1. Block 4.2: CS6514: Software Architecture Design Portfolio

Fluctuating Finite Element Analysis (FFEA) Case Study

Art Ó Liathain

September 2025

2. Table of Contents

Contents

List of Figures

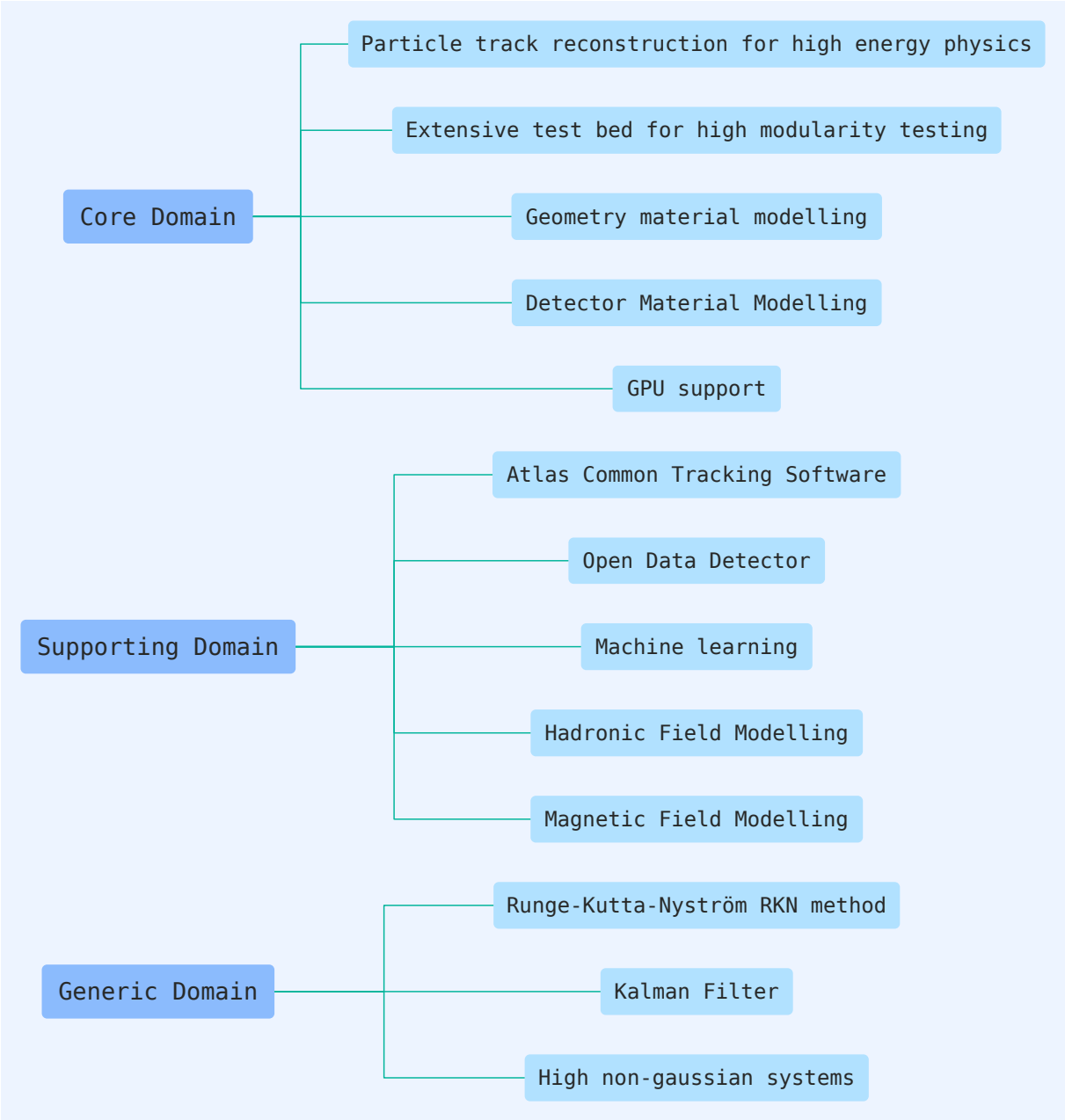
3. Tech Stack

Main Language: C++

Heavily used external libraries: Eigen, boost, cmake

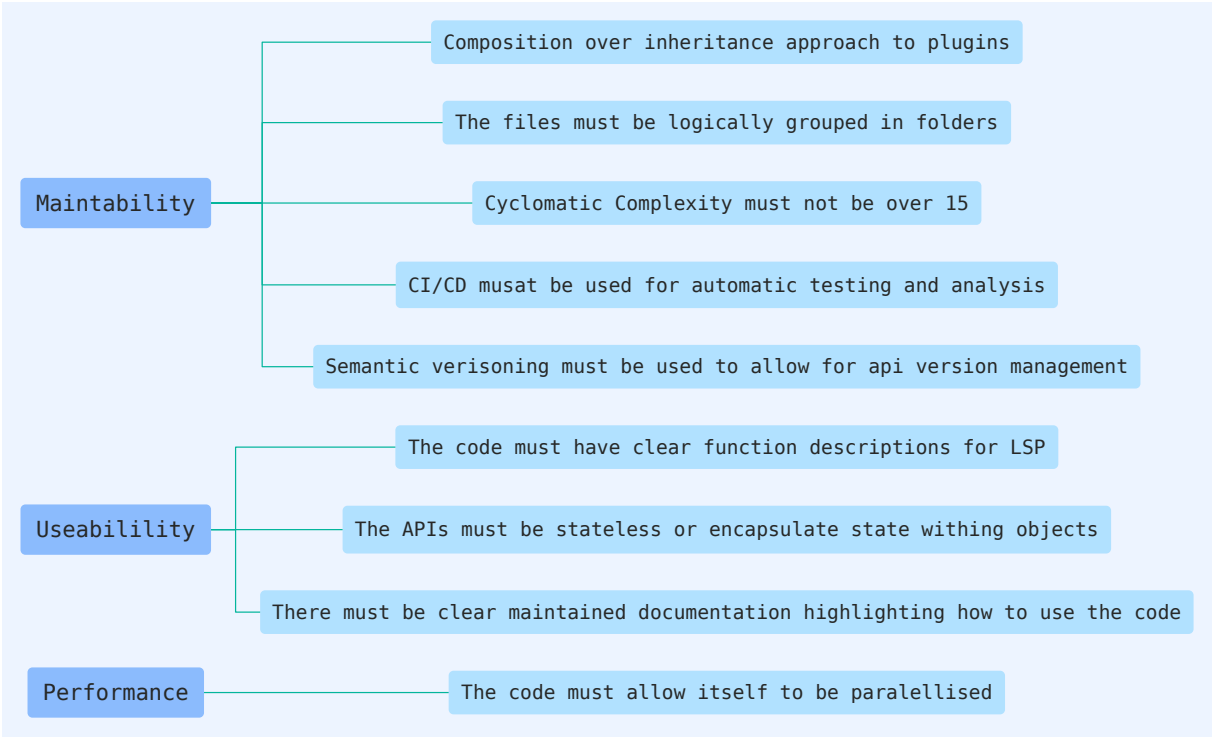
Used for example scripts: Python bindings using pybind11

