

# Chapter 5

## Quality-of-Service Based Web Service Composition and Execution Framework

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### **ABSTRACT**

*Software is gradually becoming more built by composing web services to support enterprise applications integration; thus, making the process of composing web services a significant topic. The Quality of Service (QoS) in web service composition plays a crucial role. As such, it is important to guarantee, monitor, and enforce QoS and ability to handle failures during execution. Therefore, an urgent need exists for a dynamic Web Service Composition and Execution (WSCE) framework based on QoS constraints. A WSCE broker is designed to maintain the following function: intelligent web service selection decisions based on local QoS for individual web service or global QoS based selection for composed web services, execution tracking, and adaptation. A QoS certifier controlled by the UDDI registry is proposed to verify the claimed QoS attributes. The authors evaluate the composition plan along with performance time analysis.*

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## **INTRODUCTION**

Service-Oriented Architecture (SOA) is an approach to construct distributed systems that bring application functionality as services to end-user applications (Booth, Hass, McCabe, Newcomer, Champion, & Ferris, 2005). The basic idea of SOA is to compose an application as a set of services that are language and platform independent, communicate with each other using standardized messages like XML, Web services is a technology that realize the SOA.

A web service is a software system identified by a URL, whose public interfaces and bindings are defined and described using XML. Its definition can be discovered by other software systems (Booth, Hass, McCabe, Newcomer, Champion, & Ferris, 2005). As individual web services are limited in their capability, which created the need for composing existing services to create new functionality in the form of composite service. However, the process of creating composite service is achieved by combining existing elementary or complex services, possibly offered by different providers. For example, a travel plan service can be developed by combining several elementary services such as hotel reservation, ticket booking, car rental, sightseeing package, etc. In carrying out this composition task, one should be concerned with the efficiency and the QoS that the composed process will exhibit upon its execution (Chandrasekaran, Miller, Silver, Arpinar, & Sheth, 2003).

Some proposals are being made to enable dynamic composition of web services and execution monitoring frameworks (Al-Shargabi, El Shiekh, & Sabri, 2010). Few of these proposals address user QoS constraints: whether these constraints are locally on every individual web service or globally for the whole composition process according to Al-Shargabi, El Shiekh, and Sabri (2010). These constraints must be addressed to satisfy client requirements, such as price, availability, so it is

necessary to represent required QoS in the selected and composed web services. Moreover, Evaluation of composition process: when the composer selects a web service, it is quite common that many web services have the same functionalities. So it is possible that the composer generates more than one composite service fulfilling the requirements. In that case, the composed web services are evaluated by their overall utilities using the information provided from the non-functional attributes. The most commonly used method is utility functions as in WSCE framework. The requester should specify weights to each QoS attribute and the best composite service is the one that is ranked on top. During the execution of composed web service, some web services may update their QoS properties others may become unavailable. A dynamic composition approach is needed, in which runtime changes in the QoS of the component services are taken into account. It is imperative to design a Web Service Composition and Execution (WSCE) framework that adapts to failure of web services or changes in their QoS offerings to satisfy user requirements or constraints, these issues already have been discussed in previous work by Al-Shargabi, El Shiekh, and Sabri (2010).

The remained of paper organized as follows: the proposed WSCE framework is presented. The next section describes WSCE Broker functions. The following section presents domain registries. The QoS certifier is then presented, followed by analysis and validation. Conclusion and future work are found in the last section.

## **WSCE FRAMEWORK ARCHITECTURE**

The WSCE framework is a broker-based framework for the dynamic composition of web services. The main motivation of the proposed framework is to build a WSCE broker to make intelligent service

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