The Application Architecture Reference Model Blueprint

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Abstract This paper presents proposed changes and extensions of EA frameworks made towards its easier acceptance. The goal is to provide valuable content: reference models and implementation utilities (accelerators) simplifying logical application architecture modeling, focused on helping organizations to achieve their strategic goals. EA Frameworks methodology recommends a reference model reuse as much as possible. However, not enough suitable reference models are available for an application architecture area. Therefore a specific application architecture reference model was developed, that decomposes the architecture into domains aligned with the sense of fundamental dimensions. The model was verified in several architectural studies for clients in the Czech Republic.

Keywords Enterprise Architecture, Framework, Application Architecture, Reference Model

1. Introduction

The term Enterprise Architecture (EA) as well as related research activities, and implementations are relatively recent as Langenberg points out in [3]: “In 1996 the Clinger-Cohen Act (formerly known as the Information Technology Management Reform Act) of the US government directed federal agencies to implement a holistic approach to align information technology to their business goals. According to Malveau, this led to the creation of the term enterprise architecture”.

EA is based on various architectural frameworks. Schulman defines architecture framework as “a structure within which the key components of the architecture and the relationships between these components are defined” [6]. Number of frameworks, albeit with different scope relative to different definitions of EA, are presented in literature, e.g. Zachman Framework [10], [11], TOGAF (The Open Group Architectural Framework) see [5]. As Zachman points out “this lack of definition precipitated the initial investigation that ultimately resulted in the Framework for Information Systems Architecture (see [10]). Although from the outset, it was clear that it should have been referred to as “Framework for Enterprise Architecture”.

Applications of EA are mainly oriented towards its use for effective planning, effective communication and effective governance. However, the application EA in practice is much broader. EA is used as an important tool for rapid implementation of new business models in the enterprise.

Langenberg sees need for research in the EA problem domain when he says: “Although a wide range of EA topics is covered, the EA discipline is lacking basic research. We can conclude the immaturity of the discipline. Immature disciplines rely
on basic research in order to progress. Given this lack, the increased attention from academic world would be beneficial”[3]. To cover these problems the research project GA CR P403/10/0303 Enterprise Architecture as Management Principle for SMEs was defined. Consolidation of EA concepts and enabling EA as an instrument for management in enterprises in general, and in SMEs in particular are the main objectives of this project. In the frame of this project Pavel Hrabe is working on his dissertation focusing on the Enterprise Architecture methodology improvement through design of proven logical application architecture of Czech companies and organizations. The architecture design should respect heterogeneous architectures, save IT investments, reflex current transition to standard packaged SW applications and packaged service architecture.

1.1 Existing generic models

The official publication of TOGAF [7] describes in the corresponding section a reference model that focuses on the Application Software space, and “Common Systems Architecture” in Enterprise Continuum terms, that is named as the Integrated Information Infrastructure Reference Model (III-RM).

The III-RM is focusing on e-business e-2-e scenario and doesn’t represent other dimensions and aspects of the application architecture. Moreover it does not offer any hierarchy or taxonomy. The III-RM is not the application architecture reference model, despite it provides possibility to divide applications into categories.

The basic principle of our proposed model is a consistency with an idea of Extended ERP, published in [1]. Key building blocks of so called Global Architecture are described in [8], where also the application architecture layers principle is presented.

In [9] the exemplary structure of current Enterprise information system is described and the principle of application alignment with stakeholder interests is presented.

Typical generic Enterprise IS architecture is presented in [2]. However, the schema is not detailed enough and needs further elaboration to be useful for daily application in the architecture management practise.

1.2 Industry reference models

Application architecture reference models are available just for some specific industries, e.g. Telecommunication, Insurance or Supply Chain. Industry reference models provided e.g. by TM Forum and ACORD are covering all most important areas of Enterprise Architecture with suitable reference models. However, these frameworks are available to download just for members.

1.3 Public Czech application architecture artifacts

In the literature and on the web we can find many architectural artifacts trying to catch, present, explain and interpret application architecture in specific cases. Many public examples show various approaches of defining and implementing the application architecture. However, studies are more focused on application development standards than on business to IT alignment and structuring applications. These
documents surprisingly often do not focus on the application content, its logic and relations to other applications.

2. New application architecture reference model blueprint

Previous analysis confirms the long-term feeling, that reference models and modeling standards for an application architecture modeling that is conducted from various points of view are missing.