Containerisation: Docker



Listing 1: Domain Model

4. Utility Tree



Listing 2: Utility Tree

5. Use Case Diagram

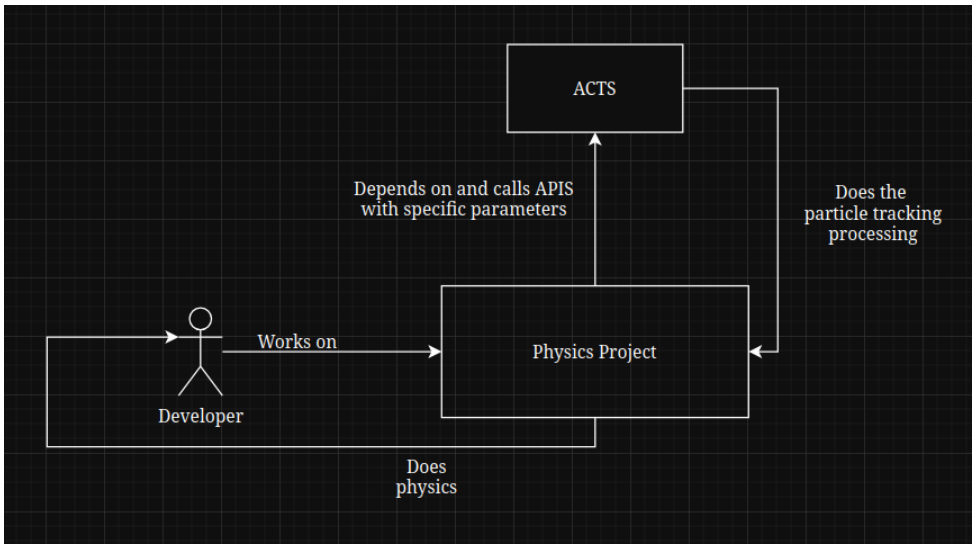
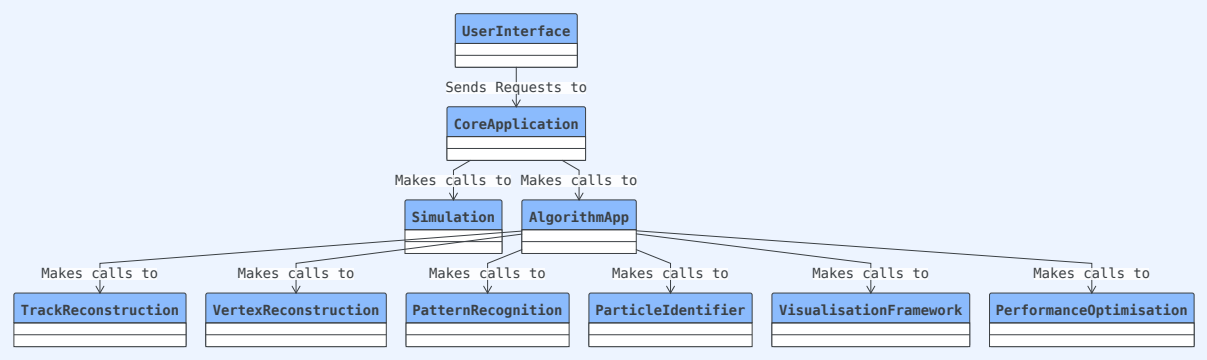


Figure 1: Use Case Diagram

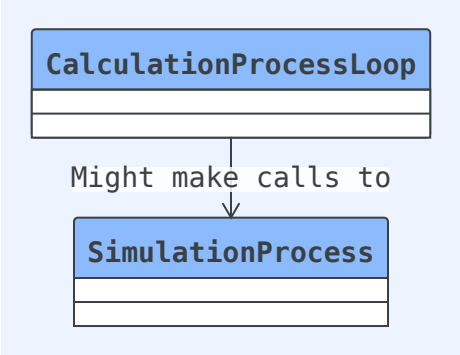
6. 4+1 Diagram

6.1. Logical View



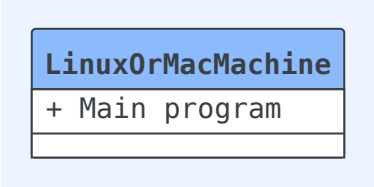
Listing 3:

6.2. Process view



Listing 4: Process view

6.3. Physcial View



6.4. Development View

- There are two layers of folder organistion in the codebase. The first is include/ and src/ follwing that there are logical groupings such as Geometry/ but there are some subfolders with a high file count befitting another layer of depth which is not in place. Geometry/ has over 30 files flat
- There is a consistent commit structure and rule
- Integration tests are loosely handled in

