

Development of a Prototype of Open-Source Network Management System

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KEYWORDS	ABSTRACT
Network Management System Open-source LibreNMS	A network administrator usually experiences network problem in the form of lack of effectiveness and efficiency of monitoring network devices. This is because the processes and operations are manual, meaning that the network administrator must jump into the field directly to monitor all the resources. Thus, a monitoring system of network devices is required so that they can be controlled centrally. This paper discusses a study to overcome the issue related to the problem of monitoring network devices using open-source tools and software. Based on the results of its implementation, it shows that a free network monitoring software such as a LibreNMS is capable to track and monitor all devices both conditions and can notify the administrator if there is error in the network. This study proved that a free open-source solution could be deployed to establish a responsive network monitoring system just like a proprietary system do.

1.0 INTRODUCTION

Today's world mostly depends on information. The whole world is connected and empowered using various kinds of networks based on different technologies. A Local Area Network (LAN) is a computer network within a small geographical area that composed of inter-connected workstations and personal computer. This network is important to enable the user to get access to the internet and should be available and maintainable. But, failure on the network is something unexpected. The solution for this problem is to detect risks and failure by monitoring the network as early as possible so that the network will be working fine.

Network monitoring is the practice of consistently overseeing a computer network for any failures or deficiencies to ensure continued network performance. For example, network

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monitoring will monitor the conditions of network components such as routers, servers and firewalls. If a slowing or failing component is detected, the network monitoring software in use will notify network administrators of the issue. Likewise, if a performance bottleneck is detected, the network monitoring software will notify administrators. It is very important to have a responsive network monitoring tool in an organization so that any failure or other issues on the information assets could be easily detected and repaired. The problem exists when not using network monitoring tools are if the resources like switches are down, there will be a problem where the user cannot get access to the network. The problem is administrator do not know where and when the resources down. The administrator does not capable to monitor manually the network when some of the resources down. It is important to have a system that could monitor this before it happens. Therefore, this open-source network management system is the way to overcome the problem.

This paper discusses a study to develop a prototype of a open-source network management system to provide a free solution of network monitoring problem. This system is created to monitor network resources and hardware in the network. It will collect useful information from various part of the network so that the network can be managed and controlled. This system also will notify and locate any problem on the network. Next section presents some review of concepts and technologies related to this study. It follows by methodology applied in this study in section four. Section five discusses the implementation and results and the findings are concluded in the last section.

2.0 LITERATURE REVIEW

2.1 Network Management System

According to Rouse (2018), a network management system (NMS) is an application or set of applications that lets network engineers manage a network's independent components inside a bigger network management framework and performs several key functions. An NMS identifies, configures, monitors, updates and troubleshoot network devices, both wired and wireless in an enterprise network. A system management control application then displays the performance data collected from each network component, allowing network engineers to make changes as needed. Network Monitoring have several functions such as monitor performance, detect devices, analyze performance and enable notifications.

2.2 Network Monitoring Tools

The most common and popular open source network monitoring tools are Cacti and Nagios (Abdulkadir, 2015). Cacti is an open-source, web-based network monitoring and graphing tool designed as a front-end application for the open-source, industry-standard data logging tool RRDtool. Cacti allow a user to poll services at predetermined intervals and graph the resulting data. Cacti monitor the availability of a network devices and services. Cacti presenting the performance of a network device in a graphical way. Configuration interfaces is a little time-consuming.

As for Nagios, it is an open source monitoring system for computer systems. It was designed to run on the Linux operating system and can monitor devices running Linux, Windows and Unix operating systems (OSes). Nagios provides complete network monitoring capabilities. Nagios monitors the network for problems caused by overloaded and/or crashed servers, network connections or other devices. Easily able to monitor availability, uptime and response time of every node on the network. Nagios can deliver the results in a variety of visual representations and reports. Nagios also have availability of a large number of plugins.

3.0 METHODOLOGY

In this study, there are three objectives need to be achieved. First is to develop Network Monitoring System (NMS) using open-source software of LibreNMS. Then, for the second objective, this system should be able monitor network resources in the network. Finally, the last objective is to notify and locate any problem of it resources to administrator.

3.1 Design topology

The design of the NMS for this study is based on topology as shown in Figure 1. The figure shows the elements of a computer network for NMS. NMS server connected to the main switch. Then, main switch will be connected to another switch and access point.

