ArchiMedes
Publication and Integration of Architectural Knowledge

Remco C. de Boer

ArchiXL

Amersfoort, The Netherlands

rdeboer@archixl.nl

Abstract—**ArchiMedes is a cloud-based architecture tool built upon our WikiXL semantic knowledge management platform. ArchiMedes' core capabilities include publication, enrichment, analysis and integration of architecture knowledge. In its most straightforward implementation, ArchiMedes connects to an architecture model repository and publishes the model contents in a browsable interface, thereby disseminating the work of the architect team to a large target audience. Since the contents are published in a wiki-like structure, clarifications and context information can be added, such as historical notes or considerations and trade-offs in decision making. This makes ArchiMedes a true encyclopaedia instead of just a collection of diagrams. Moreover, the published content is semantically enhanced, which enables further analysis and integration of the architecture knowledge. ArchiMedes can, for example, combine enterprise architecture models with information from an organizational CMDB. This combination creates dynamic, 'live' architecture maps that show a projection of the current state of the system landscape onto the enterprise architecture models. Such a projection extends the architecture from a 'design time' reference model to a 'run time' dashboard.**

I. INTRODUCTION

For several years now, our company has been using semantic wikis for architectural knowledge management [1]. Our experiences with this approach for a wide array of customers – including banks, hospitals, educational institutions and government organizations – have led to the construction of *ArchiMedes*, a tool built upon our WikiXL semantic knowledge management platform. ArchiMedes' core capabilities include publication, enrichment, analysis and integration of architecture knowledge. These are the features that in our engagements we found are asked for the most. Combining these features in a standard tool enables us to quickly setup an environment that realizes the main architectural knowledge management requirements many of our customers have. ArchiMedes can either be used 'as is', or form the basis of further extension and customization for organizations with specific architectural knowledge management needs.

II. OUTLINE

This paper is structured as follows. Sections III to VI discuss our tool's main capabilities: publication, enrichment, analysis and integration of architectural knowledge, respectively. Section VII provides some background on the technology used by ArchiMedes. The concluding Section VIII outlines our ongoing work towards 'live architecture' by further enhancing ArchiMedes' integration capabilities.

III. PUBLICATION

Most organizations that we engage with maintain their architecture models in an architecture repository. In our practice, the models we encounter are often constructed with ArchiMate. ArchiMate is "an open and independent modeling language for Enterprise Architecture" [2], maintained by The Open Group. ArchiMate defines "a common language for describing the construction and operation of business processes, organizational structures, information flows, IT systems, and technical infrastructure". ArchiMate models typically provide a 'system of systems' perspective on an organization, answering such questions as: which activities does an organization perform, what is the role of the various information systems involved and how do business and application services interact to achieve the desired goals?

One of the challenges for the architect team is to disseminate their models in a timely fashion to other stakeholders, who may not have (or even want) direct access to the repository. The more external stakeholders – such as other business units and departments, suppliers, and partner organizations – there are, the bigger this challenge becomes.

ArchiMedes connects to the architecture repository, and shows the repository contents in a browsable interface. It reconstructs the views that have been defined in the repository, and includes an element catalog with links to further details on the diagram constituents. Figure 1 shows a screen that displays the *Application Structure View* from an architecture repository that contains models from the *ArchiSurance* case study [3]. The repository, in this case, has been the open source Archi tool [4], but it can be any ArchiMate-compliant repository. Figure 2 shows the details for *Insurance Policy Data*, one of the diagram constituents from Figure 1. On this screen, a context diagram is generated based on the repository contents that shows all other elements that are related to *Insurance Policy Data*. ArchiMedes also provides links to all views in which this element is used, including the *Application Structure View* we started at. Via these links, the user can browse through the contents of the architecture repository.