7. Codescene

Figure 2: Dependency Coupling Graph

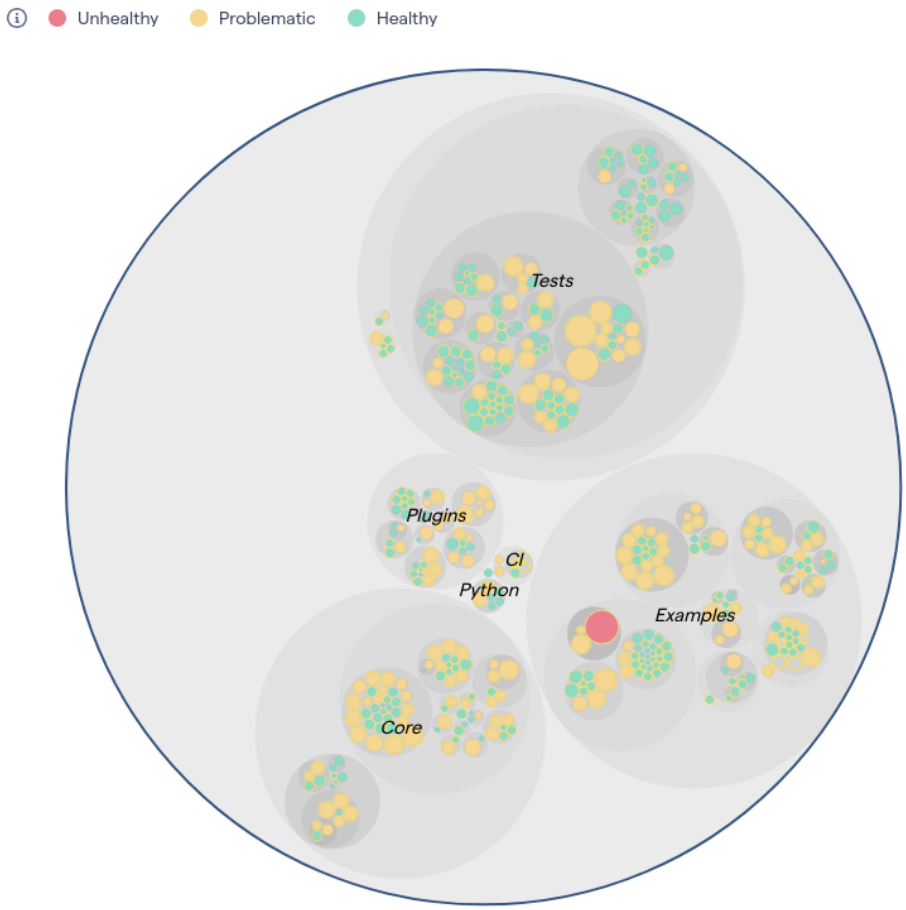


Figure 3: Technical Debt Codescene

8. Understand

Figure 4: Understand High Level Info

Figure 5: Understand complexity ratings

