An Application for Management and Monitoring the Data Centers Based on SNMP

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***"Abstract*—Today" few organizations have a thorough understanding of what is on their networks at any given time. This study tries to develop Computer and Network Asset Manager (CNAM) that is a network management application which helps large enterprises, and Small medium enterprises (SMEs) service providers, manage their data centers and IT infrastructure efficiently and cost effectively. CANM collects information on all hardware components of the network instruments that are on the network. In this project, a real-time network monitoring method is suggested for dynamic information to reduce the complexity and cost based on network management. In the proposed method, a Simple Network Management Protocol (SNMP) is first used to collect data for start interaction between equipment in the specific data center, to gather these data SNMP would need to request it from Management Information Base (MIB) that served as a database for stored information. Furthermore, to ensure data authenticity in the management station that fetches real-time data periodically from equipment, network engineer would have to manually key-in static information into CNAM when it was first launched. The SNMP would then pick up on this stored static information and automatically began collecting real-time data; this feature will be developed with the help of Model View Controller (MVC) pattern that is a software pattern for implementing user interfaces. It allows users to have interaction with the CNAM as well as input the related data. The object oriented approach shall be used to implement SNMP and MIB which represents system management information. Web Based Enterprise Management (WBEM) is required in order to transfer protocol like SNMP, as well as to enter the actual data manually for further authenticity with the real time data. This study would hopefully encourage companies to try an interactive solution for problem in managing their equipment in the data center.**

Keywords— SNMP; MIB; Real time Monitoring; Network Management; MVC.

I. INTRODUCTION

Most of companies used computer systems in large scale servers and mainframes; large amount of user supported through variety of terminals by server. These types of servers granted management via dedicated user consoles that has been a specific terminal usually placed in advantage area. Specific management console available for each vendor. Most of the management console are in a text oriented format that be able to show current status of configuration. There is little integration among several vendors to provide the ability to show status of configuration through a terminal. The machines from different manufacturers would be able to communicate with each other through networking technology and open standard. For this type of communication the manufacturers need to use several protocols such as Simple Network Management Protocols (SNMP) to prepare the stable transforming of the data [1].

A large of client application used, the server application service in the client-server pattern. As management definition in this pattern, it is preparing the management feature to several different agents. An agent has duties to provide the required data for management, and the centralized software as manager would be showing this information to an operator in specific format.

Computer and Network Asset Management (CNAM) is a network management software that helps large enterprises, and Small medium enterprises (SMEs) service providers, manage and monitor their equipment and IT infrastructure efficiently and cost effectively. CNAM is simple to use and collects information on all hardware components of the network instruments and it will start to monitor them based on SNMP.

Integrate the information from two different device cause difficulty for developers to manage the devices based on client-server based. Reduce the complexity of the integrity the data to management purpose is most significant. CNAM tried to integrate the different types of equipment with different vendor

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in the same platform for managing and monitoring purpose. To implement CNAM will need to use internet protocol, model, and pattern.

II. Simple Network Management Protocol

Simple network management protocol (SNMP) is a popular application layer protocol used in managing data networks. Almost all networking vendors support SNMP. A number of telecom equipment vendors are also starting to support SNMP in order to enable integrated management. A significant amount of network management activity is currently carried out using the SNMP framework by a large percentage of enterprise networks as well as a sizeable number of service provider core networks [2].

The SNMP based on the server - client paradigm are included management station, agents and Management Information Bases (MIB). The purpose of the management station is to transmit a request to agents and control them, it also provides an interface between the human network manager and the network management system. Each networked device would have an agent in it that controls a database and when a management station began to poll, these agents will send report of information to the management station.

In the SNMP monitoring approach, the agents will send the network management station an information via event reporting polling. Polling is an activity to make interaction between agents and management station using the request and response method. However, management station just listening to entrance information in event reporting approach. The agents will send information to management station whenever it is necessary based on a decision.

Real time monitoring approach will be defined as an agreement between agents and management station that in this kind of agreement the agents shall send the information to their management periodically without requests from station [3].

In an organization, the status and behavior of the end system will be considered as monitoring job for the MIB information. The type of data that will be used in monitoring is more important rather than network design. In the following the information which shall be used in monitoring are listed:

• Static: the structure and elements in the configuration are categorized such as the id of ports on a router or host. This information will change infrequently.

• Dynamic: It is the information of network events such as packets, network elements.

• Statistical: It is information which shall be derived from dynamic information such as average of packets transmitted per unit.

