A Configurator for Visual Analysis of Enterprise Architectures

Matheus Hauder, Sascha Roth, Simon Pigat, and Florian Matthes

Technische Universität München
Boltzmannstr. 3
85748 Garching, Germany
{matheus.hauder,roth,simon.pigat,matthes}@tum.de

Abstract. Enterprise Architecture (EA) management seeks to mutually align business and IT while fostering flexibility to react upon environment changes appropriately. Highly distributed data within the entire enterprise is collected to facilitate decision making processes during enterprise transformations. At the same time enterprise architects and EA stakeholders have new and arising questions hard to predict in advance. Visualizations are a common means for decision makers to analyze complex information about the entire enterprise. Thereby, these visualizations are commonly generated using model-driven approaches. Although, a common set of best-practice EA visualization types could be distilled, their actual binding to underlying data and organization-specific configuration is still challenging for business users. In order to cope with this challenge, this demo[1] paper presents a configurator for EA visualizations end-users without an IT background are able to create spontaneously.

Keywords: Enterprise Architecture, visualization, collaboration

1 Visual Analysis of Enterprise Architectures

In recent years, enterprise architectures (EAs) and their corresponding management function received increasing attention from academia and industry. Modern enterprises are confronted with an ever changing economic, regulatory, and technical environment they are forced to continuously adapt to [4]. Performing the necessary and beneficial adaptation is aggravated by the intricate and highly interwoven architecture of the enterprise. Therein, local changes to one organizational artifact, e.g. a business process or a business application, might have unforeseen global consequences and potentially detrimental impacts on related artifacts. Facing the aforementioned challenge, EA management promises to balance between short time business benefit and long term maintainability of both business and IT in an enterprise [4]. To do so, typical decisions concerning the EA need a holistic perspective on the overall make-up of the enterprise, its constituents, and their dependencies. This perspective nevertheless depends on

[1] http://www.youtube.com/watch?v=_scjOxZ49hY, last accessed on: 2013-07-15

the actual EA management-problem to be addressed, as the key stakeholders of the EA, namely enterprise architects and C-level executives, require different information during decision making. Additionally, the relevant information has to be presented in a stakeholder-specific way in graphical architecture descriptions [7]. The employed architecture views vary widely with respect to the used visualization elements, but also with respect to the information visualized.

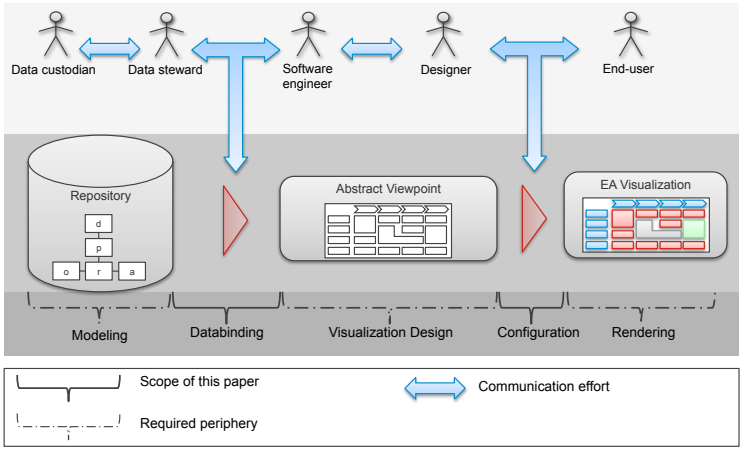

Fig. 1. Overview of the model driven approach to EA visualizations

In recent years, an approach to support the automated generation of graphical EA descriptions based on arbitrary underlying information models has been developed [8, 7, 2]. Central to this approach is the idea to describe a viewpoint as a model-to-model transformation from the information model to the *visualization model* [1], an expressive model for describing visualizations. A particular transformation defines which information model concepts are translated into which visualization elements. Research in close cooperation with practitioners has shown that this approach can be beneficially applied in the context of EA management. Nevertheless, the development and definition of the actual model-to-model transformation remains a central but complex part of the design process, as prevalent model-transformation languages are complex to understand, especially for the stakeholder of an EA visualization tool. Further, the application cases revealed that users want to perform customizations, i.e. minor adaptations, of the visualizations with respect to the visualized information, e.g. by replacing one type from the information model with a different one. A possible example would be 'database management systems per server' instead of 'business applications per server'. The delineated shortcomings for visualizations in the context of EA management motivate the objective addressed in this demo paper: *How can business users be empowered to configure visualizations that are bind to an arbitrary EA information model?*

