Chapter 16

Web Services Communities:
From Intra–Community Coopetition to Inter–Community Competition

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ABSTRACT

This chapter discusses the structure and management of communities of Web services from two perspectives. The first perspective, called coopetition, shows the simultaneous cooperative and competitive behaviors that Web services exhibit when they reside in the same community. These Web services offer similar functionalities, and hence are competitive, but they can also cooperate as they share the same savoir-faire. The second perspective, called competition, shows the competition that occurs not between Web services but between their communities, which are associated with similar functionalities. To differentiate such communities, a competition model based on a set of metrics is discussed in this chapter.

INTRODUCTION

For the World Wide Web Consortium, a Web service "*is a software application identified by a URI, whose interfaces and binding are capable of being defined, described, and discovered by XML artifacts and supports direct interactions with other software applications using XML-based messages via Internet-based applications*". For the last few years, the development pace of Web services has been impressive (Di Martino, 2009; Maamar et al., 2008; Maaradji et al., 2010; Khosravifar et al., 2010a). On the one hand, several standards have been developed to deal for example with Web services definition, discovery, and security. On the other hand, several projects have been initiated to examine among other things Web services composition, personalization, and contextualization.

Nowadays, competition between businesses does not stop at goods, services, or software products, but includes as well Web services. In-

dependent providers develop several Web services that sometimes offer the same functionality such as weather forecast and currency exchange. It is reported in (Bui, 2005) that although Web services are heterogeneous, the functionalities they offer are sufficiently well defined and homogeneous enough to allow for market competition to happen. To ease and improve the process of Web services discovery in an open environment like the Internet, we gather similar Web services into communities (Maamar et al., 2009). Acknowledging the efforts that service engineers need to put into designing and managing communities, we put forward guidelines that define how to specify and set up a community, how to manage the Web services that reside in a community, and how to reconcile conflicts within a community and between communities. In a community, the Web services are simultaneously in competition and in cooperation, i.e., they compete to participate in composite Web services since they all offer the same functionality with different non-functional properties (or QoS) and at the same time cooperate when they substitute for each other in case of failure.

As several communities of Web services come online and in line with today's economy featured by competition, there, also, exist relationships between communities that offer the same functionality. This increases the competition among communities of Web services and potential users of Web services. On the one hand, providers are interested in finding the communities that give better exposure to their respective Web services. On the other hand, users are interested in binding to the best communities that host the appropriate Web services as per their respective needs. The development of a reputation model is deemed appropriate for both parties.

The remainder of this chapter is organized as follows. The next section introduces the definitions of some concepts upon which communities of Web services are built. The intra-community coopetition and inter-community competition

are discussed after that. Finally some concluding remarks are drawn.

SOME DEFINITIONS

Community. It means different things in different settings. In Longman Dictionary, community is "*a group of people living together and/or united by shared interests, religion, nationality, etc.*" In the field of knowledge management, communities of practice constitute groups within (or sometimes across) organizations who share a common set of information needs or problems (Davies, 2003). Communities are not formal organizational units but networks with common interests and concerns. When it comes to Web services, Benatallah et al. define community as a collection of Web services with a common functionality although these Web services have distinct non-functional properties (Benatallah, 2003). Medjahed and Bouguettaya use community to provide an ontological organization of Web services sharing the same domain of interest (Medjahed, 2005). Medjahed and Atif use community to implement rule-based techniques for comparing context policies of Web services (Medjahed, 2007). Maamar et al. define community as a means to provide a description of a desired functionality without explicitly referring to any concrete Web service that will implement this functionality at run-time (Maamar et al., 2009). Finally, Wan et al. define communities of Web services as virtual spaces that can dynamically gather different Web services having complementary or related functionalities (Wan et al., 2010).

Reputation. It is "*the opinion (more technically, a social evaluation) of the public toward a person, a group of people, or an organization*" (Wikipedia). Reputation, besides other selection criteria, has been widely used for evaluating and ranking participants in social networks, online collaborations, agent-based systems, or in e-business platforms (like e-Bay). Nowadays, opinions and user ratings are no longer sufficient for assessing

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