

Automating the Migration of Enterprise Architecture Models

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ABSTRACT

The evolution of Enterprise Architectures (EA) is the result of applying EA development projects within organizations with the goal of accomplishing specific business requirements. Recent approaches seek to automate and improve EA practice within organizations by employing EA management tools. Thus, evolving the organization's EA meta-model is a consequence of fulfilling such initiatives. Currently, the migration of EA models conforming to a specific EA meta-model evolution is a manual task in which EA data corresponding to the actual models is gathered and the models re-designed. This results in an error-prone and time-consuming task. To address this issue, the authors propose a set of migration rules to automate the migration process. The proposed migration rules were implemented within an EA tool and then demonstrated and validated using a fictitious organization migration scenario.

KEYWORDS

ArchiSurance, EA Meta-model, EA Migration, EA Models, EA Tool, Lifecycle, Meta-model Evolution, Migration Rules

INTRODUCTION

In Enterprise Architecture management (EAM), EA models are structured, object-oriented models conforming to an organization-specific meta-model that evolves over time. The data regarding these object-oriented models is stored in EA repositories used by EA software tools to aid in the EAM tasks.

EA meta-models specify the information about EA concepts, i.e., the elements and relationships, which will be used to represent and/or model the organization (Sabine Buckl & Ernst, 2007).

EA development projects start with the definition of a set of concepts that will be used to represent and/or model the organization. These concepts, such as the ones presented in EA frameworks as TOGAF® (The Open Group, 2009) or notations like ArchiMate® (The Open Group, 2013), are used or proposed, as in domain-specific languages (Ulrich Frank et al., 2009).

Since EA projects are very ambitious, the idea of starting with a simplified meta-model and enriching it while growing within the organization is appealing. However, addressing these projects implies that EA meta-models are supported as living artifacts that evolve according to the organization's needs (Tribolet, Sousa, & Caetano, 2014). Furthermore, each EA project, being an EAM process, is supported by three central tasks: **documenting** the current state of the organization's architecture, **envisioning** the future perspective of the architecture, and **planning** different intermediate architecture

scenarios deciding on an architecture roadmap (Sabine Buckl, Ernst, Matthes, & Schweda, 2009). From these tasks, one derives the transformation from the *AS-IS* EA state to the envisioned *TO-BE* state.

This transformation occurs in cycles, over and over again. Usually, the meta-models and concepts used to model the first *AS-IS* are no longer enough to model the current *AS-IS* or even the current *TO-BE*. For example, an organization wants to reformulate its business model by changing, deleting and creating new business concepts. The current information systems architecture that supports the *AS-IS* and, supposedly, the *TO-BE* business cannot be adapted in any way. Thus, the organization's EA needs to be drastically re-designed not only business-wise but also in terms of the information systems that will support the *TO-BE* business. Migrating all these changes can lead to many issues.

All the issues that result from performing this challenging task have to do with uncoordinated, ad hoc decisions concerning EA components and their interrelationships resulting in the duplication of efforts and resources, poor coordination and control, management and business performance issues, and inefficiencies in operation (Kaisler, Armour, & Valivullah, 2005). Therefore, co-evolving the EA meta-model and its models by stepwise adaptation, i.e., evolving the meta-model together with (the migration of) its instance models, can lead to an error-prone task as well as become time-consuming (due to duplication and poor coordination of manual effort).

Consequently, the EA model migration poses resistance to the incremental approach of EA practice within organizations. As a result, the research problem can be identified as follows: **The process of migrating EA models using stepwise EA meta-model evolution is error-prone and time-consuming.**

With regard to the above-mentioned research problem, based on a Design Science Research Methodology (DSRM) iteration (Hevner, March, Park, & Ram, 2004) the authors proposed a set of nine migration rules specifications as an innovative, purposeful IS artifact that were then implemented in a commercial EA tool for automating the migration task of EA models when stepwise EA meta-model evolution takes place. Each migration rule specification is an adaptation of Wachsmuth's research (Wachsmuth, 2007) in which he deduced a set of automatic co-evolution steps from well-defined evolution steps when evolving MOF¹ compliant meta-models.

The remainder of the paper is presented as follows: first, the authors present an overview on the state-of-the-art in what concerns enterprise transformation and meta-model co-evolution, as found in literature in "RELATED WORK". In "PROPOSAL", a description of each migration rule specification is made. Then, a stepwise evolution scenario is given in "DEMONSTRATION", showing the application of the proposed migration rules using the fictitious ArchiSurance case study and the EA tool in which the migration rules were implemented. Next, "EVALUATION" outlines a validation of the proposed migration rules. Finally, the research conclusions and themes for future work are presented in "CONCLUSION".

RELATED WORK

In this section, topics regarding enterprise transformation, a multi-purpose enterprise methodology, and meta-model co-evolution are brought up and discussed. Literature focusing on the co-evolution and co-adaptation of both EA meta-models and their respective models seems to be scarce. However, the model-driven community has thoroughly addressed this subject concerning object-oriented meta-models. Furthermore, research has been done with reference to EA evolution from a visual perspective. In the next sub-sections, the authors revisited these publications and highlighted the main aspects of each one.

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