

Chapter 27

Towards Efficient Trust Aware E-Marketplace Frameworks

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INTRODUCTION

In the liberalized and deregulated e-marketplace some key factors for service providers' success are the following. First, the efficiency with which services will be developed. Second, the quality level, in relation with the corresponding cost, of new services. Third, service providers' reliability with respect to service provisioning. Fourth, the efficiency with which the services will be operated (controlled, maintained, administered, etc.). The aim of this paper is, in accordance with efficient service operation objectives, to propose enhancements to the sophistication of the negotiation functionality that can be offered by e-commerce systems in open competitive communications environments.

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In the highly competitive and dynamic e-marketplaces, Service/Product Requestors (*SPRs*) should be provided with mechanisms that enable them to find and associate with the most appropriate Service/Product Providers (*SPPs*), i.e., those offering the desirable quality of service / product at a certain time period, in a cost efficient manner. Such mechanisms may entail a wide variety of negotiation mechanisms, including auctions, bilateral (*I to I*) and/or multilateral (*M to N*) negotiation models and strategies, as well as posted offer schemes (i.e., a nonnegotiable, take-it-or-leave-it offer) in order to establish the 'best' possible contract terms and conditions with respect to service / product access and provision.

Efficient e-marketplace operation requires for a cooperation of high degree among the various entities (*SPRs* and *SPPs*). However, seeking for the

maximization of their welfare, while achieving their own goals and aims, entities may misbehave (intentionally-acting selfishly or unintentionally-due to faults), thus, leading to a significant deterioration of system's performance. Therefore, trust mechanisms should be exploited in order to build the necessary trust relationships among the e-marketplace entities, enabling them to automatically adapt their strategies to different levels of cooperation and trust.

In related research literature, reputation mechanisms are employed to provide a "soft" security layer, sustaining rational cooperation and serving as an incentive for good behaviour, as good players are rewarded by the society, whereas bad players are penalized by spreading in the market their bad reputation. In general, reputation mechanisms establish trust by exploiting learning from experience concepts in order to obtain a reliability value of system participants in the form of rating based on other entities' view/opinion. Reputation related information may be disseminated to a large number of system participants in order to adjust their strategies and behaviour, multiplying thus the expected future gains of honest parties which bear the loss incurred by cooperating and acting for the maximization of the social welfare. Current reputation system implementations consider feedback given by Buyers in the form of ratings in order to capture information on Seller's past behavior, while the reputation value is computed as the sum (or the mean) of those ratings, either incorporating all ratings or considering only a period of time (e.g., six months) (eBay), (OnSale).

In the context of this study, our focus is laid upon the evaluation of the reliability of SPPs. To this respect, a collaborative reputation mechanism is presented and evaluated, which takes into account the SPPs' past performance in consistently satisfying the SPRs' expectations. Specifically, the reputation mechanism rates the SPPs with respect to whether they honoured or not the agreements established with the SPRs, thus, introducing the concept of trust among the involved parties. The

reputation mechanism considers both first-hand information (acquired from the evaluator SPR's past experiences with the target SPP) and second-hand information (disseminated from other SPRs), is decentralized and exhibits robust behaviour against inaccurate reputation ratings intentionally and/or unintentionally provided.

The rest of the paper is structured as follows. After briefly revisiting the related research literature, the authors discuss on the fundamental concepts lying behind the design of the trust-aware framework. The problem of cheating witnesses is described and the solution introduced is experimentally evaluated.

BACKGROUND

The issue of trust has been gaining an increasing amount of attention in a number of research communities. In (Wang, 2008) the authors review the reputation-based trust evaluation mechanisms in literature and outline some trust issues that are particularly important in e-commerce environments. In (Josang, 2005) an overview on existing and proposed systems that can be used to derive measures of trust and reputation for Internet based transactions is given, while current trends and developments are analyzed. A general observation is that commercial systems so far utilize simple schemes, while academic community proposes systems with advanced features, which however lack coherence, as there is no consolidated set of well recognized principles for building trust and reputation systems.

In (Mui, 2003) a typology is proposed summarizing existing works on reputation across diverse disciplines (i.e., economical studies, scientometrics, computer science, evolutionary biology, sociology). Specifically, reputation is assumed to be context dependent, it can be viewed as global or personalized, can be used to describe an individual or group of individuals. Individual reputation can be derived either from direct en-

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