IV. ENRICHMENT

The contents of an architecture repository – i.e., models, views, and model elements and relationships – usually require further documentation for their meaning to be fully grasped. Such documentation contains, for instance, the
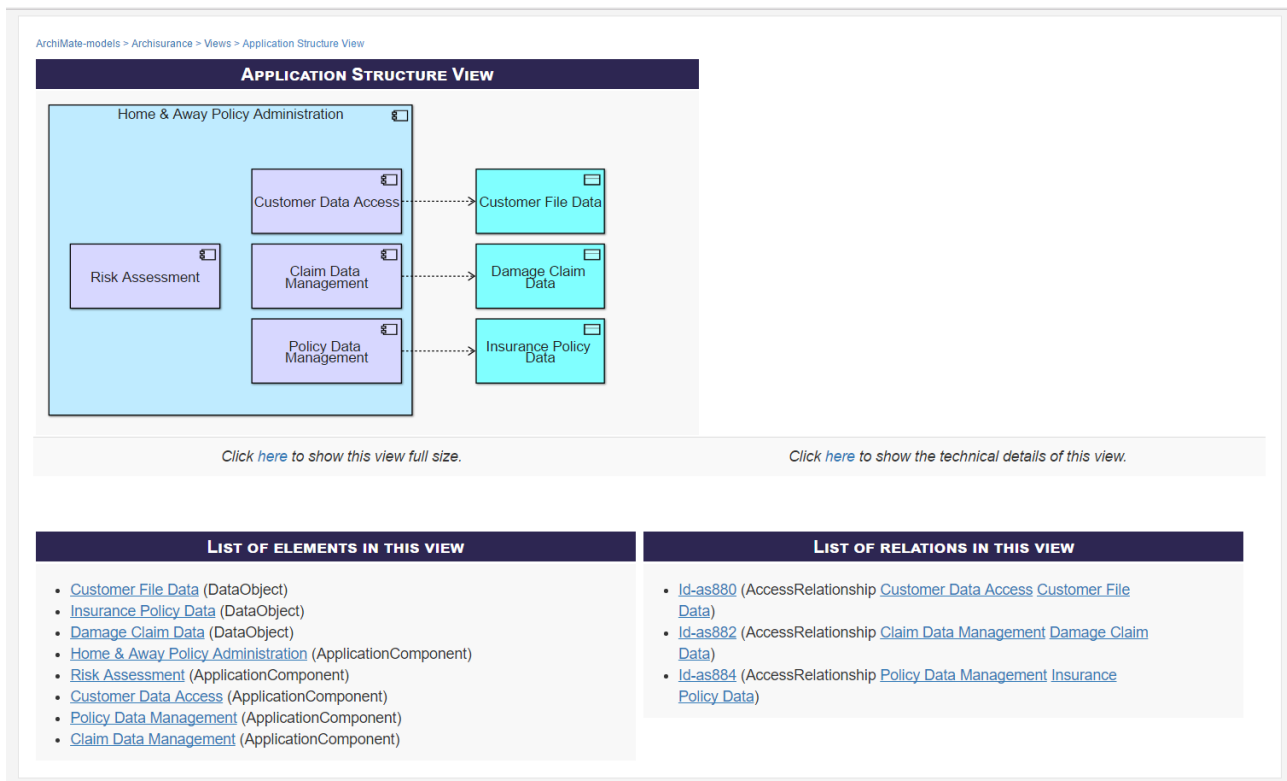
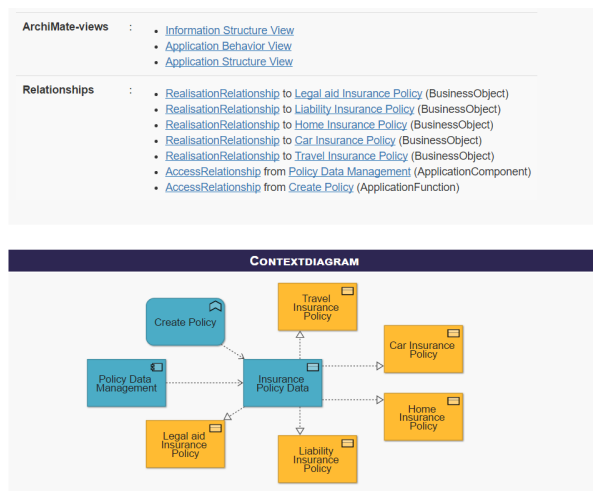Fig. 1. ArchiMedes displaying an ArchiMate view

Fig. 2. ArchiMedes showing element details

design decisions and trade-offs that led to the architectural design shown in a view. This information cannot usually be maintained in the repository itself.

