ABSTRACT

Web Services are innovative and powerful mechanisms for heterogeneous distributed computing, designed to support interoperable machine-to-machine interaction over a network. They are highly popular because they provide the possibility of a standardized, platform independent and easily extensible communication along with the other benefits like platform and vendor independence, faster time to production, and convergence of disparate business functionalities. Businesses can dynamically mix and match Web Services to perform complex functionality with minimal programming. Web Services are important for interoperability of applications and integration of large scale distributed systems irrespective of the platform.

With Web Service based Systems, service access in real time is purely based on the dynamic service discovery from the registry named as Universal Description, Discovery and Integration (UDDI). It is not only the fluidity and flexibility of the services affect the service users but also the way and the frequency of updates in service offerings affect the users via service access operation in registries and hence UDDI becomes one of the critical constitutes of the Web Service based Systems. UDDI plays a very important role to publish and lookup the services in Web Service environments.

WSDL and UDDI have been accepted as standards for service discovery but being syntax based and centralized, their robustness, scalability and flexibility in Service Discovery process requires research attention. Most of the UDDI implementations are centralized, which lead to a steep decrease in their performance if there is high volume of services to be registered or queried. But, the internet has been witnessing a steep increase in the number of Web Services accessible online. This tendency demands distributed models and architectures for
the service discovery process to enhance the scalability and other concerns of the
service publication and service retrieval operations. Recent versions of UDDI have
made changes to accommodate interactions between distributed registries and many
researchers devote to utilize peer-to-peer technology to solve the issues faced in
traditional Web Service discovery process.

In this research, we propose an effective model for replica management in a
Distributed UDDI environment. With the aim of providing a Distributed UDDI
model to facilitate complex free service registration and updates for the service
provider and to provide a means for convenient access to the service requesters to
find the latest service information, the goals of this research have been identified
and given hereunder.

1. To Maintain and Manage the Replica Consistency across the nodes of the
Distributed UDDI Environment.

2. To Reduce the overall Response Time for Service Inquiry, Registration
and Updation in the Distributed UDDI Environment.

The goals of this work have been derived on the basis of improving the
overall response time of the UDDI registry both for Service Inquiry and Service
Publish in a Distributed UDDI Environment. The goals are highly specific and
realistic which leads to measurable outcomes. While both goals are related to
Distributed UDDI Environment, the first one is operation and performance oriented
whereas the second one describes the efficiency of the proposed model for replica
management. This work differs in flavor from the majority of research works
carried out so far in the domain of Distributed UDDI registry. This research is an
attempt to present a new model for replica management, supported by the
experimental results with quantitative outputs.
A layered architecture has been proposed for replica management in which the base layer consists of the proposed Distributed UDDI registry. Web Service publish/update and distribution to the DUDDI nodes are the responsibilities of the functionality layer and operations layer. The assessment criteria and performance attributes have been defined in the top two layers of the proposed architecture. An experimental setup using a simulation environment has been developed and used as a test bed to study the behavior of the proposed P2P based DUDDI system. The traditional P2P based DUDDI system has been further augmented by using Distributed Spanning Tree structures and modified Ant Colony Optimization for improving the performance of the proposed model.

The experimental results for the replica consistency, message density, response time and other performance based evaluations of the P2P based DUDDI system have been compared with the augmented models, the DST structured P2P based DUDDI system and the ACO optimized DST structured P2P DUDDI system. The comparison of the outcomes and the promising experimental results demonstrate consistent and progressive performance for the Service Replica Consistency, Service publish and retrieval, Scalability, Response Time and Availability. The constructive and encouraging results justify the significance and necessity of the proposed line of research and of course it may encourage further enhanced investigation in the identified area of research.