

GEANT-4 GPU Port:

Software Requirements Specification

Volere Template, Edition 16

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1 Project Drivers

1.1 Purpose of Project

1.2 Stakeholders

2 Project Constraints

2.1 Mandated Constraints

2.2 Naming Conventions & Terminology

Throughout the document, “the project”, “the product”, and/or “the software” all refer to the modified GEANT-4 code that will run on a GPU. The “existing software” refers to the current GEANT-4 simulation program, including the modifications made by McMaster’s Engineering Physics department to suit it to their needs.

Refer to the following table for definitions of all domain-specific terms used.

Term	Description
GEANT-4	open-source software toolkit used by stakeholders to simulate the passage of particles through matter
GPU	graphics processing unit, well-suited to parallel computing tasks
CUDA	parallel computing architecture for general purpose programming, developed by NVIDIA

Table 1: Glossary

2.3 Relevant Facts and Assumptions

Placeholder

3 Functional Requirements

3.1 The Scope of the Work

3.2 Business Data Model & Data Dictionary

3.3 The Scope of the Product

The following table outlines the use cases for the product. Click the PUC # to go to its description.

PUC #	PUC Name	Actor(s)	Input/Output
1	Simulating Particles	Researcher	Simulation parameters (in), Distribution of particle's locations (out)

Table 2: Product Use Cases Summary

Descriptions of each PUC, referenced by PUC # are as follows.

1. The software will be used by researchers wishing to simulate large numbers of particles interactions with materials. The researcher sets simulation parameters, including the number of particles, their lifetime, and the material properties before running the simulation. On completion, the program gives back a map of where each particle travelled, so researchers can study where the particles are most probably to end up.

3.4 Functional Requirements

Placeholder

4 Non-functional Requirements

4.1 Look and Feel Requirements

4.2 Usability and Humanity Requirements

4.3 Performance Requirements

Requirement #: 4.3

Description: Decreasing the time it takes to run a simulation while maintaining identical results

Fit Criterion: Running a simulation with a given set of input parameters should complete significantly faster on the product as compared to the existing software. Both should have identical outputs.

Dependencies: None

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4.4 Operational and Environmental Requirements

4.5 Maintainability and Support Requirements

4.6 Security Requirements

4.7 Cultural Requirements

4.8 Legal Requirements

5 Project Issues

5.1 Open Issues

5.2 Off-the-Shelf Solutions

5.3 New Problems

5.4 Tasks

5.5 Migration to the New Product

5.6 Risks

5.7 Costs

5.8 User Documentation and Training

5.9 Waiting Room

5.10 Ideas for Solutions