Since ArchiMedes is built on wiki technology, authorized users can easily add explanations and documentation, at exactly the right level: with an individual view, with a particular element (that may occur on different views), or as 'cross-view documentation'. Fig. 3 shows an example where the coming-to-be of Archisurance's *Document Processing Shared Service Center* is put into historical perspective of

the organization's merger. This historical perspective is not directly apparent from the organization structure view and/or the context diagram.

V. ANALYSIS

Model content that is published in ArchiMedes is semantically enhanced: individual model elements, relationships and views are registered as entities and their attributes and relations are semantically annotated. This makes the models not only browsable by humans – as discussed in Section III – but also queryable by machines. Within ArchiMedes, predefined queries can be used for model analysis.

As an example, Fig. 4 shows how ArchiMedes can support impact analyses. This example analysis follows a three-step procedure (labeled in the figure): 1. select an application component, 2. run the analysis routine, 3. present the result.

A. Step 1: Select an application component

In this example, the *Home & Away* policy administration system needs to undergo significant maintenance. Before maintenance is started, the possible business impact needs to be determined so that it is clear which business processes are affected and a risk mitigation and contingency plan can be established.

ArchiMedes shows an overview of all application components from the architecture repository. From this list, *Home & Away Policy Administration* is selected (Fig. 4, step 1).

The merger

ArchiSurance was formed to take advantage of numerous synergies between three organizations: *Home & Away*, specializing in homeowners' insurance and travel, *PRO-FIT*, specializing in auto insurance, and *Legally Yours*, specializing in legal expense insurance. While the three pre-merger companies sold different types of insurance, they had similar business models. All three sold direct to consumers and small businesses through the web, email, telephone, and postal mail channels. Although based in different cities, each was completely housed in a modern office complex in a major metropolitan area. Each had loyal customer bases and strong reputations for integrity, value, service, and financial stability. All three companies were privately held by interlocking groups of institutional and individual investors.

The new company offers all the insurance products of the three pre-merger companies, and intends to frequently adjust its offerings in response to changing market conditions. Like its three predecessors, ArchiSurance sells directly to customers via print, web, and direct marketing.

The Shared Service Center

A Shared Service Center (SSC) has been established for document processing at the pre-merger headquarters of PROFIT. The center administers the central document repository as well as all automated document workflows. In addition, it performs all scanning, printing, and archiving for legally binding documents as they enter or leave ArchiSurance. To ensure business continuity and handle periods of peak activity, the SSC also hosts trained personnel and equipment to perform the functions of the front-office, which is similarly prepared to reciprocate.
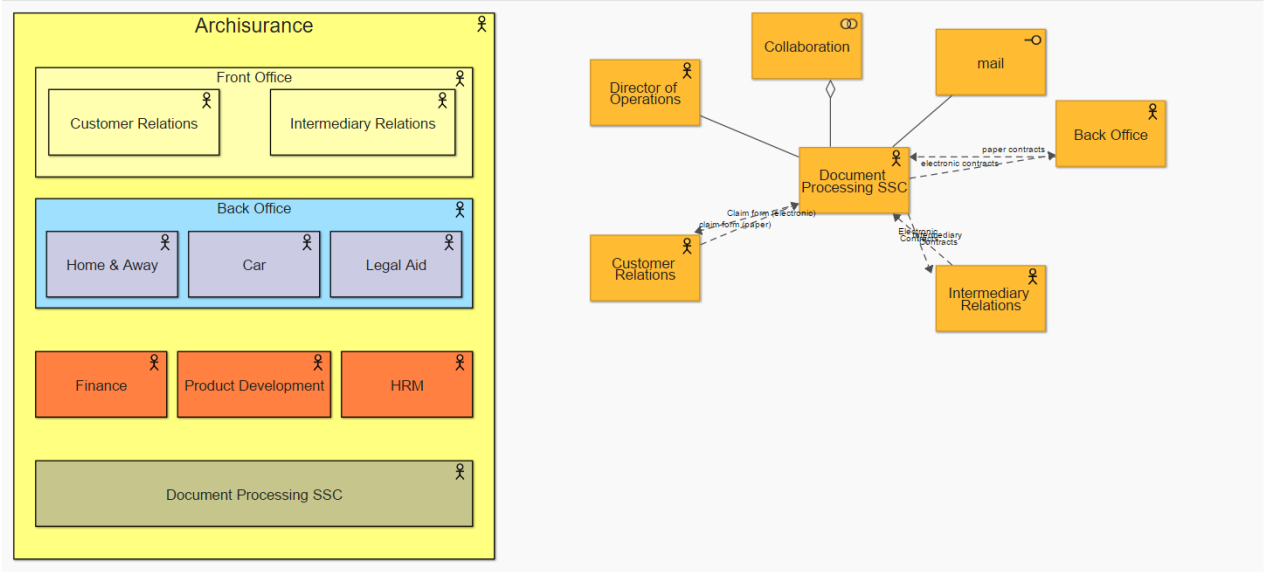