2 Configurable Enterprise Architecture Visualizations

Prevailing approaches for generating EA visualizations typically take into account multiple steps performed by a variety of different actors as displayed in Figure 1. During the modeling step the required information is gathered from stakeholders or existing information sources in the organization (cf. e.g. [5]). The result of the data binding step is a mapping, i.e. model-to-model transformation, between information model elements and an abstract viewpoint definition, i.e. a visualization type. As motivated above, typically this step requires specific knowledge from expert users. The definition of the abstract viewpoint is performed within a visualization design step. During configuration, the abstract viewpoint is detailed with e.g. color encodings, axis descriptions, and symbols. As a result, these subsequent steps lead to a communication effort between the various actors. We aim at providing better end-user support for the creation of these configurable EA visualizations. In particular, we focus on the data binding and configuration to reduce the required communication effort.

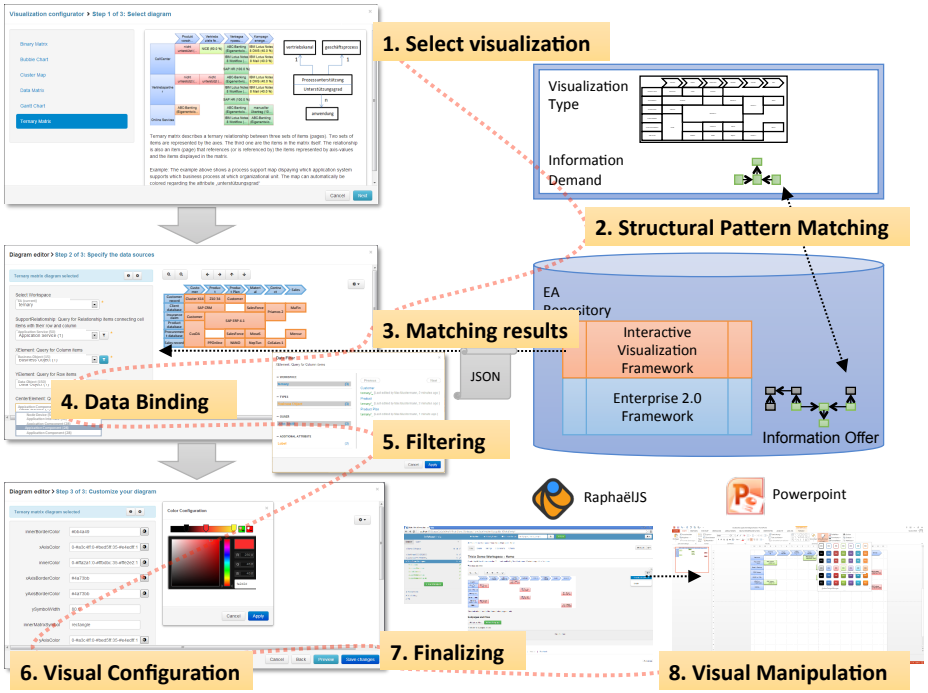

Fig. 2. Screenshots of the demo and high-level architecture

2.1 Demonstration

We employ structural pattern matching of models [6, 2] to recommend feasible model-to-model transformations based on a chosen visualization type and given EA information model. The former specifies the demand model whereas the latter requires the offer model. In a first step, an end-user may choose from a list of offered best practice visualization types that have been identified in previous projects (cf. Figure 2). These visualization types are queried from the backend-system. Based on the chosen visualization type, the information demand is determined automatically. In the next step, the data binding is specified by the user. Thereto, the business users does not have to fully grasp the entire EA information model and can concentrate on the analysis of the EA. In order to recommend feasible configurations for a data binding, the information demand of a visualization type and information offer from the EA repository's information model are matched structurally. The outcome of this step defines a model-to-model transformation. Especially transitive relationships are also auto-recommended which also lowers the barrier for more complex queries. Selected elements of an EA information model can be filtered subsequently by the end-user. This filter is applied to the instances, e.g. to use all business applications with criticality high. Next to this step, the configuration of the visual design can be specified in detail to customize the visualization. These visual parameters are preconfigured variability points of a particular visualization type, e.g. size, shape, or color used within a visualization. The visualization is then inserted on an ordinary wiki page and may be annotated or viewed within the content area of a wiki page that is stored in the EA repository. For executive presentations, any visualization on a wiki page can also be downloaded in fully compatible PowerPoint (pptx) format. This way, users can manipulate generated visualizations even beyond the model-driven approach, i.e. just edit colors for reasons not visible in the actual data displayed as it is commonly the case for tacid knowledge required for a particular management meeting.