III. Management Information Bases (MIB)

In the network for management entities will use Management Information Bases (MIB) which is required for SNMP, also is more general in OSI/ISO network management model. In terms of management information on entity will refer to particular subset [4]. The definition of the MIB is group of managed objects that is related to the protocol in the management device. Based on SNMP the object shall categorize into a hierarchical tree into object classification such as directory, management, experimental, and private. The Management information is mandatory for SNMP and it used to identify objects that also it used in internet experiments. The Request form command is listed the complete numbers related to sub trees. The private management information will be used to identify objects, so it is better that vendor register their information below private [5].

IV. Requirement Analysis

Collection the information from equipment is main activate in monitoring, for doing this action need to prepare the station as management information to do these operations. As following table tried to list operation which be used for collecting information.

Table I. Components and functions of SNMP

No	Operation/Element	Description
1	Station	Executes network management application that monitor and control network elements
2	Agent	Agents expose management data on the managed systems.
3	Polling	Interaction-response between the station and agent.
4	Set	Request from station to agents
5	Get	A request to retrieve the value
6	Trap	Response from Agents to station.

In the following figure tried to show schema of SNMP in CNAM.

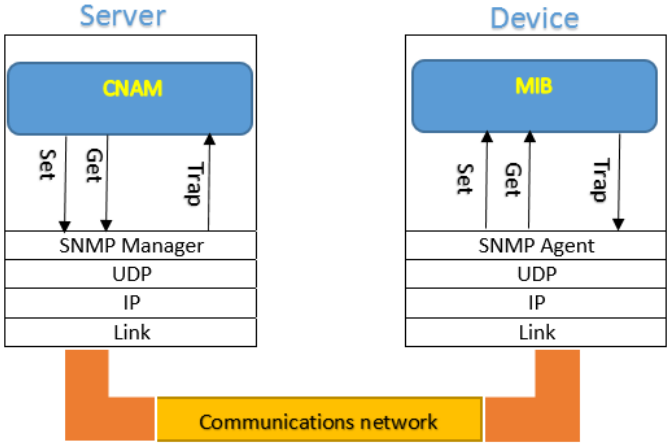

Fig.1. Connectivity between station and agent

A. Pooling the information

Monitoring has Station and Agent as elements. Station as network management shall control the agents, and agents have to response the station. Polling as technic has responsible for prepared information from agents to the management station. For management information need to define several rules for interaction between agents and station that can be specific language for collecting the data; this is the main idea to request and response interaction that are used in SNMP. All equipment

in the network must support SNMP and for stating an interaction need to be enabled.

B. *Set Request*

The manager would be able to change the value of variable inside the agents; the variable is specified in the body of the request. The result of this operation will be the new value of the variable.

C. *Get Request*

The station would be able to know about the value of variable inside the agent by sending this operation. The current value of variable will be returned.

D. *Trap*

This operation will enable the agents to send notification to their station such as sysUpTime value.

E. *Manage Information Base*

The SNMP to run all kinds of operation such as Get, Set, and Trap need to use Management Information Bases (MIBs) file; actually it will be used to verify the activity during the interaction. Nowadays, most of vendors prepared the specific MIB file and they attached to their devices; on the other hand, the SNMP provides the default MIB file for the older version device.

V. DESIGN

All classes used in CNAM are organized into packages according to their functionality. There are three packages have been identified in CNAM system. Furthermore, these packages are known as CSCs (Computer Software Components). Model View Controller (MVC) has been adopted as architecture. This architecture includes 3 types of layers which are Model, View and Controller layers.

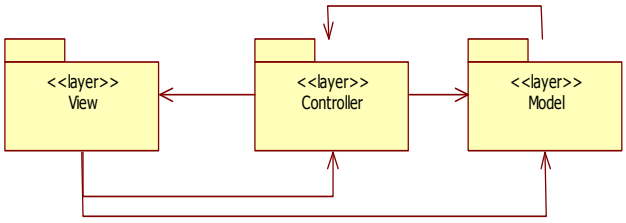

Fig.2. Layer dependency

The first layer is view layer, this layer consists all CNAM classes. This classes considered as user interface. The second layer is the Controller layer, this layer consists all the Ctl class which each class will be the controller for each CNAM class. The controller class interacts with any of the classes in Model and view Layers. The Model layer contains of all the Entity classes that will implement most of the system's functions.

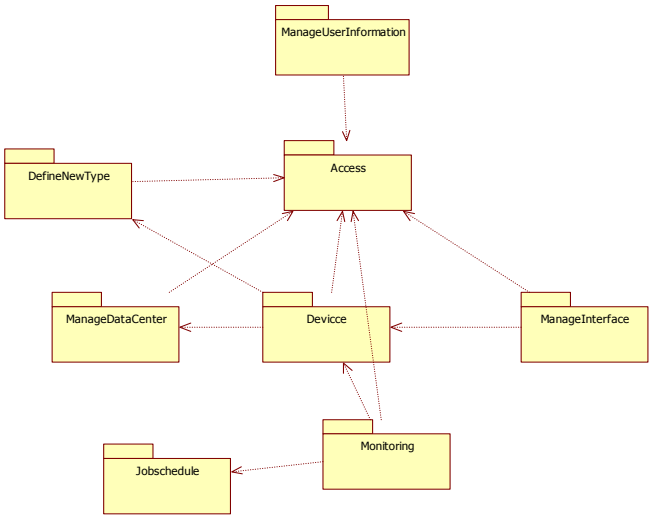

Fig.3. Controller layer and their dependencies

The model layer contains objects that encapsulate the data in the database. The View is the presentation layer which the users have interacted with them and it would include HTML, CSS, and Java script file. The controller it will process and response to events such user action; based on the code the controller make decision for any action and if need to interact with data or database the controller will send the order to the model for connecting with database, and model can return result back to the controller; then, the controller shall return the results to the View (presentation layer). Finally, the view will present the result based on HTML, CSS, or Java script on the browser.

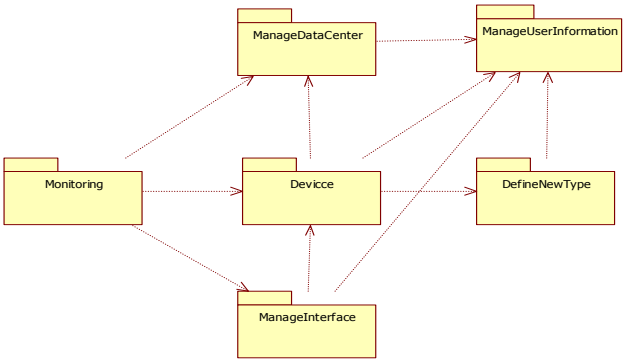

Fig.4. Model layer and their dependencies

VI. IMPLEMENTATION

To implement the CNMA we used Ruby on Rails for developing the MVC architecture. Ruby provides many libraries to write network management applications, such as SNMP. In case of using MIB file based on standard IETF, the Ruby has been included with the SNMP; the MIBs file will be used in SNMP session, so we have access to all of the OIDs.

For the purpose of monitoring the real time notification, we had to implement the several actions with the SNMP such as get request, get-next request, and table walk. To use these

action need to know the IP address of the equipment and there MIBs file, so during the registration of the device inside a specific datacenter we have to specify the IP address in the interface section and add the OIDs as description of the device then a code of monitoring will be executed.

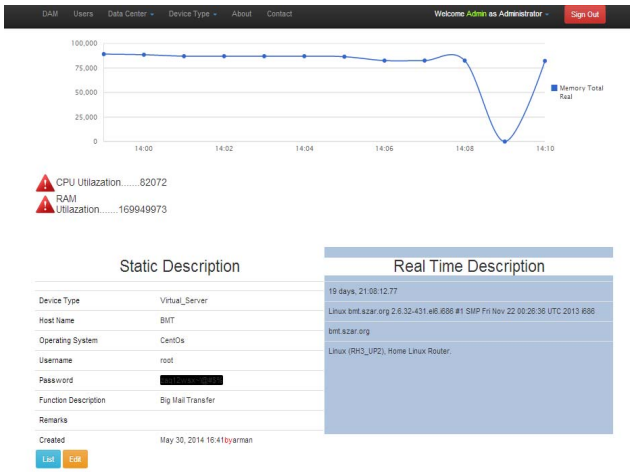

Fig.5. Real time monitoring "result."

VII. Conclusion

In this article tried to show main activity and result of real time monitoring for datacenter equipment. CNAM provide the integrity between different type of device that allow users without having enough knowledge start to monitor and track the device activities in their network.

Overall, the analysis, design, and implementation of CNAM was considered. The most significant objective of working throughout this study is to achieve an application that it have several advantage such as running cross platform, implementing the SNMP, integrating the different type of vendor in the same platform for managing and monitoring purpose, data collecting of the network instruments, accessibility to the CNAM anywhere, anytime based on web.

Acknowledgement

This research is funded by the Universiti Teknologi Malaysia (UTM) in collaboration with the Malaysian Ministry of Education under the Vot no. 4F238. The authors would like to thank the Research Management Centre of UTM and the Malaysian Ministry of Education for their support and cooperation including students and other individuals who are either directly or indirectly involved in this project.

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