Fig. 3.   A page in ArchiMedes showing enriched model information (texts adopted from [3])

B. Step 2: Run the analysis routine

On the page that shows the element details (cf. Fig. 2) for the selected *Home & Away Policy Administration* application component, the available analyses for this type of model element are listed. The analysis *"Where is this application component used?"* is selected, which starts an automated analysis that performs the following query (Fig. 4, step 2):

- Starting from the selected *Home & Away Policy Administration* application component...
- ...which services are realized by this application component? (answer: the *Policy Creation Service*)...
- ...and for each of these services: which business behavior are they used by? (answer: *Check and Sign Contract*).

C. Step 3: Present the result

The way that the analysis results are presented, depends on the analysis implementation. Possible presentation formats include tables, lists, (generated) diagrams, relation matrices, et cetera.

ArchiMedes presents the analysis results for this particular analysis in tabular format (Fig. 4, step 3). The table contains a row for each answer found, and consists of two columns containing a) a link to the business behavior element found,

and b) an indication of the type of behavior. In this case, the table consists of a single row that links to *Check and Sign Contract* and shows that this element is of type ''business interaction' (a form of business process that is executed by a collaboration of roles). Parties involved in this business interaction should be consulted to establish a risk mitigation and contingency plan before starting maintenance on the policy administration system.

VI. INTEGRATION

ArchiMedes provides standard connectivity to repositories that support ArchiMate and the ArchiMate Model Exchange File Format [5]. It can, however, be adapted to connect to other repositories as well. As long as model semantics can be derived from the repository export, any exchange file format (such as XML, CSV, and RDF) can in principle be read.

ArchiMedes' adaptability even enables the connection of multiple repositories, which makes it possible to integrate semantically related models that are maintained in separate repositories. ArchiMedes can, for example, combine enterprise architecture models with information from an organizational CMDB.

An example of this type of integration is the case of the Dutch Municipalities Software Catalog [6] (see Fig. 5). This catalog contains the available software products for the Dutch
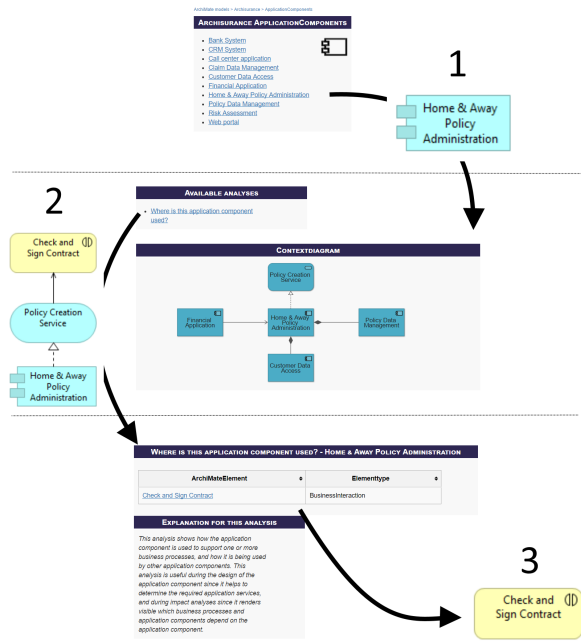
Fig. 4. Impact analysis using ArchiMedes.

