ABSTRACT

With the development of information technology, data on the Internet is growing even faster than Moore’s Law. At the age of big data, more and more services are created to deal with big data, which are called data-intensive services. In most cases, multiple data-intensive services are assembled into a service composition to meet complicated requirements. Since the big-data transmission, which is occurred among component services as well as between a service and a data center, has great influence on the overall performance of a composition, deploying those services cannot be considered independently. This paper proposes an optimal deployment method based on a negative selection algorithm for a data-intensive service composition to reduce the cost of the data transmission. When making a deployment schedule, it considers not only the cost of data transmission among component services, but also the load balance of data centers where component services are deployed. It models the deployment problem as a combination optimization problem and extends a negative selection algorithm to get an optimal deployment plan. A series of experiments are carried out to evaluate the performance of the proposed method using different settings as well as to compare with other methods. The results show that the method outperforms others for the problem of data-intensive service composition deployment.

Keywords: Big Data, Data-Intensive, Deployment, Information Technology, Service Composition
INTRODUCTION

With the development of Service Oriented Computing (Papazoglou et al., 2008), web service technology has attracted much attention from industry and academia in recent years and achieved significant success. Service composition is one of the most important issues in SOC, and has become a main technology enabler for delivering cloud solutions with its ability of enabling the interoperability of heterogeneous systems, reuse of distributed functions in an unprecedented scale and creating value-added business applications (Jiang et al., 2012; Deng et al., 2013).

The explosion of data and information has been recognized in recent years and people have stepped into the age of big data. Generated data is growing too fast to store and handle as before. Emerging cloud-based infrastructures for storage have been widely accepted as the next-generation solution to address the data proliferation and the reliance on data (Kolodner et al., 2012). Data-intensive services are now being developed and utilized in more and more fields (Deng et al., 2013). The emergence of cloud computing and data-intensive services brings both huge changes and new challenges for Service Oriented Computing technology. Traditionally, service providers usually deployed services on their own local infrastructures. Due to the explosion of data and economic benefits, nowadays service providers prefer to deploy their services in cloud. Generally, these services are deployed in the data centers of cloud providers (e.g. Amazon, Google). For traditional service compositions, the time cost of data transmission among component services is negligible compared to the execute time of component services. So most research focuses more attention on how to effectively make service composition, but rarely considers the problem of deploying service composition. However, the data transmission among components in data-intensive service compositions is incredibly huge. If the component services are deployed independently and casually, the latency of the whole composition would be incogitable. Hence, it is essential to make an optimal deployment strategy for data-intensive service compositions for reducing latency of user requests.

At present, limited work has focused on the problem of deploying service compositions. The work in Kang et al. (2012) may be a little similar to ours, but they aimed at deploying multiple correlated services in cloud. However, service composition is much more complicated because the component services in compositions may be organized in different structures (Rao & Su, 2005). And there are complex dependency relationships (data/logic dependency) among component services. Dependency relationships, especially data dependency relationships, have a great influence on the overall performance of data-intensive service compositions. In this paper, we mainly consider the following factors to tackle the issue of deploying data-intensive service compositions:

1. **Mass Data Transmission**: For a data-intensive service composition, data transmission across different data centers is inevitable. Besides, the amount of transmitted data is quite huge. Hence, it requires taking consideration of the network bandwidths between datacenters and the transmitted data size comprehensively to make an optimal deployment schedule and reduce the overall latency of the composition;

2. **Dependency Relationships**: The component services in a data-intensive service composition may have multiple logic/data dependency relationships with each other. The components having dependency relationships should be deployed as close as possible. It can reduce the cost of data transmission;

3. **Load Balance**: To make an optimal deployment schedule, we should also consider maintaining a relatively load balancing of data centers.

In this study, we transformed the problem of data-intensive service composition deployment to a combination optimize problem. Then
Context and End-User Privacy Policies in Web Service-Based Applications
Georgia M. Kapitsaki (2019). In Innovative Solutions and Applications of Web Services Technology (pp. 194-215).
www.igi-global.com/chapter/context-and-end-user-privacy-policies-in-web-service-based-applications/214836?camid=4v1a

Computational Business Intelligence, Big Data, and Their Role in Business Decisions in the Age of the Internet of Things