Chapter VI

Building Adaptive e-Business Infrastructure for Intelligent Enterprises

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ABSTRACT

With the advancement of information technology and business transformation, an enterprise has to be adaptive to expand its infrastructure and collaborate with its internal and external business processes to make more profits from its value chain. As an enabling technology, Web services provide a standard means to allow heterogenous applications to communicate with each other using Simple Object Access Protocol (SOAP). The standard interface description language and communication mechanism of Web services are the keys to build a modularized and adaptive e-business infrastructure that can adjust to the changing environments. In this chapter, we will introduce how to use Web services and Grid services to build adaptive e-business infrastructure for intelligent enterprise. Specifically, we will introduce a conceptual architecture of building adaptive e-business infrastructure using Web services. Then we will present an overview of Web services creation and invocation, federated Web services discovery and Web services flow composition. After that, a concept of universal Grid service is introduced for enabling Open Grid Services Architecture to support business process integration and management. At the end of this chapter, we will conclude by introducing our vision on the future adaptive e-business infrastructure for intelligent enterprise.

INTRODUCTION

An enterprise is a business entity that defines and executes a business model for providing products or services. The success of an enterprise is highly dependent on its business model and operations. One of the requirements of an intelligent enterprise is to provide a productive management system for connecting its employees and its organization units. In most enterprises, they have their own enterprise applications such as Human Resource (HR) systems, Information Technology (IT) management systems, Supply Chain Management (SCM) systems, Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, etc. In general, different software vendors provide those enterprise applications. Moreover, the applications may run on different operation systems or Web application servers. Therefore, one challenging issue is how to efficiently integrate all the enterprise applications in a common way.

Meanwhile, enterprises cannot be stand alone. They have to collaborate with other enterprises in the context of their business processes. For example, a service provider needs to advertise its services in marketplaces and allow its trading partners to conduct a business more easily and quickly. Hence, this service provider needs to provide a standard way to describe its offerings and provide service interfaces for customers to consume the enterprise's services.

The adaptive business processes based enterprises should look beyond the traditional enterprises and marketplaces through collaborative interactions and dynamic e-business solution bindings. Adaptive e-business is an evolution in e-business solution capabilities, which integrates all kinds of applications and processes located in different enterprises or marketplaces within a unified solution sphere.

There are lots of results and activities related to the business process integration and management. Elzinga (1995) presented some survey results on business process management. In general, industry companies implement their own business processes in different formats (Elzinga, 1995). Shim (2000) introduced a few XML-based business-to-business e-commerce frameworks.

A major nonfunctional requirement of an intelligent enterprise is the ability of the enterprise e-business infrastructure to adapt to rapidly changing business conditions. For instance, it is required to integrate with other enterprises and marketplaces and support new protocols and messaging standards. In most cases, the enterprise infrastructure has to provide the capability of dynamic discovery of trading partners and service providers as well as to enable federated security mechanisms, solution monitoring and management.

The convergence of Web services, Grid computing, autonomic computing (Kephart, 2003) and business process integration and management methodology provide a new avenue for building such an intelligent enterprise. In this chapter, we will discuss a framework of building adaptive e-business infrastructure using business process integration and management methodology, emerging Web services and Grid computing technologies. Note that security and autonomic system management are two other critical aspects of the adaptive infrastructure for intelligent enterprise. This chapter, however, will not cover the security and solution management issues, which are addressed in Naedele (2003). Naedele (2003) introduced the status of the current standard activities such as XML signatures, XML encryption, Security Assertion Markup Language (SAML), Extensible Access Control Markup Language (EACML), Extensible

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