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Analysis of Asset Specification Languages for Representation of Descriptive Data from MDE Artifacts

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Abstract

In order to improve the adoption of Model-Driven Engineering (MDE) Artifacts (e.g., design languages and associated model transformations), the literature points out that these elements need to be first shared in Knowledge Bases (KB) to be further downloaded, compared and integrated to software projects. A common concept used as pivotal representation between software artifacts and repositories is the Asset: structured information that provides standard taxonomies to catalog artifacts from different natures. In this work, we evaluated the applicability of concepts from two important asset specification languages on the representation of MDE artifacts: The Asset Management Specification (AMS) and the Reusable Asset Specification (RAS). Our contribution is a list of benefits and drawbacks from RAS and AMS to work as a pivotal language in KBs for MDE.

Keywords: Pivotal Language; Asset; Globalization of DSL; Model-Driven Engineering; Artifacts.

1. Introduction

Artifacts for Model-Driven Engineering (MDE), also referred as MDE settings[1], aim at producing software using (semi-) automatic tasks among many phases of software development processes. Examples are model transformations and Domain-Specific Languages (DSLs)[2]. Many of these artifacts have been developed for specific

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needs along more than 15 years. The options of artifacts to include in an MDE-based process has grown to the point that it is very difficult to decide which option meets specific needs[5]. Currently, all the information that could benefit the industry in applying MDE in practice is distributed among many documents, requiring a long time from software engineers to reach those options that best meet specific needs. Thus, in order to facilitate the access and retrieval of data associated with these artifacts, the literature of the area pointed out to the need of a Knowledge Base (KB)[6,14].

A possible solution to publish and download content from artifacts into a KB is through assets[7]. An asset is anything that provides reuse and value through a reference (link), cataloged with taxonomies, described by a set of properties and owning zero or more data about artifacts[8]. Assets have been used to describe software components[9], application and domain models[10] and, more recently, tools on the cloud in the context of MDE[11]. Thus, assets are important for playing a pivotal role between artifacts reusers (clients) and service providers (KBs for MDE).

We present an analytical study on the feasibility of the current technological support for a pivotal representation language for MDE. For instance, this language should be used together with KBs. Likewise, we executed an analysis of benefits and limitations in existing asset specification languages: Reusable Asset Specification (RAS)[7] and the Asset Management Specification (AMS)[8]. We compared these specifications, representing 37 assets for each language using two DSLs generated with the Eclipse EMF. This means that these assets are models. At the end, we present research gaps that increment our understanding about the role of a pivotal language, with issues in the state-of-art for conception of a KB for MDE. Although technical data is essential for artifacts shared in KB for MDE[6,14], they are discussed elsewhere. Thus, due to the lack of contributions discussing the needed semantics associated with MDE Artifacts, this paper considered only the representation of descriptive data, including: 1) catalog information for searching DSLs based on standard data; 2) instructive information about how to use and adapt existing components and; 3) information for decision making to one decides the best option for DSLs after a search in a KB.

Next sections present the result of our analysis and are organized as follows: Section 2 provides background on the role of a pivotal language for MDE Artifacts and Section 3 introduces asset specifications; Section 4 demonstrates RAS and AMS on the modeling of descriptive information associated with MDE Artifacts, allowing the evaluation of the representativeness of these languages. Benefits and drawbacks are discussed in Section 5, complemented in Section 6 with a discussion of limitations of RAS and AMS to be explored in future research; Section 7 highlights research gaps for long-term investigations; and, Section 8 presents our conclusions.

2. The Role of a Pivotal Language for a KB for MDE Artifacts

The need for a knowledge base for MDE artifacts is recently discussed in the literature[5, 6]. Authors claim that a knowledge base is necessary for end-users to easily find and comprehend what is necessary to introduce artifacts in practice. A KB is a solution to reduce costs in producing new DSLs, reusing those already produced and shared for free by the MDE community. In this regard, the initiative initially called Globalization of Models of Computation (GEMOC, <http://gemoc.org/>), proposes that the community makes an effort for sharing artifacts such as DSLs, model transformations, scripts, tools and others in repositories[14]. Not much is understood about the requirements for the implementation of this global reuse scenario and, as the authors claimed, there are more questions than answers[14]. In this sense, we are investigating the role of pivotal representation languages for this reuse scenario. Pivot languages discussed in the next section connect clients with repositories through links and descriptions.

Representation/structures from repositories are related research topics, as illustrated in Fig.1. The Repository for Model Driven Development (ReMoDD)[15] is our current alternative for a KB. It allows, for example, the use of searches through a web platform about some artifacts associated with proposals for DSLs published in some conferences such as MODELS, ECMFA, etc. Most data that should be explicit in repository structures is available as physical files, papers and tutorials, which requires a long time to find and analyze adequate options for MDE Artifacts. Several other options for MDE repositories have been proposed in the last years, such as MDEForge[17]. Another KB that gained attention in the last years is the SEMAT[16] - an initiative in Software Engineering that starts from the principle that stored models for methods are represented with a DSL named Essence[16]. Differently, GEMOC repository and MDEForge are for any type of MDE artifacts[14], thus complementary to SEMAT.

These proposals are unconnected. A pivotal language for MDE could connect clients with many KBs, but we miss this language and its requirements. We found in a previous literature review that the closer in the state-of-art from the conception of this type of language are two asset specifications: RAS and AMS.