

SNMP over SIP for Network Management

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Networks are rapidly growing in size and there is an increased number critical applications are being network enabled. This is a challenge for administrators who are responsible for managing the network. To ensure availability of the network the administrator needs tools to locate and fix problems. SNMP is the industry standard for managing the IP Networks and a number of tools and products have been built around this protocol. Although SNMP is extremely simple and versatile it suffers from problems like scalability and high bandwidth utilization. Attempts to modify the SNMP protocol to solve these problems have not been very successful. Other attempts to use technologies such as HTTP and CORBA to manage networks have not been successful because of the lack of standardization of the interfaces. SIP was a protocol defined for signaling in IP Telephony environments. However the protocol definition is generic enough that it can be easily used in other areas. This paper proposes a solution for large scale network management using SNMP over SIP. SIP is defined as a general-purpose protocol for creating, modifying, and terminating sessions that works independently of underlying transport protocols and without dependency on the type of session that is being established. Our work focuses on developing a SIP user agent that resides on the device or on an SNMP proxy and provides an efficient management interface.

The proposed SNMP over SIP system architecture is illustrated in Figure 1. The architecture shows a device that has an embedded SIP User Agent. The SIP User Agent on the device receives the requests and uses the SIP Message decoder to retrieve all the SNMP requests that need to be executed. The SNMP message decoder processes the requests and returns the results back to the SIP Message processing unit. The SIP message processing constructs a response based on the values returned by the SNMP Message processing unit. This SIP User Agent could also reside on a SNMP proxy that aggregates the current view of SNMP data from multiple devices. This provides a migration path where a forklift upgrade is not possible. The SNMP User Agents on the devices and proxies register with a centralized SIP Proxy server. The Network Management Station also registers as a User Agent on the SIP proxy Server. The existing SNMP based management systems will continue to function which makes it easy to upgrade.

One of the biggest benefits that we derive from SIP based management is the notion of presence. A managed system can indicate that it is active and alive. If it cannot do so because of a crash or connectivity issues the SIP Proxy server updates

the presence. This enables management of the entities without having to go back to the device very frequently.

In order to validate our architecture, we have developed a management system called Morpheus that provides Inventory collection capabilities. Inventory collection is one of bandwidth and time hungry functions of any Network management system. The implemented system consists of three modules: SIP User agent on the device, SIP Proxy Server, SIP User Agent on the management application. The SIP protocol defines a standard type for transport text for Instant Messaging systems. This is called the “Message” construct. The implemented system reuses the Message construct to perform all the operations. The payload was initially transported in XML, however due to parser and size inefficiencies of text based data this was changed to BER encoding as in SNMP.

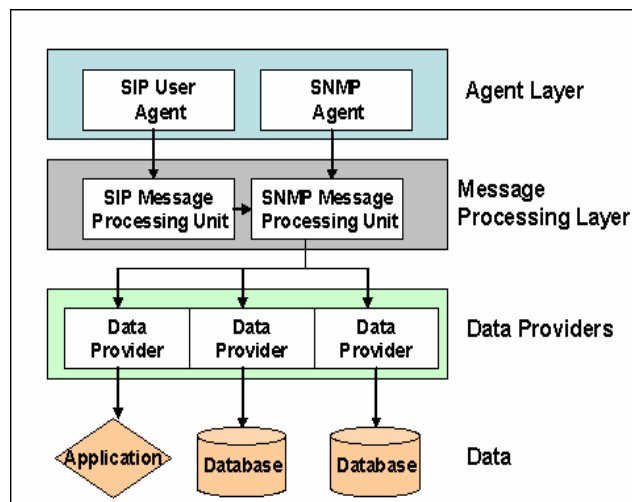


Figure 1: Proposed SNMP over SIP Device Agent Architecture

The current implementation focuses on optimization in terms of bandwidth requirements, processing requirements on the Network Management Station and device. However the performance of the architecture needs to be benchmarked against the performance of the existing SNMP based systems. To provide a realistic comparison all aspects of the OAMP model need to be considered. As a continuation of our current work, the current implementation is being extended to provide Event, Alarm management and mass configuration deployment. There has been a recent discussion in SIP about a concept of exploders that is used to broadcast or multicast messages to a group of agents. This concept will be used in cases where mass configuration changes are required.