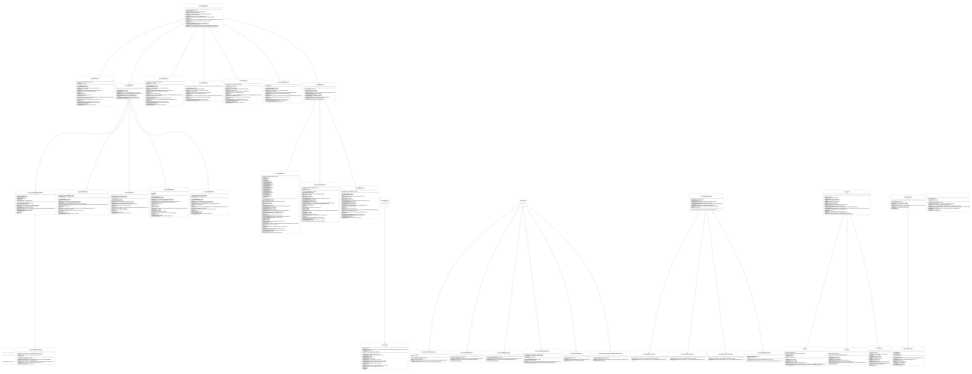


Figure 6: Class Diagram Inheritance

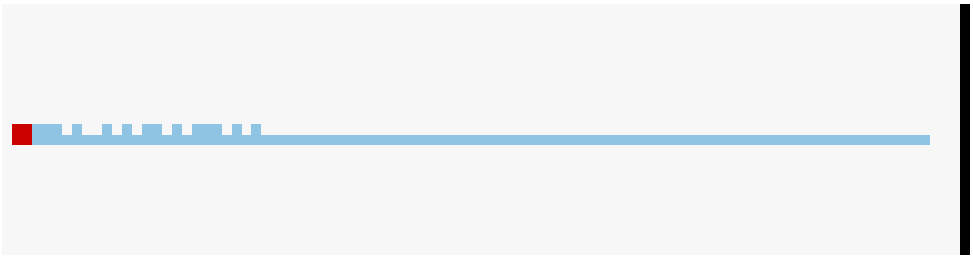


Figure 7: Class Diagram flat

9. Sonarqube

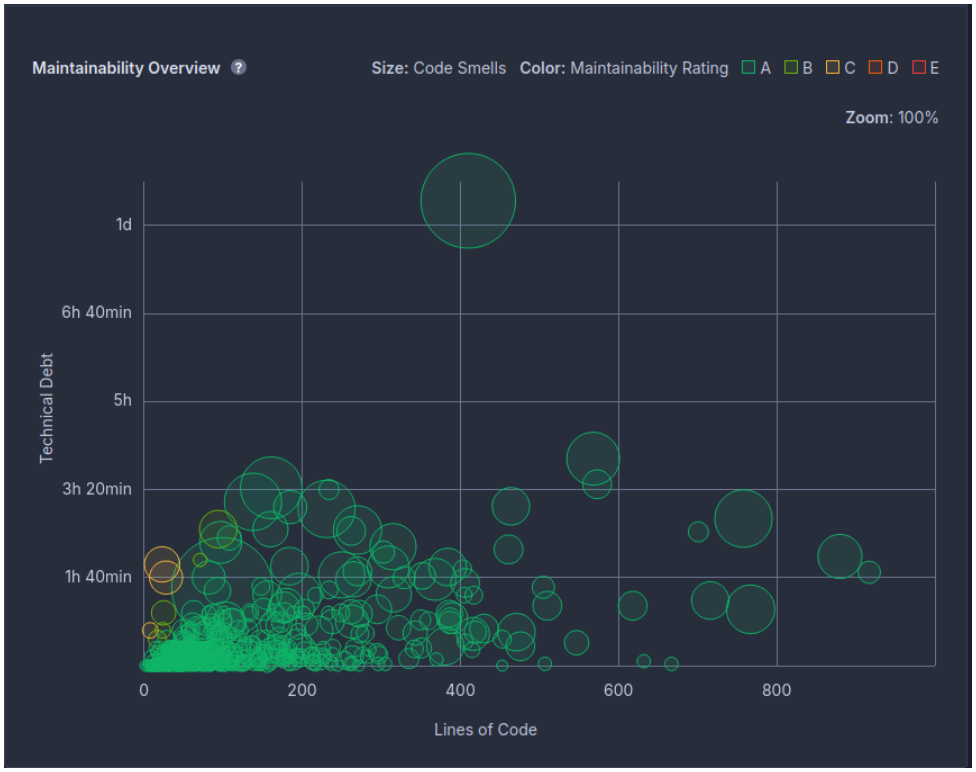


Figure 8:

