Application of Network Monitoring System in Cacti and SNMP Based GPON Devices (Case Study of PT Telkom Indonesia Witel Bogor Network for Bogor District Health Office)

Muhammad Amin S.Kom[1], Dr. Ahmad Sabri Ph.D[2]

[1]Departement of Computer Since, Gunadarma University, Jakarta, Indonesia, 16424
[2]Departement of Computer Since, Gunadarma University, Jakarta, Indonesia, 16424

Abstract— *The rapid development of telecommunications technology will bring various forms of service to consumers. This is directly proportional to the business to build a bigger and better network at a more affordable price, so we need a network management device for its management. To be able to increase customer satisfaction, we need a Network Monitoring System (NMS) system that can monitor ISP devices located at the location of the customer, to reduce the number of reporting of disturbances from customers. NMS is a system for managing Internet Protocol (IP) based network devices. To run an NMS, we need a rule or protocol that underlies the system, the protocol is the Simple Network Management Protocol (SNMP). The SNMP protocol allows administrators to remotely manage and manage network device performance. In this research, a network monitoring system will be implemented in the cluster contained in the PT Telkom Witel Bogor fiber-optic network for the Bogor District Health Office. This NMS implementation uses the water flow method and an application called Cacti. Cacti is an open-source application that provides a system that can process SNMP information sent by SNMP agents and displays it in the form of device monitoring. The results of this study illustrate the state of the system based on ONT status indicators, ONT optical attenuation, and ONT optical module temperature.*

Keywords— *Network Monitoring System, GPON, OLT, ONT, Cacti.*

I. INTRODUCTION

The rapid development of telecommunications technology will bring various forms of service to consumers. This is directly proportional to the business to build a bigger and better network at a more affordable price. With an increase in the size and number of network devices the higher the risk of network disruption. Network management especially the monitoring system becomes something important to do.

PT Telkom Indonesia Witel Bogor is a state-owned company engaged in telecommunications and network services in the area of Depok City, Bogor City, and Bogor Regency. Many customers use the services of PT Telkom Indonesia Witel Bogor to obtain communication and internet services. Currently, PT Telkom Indonesia Witel Bogor has used Gigabit Capable Passive Optical Network (GPON) made by device vendors Huawei, Fiberhome and ZTE. GPON [1] is an access node technology that uses fiber optic cables and can provide multimedia services (Voice, Data, Video and other content) for residential and business customers.

Bogor District Health Office is one of the customers of PT Telkom Indonesia Witel Bogor who uses the Astinet lite service from PT Telkom Indonesia Witel Bogor. The service is used by 81 health centers throughout Bogor Regency to access various applications. Astinet Lite is a dedicated internet service from PT Telkom Indonesia with upstream: downstream 1: 4 with the same path for access to domestic and global, static public IPs obtained by customers are only 2, 1 is used for gateway 1 is used for addresses. For Astinet Lite services that are used by 81 health centers throughout Bogor Regency. PT Telkom Indonesia Witel Bogor must maintain optical access from the Optical Line Terminal (OLT) equipment located at Telkom's STO closest to the customer location to the Optical Network Termination (ONT) located at the customer's location.

At present, the PT Telkom Indonesia Witel Bogor Astinet Lite service limit is 3.5 hours per month. And the MTTR achievement is currently 2.9 hours per month.

To minimize the MTTR (Mean time to repair) and meet the Astinet Lite SLA service that is used by 81 community health centers in Bogor Regency. So now we need a study that can provide information about the use of NMS applications in managing the network. Network Monitoring System (NMS) is a subsystem in network management (Network Management System) which involves the use of software and hardware.

For monitoring purposes, one of the most widely used software today is Cacti. Cacti [2] stores all data or information needed to create a graph and collect it. To run cacti it requires supporting software such as MySQL, PHP, RRDTool, net-SNMP, and a web server that supports PHP such as Apache or IIS.

Cacti is used as a system that manages the ONT status monitoring process, the quality of optical fiber 81 health centers in Bogor Regency from Optical Line Terminal (OLT) to ONT, the distance from OLT at the nearest Telkom STO to the customer location to the ONT at the customer's location and ONT temperature. It is expected that the presence of NMS can minimize MTTR (Mean time to repair) and meet the Astinet Lite SLA service that is used by 81 health centers throughout Bogor Regency and increase customer satisfaction.

