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Composing and Ensuring Time-Bounded Agent Services

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Abstract. There are situations where an agent needs to compose several services together to achieve its goals. Moreover, if these goals should be fulfilled before a deadline, the problem of service composition become more complex. In this paper a multi-agent framework is presented to deal with service composition considering service execution time taking into account the availability and the workload of the agent that offers the service.

1 Introduction

Multi-Agent Systems technology makes possible to cover a broad area of problems. Typical problems are systems in which there are entities (Requesters) which may require one or more services from other different entities (Providers). As an example, in the area of manufacturing systems, Requesters would be clients with new work orders and Bidders would be factories or factory clusters which provide the needed resources to obtain the required product. Obviously, the development of these types of systems is complex and, therefore, it is necessary to analyze in detail the intrinsic characteristics of these application environments.

One of the main problems in this kind of systems is how to create added-value services dynamically by composing elemental services. Services can be seen as elemental components and they are commonly used by human developers to create bigger systems. Semantic annotations help machines to deal with services, but service discovery and composition are complex tasks that need extra intelligence doses to achieve proper results, specially in open and dynamic environments where services are not always available.

Another important problem to solve in this kind of systems is to attend requesters requirements when they ask for having the answer available in a bounded time. The late fulfillment of some services could reduce the quality of the response offered by the multi-agent system. Therefore, before performing a complex service, someone must analyze if the service can be provided on time.

This paper presents a multi-agent framework which allows to compose time-bounded services and to ensure their fulfillment. The multi-agent framework considers the current workload and the availability of the provider agents of

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not consider workload or service availability in that moment. It is necessary to contact with provider agents and to query their availability and workload at that moment. With this information, a more realistic estimation can be obtained.

In this paper, a multi-agent system framework to deal with this problem has been presented. In this framework, a planning technique is used to get a service composition considering service execution time. To refine this service execution time, provider agents are consulted. These agents use real-time and CBR techniques to calculate the execution time taking the current situation of agents into account. In this way, the client can make a decision with more reliability in the information about services execution time and probability of success.

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