QoS-Aware and Federated Enhancement for UDDI

Chen Zhou, Liang-Tien Chia, Bu-Sung Lee
Nanyang Technological University, Singapore

ABSTRACT

With more and more Web services appearing on the Web, Web service’s discovery mechanisms become essential. UDDI is an online registry standard to facilitate the discovery of business partners and services. Service requesters can choose good performance Web services by manual test and comparison. However, this method of choosing is inefficient and costly in terms of time and money. The ability to predict the quality of service is missing in UDDI. Furthermore, UDDI registries in federated organizations should be able to share more about the service requester’s connection information to make better predictions for services’ performances. To address these problems, we propose UX (UDDI eXtension), a system that facilitates requesters to discover services with good performance. In each enterprise domain, the requesters’ QoS feedback is received and then stored in a local UX server. By sharing these experiences from all the requesters in the local domain, the system can predict the service’s future performance. To support the discovery between different cooperation domains, we design a general federated service and then enhance the UX system’s federated discovery ability based on this federated service. The system handles the federated inquiry and provides a simple view over the whole federation. Meanwhile the UX server’s inquiry interface will still conform to the UDDI Specification.

Keywords: Web services; UDDI; QoS-aware; service discovery; federation; UDDI extension; similarity domains; QoS metrics.

INTRODUCTION

With the industry’s efforts on promoting the use of Web services, a huge number of Web services are being developed and made available on the Web. Organizations now wish to offer electronic services worldwide and this creates several technical problems. First, being able to discover what services are available. Second, being able to determine which services match your specification. Third, being able to control which services are advertised to whom, and when. Fourth, being able to assess previous and current service usage for future selection.

There are three major roles in the Web services architecture: the service
provider, the service requester and the service registry. The service provider is the business entity that provides software applications as Web services. The service requester is the entity who has a need that can be fulfilled by an available Web service. The service registry is a searchable repository of Web services descriptions where service providers publish their Web services and service requesters locate Web services and obtain binding information to invoke the services. UDDI (Bellwood et al., 2002) stands for Universal Description, Discovery and Integration. It is a public specification that defines a service registry to publish information regarding the Web services and to make this information available to potential clients.

As more and more services appear on the Web, service requesters are presented with a group of service offers providing similar services. Different service offers may have different qualities of service. This will require sophisticated patterns of negotiation. For example, the trade-offs between quality and cost, or invocation of another trade service determining the QoS of various service offers. Current UDDI registries are neither accountable nor responsible for the QoS descriptions in service offers.

Some extension can be made for UDDI to register the service’s QoS description. However, even with the QoS descriptions registered on UDDI through extension, the QoS description may still be a bad prediction of the service’s real performance. This is mainly caused by the following reasons: firstly, the published description could use false information just to attract potential clients. Through the development of trust mechanism and digital signatures, this problem may be solved. Secondly, the false prediction inherits from the architectural aspect of UDDI system. The most distinctive architectures of UDDI registry system contain: centralized architecture and semi-centralized model (the cloud model). Single public UDDI is a centralized architecture model. To this model, UDDI is a central point that mediates service publishing/discovering in the framework. All services are registered on it and can be accessed by all those potential requesters. Different service requesters have quite different connection conditions and routing paths. This difference leads to the requester’s different experiences of service QoS even when the service’s server-side processing condition is not changed at all. The unique service QoS description in the central UDDI is therefore not a good prediction for a requester’s reference. To the semi-centralized model (the cloud model), where there is more than one UDDI registry, replication technology will be used to ensure consistent content in different registries. The service provider is required to publish the service descriptions to any one of the cloud nodes. After the replica, service requesters can discover the service from any one of the cloud nodes. Through replication, the service requester can choose the most suitable cloud node...
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