

# Using Goals and Quality Models to Support the Matching Analysis During COTS Selection

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**Abstract.** The selection process is a crucial activity of the development of COTS-based systems. A key step of the evaluation of COTS components carried out during selection is the matching between user requirements and COTS features. We propose a goal-based approach to guide the matching process, using quality models for leveraging goals and COTS features. The different mismatch situations that may arise are reasoned by means of exploratory scenarios. We demonstrate the approach with the mail server case study.

## 1 Introduction

The growing importance of COTS components (throughout the paper, we use the noun “COTS” as an abbreviation of “COTS component”) requires the definition of processes, methods, models and metrics aimed at supporting COTS acquisition. One of the most important activities taking place in this context is *COTS selection* [3, 14]. For COTS selection to be successful (i.e., reliable and as less time-consuming as possible), many factors need to be taken into account, among which we mention: requirements shall play a prominent role during the process; a well-defined process shall be followed; selection usually involves multiple components; and knowledge about the COTS market shall be deep enough and shall be expressed properly. Our paper tackles these fundamental issues as follows.

**Requirements.** When selecting COTS, stakeholder requirements have to be assessed and matched against product features. In our approach, we employ a goal-oriented requirements engineering strategy [9].

**Process.** The evaluation of COTS usually reveals some mismatches that demand an extensive negotiation of requirements in order to accept products limitations [1]. In contrast with other proposed methods, our work aims at by supporting the matching process as a way to guide COTS selection.

**Multiple Components.** In real-world applications, selection of one component will usually require selection of others [6]. As a result, the process delivers an ensemble of components forming a configuration of the prospective system.

**Knowledge of the COTS Market.** In this paper, we propose the notion of quality model [7] as a means to support the uniform description of quality features of components in the COTS market, as well as an essential aid for leveraging user requirements. This decision conforms to one of the lessons enumerated in [12], about making requirements as measurable as possible.

Summarizing, we propose a process based on goals and quality models to support the matching between COTS features and stakeholder needs. To facilitate the process we defined some matching patterns. The decision-making is based on concepts from utility theory [11] to measure to which extent COTS alternatives satisfy or not goals. We underline the importance to identify and tackle mismatches as early as possible. For that, we defined exploratory scenarios that help reasoning about mismatches and examine possible resolutions.

We use as case study some requirements for the selection of *mail servers systems*. Mail servers are a good case study not only for their strategic importance, but also because of their own nature (see [2] for details). Mail servers provide a lot of functionalities and exhibit a great deal of quality features which can be hard to analyze. In particular, features such as security control and operability shall demand additional COTS components to be selected and connected, e.g. anti-virus and backup and recovery tools. In order to demonstrate our approach in a practical fashion, we have defined a goal specification that we will use in the rest of the paper (see Table 1).

**Table 1.** Goal specification for the mail server case study

High level goals	Operational goals
g1 Ensure and communicate message delivery	g1.1 Configure number of delivery retries g1.2 Configure time between retries g1.3 Provide message delivery notification
g2 Ensure that messages never get lost	g2.1 Messages must never get lost if mailbox runs out of space g2.2 Messages must never get lost if a failure happens g2.3 Messages must never get lost if they cannot be delivered
g3 Ensure fast message delivering	g3.1 The average response time should not exceed 1 minute g3.2 Message throughput should be less than 5 minutes per Mb
g4 Support collaborative work	g4.1 Provide integrated document management g4.2 Provide instant messaging g4.3 Provide voice and video conferencing
g5 Ensure data security	g5.1 Provide authentication of users g5.2 Ensure data integrity
g6 Support protection against external attacks	g6.1 Provide anti-spam filters g6.2 Provide anti-virus scanning

The remainder of the paper is structured as follows. Sections 2 and 3 introduce the key concepts of goal and quality model and their relationships. Section 4 describes our proposal to guide the matching process. Section 5 introduces the notion of satisfaction function as the cornerstone of the measurement strategy. Section 6 shows the use of scenarios as a way to manage mismatches. Finally, we discuss related work and conclusions.