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A trustworthy Reputation Approach for Web Service Discovery

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Abstract

Trust and Reputation for Web Services arises as an important research issue in Web Service discovery. To the best of our knowledge, current Web Service Reputation models do not include the trust factor in the calculation of Web Service Reputation. In this paper, we propose a Web Service discovery and selection model based on reputation model that can overcome such limitations by considering consumer trust factor when calculating Web Service Reputation. In addition, the trust Negotiation approach is included in the selection process. The proposed approach is implemented and test. The results show that including the consumer trust factor in calculating the Web Service Reputation affects positively as it allows the system to behave systematically and gives more trustworthy results in the discovery process.

Keywords: Web Service Discovery,Quality of Service (QoS), Reputation, Trust Negotiation;

1. Introduction

Service-Oriented Architecture (SOA) and Web Services (WS) have received significant attention recently. SOA is a set of principles and methodologies for designing and developing software in the form of interoperable Services. As an implementation of SOA, Web Services are defined as a set of standards such as Simple Object Access Protocol (SOAP), Universal Description Discovery Integration (UDDI), and Web Services Description Language (WSDL).

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These standards enable a flexible way for applications to interact with each other over networks. Simple Object Access Protocol (SOAP) is the protocol for applications to communicate with each other. UDDI is a registry for Service Providers to publish their Services. WSDL is used to describe a WS capabilities and the interface to invoke it. A WSDL document is self-describing so that a Service Consumer can examine the functionality of the WS at runtime and generates corresponding code to automatically invoke the service. All these standards are XML-based (Extensible Markup Language), which allow applications to interact with each other over networks, no matter what languages and platforms they are using.

Quality of Service (QoS) requirement can be used as a measurement for service selection. QoS is a set of non-functional attributes like Service Response Time (SRT), throughput, reliability, and availability [1, 2]. In SOA, both service providers and consumers should be able to define QoS-related statements to enable QoS-aware Service discovery.

With the rapid growth of Web Services, a large number of Web Services with the same o function are developed and published. How to select a suitable and a good reputation service has become an important research topic. The Web Service selection based on QoS has been referred for solving this problem, which considers distinguishing those Web Services with the same function using a set of different QoS levels [3].

Some ofQoS-based services selection approaches assume that the QoS data coming from service providers and the consumers are effective and trustworthy. However, the values of QoS attributes, which are provided by service providers, may be unbelievable, since service providers sometimes may advertise higher QoS data than the factual level of the service in order to attract more users to use their services and so gain better benefits [4]. For example, the maximum response time of these services may be increased, while the supplication rate remains under a certain threshold during runtime. Therefore, how to give the objective and effective evaluation to service provider's reputation to help the consumer to reference and choose the appropriate service becomes a problem to solve [5].

To ensure the integrity and objectivity of a Web Service Reputation evaluation, this paper proposes a discovery model in which selecting Web Services based on a new calculation of the Web Service Reputation. The proposed Discovery Unit receives requests from service consumers and performs three main functions. Firstly, it finds the services that match their requirements. Secondly, if the request has a reputation requirement, the Reputation Module computes the trust factor of the consumer that assign reputation to services, then it return the reputation value of the services after computing. If there is no matching service with the request the Negotiation Module starts the Negotiation with the Services Provider about the service that accepts Negotiation. Finally, a Discovery Unit returns the matching list of services to the consumers.

This paper is organized as follows. Section 2 outlines the related work to our proposed model. The proposed discovery and selection model is illustrated in Section 3. Section4 presents the experiments that evaluate the effectiveness of our model and the effect of the new reputation algorithm. Section 5 presents the conclusion and the future work.

2. Related Work

Many significant research efforts have been produced in the last years in order to study the QoS-based Web Service description, reputation, and Negotiation systems. We provide an overview of some of this work as a context for the research discussed in the remainder of the paper. In addition to the existing three roles of service provider, service consumer and UDDI registry, Ran [6] proposed a model that extends the traditional model with a new role called a Certifier. The certifier verifies the advertised QoS of a WS before its registration. The consumer can also verify the QoS claims to assure satisfactory transactions. Although this model incorporates QoS into the UDDI, it does not integrate consumer feedback into the discovery process.

Maximilien and Singh [7] proposed an agent framework and ontology for dynamic WS selection. Service quality can be determined collaboratively by participating service consumers and agents via the agent framework. Although these approaches tackle the issues of incorporating QoS information into the WSD process, they did not consider feedback from consumers.

Jebrin and David [8] presented an approach to assess and predict reputation in Service oriented environments. For assessing a WSD reputation, they defined reputation key metrics to aggregate the feedback of different aspects of the ratings. Different customers evaluate a WSD from different QoS aspects, so they proposed a model to handle different aspects with different values in the Feedback Management System.