

Quality and Business Offer Driven Selection of Web Services for Compositions

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Abstract. The service composition makes use of the existing services to produce a new value added service to execute the complex business process. The service discovery finds the suitable services (candidates) for the various tasks of the composition based on the functionality. The service selection in composition assigns the best candidate for each tasks of the pre-structured composition plan based on the non-functional properties. In this paper, we propose the broker based architecture for the QoS and business offer aware Web service compositions. The broker architecture facilitates the registration of a new composite service into three different registries. The broker publishes service information into the service registry and QoS into the QoS registry. The business offers of the composite Web service are published into a separate repository called business offer (BO) registry. The broker employs the mechanism for the optimal assignment of the Web services to the individual tasks of the composition. The assignment is based on the composite service providers's (CSP) variety of requirements defined on the QoS and business offers. The broker also computes the QoS of resulting composition and provides the useful information for the CSP to publish thier business offers.

Keywords: Business Offers, QoS, Broker, Composition Graph.

1 Introduction

Web services are evolving rapidly as a mechanism to expose the computational and business capability to arbitrary devices over the Web. The widespread adoption of Web service technology makes the business to expand its services by building the new value added services. The building and execution of a value added service (composite service) can be carried out in *four* phases. In the first phase, the individual tasks (activity) of the composite service are identified and the control flow is defined for these tasks using a flow language (e.g. WSFL [2] or BPEL4WS [1]). In the second phase, the suitable Web services are discovered for each task based on the functionality. The third phase involves the optimal assignment of the discovered Web services for the tasks based on the local/global requirements. Finally, the execution phase executes the assigned services according to the predefined control flow. The selection of the most suitable (best in

terms of quality, compatibility and business offerings) Web services for the various tasks is a crucial issue in Web service composition. There have been efforts towards the optimal selection of services based on the QoS requirements defined on the multiple QoS properties [5], [6], [12]. In this paper, we propose the broker based architecture for QoS and business offer aware Web service composition which identifies the right services for the tasks based on the QoS and business offer requirements.

The organization of the paper is as follows. In the following sub-sections, we give a brief description about the related works, important QoS properties, QoS aggregation for the composition patterns and the motivation. Section 2 presents the business offer model for the business Web services. The section 3 provides the representation scheme for the CSP's composition requirements. Section 4 proposes the broker based architecture for the QoS & business offer aware Web service composition. Section 5 describes the selection model for the service composition. Section 7 draws the conclusion.

1.1 Related Work

In literature, many researchers have addressed the issue of QoS-aware composition of the Web services [8], [9], [7], [6]. The work presented in this paper is closely related to the work proposed in [12], [11], [3], [10]. Zeng et-al [11] proposes a middleware which addresses the issue of the selection for compositions. The middleware employs a mechanism which assigns the best services to tasks based on the local and global constraints (global planning). The paper [3] proposes a model driven methodology for the QoS-optimized service composition based on the pattern-wise selection of services which are ranked using simple additive weight (SAW) method. Jaeger [10] explains the selection problem and points out the similarity to the Knapsack and resource constraint project scheduling problems. The authors propose heuristic algorithms such as greedy, discarding subsets etc to solve the selection problem. The paper [12] models the selection problem in two ways: the combinatorial model and graph model. The authors also define the selection problem as a multi-dimension, multi-choice 0-1 knapsack problem for the combinatorial model and multi-constraint optimal path problem for the graph model. They suggest the efficient heuristic algorithms for the composite processes involving different composition patterns with multiple constraints. So far there are no efforts from the researchers to assign the best candidates for the tasks of the composition plan based on the multiple requirements on QoS and business offers involving AND & OR operators with varied preferences.

1.2 QoS of Web Services

In this paper, we use the different QoS properties for the optimal service selection. The various Web service QoS properties have been introduced by the number of researchers [8], [11], [13]. We consider the following *six* QoS properties to describe the selection mechanism. They are: Execution Cost (EC), Execution Time (ET), Security (SC), Throughput (TP), Availability (AV) and Reputation