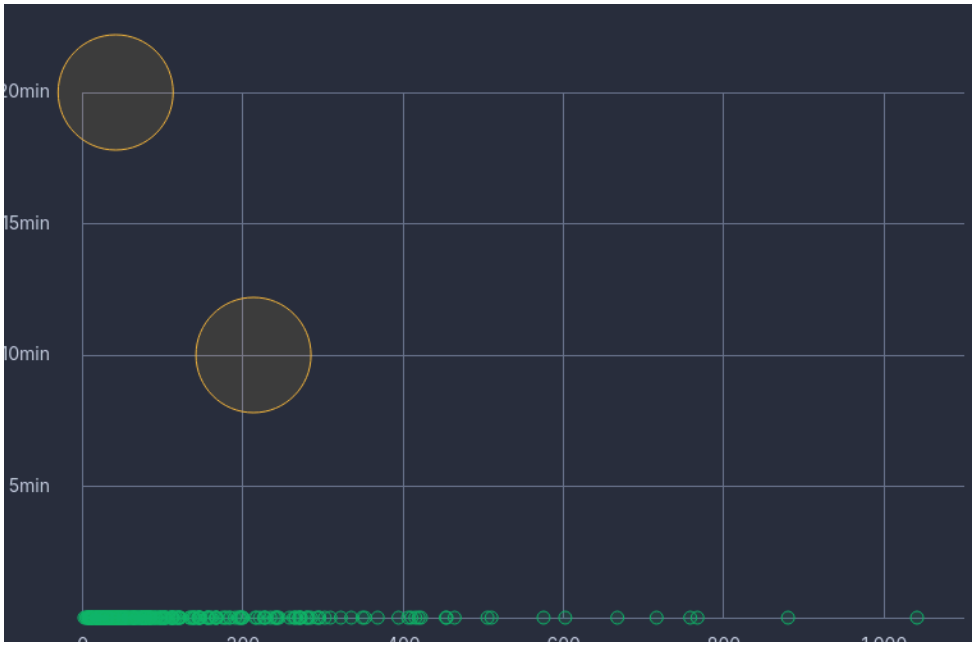


Figure 9:

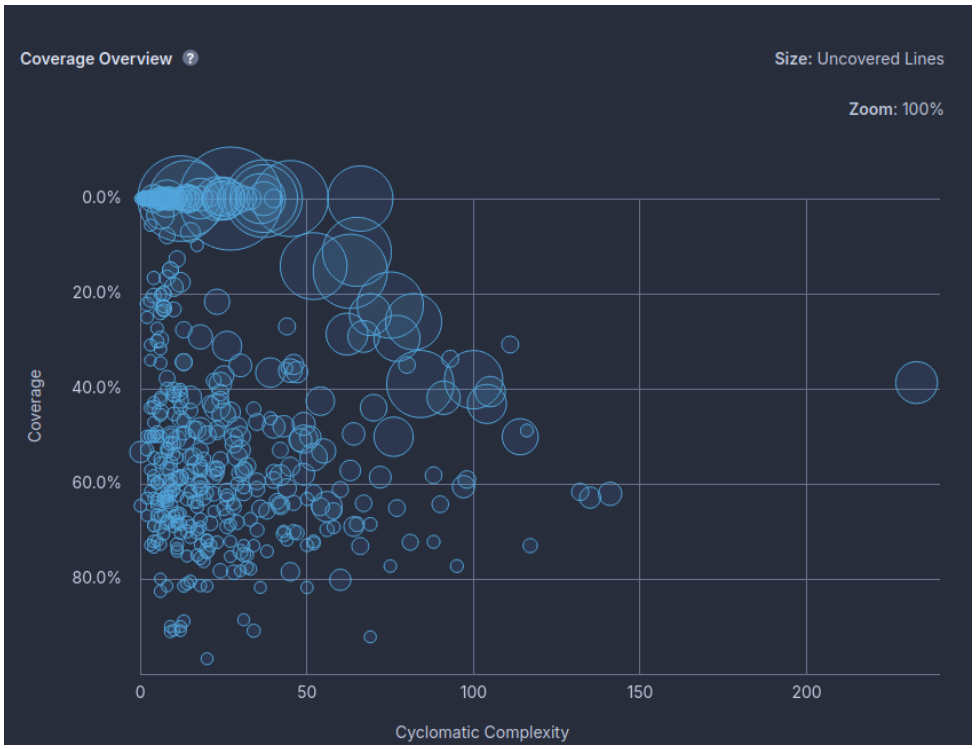


Figure 10:

