Service Discovery for Service-Oriented Content Adaptation

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Abstract. Service-Oriented Content Adaptation (SOCA) has emerged as a potential solution to the content-device mismatch problem. One of the key problems with the SOCA scheme is that a content adaptation task can potentially be performed by multiple services. In this paper, we propose an approach to the service discovery problem for SOCA and it is demonstrated to perform well.

1 Background and Related Work

Content adaptation is a multi-step process involving a number of services each performing a specific adaptation task. The service discovery problem of interest can be formulated as follow:

Let $T = \{t_1, t_2, \dots, t_n\}$ *and* $S = \{s_1, s_2, \dots, s_m\}$ *be a set of adaptation tasks and a set of available services respectively such that* $n \ll m$. *Let* Q *represent the quality of service criteria (e.g., time, rating, reputation, cost) of each available service* $s_i \in S$. *Given S, T and Q, the central problem is how to discover and select a set of composite services that are capable of performing series of tasks.*

Existing QoS-based service discovery systems for web service [1] and for pervasive computing require that both the services and the client QoS must be known a priori. However, this may not be practical as most end-users may find it difficult to indicate all their QoS precisely. Moreover, there may not be services that match users' indicated QoS thus, resulting faulty QoS matchmaking. The proposed approach addresses these problems.

2 Proposed Solution and Evaluation

Fig.1(a) shows a high level service discovery architecture for the SOCA platform. The provider layer has the platform providing the services. A service provider advertises its services in one or more service registries. Access to a service is made possible through its service handle in a reference form. The discovery layer deals with those aspects that describe how service discovery is operated to facilitate incoming client requests. Fig.1(b) outlines the algorithm for the service discovery. It is composed of three inter-related steps: adaptation function matching, candidates' discovery and composite service selection. For details of the proposed discovery architecture and algorithm, please refer to [2].

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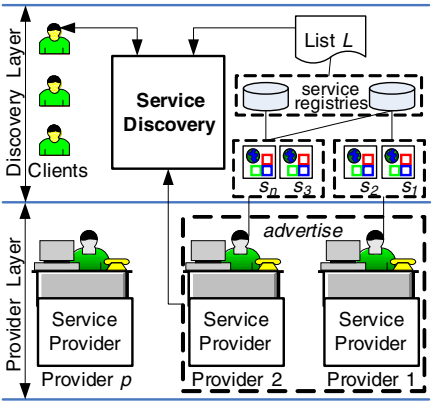

Algorithm 1: Service Discovery

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1:  INPUT: T, S, G, Q, δ_q
2:  BEGIN
3:  AP ← ⟨C,C',T,S,Q⟩
4:  Compose AP
5:      FOR each path created DO
6:          Calculate Path Score (AgP_i)
7:          Select a service from the best path
8:          FOR each task DO
9:              Match with group g_k
10:         END FOR
11:         FOR each g_k DO
12:             Candidate services ← if δ_q within X
13:         END FOR
14:     END FOR
15: END
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Fig. 1. (a) Service Discovery Architecture and (b) Service Discovery Algorithm

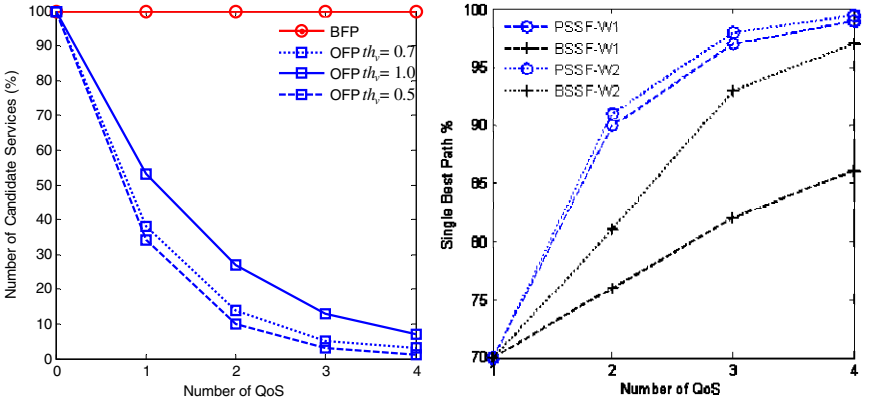

Fig. 2. (a) Number of Candidates and (b) Single Best Path, versus QoS Variations

Fig.2(a) demonstrates that our optimize filter (*OFP*) variations reduce the number of candidates compared to the baseline filter (*BFP*). The suitable *OFP* threshold th_v for providing sufficient candidates is around 0.8 to 1.0, especially when more QoS is taken into account. As shown in Fig.2(b), our objective function (PSSF) generated higher percentages of single path generation for both W1 (equal weight) and W2 (unequal weight) compared to the baseline function (BSSF). For a detailed explanation on experimental setup and result, please refer to [2].

References

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