A Survey of Web Services Provision

An Liu, University of Science & Technology of China, CityU-USTC Advanced Research Institute, and City University of Hong Kong, China

Hai Liu, University of Science & Technology of China, CityU-USTC Advanced Research Institute, and City University of Hong Kong, China

Baoping Lin, University of Science & Technology of China, CityU-USTC Advanced Research Institute, and City University of Hong Kong, China

Liusheng Huang, University of Science & Technology of China, and CityU-USTC Advanced Research Institute, China

Naijie Gu, University of Science & Technology of China, and CityU-USTC Advanced Research Institute, China

Qing Li, CityU-USTC Advanced Research Institute, and City University of Hong Kong, China

ABSTRACT

Web services technologies promise to create new business applications by composing existing services and to publish these applications as services for further composition. The business logic of applications is described by abstract processes consisting of tasks which specify the required functionality. Web services provision refers to assigning concrete Web services to perform the constituent tasks of abstract processes. It describes a promising scenario where Web services are dynamically chosen and invoked according to their up-to-date functional and non-functional capabilities. It introduces many challenging problems and has therefore received much attention. In this article, the authors provide a comprehensive overview of current research efforts. The authors divide the lifecycle of Web services provision into three steps: service discovery, service selection, and service contracting. They also distinguish three types of Web services provision according to the functional relationship between services and tasks: independent provision, cooperative provision and multiple provision. Following this taxonomy, we investigate existing works in Web services provision, discuss open problems, and shed some light on potential research directions.

Keywords: Cooperative Provision, Independent Provision, Multiple Provision, Service Contracting, Service Discovery, Service Selection, Web Services

INTRODUCTION

Web services are rapidly emerging as a new paradigm for developing and deploying business processes within and across enterprises. The reason for this great success achieved in Web services arena can be boiled down to its declarative lookup and invocation modes. In particular, Web services highly rely on some descriptive XML-based artifacts to accomplish

communication and interaction, and henceforth some de-facto standards, such as SOAP, WSDL, and UDDI (Curbera et al., 2002), are speedily shaping to accelerate the development of Web services agenda. Currently, enterprises encapsulate their internal business processes as Web services and publish them into public directories such as UDDI so that other enterprises can invoke these business processes through well defined service interface in their business processes. Generally, a business process contains a number of tasks describing the required business functionalities. At runtime, appropriate services need to be chosen to perform these tasks.

Web services provision refers to assigning concrete Web services to perform the constituent tasks of abstract processes. In general, the lifecycle of service provision consists of three phases. First, it is necessary to discover services that can perform the functionality defined by a task. Considering the fact that many services provided by different organizations have the similar functionality, a large number of services may be obtained after the discovery phase. However, these services can be further distinguished according to their non-functional properties, that is, quality of service (QoS). Therefore, in the second phase, the best service is selected for each task from the candidates according to their QoS. Finally, the composite service makes a contract with the selected services regarding usage requirements both at high business level and low interface level.

In the real applications, however, the above three basic steps may become more complicated due to service capability. In particular, there are three types of relations between services and tasks from a functional point of view: 1) a task can be fulfilled by one service and this service can only perform this task; 2) a task cannot be fulfilled by one service but can be carried out by a set of services; 3) a service can accomplish multiple tasks in a business process. According to these relations, we distinguish three types of provision: independent provision, cooperative provision and multiple provision.

Even in the same phase of Web services provision, for example, the service discovery phase, different provision types will introduce different research issues. Up to now, a large variety of research works and industrial progress have been made in these aforementioned arenas. In this article, we provide a survey to review these works, including their contributions and potential improvements.

The rest of the article is organized as follows. Section 2 introduces a motivating example for Web services provision. Section 3 provides a survey on Web services discovery, including simple services matchmaking, services planning and process matchmaking. Section 4 presents the recent advances in QoS-aware service selection. Section 5 introduces semantic Web services contracting and heterogeneity mediation. Finally, Section 6 discusses some open problems and concludes the article.

MOTIVATING EXAMPLE

To illustrate Web services provision and provide application requirements for the research issues that we focus on in this survey, we describe here a classic scenario – travel agency – in which a customer makes a plan for his trip through a travel agent.

Suppose Bob wants to plan a trip with his family to celebrate his birthday. At first, he and his family come to an agreement that the scenic spot should be close to mountains and not be too hot, and they can go there directly by plane. Then, Bob sends a travel agent these requirements based on which candidate scenic spots can be searched. After finding these scenic spots, the agent contacts a flight company to see whether enough tickets are available. If not, it notifies Bob the unfortunate result; otherwise, it tells Bob to select and confirm one scenic spot and corresponding flight tickets. As soon as Bob acknowledges the initial plan, the agent starts to confirm the expected flight. After that, it reserves hotel rooms nearby and tickets for the scenic spot. Finally, Bob is informed of the plan details including flight tickets, scenic spot tickets, and hotel rooms.

18 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/autonomic-business-driven-dynamic-adaptation/39100

Related Content

Adaptive Threshold and Directional Weighted Median Filter-Based Impulse Noise Removal Method for Images

Ashpreetand Mantosh Biswas (2022). *International Journal of Software Innovation (pp. 1-18).*

www.irma-international.org/article/adaptive-threshold-and-directional-weighted-median-filter-based-impulse-noise-removal-method-for-images/297983

EXTREME: EXecuTable Requirements Engineering, Management, and Evolution

Ella Roubtsova (2013). *Progressions and Innovations in Model-Driven Software Engineering (pp. 65-89).*

www.irma-international.org/chapter/extreme-executable-requirements-engineering-management/78209

Integrated Security Process Improvement Framework for Systems and Services

Muthu Ramachandran (2014). *International Journal of Systems and Service-Oriented Engineering (pp. 53-67).*

www.irma-international.org/article/integrated-security-process-improvement-framework-for-systems-and-services/104654

An Approach for the Transformation and Verification of BPMN Models to Colored Petri Nets Models

Said Meghzili, Allaoua Chaoui, Martin Streckerand Elhillali Kerkouche (2020). *International Journal of Software Innovation (pp. 17-49).*

www.irma-international.org/article/an-approach-for-the-transformation-and-verification-of-bpmn-models-to-colored-petri-nets-models/243378

Software Cost Estimation and Capability Maturity Model in Context of Global Software Engineering