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Assessment of Geant4 Maintainability with respect to Software Engineering References

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Maintainability is a critical issue for large scale, widely used software systems, characterized by a long life cycle. It is of paramount importance for a software toolkit, such as Geant4, which is a key instrument for research and industrial applications in many fields, not limited to high energy physics.

Maintainability is related to a number of objective metrics associated with pertinent characteristics of the software. We present an extensive set of these metrics, gathered over recent Geant4 versions with multi-threaded execution capability: they include estimates of the software size, complexity and object-oriented design features.

The collected metrics have been analyzed with various statistical methods to assess the status of Geant4 code with respect to reference values established in software engineering literature, which represent thresholds for risk. The assessment has been detailed to a fine grained level across Geant4 packages to identify potential problematic areas effectively, also taking into account specific peculiarities of different simulation domains.

The evaluation of the metrics suggests preventive actions to facilitate the maintainability of the toolkit over an extended life cycle.

Tertiary Keyword (Optional)

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Simulation

Primary Keyword (Mandatory)

Software development process and tools

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