ABSTRACT

In recent years, web service has been the most successful and popular technology in distributed computing. Web services communicate based on Hypertext Transfer Protocol (HTTP), described using Extensible Markup Language (XML), and transported via Simple Object Access Protocol (SOAP). Due to these characteristics, web service have been widely adopted and applied in the IT industry. The accomplishments in the area of the Web Service (WS) research have led to an explosion of Web Services.

The Web Services are advertised in the registries, and discovered based on the needs of the consumer. These registries rely on the current Web Service standard stack that uses WSDL and UDDI for Web Service description and discovery. Developers and researchers have realized the difficulty of discovering web services to fulfill their tasks in such a large scale publication of web services. Current web technologies are built upon syntactical techniques; hence, search mechanisms cannot differentiate similar web services.

This situation creates a need for augmenting semantics to web services to achieve precise and accurate results. Semantic Web Service descriptions are provided using ontologies which describe the meaning to concepts and relationships between them. Discovery algorithms are used to select appropriate services among multiple similar services that perform the same function using these ontologies. OWL-S is the joint effort of Semantic Web and Web Service. However, with proliferation of web services, invoking the desired service effectively and efficiently has become a challenging issue. QoS (Quality of Service) which describes the non functional attributes of the

service can be used as a distinguishable factor as it reflects users' expectations. Further, discovery algorithms should perform QoS-based filtering (matchmaking) and ranking (selection) on WS advertisements in order to produce ranked results.

The major issues related to web service selection are identified as follows: improving the relevancy of the discovered services, incorporating automation in the selection process, integrating dynamism in the selection process, and improving the efficiency of service selection process. Based on the investigation carried out on existing and considering the above research issues, attempts have been made to design a conceptual framework for QoS based semantic web service selection.

The research work is realized in five phases. The first part deals with service discovery; the second phase focuses on service selection. Efforts have been taken to apply using map reduce technique for service selection in the third phase and the fourth phase of the work proposes dynamic replication technique to increase the availability of service. The last part of the research verifies various selection methods using Analysis of Variance Technique and recommends appropriate methods.

The summary of observations based on QoS parameters significance and the selection schemes are as follows:

i. In AHP, the user is allowed to give preferred weights for the QoS parameters but this is not possible in WsRF.
ii. In WsRF, the user cannot request for a web service with their preferred weights.
iii. In AHP, decomposing the complex decision problems into a hierarchy of smaller sub problems increases the number of pair wise comparisons within sub problems. When a level of hierarchy increases the AHP

method takes a long time to synthesize weights. Even for a small problem the computational requirement is more.

iv. Non-Hierarchical approaches of service selection allow a consumer to choose multiple preferences. LSP retrieves the best web service when three QoS parameter is considered.

v. In multiple preferences, LSP produced better results for response time, throughput and scalability. Overall this technique works better when single QoS parameter is considered and gives good results for the user request based on response time, throughput and scalability.

vi. Fuzzy Topsis selects best web services for both single and multiple QoS preferences.