Chapter 18
A Theoretical Foundation of Demand Driven Web Services

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ABSTRACT

Web services are playing a pivotal role in business, management, governance, and society with the dramatic development of the Internet and the Web. However, many fundamental issues are still ignored to some extent. For example, what is the unified perspective to the state-of-the-art of Web services? What is the foundation of Demand-Driven Web Services (DDWS)? This chapter addresses these fundamental issues by examining the state-of-the-art of Web services and proposing a theoretical and technological foundation for demand-driven Web services with applications. This chapter also presents an extended Service-Oriented Architecture (SOA), eSMACS SOA, and examines main players in this architecture. This chapter then classifies DDWS as government DDWS, organizational DDWS, enterprise DDWS, customer DDWS, and citizen DDWS, and looks at the corresponding Web services. Finally, this chapter examines the theoretical, technical foundations for DDWS with applications. The proposed approaches will facilitate research and development of Web services, mobile services, cloud services, and social services.

1 INTRODUCTION

Web services are playing a pivotal role in businesses, governments, communities and organisations, and societies with the dramatic development of the Internet and the Web. Technically, Web services are Internet-based application components published using standard interface description languages and universally available via uniform communication protocols (ICWS, 2009). Generally, Web services refer to all the services provided on the Web. With the dramatic development of the Internet and the Web in the past decade, Web services have been flourishing in e-commerce, e-business, artificial intelligence (AI), and service computing. They have also offered a number of strategic advantages such as mobility, flexibility, social-ability, interactivity and interchangeability in comparison with traditional services (Hoffman, 2003). Web services are playing a pivotal role

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both in e-business, service computing and social networking services and cloud computing. This is also the case in the traditional FREG (foods, resources, energy and goods) services, IT services (Kauffman, Srivastava, & Vayghan, 2012), because almost all traditional services are fully or partially replaced by Web services.

The fundamental philosophy of Web services is to meet the needs of users precisely and thereby increase market share and revenue (Rust & Kannan, 2003). Web services have helped users reduce the cost of information technology (IT) operations and allow them to closely focus on their own core competencies (Hoffman, 2003). At the same time, for business marketers, Web services are very useful for improving interorganizational relationships and generating new revenue streams (Sun & Lau, 2007). Furthermore, Web services can be considered a further development of e-business (Gottschalk, 2001), because they are service-focused business paradigms that use two-way dialogues to build customized service offerings, based on knowledge and experience about users to build strong customer relationships (Rust & Kannan, 2003). However, one of the intriguing aspects of Web services is that any Web service cannot avoid similar challenges encountered in traditional services such as how to meet customer's demands in order to attract more customers.

Demand-driven Web services (DDWS) as a computing paradigm (Currie & Parikh, 2006) and a service paradigm are becoming important for Web services, service computing, cloud computing and social networking computing. However, many fundamental issues in developing DDWS remain open. For example, the following research problems arise in Web services:

- What is a unified perspective to the state of art of Web services?
- What are the main players in various Web services?
- What are the theoretical, technological foundations for Web services?

These problems remain open in Web services in general, and DDWS in particular. This chapter addresses these issues. This chapter was motivated by our early work (Sun, Dong, & Yearwood, 2011), in which we proposed a demand-driven architecture for Web services and a demand-driven Web service lifecycle for the main players in Web services respectively, we also looked at mathematical analysis of demands in Web services. As the further development of our early work, the remainder of this chapter is organized as follows. Firstly we examine state of art of Web services. Then we propose an extended service-oriented architecture (SOA): eSMACS (e + social (networking) + mobile + analytics + cloud + service) SOA and discuss the main players in this architecture. We also classify demand-driven Web services (DDWS) as government DDWS, organizational DDWS, enterprise DDWS, customer DDWS and citizen DDWS and look at the corresponding Web services in detail. Finally, we examine the theoretical and technical foundations for DDWS with applications. We end this chapter with providing some concluding remarks and discussing some future research directions.

2 THE STATE OF THE ART OF WEB SERVICES

2.1 E-Services and Web Services

E-services are "electronic offerings for rent" made available via the Internet that complete tasks, solve problems, or conduct transactions (Hoffman, 2003). Song (2003) demonstrates that e-services have the following features: integration, interaction, customization, self-services, flexibility and automatic response. Interaction is an important feature of e-services. Each e-service interacts with others to fulfill customer requests. Self-services are another feature of e-services (Song, 2003). Websites offering e-services allow customers to review accounts, monitor shipments, edit profiles,

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