municipalities. The catalog is maintained by KING – the quality institute for Dutch municipalities – who also maintains the municipalities reference architecture GEMMA [7]. Publication of GEMMA uses ArchiMedes technology.
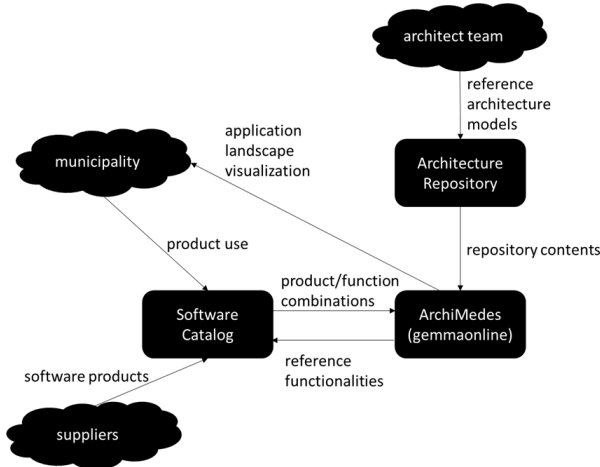

Fig. 5. Integration of reference architecture repository and software catalog contents through ArchiMedes

The contents of the software catalog are maintained by software suppliers who register their product offerings in the catalog, and the Dutch municipalities who register in the catalog which software products they have and how they use them. For the latter, municipalities select for each of their software products the applicable functionality from the GEMMA reference models (which cover generic functionality such as 'Document Management' and domain-specific functionality such as 'Parking Management'). Since the same software product often fulfills multiple functionalities,

different municipalities can make different choices.

A municipality can send the product usage they registered in the software catalog to ArchiMedes. This generates an instantiation of the GEMMA reference models specifically for that municipality. This instantiation shows a projection of the municipality's software products on the reference functionality. The creation of this type of 'application landscape' overview used to take significant time and effort for Dutch municipalities, but can now be generated through ArchiMedes where the reference architecture repository and software catalog contents are integrated.

VII. TECHNOLOGY

ArchiMedes is built upon our WikiXL platform [8]. This SAAS-service is based on MediaWiki [9] and Semantic MediaWiki [10] technology and complemented with several in-house developed extensions, including SmartConnect which provides a configurable pipeline architecture to connect to external repositories [11].

VIII. OUTLOOK

We are currently working on further enhancement of the integration capabilities of ArchiMedes, which we call ''live architecture'. The GEMMA case currently integrates implementation decisions with reference architecture contents. We aim to extend this with run time information, e.g. from monitoring environments. Since the GEMMA architectural models provide insight into the application usage from a business perspective (not unlike the analysis example in Section V), we intend to use this enhanced integration to provide near-realtime impact analyses that display the effect of e.g. system and network issues on the organization's business processes. This combination creates dynamic, 'live' architecture maps that show a projection of the current state of the system landscape onto the enterprise architecture models. Such a projection extends the architecture from a 'design time' reference model to a 'run time' dashboard.

REFERENCES

[1] R. C. de Boer and H. van Vliet, "Experiences with Semantic Wikis for Architectural Knowledge Management," in *2011 Ninth Working IEEE/IFIP Conference on Software Architecture*, June 2011, pp. 32–41.
[2] The Open Group. The ArchiMate® Enterprise Architecture Modeling Language. [Online]. Available: http://www.opengroup.org/subjectareas/enterprise/archimate-overview
[3] H. Jonkers, I. Band, and D. Quartel, "ArchiSurance Case Study," The Open Group, Tech. Rep. Y121, January 2012.
[4] Phillip Beauvoir. Archi - The Free ArchiMate Modelling Tool. [Online]. Available: http://www.archimatetool.com/
[5] The Open Group, "ArchiMate® Model Exchange File Format," Open Group Standard C154, August 2015.
[6] KING. GEMMA Softwarecatalogus. [Online]. Available: https://www.softwarecatalogus.nl/
[7] ——. GEMMA Online. [Online]. Available: http://www.gemmaonline.nl
[8] ArchiXL. XL&Knowledge Services. [Online]. Available: http://www.xl-knowledge.nl/index.php/Diensten/en
[9] Wikimedia Foundation. MediaWiki. [Online]. Available: https://www.mediawiki.org
[10] The SMW Project. Semantic MediaWiki. [Online]. Available: https://www.semantic-mediawiki.org
[11] R. C. de Boer, "SmartConnect," SMWCon Fall, 2015.