II. REALETED WORK

Research on Cacti and Dude Network Monitoring has been done quite a lot. Anggit Wulandoro [3] in his journal stated that the NMS informs the state of the system based on indicators such as: bandwidth, processor workload, and memory usage.

Subsequent research conducted by R.Aditya Indra Pati [4] in their research title created a monitoring system to detect communication disruptions on the network using cacti, which resulted in the conclusion that cacti can monitor ping latency, disk management, memory management and cannot monitor Ethernet, CPU Usage, System Activity.

Furthermore, research by Dwi Risza Budi Raharja. [5] under the title implementation of network monitoring using cacti and web authentication using Kerberos in Man 1 Bojonegoro said Cacti could be integrated with an SMS gateway.

Furthermore, research by E A Z Hamidi. [6] The Implementation of the Alert System for LAN Network Monitoring Using the Dude Based Email states that the NMS uses the Dude application and if there are indications of interference on the notification device an admin email will be sent.

III. METHOD

A. Research Methods

There are several variants of the software development process model, one of which is the waterfall model. In the waterfall model, each process is carried out in stages from one stage to the next [7]. The stages of this research are determined based on the stages in the waterfall development model. Several stages in this research flowchart, namely preliminary studies, literature studies, data collection, system analysis, system design, implementation, system testing, and report generation as in Figure 1.
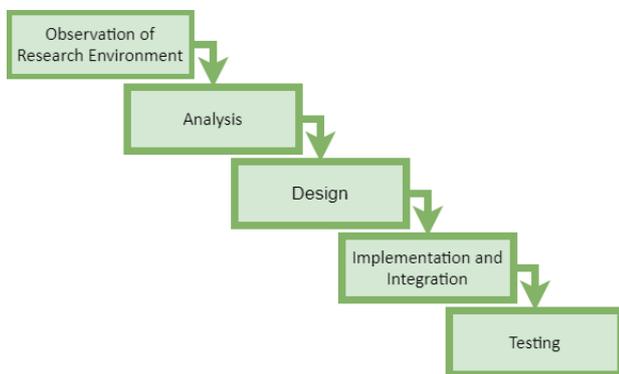

Fig. 1. Research Flow

B. NMS Design

In general, network monitoring systems are as follows (figure 2):

The server will give commands to the NMS. Then the NMS forwards the instructions to the monitored device. From the cluster node (as an agent) will send the data source to the NMS, then the data is collected in the RRD database, and will be forwarded to the server to display the data as a monitoring device on the cacti web display.
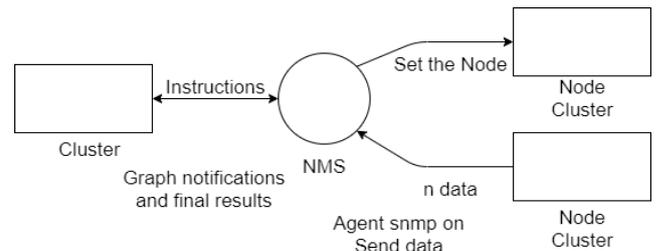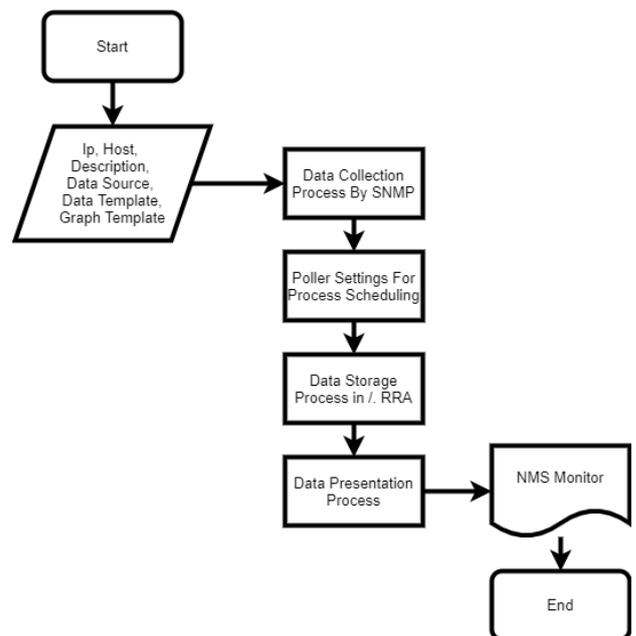

