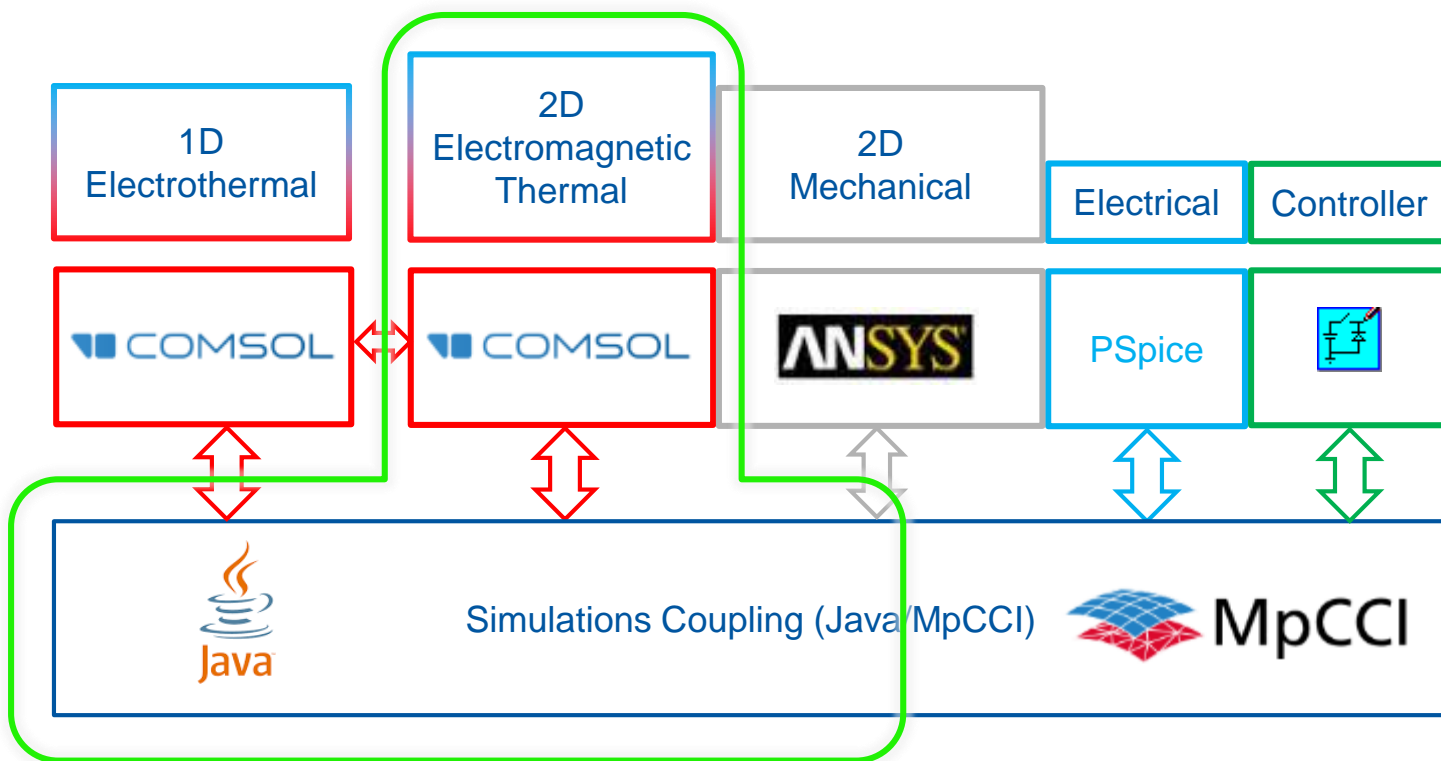# STEAM user perspective

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Scope

FEM model construction and magnetic field calculation of MQXF (Inner Triplet quadrupole magnet in HL-LHC)
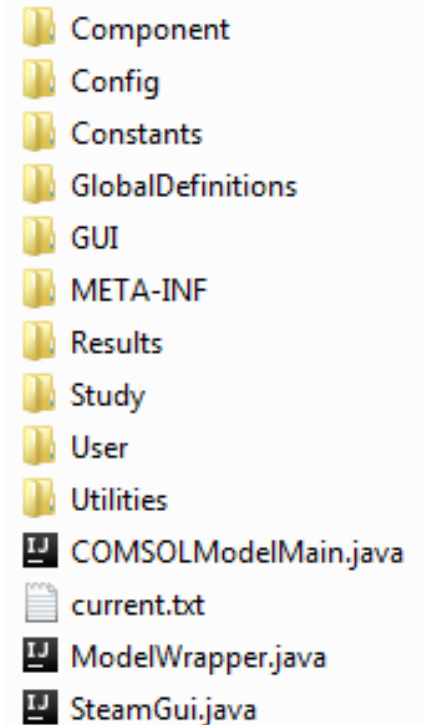
FEM model construction of a magnet in STEAM. Overview