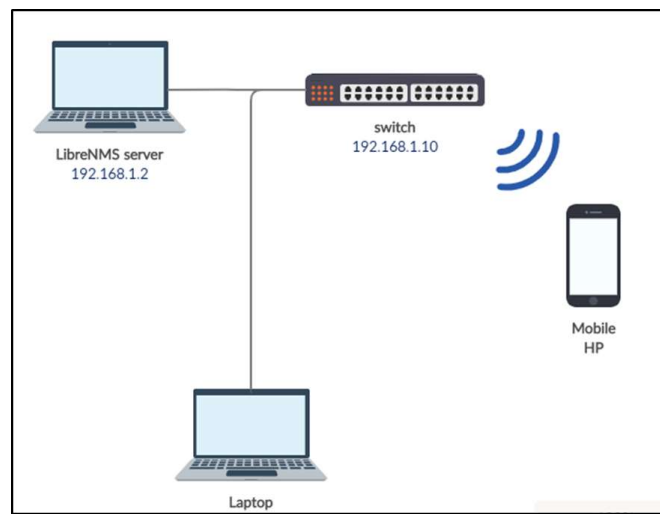


Figure 1: Design topology

3.2 Flowchart

Figure 2 shows the flowchart diagram of this system. It represents a workflow or process by showing the steps on how the system works. First process is the server monitoring the network and checking if there is an error. If there is an error in the network, the error will be sent to the administrator. Administrator will read the error that have been sent and inform the technician to do the troubleshooting.

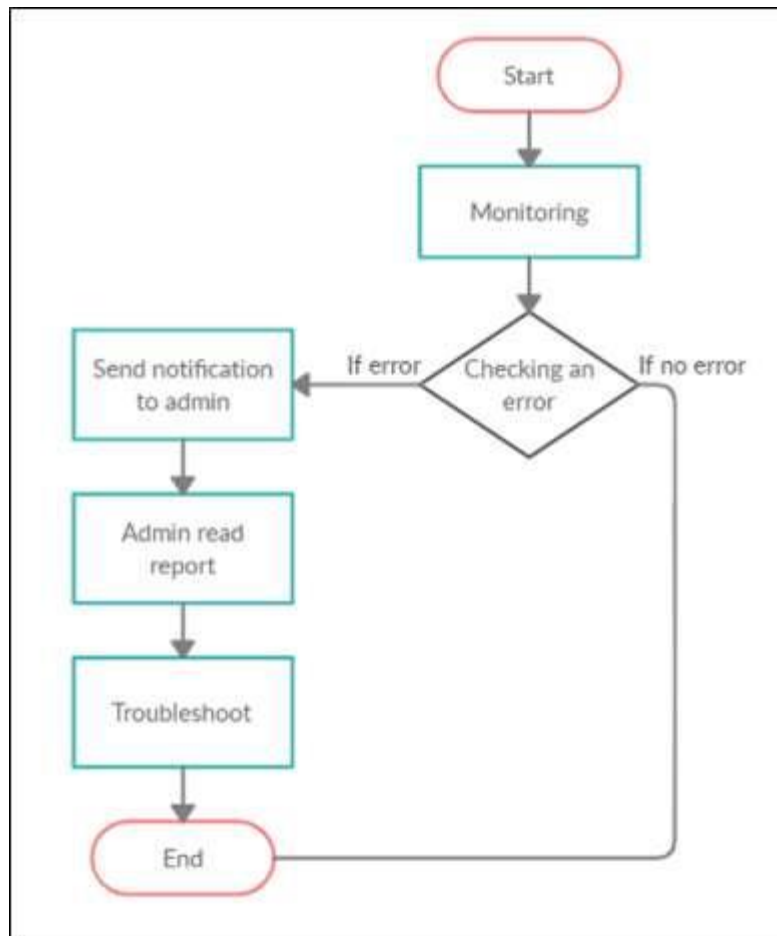


Figure 2: Flowchart

4.0 Implementations and Results

After the design the topology and its associated flowchart, the NMS was developed. Figure 3 shows all the steps involve in this phase.

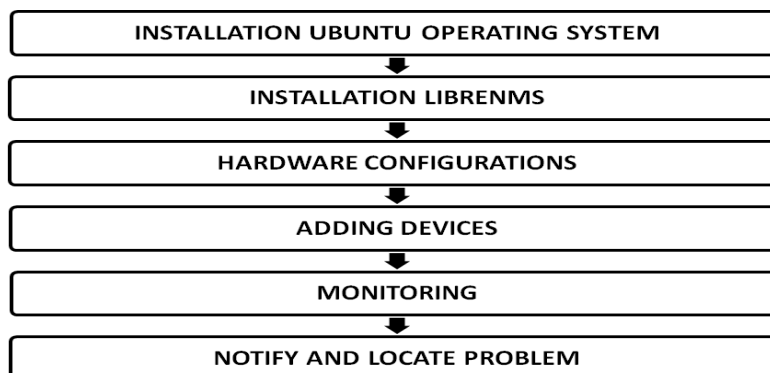


Figure 3: Phases of Open-Source NMS development

4.1 Results

After performing all the major steps presented as in Figure 3, all the three objectives were examined.