Fig. 2. Network Monitoring System Flow

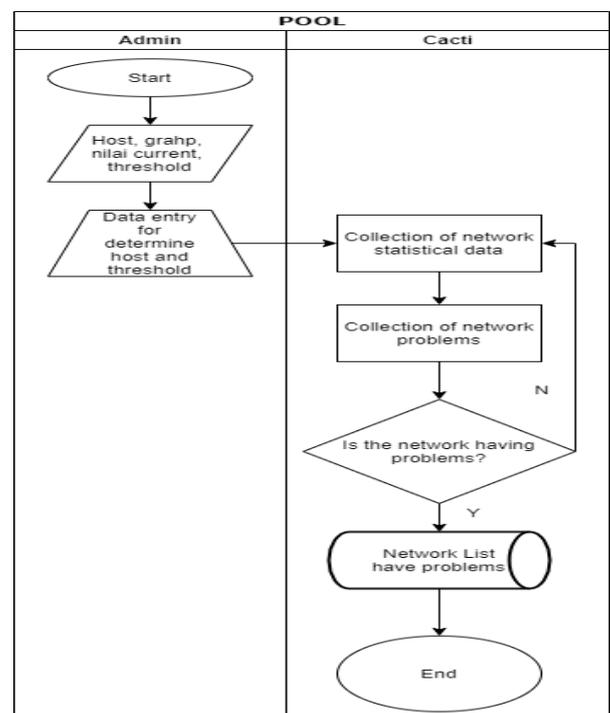Fig. 3. Flowchart the Process of Collecting Network Statistics by Cacti.

Fig. 4. The Process of Collecting Data on Network Problems by Cacti

C. Network Monitoring System Design With Cacti

The system design stage is a procedure for converting logical specifications into a design that can be implemented in software. This stage is carried out after the software analysis phase is completed. The design of the software that will be made includes the design of a base and interface design consisting of; menu structure design and display design. Designing a network monitoring system process so that it can be accessed via the web.
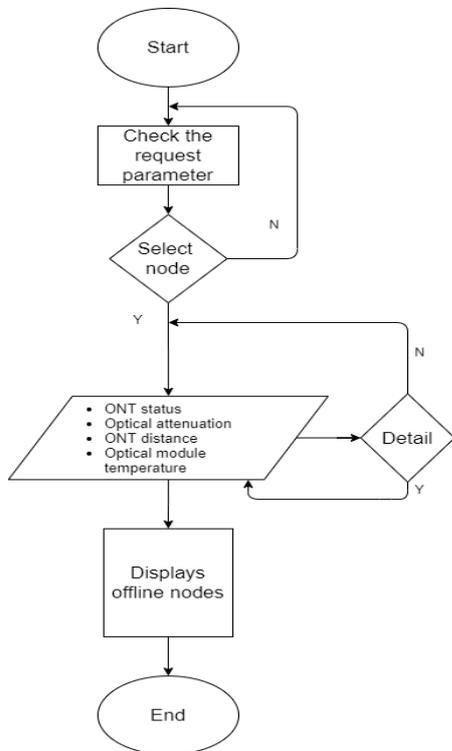
Fig. 5. Network monitoring system design with Cacti

First, get device information that will be monitored first. Information can be in the form of device description, hostname, olt slot, olt port, onu id, onu serial number. Check all parameter requests. Then select the node to monitor. For each node, there are four indicators namely ONT status, optical attenuation, ONT distance, and optical module temperature. Each indicator item can be chosen individually as desired.

D. Cluster Node Management Process

The node setup process is made to make it easier when there are additions or changes to nodes in the cluster. To add or change nodes, data is needed from the node you want to add.

Inputs needed are node names, specifications, IP addresses, and communities. If all input data entered is correct, it will be saved on self. DIRS_DATA_SYSTEM + self. NODES_FILE (/data/system/nodes.dat). Likewise, with the monitored item settings, the process is the data needed to add or change the monitored item is the name of the monitoring group, item name, type, OID, and interval. If it is filled incorrectly, it will be saved on self.

