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A Combinatorial Procurement Auction for Composite Web Service Selection

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Abstract

Web services have emerged as the dominant technology for realizing service-oriented computing. These services are self-contained, modular applications with open, Internet-oriented, standards-based interfaces. This interface supports organizations in developing applications by composing available services.
However, the functionality offered by a single web service is often limited, while the end-user demands can be complex. A practical way to tackle this problem is to define the complex functionality as a high-level business process and then select those services which can execute the tasks defined in the business process, i.e. composite web service selection.
The two current approaches to service selection suffer from serious limitations. The first, optimization-based service selection, requires service providers to publish their services with predetermined values for the service quality attributes, e.g. a fixed price, or availability for everyone. The second, negotiation-based service selection, needs a complex decision model for the automated software negotiators, making the application of fully-automated negotiators unrealistic.
My approach based on game theory is to design a combinatorial procurement auction, where the service providers bid for the defined tasks. The auction design consists of two main elements: winner determination problem which determines the winning bidders, and the pricing schema which determines how much each winning bidder should be paid to have enough incentive for bidding truthfully. Auctions offer a dynamic pricing schema, in contrast to optimization-based approaches, and they do not require complex decision models as negotiation-based solutions.
My research contributes to the global challenge of extending today's Internet to become service-enabled. The "Internet of Services" vision is not achievable without incorporating automated service selection and composition techniques.