2.2 Implementation

We utilized an existing Enterprise 2.0 framework [3] which allows us to manage structured information using a web browser or import data from arbitrary information sources in the organization. This system is developed in Java and has already been applied as a lightweight EA repository in practice. We extended this framework with interactive visualizations capabilities that build upon the concepts presented in [7]. The actual visualization rendering within the browser is accomplished using the RaphaëlJS[2] framework to provide cross-browser support. The pattern matching between the abstract viewpoint and the information stored in the Enterprise 2.0 framework is achieved using the algorithm proposed in [6]. Changes to these generated visualizations are propagated to the EA repository such that underlying data is manipulated.

[2] `http://raphaeljs.com/`, last accessed on: 2013-07-15

3 Conclusion

In this paper we presented our demonstration system that empowers business users to configure visualizations that are bound to an arbitrary EA information model. Thereby, the major design goal was to lower the barrier for stakeholders with a non-technical background analyzing the EA. Special to our approach is the recommendation of feasible configurations to the end-user such that it is not required to fully understand the entire EA information model. Our solution supports EA stakeholders that want to analyze the EA and derive planned-states in a rapid manner without manipulating underlying data. We offer the capability to export the visualization as an editable PowerPoint presentation. In future work we plan to identify further abstract viewpoints from practice and extend the configurator with new capability for the analysis of EA models.

Acknowledgment

This research has been sponsored in part by the German Federal Ministry of Education and Research (BMBF) with grant number TUM: 01IS12057.

References

1. Alexander M. Ernst, Josef Lankes, Christian M. Schweda, and André Wittenburg. Using model transformation for generating visualizations from repository contents – an application to software cartography. Technical report, Technische Universität München, Chair for Informatics 19 (sebis), Munich, Germany, 2006.
2. M. Hauder, F. Matthes, S. Roth, and C. Schulz. Generating dynamic cross-organizational process visualizations through abstract view model pattern matching. In *Architecture Modeling for Future Internet enabled Enterprise (AMFInE)*, 2012.
3. Florian Matthes, Christian Neubert, and Alexander Steinhoff. Hybrid wikis: Empowering users to collaboratively structure information. In María José Escalona Cuaresma, Boris Shishkov, and José Cordeiro, editors, *ICSOFT (1)*, pages 250–259. SciTePress, 2011.
4. Jeanne W. Ross, Peter Weill, and David C. Robertson. *Enterprise Architecture as Strategy*. Harvard Business School Press, Boston, MA, USA, 2006.
5. Sascha Roth, Matheus Hauder, Matthias Farwick, Ruth Breu, and Florian Matthes. Enterprise architecture documentation: Current practices and future directions. In *11th International Conference on Wirtschaftsinformatik (WI), Leipzig, Germany*, 2013.
6. Sascha Roth, Matheus Hauder, Marin Zec, Alexej Utz, and Florian Matthes. Empowering business users to analyze enterprise architectures: Structural model matching to configure visualizations. In *Trends in Enterprise Architecture Research (TEAR), Vancouver, Canada*, 2013.
7. M. Schaub, F. Matthes, and S. Roth. Towards a conceptual framework for interactive enterprise architecture management visualizations. In *Modellierung*, Bamberg, Germany, 2012.
8. André Wittenburg. *Softwarekartographie: Modelle und Methoden zur systematischen Visualisierung von Anwendungslandschaften*. PhD thesis, Fakultät für Informatik, Technische Universität München, Germany, 2007.