_DIRS_DATA_SYSTEM + self._MONITORING_ITEM_FILE (/data/system/monitoring_item.dat). Third Level Heading The third level heading follows the style of the second-level heading. Avoid using headings more than three levels.
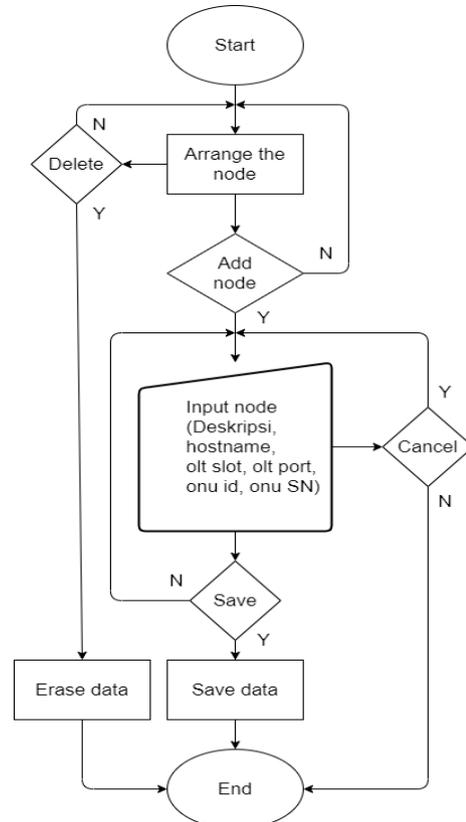
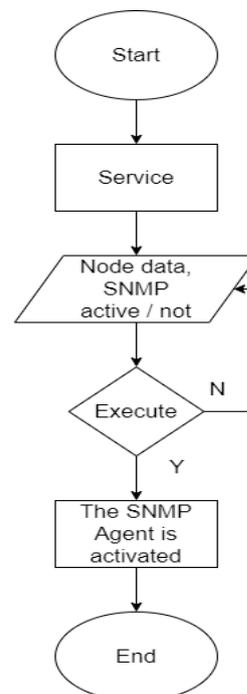Fig. 6. Node Configuration Process

Fig. 7. SNMP Service Configuration Process

Muhammad Amin S.Kom and Dr. Ahmad Sabri Ph.D, "Application of Network Monitoring System in Cacti and SNMP Based GPON Devices (Case Study of PT Telkom Indonesia Witel Bogor Network for Bogor District Health Office)," *International Research Journal of Advanced Engineering and Science*, Volume 5, Issue 2, pp. 25-29, 2020.

E. Cacti Configuration Process

Cacti has a notification feature if a device is down. If Cacti detects ONT optical module attenuation below -12 or above -24 dBm, the ONU Rx Level (dBm) will turn red. If Cacti detects the temperature of the ONT optical module above 50 ° C, the Optical Module Temp (° C) will turn red. Following is the table of Notification information on Cacti. This configuration process is made so that the Cacti server can be connected to the Bogor cloud management GPON and the Bogor Witel intranet. The server uses 2 for Network Interface Cards where each planted with a different IP for the Cacti 10.55.2.184 server address is connected to Telkom's intranet cloud while the other one is planted with a 172.24.205.110 IP to communicate with GPON Bogor cloud management.
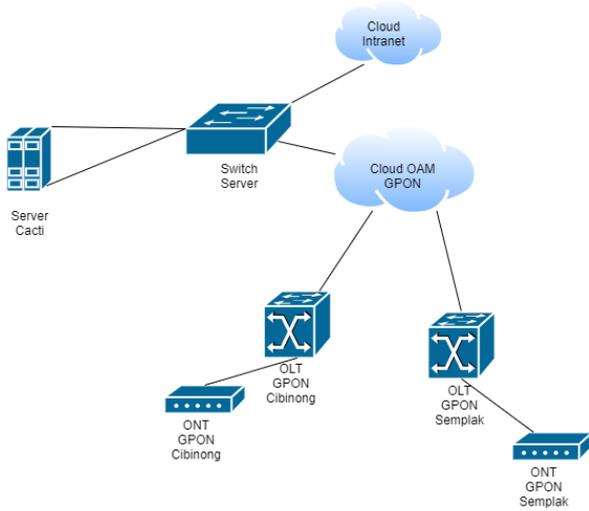
Fig. 8. SNMP Service Configuration Process