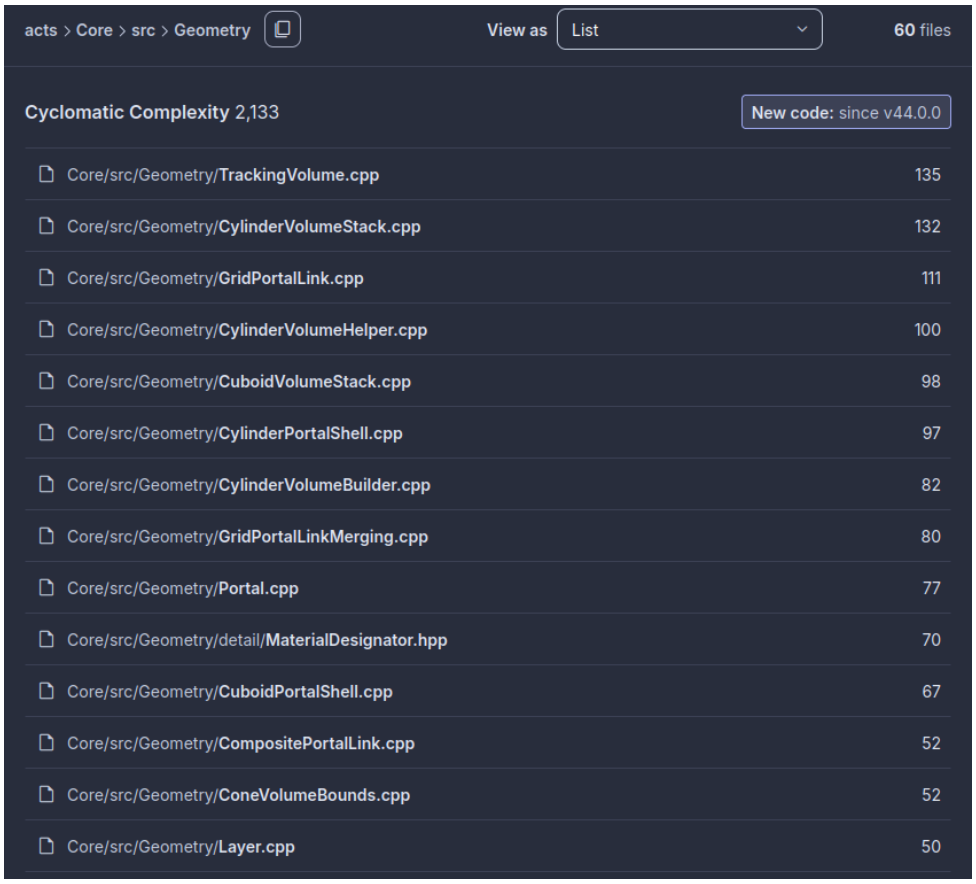


Figure 11:

