PSSRC:
A Web Service Registration Cloud Based on Structured P2P and Semantics

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ABSTRACT
The Universal Description, Discovery and Integration (UDDI) registry is widely used for organizing Web services in the Internet, but it cannot meet the requirement of organizing massive Web services in the cloud computing environment. In this paper, a Web service registration cloud based on structured P2P and semantics (PSSRC) is presented. On the one hand, PSSRC works on a structured P2P overlay which is organized by using Pastry in multiple registration nodes, where each registration node is composed of seven modules namely system configuration, schedule and distribution, P2P communication, access and control, UDDI, resources monitoring, and semantic process. On the other hand, a semantic ontology database named WordNet is used to process semantic queries in PSSRC. PSSRC inherits the advantage of UDDI in that the registration and discovery of Web services are transparent to Web services providers. Furthermore, it is shown by experiment that the capacity of PSSRC can be extended dynamically, and both semantic queries and large scalable accesses are well supported.

KEYWORDS
Pastry, Semantic, UDDI, Web Service Registration, WordNet

1. INTRODUCTION
Cloud computing combines such existing and new techniques as Service-Oriented Architectures (SOA) and virtualization, and cloud computing has become a new typical computing paradigm. In cloud computing environment, all the computing infrastructure resources are provided as services over the Internet, and various business models can be described by terminology of “X as a service
(XaaS)” where X could be software, hardware, data storage, and etc. Web Service is a main function interface form provided by the cloud computing, especially in Software as a Service (SaaS), which realizes flexible program development. There are massive functions and resources are encapsulated into Web services in cloud environment. The Service Oriented Architecture (SOA) is a very important technology in cloud computing, and how to organize and integrate Web services is a very important work (Duan et al., 2012; Papazoglou et al., 2008). There are 3 roles in SOA: service provider, service registration center and service requestor. The service registration center, which stores and integrates Web services URL information, is the basis for the realization of service composition among the entire architecture of SOA. The Universal Description, Discovery and Integration (UDDI) gives a descriptive specification for information related Web service, and it also includes the standard specifications of Web services information registry center at the same time (Liu et al., 2007).

The centralized architecture is normally used in traditional service registration/UDDI systems (Apache jUDDI; Tamilarasi et al., 2012). Because centralized architecture systems have such shortcomings as performance bottlenecks, bad scalability and single-point-of-failure, the traditional service registration systems are not adapt to large-scale service registration and queries (Goodwin et al., 2007; Zhang et al., 2008; Yao et al., 2010; Guo et al., 2009; Steinmetz, 2004; Sioutas et al., 2009). The P2P technology can provide appropriate exchanging mechanism between multiple private service registrations. Such problems as solitary-island are avoided, and it becomes a research tendency to utilize the P2P network’s advantages to solve problems caused by centralized architecture (Steinmetz, 2004). Using a distributed architecture to reduce and balance the burden of single node, the performance of whole Web services registration system can be improved. This paper make a scalable P2P architecture to extend JUDDIV3 (Tamilarasi et al., 2012) system, to solve such problems as performance bottlenecks, single-points-of-failure. The Web service registration cloud based on structured P2P and semantic (PSSRC) provides Web services registration and discovery services for the service providers and requesters. The registration and discovery services are transparent and the interfaces are standard Web services mode. If there are enough computers can be deployed on the Web services registration overlay, PSSRC can support magnanimous web services registration.

The contributions of this paper are summarized as follow:

1. In this paper, a Web services registration cloud is firstly proposed. Pastry (Rowstron et al., 2001) is introduced to organize and coordinate multiple UDDI nodes to build a Web services registration overlay network. The scalable architecture is suitable for dynamic work load in the cloud environment. The Web services registration and discovery provided by PSSRC is the same as one single UDDI;
2. The semantic process mechanism based on WordNet (WordNet) is used to find these synonym Web services on PSSRC. It helps to find more suitable Web services with better QoS that can meet the requestor’s requirements;
3. The scalability and performance of PSSRC is evaluated through the experiments using SoapUI (Luo et al., 2010) and LoadRunner (ALM). This evaluation schema can be referred by the Web services registration system researchers.

The rest of this paper is organized as follows. The related work is introduced in section 2. The architecture is proposed in Section 3. The system scheduling and communication algorithm based on structure P2P is given in Section 4, and WordNet based semantic process is proposed in Section 5. The registration and discovery of web service on PSSRC is discussed in Section 6. The performance is evaluated in Section 7 and we conclude the paper in Section 8.
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