Chapter 2

SLA-Aware Enterprise Service Computing

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ABSTRACT

There is a growing trend towards enterprise system integration across organizational and enterprise boundaries on the global Internet platform. The Enterprise Service Computing (ESC) has been adopted by more and more corporations to meet the growing demand from businesses and the global economy. However the ESC as a new distributed computing paradigm poses many challenges and issues of quality of services. For example, how is ESC compliant with the quality of service (QoS)? How do service providers guarantee services which meet service consumers’ needs as well as wants? How do both service consumers and service providers agree with QoS at runtime? In this chapter, SLA-Aware enterprise service computing is first introduced as a solution to the challenges and issues of ESC. Then, SLA-Aware ESC is defined as new architectural styles which include SLA-Aware Enterprise Service-Oriented Architecture (ESOA-SLA) and SLA-Aware Enterprise Cloud Service Architecture (ECSA-SLA). In addition, the enterprise architectural styles are specified through our extended ESOA and ECSA models. The ECSA-SLA styles include SLA-Aware cloud services, SLA-Aware cloud service consumers, SLA-Aware cloud SOA infrastructure, SLA-Aware cloud SOA management, SLA-Aware cloud SOA process and SLA-Aware SOA quality attributes. The main advantages of viewing and defining SLA-Aware ESC as an architectural style are (1) abstracting the common structure, constraints and behaviors of a family of ESC systems, such as ECSA-SLA style systems and (2) defining general design principles for the family of enterprise architectures. The design principles of ECSA-SLA systems are proposed based on the model of ECSA-SLA. Finally, we discuss the challenges of SLA-Aware ESC and suggest that the autonomic service computing, automated service computing, adaptive service computing, real-time SOA, and event-driven architecture can help to address the challenges.

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INTRODUCTION

Enterprise Service Computing (ESC) is a new distributed computing and architectural style that has been adopted by more and more enterprises. ESC primarily includes Enterprise Service-Oriented Architecture (ESOA) (Tang, L., Dong, J., & Peng, T., 2008) (Tang, L. et al., SOSE 2010) (Tang, L. et al. SOCA 2010) and Enterprise Cloud Service Architecture (ECSA) (Tang, L., Dong, J., Zhao, Y., & Zhang, L.-J., 2010). Because of complicated business requirements and high customer demands, ESC poses many challenges and issues, such as performance (latency, loss, and jitter) and dependability (security, trust). The Quality of Service (QoS) becomes crucial for ESC to achieve its vision and meet business requirements and customer demands.

Nowadays, most enterprises will only invest in IT when there is a clear return on investment, lower total cost of ownership, and a clear demonstration of cost savings. Investments made in services, web services and cloud service initiatives offer the opportunity to realize these requirements, but these investments need to be deployed in a consistent, repeatable, and manageable fashion. Traditional operation management is incapable of offering the unique management functionality that can help achieve these requirements as compared to service-oriented management which is based on QoS.

Service Level Management (SLM) is one of the most important and fundamental service-oriented management. SLM provides mechanisms and tools for managing individual service and the SOA processes composed of a set of services designed to meet enterprises and their customers QoS requirements and demands. The Service Level Agreement (SLA) is a specification of service or service process functional provisioning and non functional goals - QoS which is agreed to by both service providers and service consumers. The Service Level Objectives (SLO) are key elements of SLA, which are specific and measurable quality attributes in the SLA, such as availability, throughput, frequency, performance (response time), and other quality attributes. SLA has been employed in industry such as networking and telecommunication for several decades. However, adoption of dynamic SLA in ESOA systems is relatively immature and suffers from lack of standards. Recently, cloud computing and ECSA have become the next generation enterprise service computing. The SLA and SLM have become more and more important because of the dynamic service computing environment and infrastructure. Dynamic and automated SLM provides a SLA-Aware approach in ESOA or ECSA architecture. An architectural style is a coordinating set of architectural constraints. The SOA quality attributes are the architectural constraints of ESOA and ECSA. The QoS and SLA can be part of architectural constraints and contracts at the service level in ESOA and ECSA. Therefore, at the architectural style level, adding SLA-Awareness to ESOA or ECSA generates a kind of specific architectural style, which is called SLA-Aware ESOA or SLA-Aware ECSA. At the ESOA and ESCA system (instance) level, the approach allows SLA to play a QoS role between each service consumer and service provider, which greatly improves the service visibility. It also brings service quality control intelligence and capacity into ESOA or ESCA systems, so that it greatly enhances SOA management capabilities. Therefore ESC can meet service or service process functional provisioning and non functional goals - QoS so that service providers satisfy service consumers with specific services. In addition, enterprises gain revenue from the services and avoid troubles caused by disputed services.

In this chapter, we first discuss the challenges and issues of ESC. Second, we discuss general QoS and SLA concepts, their ontology, standards (such as WS-Agreement), languages (such as WSLA), and classification in enterprise service computing. Third, we define SLA-Aware ESOA and ESCA architectural styles. The styles include: