SIP-based Network Monitoring

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Abstract—The project described is aimed to provide a new network monitoring service that goes beyond the traditional Simple Network Management Protocol (SNMP) based systems. Session Initiation Protocol (SIP) presence service will be combined with the SNMP to create a new service that will allow a network administrator to monitor network anytime anywhere. Most network management systems today are based on SNMP protocol. It is an application protocol offering network management services in the Internet Protocol suite. SNMP allows network administrators to manage their network from a central location. Networks today can become very large, with network devices sometimes situated in different locations even among different countries. Large and physically distributed network can become problematic for remote monitoring. In this research, we aim to develop a new service to help network administrators to reduce response time and increase efficiency. We will explore the ability of the SIP-based presence service to store and distribute status information to enhance the functionality of the SNMP's Remote Monitoring (RMON) [4]. The enhanced network monitoring service will enable administrators to utilize handheld devices to monitor network status at real time through the Internet from a remote location. It will provide a friendly presence management user interface which will make network administration even easier.

I. INTRODUCTION

The Internet allows a variety of devices to participate in the network. These components (i.e. the hosts, routers, and media devices) are usually multi-vender and heterogeneous in nature. Networks today are getting larger and more complex, and the network administrator's workload is getting heavier. In order to help network administrators to increase productivity and to reduce response time in troubleshooting, the development of mobile devices (handheld) based software tools to monitor network is essential.

A large number of Internet services are distributed network services. Servers and network devices are distributed at different physical locations, even countries. Network administrators have to monitor and control network through the Internet and from a remote site. Traditional SNMP supports Remote Monitoring from central location. Our research aims to free network administrators from the central location based network monitoring strategy and make network devices become more user friendly. Development of third generation (3G) mobile telecommunication will make all handsets (Personal Digital Assistant and Smartphone) to link seamlessly to the Internet. At the same time SIP (Session initiation Protocol) appears with strong multimedia session ability and IM and presence services functions.

II. BACKGROUND

Two main protocols will be discussed in this research paper. One is SNMP which is a simple request/response protocol. It conveys management information between two types of SNMP software entities (Agents, Manager). Agents are available for network devices ranging from computers, bridges, modems and printers. SNMP is interoperable. It enables network elements to monitor themselves. [3] It supports Remote Monitoring (RMON). RMON was originally developed to address the management issue of multiple LAN segments, and remote sites, from a central location. [5] It allows network administrators to control their network from a remote site.

SIP is a low complexity text-based protocol. New SIP based services can be rolled out quickly and easily. It is closely associated with the Internet protocols as HTTP and SMTP, and their associated methodologies. SIP identifies users via URLs (Universal Resource Locators) that are associated with elements such as user phone number or host name (for example, SIP:router1@mycompany.com).By employing SIP, users can request to start a session, the request is processed by SIP Proxy and SIP redirect servers that connect the parties and query the DNS (Domain Name System). [2] This is significant because the DNS is the global directory service used by the Internet for matching domain names with underlying IP addresses. SIP allows use of existing E-mail routing infrastructure for other media calls creating a simpler integration path for converged services. In addition, SIP body uses MIME (Multipurpose Internet Mail Extensions) which allows SIP messages to contain a variety of content types including audio files, images, and Java applets. [6] SIP-based presence service is a system that accepts, stores, and distributes presence information to interested parties, called Watchers. A presence protocol is a protocol for providing a presence service over the Internet or any IP network. [1]

III. Related Work

A. SMS-based network monitoring

This technology uses GSM short message services to notify network fault notification. Network administrator can get alerts by cell-phone anywhere at almost real-time. SMS-based network monitoring technology can increase productivity and reduce response time.

B. Web-based network monitoring

By using Web technology network administrator can use browser to check network status information that is published on Web pages. A web-based remote monitoring setup consists of a probe that collect network data, a software interface which convey the probe's data to HTML pages, a web server that makes those HTML pages available on the Internet or Intranet, and browsers that interpret the HTML into readable presentation.

C. Presence management

Presence Management gives users control over how others perceive their online status. Each state of presence can be

displayed before messages are sent, eliminating intrusive messaging.

IV. OBJECTIVES

The technical objective is to develop a prototype for an application that enable network administrators to use SIP-based handheld devices to communicate with a network device anywhere. Application can also monitor network by using presence anytime. This prototype can become a basis for other new value-added applications extension in future.

