An Approach for Service Discovery based on Semantic Peer-to-Peer [1]

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Abstract. The service discovery is a key step during Peer-to-Peer (P2P) converging with Web Service. In this paper, a semantic-P2P based approach is presented for web service discovery. To enable the semantic web service superiority, service profile is used to describe web service and as the service data source. The service-expertise based model is proposed for service's node selection. Meanwhile, similarity functions are accentuated for measuring the semantic similarity of different elements inside a service profile.

1 Semantic-P2P based Service Discovery Framework

At present, there are totally three kinds of pattern for Web Service discovery, as *Matchmaking*, *Broker* and *P2P model*. We introduce an expertise-based model for service discovery under P2P. In our model, every peer performs service provider and service consumer simultaneously. Each peer also has Local Service Registry (LSR) and knowledge repository (shown as Fig.1). The peers share an ontology *O*, which provides a common conceptualization of Web service domain. The ontology is used for describing the expertise of peers and the subject of requests. Here the ontology *O* can be a ServiceTaxonomy, such as NAICS and UNSPSC. An expertise description *e* is an abstract, semantic description of the knowledge base of a peer based on the common ontology *O*. Service Expertise (SE) is a subclass of the expertise. The peer selection [1] is based on semantic matching the subject of a service request and the SE, this betters query with designedly forwarding.

The semantic topology relies on the knowledge of the peers about the service expertise of other peers; thus it is independent of the underlying network topology. Due to this, the TTL of service request need not be conceived, as it can be processed by underlying P2P protocol. The semantic topology can be described by the relation: *Knows* $\subseteq P \times P$, where *Know (p1, p2)* means that p1 knows about the expertise of p2.

We abstract service as a quaternion (*Category*, F_i, Q_i, C_i), where *Category* is taken to compute similarity with expertise to select peers and forward query. F_i is the

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functional description of a service; *Qi* is the QoS attributes description, while C_i indicates the cost. The service discovery flow is described as followings. (1)Firstly, semantic topology is set up in P2P network. Each peer joined in will advertise its service expertise, then peers create semantic overly topology according to the known relations of the expertise between them.(2)One peer initializes a request described with Service Profile, and sets the key information ServiceCategory.(3)The original peer computes the similarities between request *r* and all other expertises (set of *se*) cached in local-storage, and selects next forwarding peers whose corresponding similarity value is larger than a certain threshold. (4) The forwarding peer performs the same procedure as in step 3 and forwards the request; meanwhile, it searches the service in local registry. The search focuses on semantic similarity computing for (F_i, Q_i, *Ci*).When the suitable services are found, it returns the result to the original peer. (5)The original peer receives the query results, analysis them and communicates with the service provider by SOAP message.

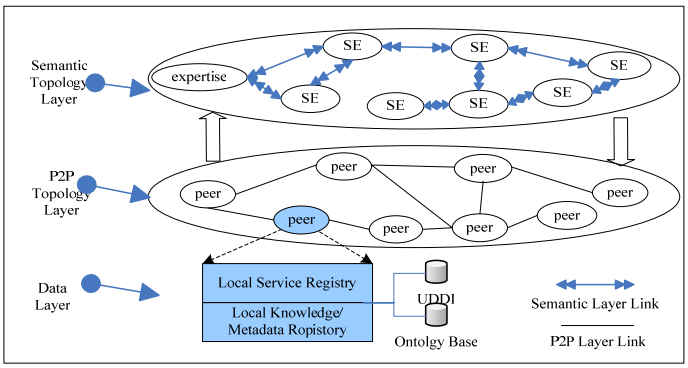

Fig. 1. Layered Architecture of the Framework

During our similarity measure for web service, we divide our global similarity into different parts, such as *category* part, *functional* part, and *non-functional* part, and contrapose the specialty of each part to select and design similarity function. By this, we easily optimize local part to improve on global measure performance.

$$Sim_{Service} = w_1 \cdot Sim_{Category} + w_2 \cdot Sim_{Func} + w_3 \cdot Sim_{NonFunc}, where \sum_{i=1}^{3} w_i = 1$$

2 Conclusion and Future works

An approach for service discovery based on semantic P2P architecture is proposed. Different from both service-oriented system such as [2] [3], our works conceive of the service request routing in P2P and the service matching in local peer; more it is totally designed for the web service, while their works are partial to provide the web service invocation for the corresponding function. To create a semantic P2P environment, we use our works on JXTA as a base, which provides refined semantic P2P architecture for SemReX. In the future, our model will be further improved on and the similarity functions should be studied deeply.

References:

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