FEM model construction in Java code

- **Use of GitLab as software repository**

- **Use of IntelliJ IDEA as development environment**

Compilation into a COMSOL model

COMSOL_model. mph

- **Project folder structure**

- Component
- Config
- Constants
- GlobalDefinitions
- GUI
- META-INF
- Results
- Study
- User
- Utilities
- COMSOLModelMain.java
- current.txt
- ModelWrapper.java
- SteamGui.java

Example of coil construction in STEAM

Relevant scripts involved

COMSOLModelMain.java
ModelWrapper.java
Input.java
Cable.java

STEAMconfig.json for the COMSOL model path (and other model options)

Steps

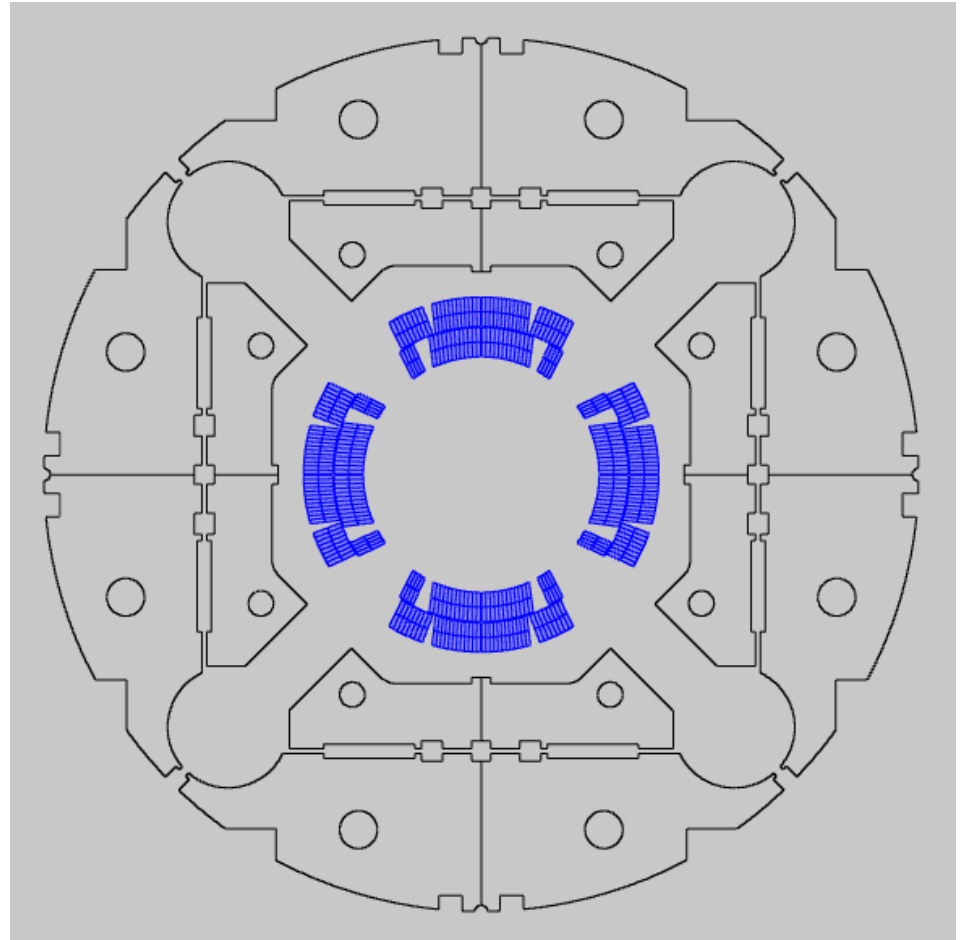- Definition of geometrical objects
Points
Lines/Arcs
Areas
- Definition of windings
- Definition of coils

Geometry documentation for FEM model construction of a magnet in STEAM.

MQXF FEM model construction

Elements

- **Coils**

- **Iron yoke**

- **Iron pads**

- **Holes**

- **Insulation**

- **Wedges**

- **Surrounding air**

Magnetic field calculation for MQXF in COMSOL

Steps

- **Add transient study**

- **Add mesh**

- **Set ramp up current**

- **Set solver parameters**

Time=1.65E5 s   Surface: Magnetic flux density norm (T)   Contour: Magnetic vector potential, z component (Wb/m)