4.1.2 LibreNMS

LibreNMS was installed and configured on Ubuntu operating system. Figure 4 shows the software is working properly by showing all the status of network resources added to it. This evidences show that the first objective is achieved.

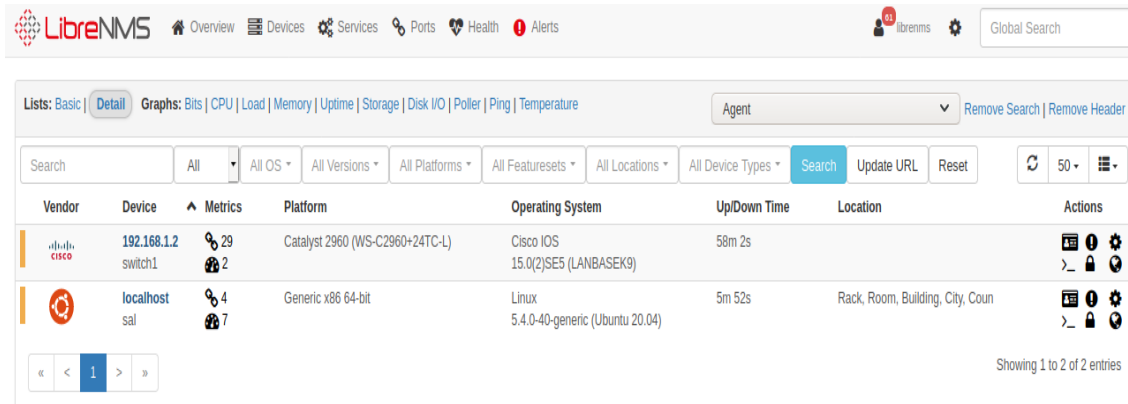


Figure 4: LibreNMS screenshot

4.1.3 Monitoring devices

The LibreNMS also working properly in monitoring all the network devices by showing all the parameters that associated with the status and performance of the network devices. For example Figure 5 shows the uptime of a switch in the network whereas Figure 6 shows the network traffic for the topology.

