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Perspectives for the migration of the LHCb geometry to the DD4hep toolkit

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The LHCb experiment uses a custom made C++ detector and geometry description toolkit, integrated with the Gaudi framework, designed in the early 2000s when the LHCb software was first implemented. With the LHCb upgrade scheduled for 2021, it is necessary for the experiment to review this choice to adapt to the evolution of software and computing (need to support multi-threading, importance of vectorization...)

The Detector Description Toolkit for High Energy Physics (DD4hep) is a good candidate for the replacement for LHCb own's geometry description framework: it is possible to integrate it with Gaudi and its features theoretically match what is needed by LHCb: in term of geometry description and detector description but also concerning the possibility to add detector alignment parameters and the integration with simulation tools.

In this paper we will report on detailed studies undertaken to compare the feature set proposed by the DD4hep toolkit, to what is needed by LHCb. We will show not only how the main description could be migrated, but also how to integrate the LHCb real-time alignment tools in this toolkit, in order to identify the main obstacles to the migration of the experiment to DD4hep.

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