10. C4

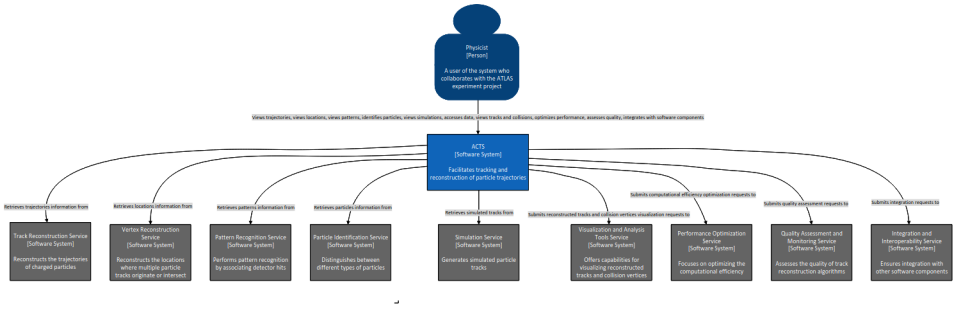


Figure 12: Context Diagram

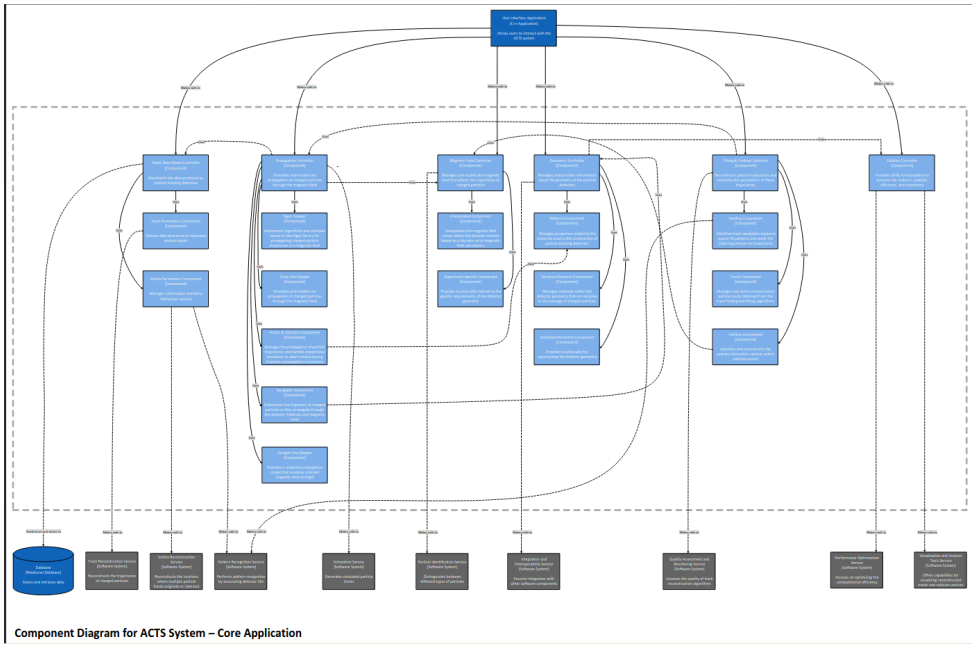


Figure 13: Component Diagram

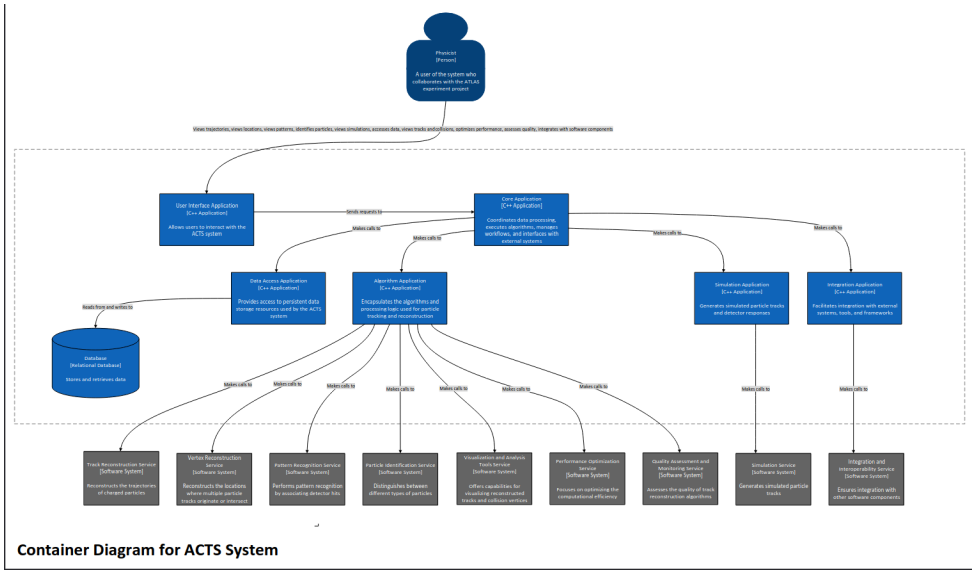


Figure 14: Container Diagram