Overview of CAFCR and Threads of Reasoning

Abstract

The described architecting method uses the CAFCR model as starting point. Qualities are used as orthogonal dimension to integrate the CAFCR views. Story telling is used to add specifics. Threads of reasoning combine all the information into a coherent overview.

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1 Introduction

At the beginning of the creation of a new product the problem is often ill-defined and only some ideas exist about potential solutions. The architecting effort must change this situation in the course of the project into a well articulated and structured understanding of both the problem and its potential solutions. Figure 1 shows that basic methods and an architecting method enable this architecting effort.

The basic methods are methods that are found in a wide range of disciplines, for example to analyze, to communicate, and to solve problems. These basic methods are discussed in Chapter ??.

An overview of the architecting method is given in Section 2. The architecting method contains multiple elements: a framework, briefly introduced in Section 3, and submethods and integrating methods, which are described in part II.

2 Architecting Method Overview

Figure 2 shows the overall outline of the architecting method. The right hand side shows the visualization as it will be used in the later chapters. The framework is a decomposition into five views, the “CAFCR” model, see Section 3.

Per view in the decomposition a collection of submethods is given. The collections of submethods are open-ended. The collection is filled by borrowing relevant methods from many disciplines.

A decomposition in itself is not useful without the complementing integration. Qualities are used as integrating elements. The decomposition into qualities is orthogonal to the “CAFCR” model.
The decomposition into CAFCR views and into qualities both tend to be rather abstract, high level or generic. Therefore, a complementary approach is added to explore specific details: story telling. Story telling is the starting point for specific case analysis and design studies.

These approaches are combined into a thread of reasoning: valuable insights in the different views in relation to each other. The basic working methods of the architect and the decompositions should help the architect to maintain the overview and to prevent drowning in the tremendous amount of data and relationships. The stories and detailed case and design studies should help to keep the insights factual.

3 The CAFCR Model

The “CAFCR” model is a decomposition of an architecture description into five views, as shown in Figure 2. The customer objectives view (what does the customer want to achieve) and the application view (how does the customer realize his goals) capture the needs of the customer. The needs of the customer (what and how) provide the justification (why) for the specification and the design.

The functional view describes the what of the product, which includes (despite its name) the non-functional requirements.

The how of the product is described in the conceptual and realization views.
The how of the product is split into two separate views for reasons of stability: the conceptual view is maintained over a longer time period than the fast changing realization (Moore’s law!).

The job of the architect is to integrate these views in a consistent and balanced way, in order to get a valuable, usable and feasible product. Architects do this job by continuously iterating over many different viewpoints, sampling the problem and solution space in order to build up an understanding of the business. This is a top-down approach (objective driven, based on intention and context understanding) in combination with a bottom-up approach (constraint aware, identifying opportunities, know-how based), see Figure 4.

The CAFCR model in Figure 4 is focused on the relation between the customer objectives and the need in the product. The architect's task is to integrate all these viewpoints, in order to get a valuable, usable and feasible product.

Figure 3: The “CAFCR” model

Figure 4: Iteration over the CAFCR views and the operational view. The task of the architect is to integrate all these viewpoints, in order to get a valuable, usable and feasible product.
world and the product. Another dimension that plays a role in specification and design is the operational view. The operational view describes the internal requirements of the company: what is needed for the operation of the company? The CAFCR model is focused on the customer world: what determines value and usability of a product? The business feasibility of a product is largely determined by the operation of the company: satisfactory margins, service levels, potential for the future. Strategic requirements of the company, which are important for the long term operation, are also part of the operational view.

The customer views and operational view are asymmetric. The customer world is outside the scope of control of the company. Customers have a free will, but act in a complex environment with legislation, culture, competition, and their own customers, who determine their freedom of choices. The operational way of working of a company is inside the scope of control of the company. The company is also constrained by many external factors. Within these constraints, however, the company decides itself how and where to manufacture, to sell, and to provide service. The operation of the company is organized in such a way that it supports its customers. The asymmetry is that a company will never tell its customers to organize in a way that eases the operation of the company. The operational view is subject to the customer views.

The CAFCR views and the operational view must be used concurrently, not top down as in the waterfall model. However, at the end of the architecting job a consistent description must be available, see [2]. The justification and the needs are expressed in the Customer Objectives View, the Application View, and the operational view. The technical solution as expressed in the Conceptual View and the Realization View supports the customer to achieve his objectives and support the company in the operation. The Functional View is the interface between problem and solution world.

The CAFCR model will be used in this thesis as a framework for a next level of submethods. Although the five views are presented here as sharp disjunct views, many subsequent models and methods don’t fit entirely into one single view. This in itself is not a problem; the model is a means to build up understanding, it is not a goal in itself.

The “CAFCR” model can be used recursively: many customers are part of a longer value chain and deliver products to customers themselves. Understanding of the customer’s customer improves the understanding of the requirements.

The notion of the customer is misleading. Many products have an extensive set of stakeholders in the customer domain. One category of customer stakeholders are decision makers such as: CEO (Chief Executive Officer), CFO (Chief Financial

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1In practice it is less black and white. A company interacts with its customers to find a mutual beneficial way of working. Nevertheless, the provider-customer relationship is asymmetric. If the provider dictates the way of working of the customer then something unhealthy is happening. Examples of unhealthy relations can be found in companies with a monopoly position.
Officer), CIO (Chief Information Officer), CMO (Chief Marketing Officer) and CTO (Chief Technology Officer). Another category are people actually operating the system, such as users, operators, and maintainers. A last category mentioned here are the more remotely involved stakeholders, such as department chiefs and purchasers.

References


History

Version: 1.5, date: April 4, 2004 changed by: Gerrit Muller
- updated overview figure CAFCR: removed operational view
- updated overview of complete method: other representation of operational view
- text changed accordingly

Old Version 1.4, April 1, 2004 Gerrit Muller
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- Changed title into “Overview of CAFCR and Architectural Reasoning”
- many small textual improvements
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- Added operational view to figure and explanation of operational view
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- Added overview of the CAFCR model

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