Overview of Preference-Based Web Service Frame

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Abstract - ***Plenty of the research on automated Web Service Frame (WSF) relates it to an AI planning task, where the composition is primarily done offline before to execution. Some of this optimization can be done offline, many interesting and beneficial optimizations are data dependent, and must be done following execution of at least some information gathering services. Recent research on WSF has argued convincingly for the features of optimizing quality of service, trust, and user preferences. In this paper, we examine this class of WSF problems without excessive data gathering. Our investigation is performed in the context of the semantic web exercising an existing preference based Hierarchical Task Network WSC system. Our experiments explained the potential improvement in both the quality and speed of composition generation afforded by our approach.***

Key Words: *automated, optimization, user preferences, afforded.*

I. INTRODUCTION

Web Service Frame (WSF) requires a computer program to automatically select, integrate, and conglomerate multiple web services in order to achieve a user-defined objective. Automated WSF is motivated by the need to improve the efficiency of composing services and integrating them. It is an example of the more general task of composing business processes or component software. A number of Business Process Management (BPM) systems exist to help organizations optimize business task by discovering, managing, gathering, and integrating business processes. With the advent of cloud computing, an expansion number of small and medium sized businesses are attempting to compound cloud services from multiple providers. Performing such integration and working manually is costly and time consuming. Automated WSF and semantic integration address this emerging challenge [1]. For the purposes of this paper, we illustrate concepts in terms of the familiar but over-used travel domain, however compelling examples exist in sectors such as Banking and Finance, Healthcare and Life Sciences, Government, Insurance, Supply Chain Management Retail. Many of these applications prowess extensive intranet or internet accessible data and will directly benefit from the work described here.

A popular approach to WSF is to characterize it as an Artificial Intelligence (AI) planning task and to solve it as such (e.g., [2,3,4]). Others have similarly used HTNs (e.g., [8]) and finite state automata (e.g., [9]) to specify composition objectives with varying flexibility. In previous work (e.g., [5,6,7]) we have argued that for a number of WSF problems it is desirable to specify a applicable workflow, comprehensive procedure, or composition template that specifies the basic steps of the composition at an abstract level, but has sufficient flexibility to support their customization for different stakeholders, scenarios, and applications.

This observation has led us to characterize the WSF task as a preference-based planning (PBP) task where actions (service part, and/or data) are selected not only to achieve the composition objective but to produce compositions that are of peak quality with respect to quality of service, trust, or other composition, service, or data-oriented user preferences (e.g., [6,7,10]). Similarly, in cases where customizations are desirable but not compulsory, customizations can be illustrating as preferences. While customization of flexible workflows can take the form of hard constraints inflicted by the specific application scenario and its stakeholders, in cases where such customizing constraints are conflicting, some form of prioritization is required.

This can result in a lot of unnecessary data access. Further, it results in a massive search space for a planner. Most state-of-the-art planners require actions to be grounded. To address this, most current WSF systems will acquire all the information required for the composition prior to initiating composition generation. However, unlike typical planning applications, many WSF applications are data intensive, which performance in a massive number of ground actions and a huge search space. While this space may still be arrangement for computing a composition, to compute an optimal composition, and to guarantee optimality, the entire search space must be searched, at least completely. This has the effect that most data-intensive WSC tasks that involve tacking of data (like picking preferred flights) will not scale using conventional PBP techniques. Indeed many of the selection points relating to the composition require data acquired at execution time. Previous work on preference-based WSF has assumed that all the information required to generate the composition is on hand at the outset, and as such, structure is done offline followed by subsequent execution of the composition, perhaps in association with execution monitoring. However, this is not as realistic in many settings. Regard the task of travel planning or any other multi-step purchasing process on the Web. A good part of the structure for these domains involves data gathering, followed by generation of an optimized structure with respect to that data and other criteria.

II. Related Work

No other WSF planners can perform true preference-based planning, enquirer [11] handle some simple user constraints. In particular, their preferences are pre-processed into task networks and conflicting user preferences are detected and removed prior to invocation of their planner. Further, they do not consider handling regulations and are not able to specify preferences over the quality of services. The scup prototype PBP planner in [12] is related but there are several differences to our work.

Another side of related work is the research on quality-driven Web Service Composition (e.g.,[13,14,10]). This performed addresses the problem of run-time service selection based on the functional (e.g., input and output matching) and nonfunctional (reliability, availability, and reputation) properties of a service. This is addressed by encoding the problem as a getting problem it can be solved using for example: Integer Programming (e.g., [14]), Mixed Integer Programming (e.g., [10]) or Genetic Algorithms (e.g., [13]). Our work differs in many ways. In particular, in our framework we are able to find a frame that is optimal with respect to the user's preferences some of which are over the entire composition, and we can do so while interleaving execution and search. Further, we are important with optimizing the selection of data in the services in addition to the selection of services themselves based on their quality.

III. Conclusion and Future Work

A significant number of WSF problems involve both optimization of the composition and the collection of information. Work on preference-based WSF has begun to address this problem but much of the work has ignored the assuming that all information is given a priori, critical information-gathering component. In this paper, we are motivated by the observation that even though some classes of WSF problems can be addressed without the need for any execution during the composition phase, without apparent consideration of the data, and without consideration of preferences that distinguish high quality solutions, many interesting and useful structure necessary be done hand to hand with the data collection and optimization. Specifically this is done giving execution of some information collecting services. The main contributions of this paper include: identification of a way to prowess structure in the better specification and domain in order to generate compositions more efficiently by performing what we call localized data optimization, identification of a condition where performing decentralized data optimization is sound, development of an execution engine for preference-based WSF that interleaves online information gathering with offline search as deemed necessary, and identification of a case where we could prove the optimality of resulting compositions.

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