Real-time network monitoring scheme based on SNMP for dynamic information

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Abstract

An efficient and automated network management is required in large and complex networks since it is very difficult to manage them only with human effort. In response to this need, the Simple Network Management Protocol (SNMP) has been developed and adopted as the de facto standard. Some management information changes with time and the management station needs to monitor its value in real time. In such a case, polling is generally used in the SNMP because the management station can query agents periodically. However, the polling scheme needs both request and response messages for management information every time, which results in network traffic increase. In this paper, we suggest a real-time network monitoring method for dynamic information to reduce the network traffic in SNMP-based network management. In the proposed strategy, each agent first decides its own monitoring period. Then, the manager collects them and approves each agent's period without modification or adjusts it based on the total traffic generated by monitoring messages. After receiving a response message containing the monitoring period from the management station, each agent sends management information periodically without the request of management

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station. To evaluate the performance of the proposed real-time monitoring method, we implemented it and compared the network traffic and monitoring quality of the proposed scheme with the general polling method.

1. Introduction

As the public Internet and private intranet have grown from small networks into large infrastructures, the need to more systematically manage the large number of network components within these networks has grown more important as well. In the automated network management system, there are 2 approaches in general: the centralized and distributed management approach.

The centralized approach manages the whole network in a single place (the management station). It includes the original Simple Network Management Protocol (SNMP) and Remote Network Monitoring (RMON). The SNMP management systems are based on the server/client model consisting of 3 components: a management station, agents and Management Information Bases (MIBs). A management station transmits a request to agents and controls them. It also serves as the interface between the human network manager and the network-management system. An agent residing on each networked device controls a database and reports the information to the management station, when the management station polls them (Case et al., 1990; Harrington et al., 2002). The RMON represents an extension of the network management station's operation to distant networks for reducing degradation of lower operating rate WAN bandwidth and allows you to monitor the traffic of LANs or Virtual LANs (VLANs) remotely. A typical RMON setup consists of 2 components: the RMON probe and the management station. The RMON probe is an intelligent-controlled device or software agent that continually collects statistics about a LAN segment or VLAN, and transfers the information to a management workstation on request or when a pre-defined threshold is crossed. The management workstation communicates with the RMON probe and collects the statistics from it. The workstation does not have to be on the same network with the probe and can manage the probe by in-band or out-of-band connections (Waldbusser, 1995).

The distributed approach is divided into the hierarchical network management and the mobile agent based management. The SNMPv2 introduces a concept of the native proxy agent for the hierarchical management. The native proxy agent is a proxy agent that acts in the role of agent in interacting with the requesting management station and acts in the role of manager in interacting with the responding agent (Galvin and Mccloghrie, 1993; Stallings, 1999). The mid-level manager is primarily used for distributed network management. It is a dual-role entity that acts in both an agent role and manager role. When it is placed remotely across a WAN link from the enterprise manager, this reduces polling traffic on the