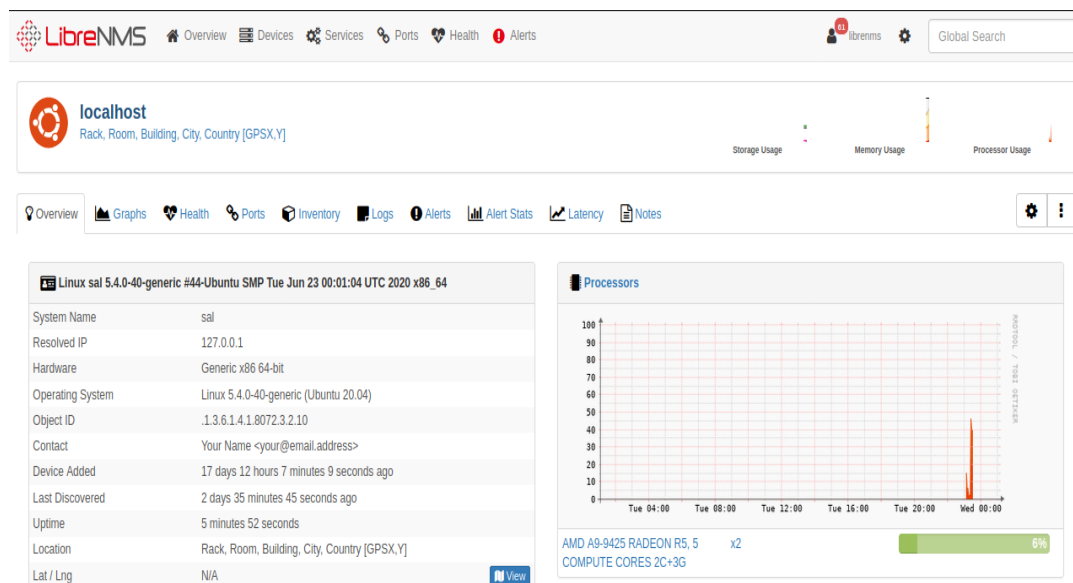


Figure 5: Uptime

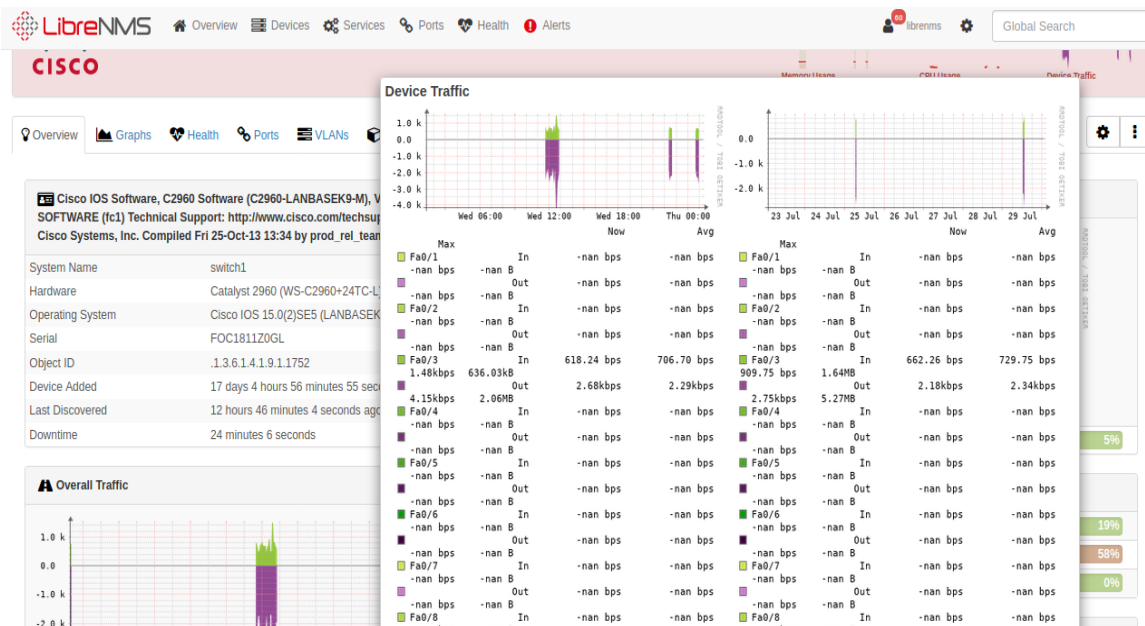


Figure 6: Network traffic

4.1.4 Notification

The last objective of this study is to notify and locate any problem of devices to the administrator. When the devices is down, administrator will get the notification below. In that notification also have the timestamp of the devices down.

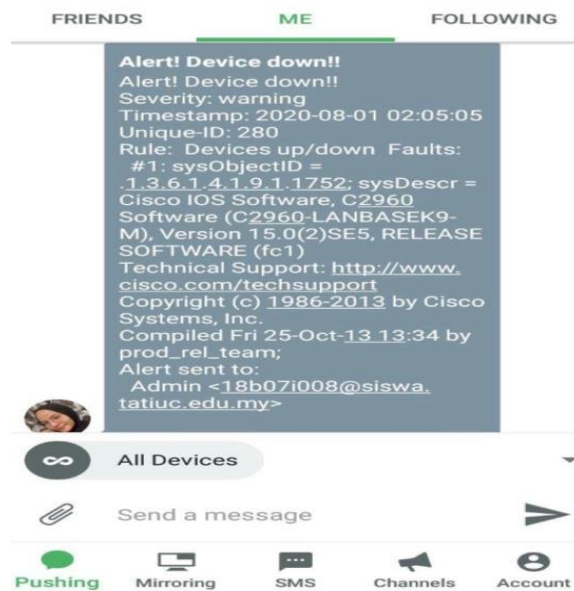


Figure 5.4 Alert notification

Next, the notification when the devices have been recovered. When the device has done troubleshooting, administrator will get the notification that shows the device has been recovered.

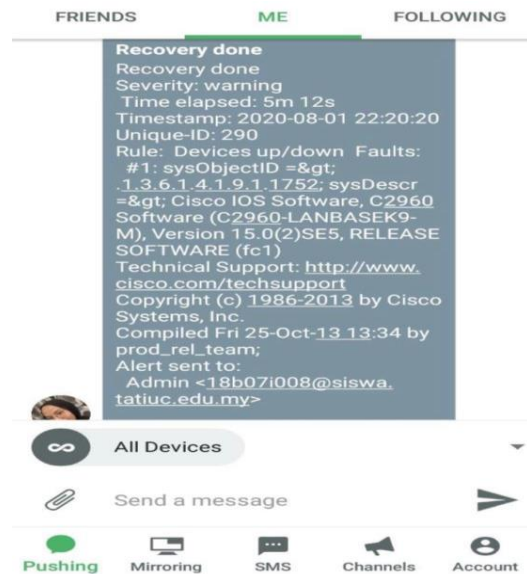


Figure 5.5 Recovery notification

5.0 Conclusion

This LibreNMS system was used Local Area Network (LAN) that will support the administrator to monitor the network devices. It will monitor the network traffic of the network devices, uptime and downtime, and bandwidth utilization of the network devices. Next, It also can triggered notification to the administrator if there is an error with the network devices. However, administrator needs to use third-party application link to the LibreNMS in order to get the notification. By this, the system will be function well.

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