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Using Knowledge Graphs to Detect Enterprise Architecture Smells (Extended Abstract)

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With the increasing complexity of today's enterprises, creating, using, and maintaining a model representation thereof becomes increasingly challenging. Enterprise Architecture (EA) provides with the modeling language ArchiMate a high-level view of different enterprise domains. Naturally, with the increasing complexity of the modeled system, the complexity of the model itself increases. Although EA modeling is widely adopted, the analysis of EA models is surprisingly underrepresented [Ba19]. Therefore, we have proposed in previous research to automatize the analysis of EA models [SB21b].

The value of EA models is threatened by different shortcomings, which we addressed in the underlying article to this abstract [SHB21] by concentrating on the use and maintenance of EA models. In particular, we automatically analyzed large EA models with the aim to detect *EA Smells* [SH20]. EA Smells are inspired by Code Smells, which are a common means to indicate possible Technical Debts [Cu92]. Generally, a smell describes a qualitative issue that effects future efforts and not the functionality. While Code Smells analyze source code, EA Smells holistically analyze an organization, beyond a technical scope. Hitherto, first EA Smells and tool prototypes have been proposed [SH20].

To allow the analysis of other EA models than ArchiMate, we generalized the EA model to a Knowledge Graph (KG) [Fe20] and provide queries representing respective EA Smells. Hence, the detection of EA Smells can be applied to all EA models, which can be represented as a KG. We proposed a *generic* and *extensible* platform that facilitates the transformation of conceptual models into KG representations (CM2KG [SB21a]) which has been instantiated for EA models (see Fig. 1). Once a transformation is realized, the existing EA Smells queries can be efficiently executed on large models.

We evaluated our approach with 369 openly available ArchiMate models [LC20]. For the feasibility, we found all implemented EA Smells in the data set. We further showed, that 78.38% of the EA models had at least one smell, that 45.82% of the models had at most two smells, and the majority of the EA models had three or more smells. Regarding the performance, we found our approach stable for more than 1000 elements (nodes and edges). While the model transformation time remains stable even for large KGs with an average

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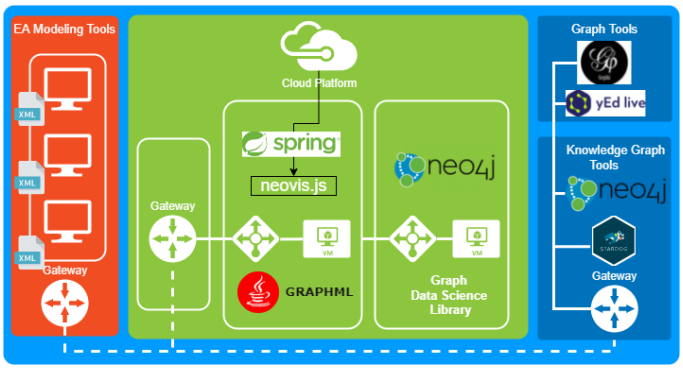

Fig. 1: Platform architecture to transform EA models into KGs for EA Smell detection (cf. [SB21b]).

time of 7.46ms ±23.85ms, the query execution time naturally increases with the size of the KG with an average of 786.31ms ±1044.09ms.

In our future work, we extend the catalog of EA Smells and conduct empirical experiments with enterprise architects. We take this work as a foundation for an entire stream of research that concerns *i*) embedding conceptual modeling knowledge into Knowledge Graphs, *ii*) applying advanced reasoning techniques on the KG, and *iii*) realizing tool support (either as stand-alone service or integrated in EA tools like Archi). CM2KG can be used via `http://me.big.tuwien.ac.at/` and as an Archi plugin [Gl22].

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