# Ontology Matching Techniques for Enterprise Architecture Models

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**Abstract.** Current Enterprise Architecture (EA) approaches tend to be generic, based on broad meta-models that cross-cut distinct architectural domains. Integrating these models is necessary to an effective EA process, in order to support, for example, benchmarking of business processes or assessing compliance to structured requirements. However, the integration of EA models faces challenges stemming from structural and semantic heterogeneities that could be addressed by ontology matching techniques. For that, we used AgreementMakerLight, an ontology matching system, to evaluate a set of state of the art matching approaches that could adequately address some of the heterogeneity issues. We assessed the matching of EA models based on the ArchiMate and BPMN languages, which made possible to conclude about not only the potential but also of the limitations of these techniques to properly explore the more complex semantics present in these models.

Enterprise Architecture (EA) is a practice to support the analysis, design and implementation of a business strategy in an organization, considering its relevant multiple domains. In recent years, a variety of Enterprise Architecture [5] languages have been established to manage the scale and complexity of this domain. Integration of EA models is necessary to support EA processes, however structural and semantic heterogeneities hinder integration. Ontology matching has been proposed as a useful technique to help address this challenge [4]. Ontologies and associated techniques are increasingly being recognized as valuable tools in the EA domain (e.g., [1]).

To evaluate the applicability of ontology matching techniques to address the heterogeneity between EA models, we have selected four case studies that demonstrate heterogeneity challenges at the model level. Cases 1 and 2 showcase *Abstraction Level Incompatibilities* between models encoded in different languages (ArchiMate and BPMN), that represent similar situations. Cases 3 and 4 illustrate both *Abstraction Level* and *Element Description* heterogeneties between models using the same language, where both pairs of models represent the same situation encoded by different modelers.

To support the matching tasks we have used AgreementMakerLight (AML) [2],

an ontology matching system that is extensible and implements several state of the art ontology matching algorithms. We extended AML to produce subclass mappings. The generated alignments were manually evaluated.

The four case studies and their matching using a combination of ontology matching algorithms illustrate the challenges and opportunities in their application to addressing EA heterogeneities. As expected, string and word based techniques are effective at capturing the mappings between equivalent individuals who share similar names. However, when equivalent individuals had dissimilar labels, for which WordNet extension did not produce any shared synonyms, the applied algorithms failed. Regarding *Abstraction Level Incompatibilities*, the results were related to the complexity of the models. In simpler model matching tasks, the Subclass Matcher approach had a good performance, identifying 75% of the subclass mappings. However, in more complex tasks performance is reduced. Since the evaluated approaches relied only on model information to perform matching, there was no practical difference between matching models using the same or different languages.

We consider that the main limitation of the employed matching techniques was their inability to explore a considerable portion of the information modelled in the ontologies. In order to extend the application of ontology matching techniques to the EA domain, ontology matching systems need to be able to explore this semantic richness by producing semantic matching approaches that go beyond current strategies which are mostly WordNet based [3]. In recent years, ontology matching systems have had a growing interest in terms of reasoning capabilities, and we propose that a combination of these strategies with pattern-based complex matching approaches [6] may provide improved solutions to the EA model integration challenge.

## References

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