Prototype provides two communication interfaces and a translation module. One is network device communication interface. Another is user interface. The translation module is a software interface that conveys SNMP data to SIP-Based presence.

V. TECHNICAL OVERVIEW

This project will combine traditional SNMP network management service and SIP-based presence and IM service, sequentially providing a new network monitoring service.

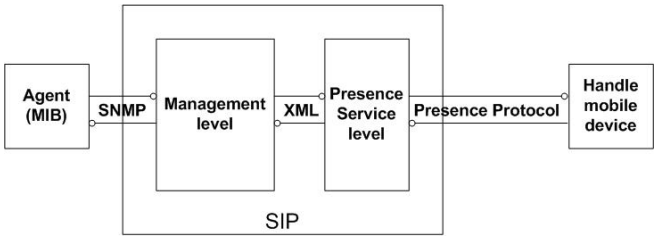

Fig 1 High Level Design for SIP-based Presence Manager

We will use SIP to provide connection routing service between network agents and mobile devices, and extend SIP MIME to contain network status and management information. Fig1 presents that there are two interfaces, one is for managed network devices, and the other is for handheld mobile devices (user interface). The interface to network devices will use SNMP protocol to communicate with agents. Interface to mobile devices will use Presence Protocol to convey Presence information. The XML technology will be used for data conversion. SNMP message is changed to Presence information, and IM is changed to SNMP messages. There are two modules: one is Management module that uses network interface to communicate with Agent and stores network devices status information. The other one is Presence service module that communicates with mobile devices by presence protocol, which stores and manages presence information.

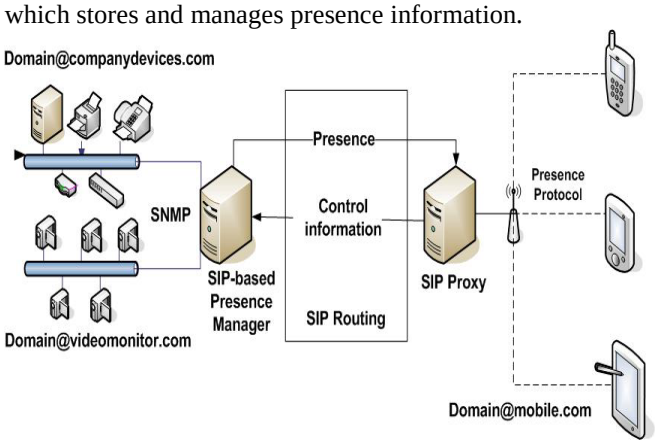

Fig 2 .Proposed Architecture

In the Fig 2 the proposed system architecture every element should have an URL (Universal Resource Locator), such as SIP:router@compony.com; SIP:SmartPhone@mobile.com. By using the URL we can identify every device ensuring that it has a unique identifier. SIP will provide presence information routing; by using the Registrar and Redirect services. Network devices must register with their URLs at SIP-based Presence Manager (SPM). SPM can then use SNMP set and get operations to read and configure network devices (Agents). At the same time network devices (Agents) can also use trap message to notify fault to SPM automatically. Handheld devices also need to register with their URLs at SIP Proxy for dynamically track the location of them. After SPM get network status information, it converts network status information to Presence format, and forward them to corresponding URL (handset). Mobile devices configure network devices by using the same principle. Mobile devices send config command to a given URL (Agent) in IM form, and then forward it to SPM. When the SPM gets the IM, it first converts IM to SNMP command according to rules that are defined beforehand. SPM will then use set operation to configure corresponding URL (agent). If SPM set operation fails, the error report will to send to administrators' handset in IM form. SPM provides subscription and notification services. By using subscription service administrators can set notification and critical boundary of specified devices. Then SPM will monitor specified devices and if specified devices status change beyond critical boundary, the SPM will provide notification service and send notifications to subscribers (By using URLs) in IM.

In addition, SIP's ability of multimedia session makes it easy to initiate a session for video transfer, so we can extend handsets to become a video monitoring medium.

VI. CONCLUSION

New network administration service combines SIP Presence, and IM service, and SNMP network monitoring service, in order to utilize handheld devices to communicate with managed devices from a remote site. Using friendly presence management user interface on handheld devices, administrators can easily check presence information of network devices in real time. Administrators can also get instant messages form network devices in time and knowing what is happening with network being monitored.

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