Using 3-Way Satisfaction For Web Service Selection

Preliminary Investigation

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Abstract

This paper examines the problem of Web service selection in a community. Web services reside in communities due to the similiar functionalities they offer. The selection in communities is important because each Web service provides a different level of service. Selection methods thus far only consider the satisfaction of users and neglect the satisfaction of Web services and the community to which they belong. In this paper we propose a method of selecting a Web service based on the satisfaction of all three parties - user, Web service and community. The proposed solution consists of first formalizing the selection process and then using linear programming techniques to define a score function, which can be maximized to find the best selection based on the three satisfaction factors.

1 Introduction

As the number of Internet applications available world wide continue to increase, users are exasperated by finding and selecting applications they need with respect to their needs and requirements.

In previous work [3, 5, 6], Web services with similiar functionalities gather together to form communities. A community is led by a Master Web Services (MWS) and the Web services in the community are known as Slave Web Services (SWS). This gathering means that users are able to direct requests to appropriate communities instead of looking through the Internet for individual Web services. This means that a selection process is necessary to decide which Web service in the community is going to handle the request. This selection is the main focus of this paper.

One of the main limits of the current state of the art is that the selection processes presented in the literature only consider the satisfaction of the user. Our work extends this further by considering the satisfaction of all 3 parties - user, Web service and service broker. We call this the 3-Way Satisfaction Selection Process.

To be able to model the selection process, in this paper we introduce parameters for the user, SWS and MWS. Using these parameters, we track the satisfaction levels of all 3 parties. We model such a satisfaction as an optimization problem that forms a linear program [8] which can be used in the selection process.

The remainder of this paper is organized as follows. Section 2 describes the user and SWS parameters that we use later in the paper. Section 3 defines the 3-Way Satisfaction. Related work is presented in Section 4. Lastly, in Section 5, we conclude the paper and discuss about future work.

2 User and SWS Parameters

In this section, we explain the parameters that we use in this paper.

At a certain time, a set of requests are generated by users to be sent to the community. These requests have certain non-functional parameters. In this paper we define these parameters as - *consumption* in terms of resources the request will use, *availability* of the SWS, *correctness* of the SWS, *execution duration* and *budget* of the request.

The SWS parameters are the non-functional properties of the SWS. They include - *capacity* in terms of the amount of resources which the SWS can provide; workload in terms of the amount of resources which the SWS is using; *availability* in terms of the probability that the SWS is accessible; *correctness* in terms of the probability that the SWS handles the request correctly; *execution duration* in terms of the amount of time units which the SWS takes to handle a request, *cost* in terms of the amount of currency which the SWS charges; and

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participation being the proportion of resources which the SWS is using and the revenue which is the amount of currency which the SWS is earning.

3 3-Way Satisfaction

In this section, we use the parameters in Section 2 to model the satisfaction of the user, SWS and MWS. Each of the 3 satisfactions can be determined by their previous respective satisfactions. We also include a decay function that puts the emphasis on recent values.

3.1 User Satisfaction

User satisfaction depends on the level of QoS that was provided to its requests. We consider 3 components for user satisfaction. These 3 components are *availability satisfaction*, *correctness satisfaction* and *execution duration satisfaction*. These 3 components depend on the respective SWS parameters (Availability, correctness and execution duration). The total user satisfaction is thus a weighted summation of the 3 components. In this paper, we assume that an increase in user satisfaction leads to an increase in the number of requests over time.

3.2 SWS Satisfaction

We define SWS satisfaction as its participation level. When a SWS joins a community, it expects to be doing a certain level of work, and thus getting paid accordingly. In this paper, we assume that an increase in SWS satisfaction leads to an increase in its *capacity*. However, there is a limit to which the SWS can increase this *capacity*.

3.3 MWS Satisfaction

MWS satisfaction is straightforward in the sense that the master is only concerned with maximizing the *revenue* of the community. Ideally, the *revenue* should increase over time.

3.4 Score

Putting the 3 satisfactions together gives the score of the selection. The score allows the MWS to quantitatively compare one selection from another in the second step of the selection process. The score is a weighted summation of the 3 satisfactions (User satisfaction, SWS satisfaction and MWS satisfaction). Depending on the strategy of the MWS, the weights give the MWS the flexibility on which area it would like to emphasize.

4 Related Work

The use of user satisfaction to select Web services has been used extensively in the context of a composition of Web services [1,2,4,7,9]. However, these works, to our best knowledge, only consider the satisfaction of the user. They do not consider the satisfaction of other parties in the composition (The Web service and the service-broker).

5 Conclusion and Future Work

In this paper, we proposed a method that allows a community of Web services to consider the satisfaction of the user, the Web services and the MWS when selecting a Web service to handle the request.

Our work can be extended to composition of Web services where the satisfaction of the individual Web services or the composition on the whole can be considered.

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