

XML Technologies for Multilevel Modeling Specifications: Technical Background and Implementation

Timothy Wayne Cook, Luciana Tricai Cavalini

Abstract

Multilevel modeling has been proven in software as a solution for semantic interoperability of distributed healthcare applications, without imposing on any functionality requirements. The existing multilevel modeling implementations have demonstrated the existence of a multiplicity of perspectives on each concept, thus precluding the achievement of global consensus for a maximal data model. The Multilevel Healthcare Information Modeling (MLHIM) specifications have adopted XML technologies as the basis for the implementation of its Reference Model (RM) and Domain Model (DM), since XML technologies are consistent across all platforms and operating systems, with tools available for all mainstream programming languages. By defining the RM in XML Schemas 1.1, the continuity is clear that the Domain Model, expressed as Concept Constraint Definitions (CCDs), are restrictions of those complexTypes from the MLHIM RM. CCDs provide the semantic interpretation of the objects persisted according to the RM on native XML and other types of NoSQL databases, also guiding the generation of application GUIs through adapted XForms tools. MLHIM-based application data can be queried by using XML technologies, or other alternatives such as RDF stores using SPARQL. This paper presents the implementation of the MLHIM RM in XML Schemas as well as a set of examples of CCDs generated from the United States National Cancer Institute Common Data Elements (NCI CDE) repository. By adopting XML technologies for the implementation of the multilevel healthcare information modeling principles, the MLHIM specifications provided application developers with a significant amount of industry experience and a wide array of tools.