We identified what is missing in evaluated examples and what therefore need to be incorporated into proposed reference model. This new reference model was created in two levels of granularity:

- as a Generic Domain model of Application Architecture
- detailed reference model for Logical Application Architecture, where the meaning of Logical Application Architecture corresponds with (The Open Group, 2009)

The model has been created as a set of principles and exemplary pictures. It allows users to create their own models with respect to these principles. The same approach was used for creating industry focused models for e.g. public sector, healthcare, utilities.

2.1 Generic domain model of the Enterprise Application Architecture

Generic domain model is the most simplified model. Generic domain model and its detailed & industry clones are all respecting the same leading design principles.

This model is based on the idea, that architectural decomposition must be done Top-Down, and provides users with first two levels of application hierarchy. First level of application hierarchy is defined as Application Layer and encompasses six layers (see Fig. 1):

- User Access Layer
- Composite Application Layer
- Knowledge, Information and Media Layer
- Transaction Processing Layer
- Cross-sectional Application Functions Layer
- Integration and SOA Platform Layer
Fig. 1 Generic domain model of the Enterprise Application Architecture.

Middle layer and its content directly support business functions, services and processes. It is divided into domains that correspond to leading enterprise capabilities. Both layers are framed with terms, which means on one side objects of interest of information system and on the other side subjects of relationship with the enterprise, subject of communication and integration (see in the detailed model on the Figure 2).

The aim of the transactional layer is to cover all end-to-end business scenarios from the vendors purchasing through the production and value creation to the sale.

2.2 Detailed reference model of the Application Architecture

The detailed reference model extends the hierarchical decomposition of the logical application architecture by one or more levels. Moreover, it divides most of the domains into specific well known application function groups, e.g. CRM, SRM, LSO, ILM etc.

This way it is possible to recognize better, how the model is related to objects/subjects. For example Technology and technological and real-time applications are special class of application, despite of they are often integrated into unified User Interfaces, Portals and mobile Appliances. Therefore technological applications are placed in the reference model. On the other hand APS (Advanced Planning and Scheduling), ECM (Enterprise Content Management) and PLM (Product Lifecycle Management) applications are not included in generic domain and detailed models, because all these areas are from our point of view artificially created by scientist and/or SW vendors and their functions are normally distributed within other domains. These areas are emphasized by special industries like APS for
Logistics & Transportation or PLM for Consumer Goods, High tech and Engineering & Construction, because they are important for them.

2.3 Extended and modified models

Based on generic domain and detailed reference model of the application architecture we can develop in the first stage industry flavored reference models and then reference models for individual clients.

2.3.1 Industrial versions of reference models

Based on same principles many industry models can be created. It is useful sometimes to add some domain level content, whereas in other cases significant difference and improvement is made on a detailed level.

On the Figure 3 an example of the model for Healthcare providers e.g. Hospitals is shown. We can see there that the CRM and the SRM components (so called Relationship Components) are replaced by the Clinical application components and Patient Administration component.
2.3.2 Individually extended models

Typical characteristics of current epoch are convergence of industries on one side and multi-industry companies on the other side. Creating a model for a big company leads to the necessity of combining industrial aspects of models and at the end to creating a company specific model.

On the other hand we can detect, that the model originally created for the Telco company suits well to the utility or media company, and surprisingly also to the public sector agency.

The model shown on the Figure 4 is enriched in its central part by areas/components dedicated for the maintenance of financial relationships with extremely high amount of customers, special kind of doing business (so called agency business integrating in one case purchasing and selling) and APS for spare parts network optimization. An important fact is that all other principles and components remain unchanged.
2.4 Reference model for the application architecture with SOA

Mostly SOA models focused on application architecture contain four basic elements:

- Access and UI layer
- Service Consumer Layer
- Service Bus and Repository layer
- Service Provider Layer

In our terminology so called Composite process-based applications layer represents service consumer applications and SOA platform called Service Bus.

Both layers share one Service Repository & Registry. Therefore it is natural to bind these layers together to get one consistent, SOA flavored model illustrated on the Figure 5.

Fig. 5 Generic model of SOA based application architecture.
This Principal SOA model can be evolved deeper in the domain and detailed level. See example of the domain model with SOA aspects on the Figure 6.

3. Conclusions

The Application Architecture Reference Model Blueprint presented in this paper demonstrates a proven tool for accelerated Enterprise Architecture development in the area of the Application Architecture. Model is open and can easily adopt new ideas like SOA or Shared Service Centers. Practical benefits of that model were verified by many customers. This reference model for logical and physical application architecture will be further elaborated, verified and customized for conditions of small and medium enterprises in the frame of the project Enterprise Architecture as Management Principle for SMEs.

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4. References


