End-to-end Internet/Intranet Service Management in Multi-domain Environment Using SLA Concept

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Abstract

This paper presents a multi-domain Internet service management framework that uses Service Level Agreement (SLA) to support QoS and to exchange management information across domain boundaries.

In rapidly growing Internet/Intranet environments, there is no standard mechanism to exchange management information between service providers and their customers or between several service providers. Such mechanism is necessary for the end-to-end management of Internet/Intranet services and to ensure the contract defined between service providers and their customers.

This paper proposes a multi-domain Internet service management framework using SLA concept. The management model and procedures for SLA management and QoS control to realize multi-domain Internet service management have been designed. Figure 1 shows a multi-domain management model in which various managers communicate with each other using CORBA ORB. CORBA/SNMP gateway is used for CORBA applications to access the SNMP agents. COPS server maintains the policy DB. In the case of intra-domain management, Network Manager is in charge of resource management and traffic control. It allocates internal resources according to the domain's specific resource usage policy. Application Manager keeps track of QoS requests from individual users and applications, and updates a policy DB to control the QoS for Internet service. According to this policy, Network Manager is able to configure the routers. In the case of inter-domain management, it is concerned with provisioning and allocating resources at network boundaries between two domains which are separately owned and administered. A bilateral service-level agreement (SLA) specifying the amount and types of traffic that each side agrees to send and receive must be established on

the boundary between two domains. SLA Manager are responsible for setting up and maintaining bilateral service agreements with Contract Manager and SLA Manager of neighbor domains to assure QoS handling of its border-crossing data traffic. Network Manager also instructs border routers how much traffic each border router should export and import.
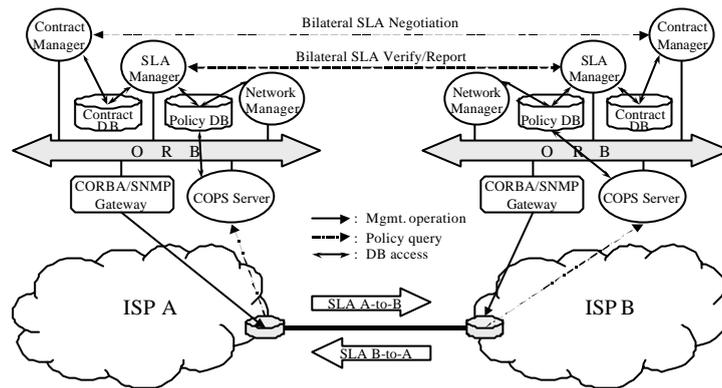
Figure 1: Multi-domain Management Model

A prototype system using Java and CORBA technologies has been built to demonstrate the functionality, and the performance is evaluated on the test-bed using Differentiated Services network. The experiments are performed to evaluate the performance of the management system in terms of SLA conformance. In our example scenario for WWW hosting service, we assume that " *The document retrieval time should be less than 4sec when a user retrieves a test document which size is 24 kilobyte. The Web server should be capable of handling 50 user at least."* are specified in the SLA.

In order to show how the SLA is conformed, we measured a WWW document retrieval time. The experiment shows that the WWW document retrieval time does not exceed the limit imposed by retrieval time constraint as network load and accessing users increase. Other researches and products only provide the monitoring functions for Internet service management. The prototype Internet service management system can not only provide monitoring function, but also perform service configuration and QoS management capabilities.

The proposed framework can be used not only for measuring and monitoring the service availability, performance and QoS of Internet/Intranet service, but also for managing a service level agreement between a customer and service provider. It will ensure an early diagnosis of faults or performance degradation by collecting and inspecting information on the usage of various resources.

For future work, we plan to apply the same management framework and techniques to other types of Internet/Intranet Services.