

Chapter V

A Framework Supporting Context-Aware Multimedia Web Services Delivery

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Abstract

As Web services become more and more popular, how to manage multimedia Web services provisioning and delivery remains challenging. This chapter presents a componentization model to support quality of service (QoS)-centered, context-aware multimedia Web services delivery, which seamlessly incorporates cutting-edge technologies relating to Web services. A multimedia Web service is divided into control flow and data flow, each being delivered via different infrastructures and channels. We also propose enhancements to Simple Object Access Protocol (SOAP) and Composite Capability/Preference Profiles (CC/PP) protocols to improve their flexibility to serve multimedia Web services. In addition, we present a set of experiments to show how our service-oriented componentization model can support efficient delivery and management of multimedia Web services.

Introduction

A Web service is a programmable Web application that is universally accessible through standard Internet protocols (Ferris & Farrell, 2003). The rapidly emerging technology of Web services exhibits the capability of facilitating business-to-business (B2B) collaboration in an unprecedented way. By means of each organization exposing its software services on the Internet and making them universally accessible via standard programmatic interfaces, this Web services paradigm enables and facilitates the sharing of heterogeneous data and software resources among collaborating organizations (Benatallah, Sheng, & Ngu, 2002). In addition, Web services technology provides a uniform framework to increase cross-language and cross-platform interoperability for distributed computing and resource sharing over the Internet. Furthermore, this paradigm of Web services opens a new cost-effective way of engineering software to quickly aggregate individually published Web services as components into new services. Therefore, the Web services technology has attained significant momentum in both academia and industry.

If the sharable data to be published by a Web service contain multimedia content, which refers to information that seamlessly integrates multiple media types in a synchronized and interactive presentation, the Web service is considered as a multimedia Web service. Multimedia Web services pose new challenges due to the unique characteristics of multimedia data (Khan, Ghafoor, & Paul, 2002). First, the transport of the multimedia information must meet some quality of service (QoS) requirements, such as the synchronization within and among different multimedia data streams or real-time delivery. For example, let us consider a typical video-on-demand (VoD) service, an Internet Kara OK service. It is critical to provide a significant short-response-time service to a VIP customer. In addition, the audio and video information needs to be synchronized on the customer's system. Second, the Simple Object Access Protocol (SOAP, 2004), the core transport technique of Web services, does not support massive message transport that is imperative for multimedia content transport, nor multimedia QoS requirements (Khan et al., 2002). Third, with the advancement of wireless information appliances, Web service interfaces provide a means to enable the content or service to be created once and accessed by multiple SOAP-enabled [4-6] devices, such as wireless phones (NORTEL), personal digital assistance (PDAs), set-top boxes, as well as regular Web browsers. A Web service is thus considered to be device independent if it can be delivered to different devices (Han, Perret, & Naghshineh, 2000). How to deliver a multimedia Web service to users based upon their possessed devices remains challenging.

In summary, the interoperability of multimedia Web services is not without penalty since the value added by this new Web service paradigm can be largely defeated if a multimedia Web service: (1) cannot guarantee QoS attributes, (2) cannot be transported via the Internet in an organized manner, and (3) cannot be effectively

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