F. Display of Cacti

The login process on the system consists of two users, the first user logging in as an admin, and the other entering as a normal user. Admin has a full role in the monitoring system. Admin has all access to the system. Whereas ordinary users can only see or monitor traffic for their needs.
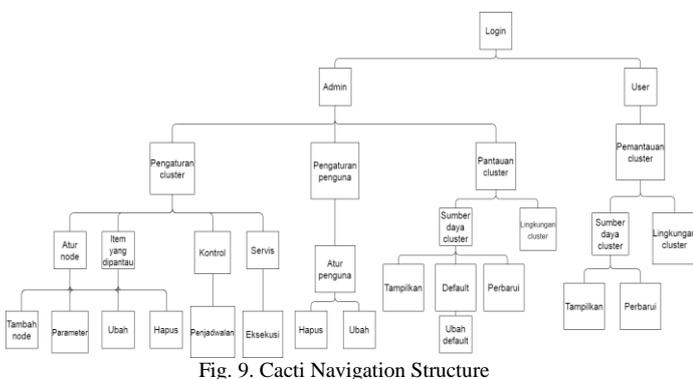

Fig. 9. Cacti Navigation Structure

G. Cacti Notifications

Cacti has a notification feature if a device is down. If Cacti detects ONT optical module attenuation below -12 or above -24 dBm, the ONU Rx Level (dBm) will turn red. If Cacti detects the temperature of the ONT optical module above 50 °

C, the Optical Module Temp (° C) will turn red. Following is the table of Notification information on Cacti.

TABLE I. ONT Notification

No	Alarm	Information
1		ONT status is active
2		ONT Off status

TABLE 2. ONU Status

No	ONU Status	Information
1	Online	Online
2	Offline	Shut down from OLT
3	Dying Gaps	There is no power flow to the ONT
4	Unknown	Unknown
5	SyncMib	ONT is synchronizing with OLT

IV. RESULT

The results of the implementation of making a network monitoring system for OLT devices can be seen as follows.
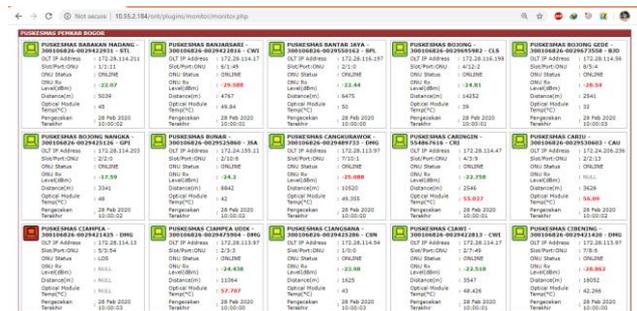

Fig. 7. NMS ONT

From Figure 7 it can be seen that the normal ONT is denoted by a green PC icon if the ONT is indicated to be faulty or is turned off denoted by a red PC icon. If the optical attenuation of the ONT module is not feasible or the threshold is below -12 dbm and above -24 dbm ONU, the ONU Rx Level (dBm) value will turn red. If the optical module temperature exceeds 50 degrees Celsius, the Optical Module Temp (° C) value will be red.

Fig. 8. Text Box Messages

ONTs that are monitored off (disturbed or turned off) will be collected and entered into the text box (See Figure 8).

V. CONCLUSION

The results obtained from this study can be concluded as

follows:

1. The NMS design process on OLT and ONT devices using Cacti requires a configuration phase both on Cacti and the OLT device itself, and the same IP address needs to be planted with the network connected to the GPON Witel Bogor cloud.

2. The process of implementing NMS on OLT and ONT devices requires applications that can assist Cacti in processing SNMP trap messages sent by SNMP agents to the server.

REFERENCES

[1] Ahmad Hambali, Jaringan Akses (GPON dan GEPON). Bandung, Indonesia, 2014.
[2] What is Cacti, Available: https://www.cacti.net/index.php
[3] Anggit Wulandoro, Fitriyani, Galih Nugraha Nurkahfi. Desain, Implementasi, Dan Analisis Network Management System (NMS) Berbasis Cacti. e-Proceeding of Engineering : Vol.3, No.1 April 2016 | Page 1199. 2016
[4] R. Aditya Indra Pati, Mia Rosmiati, S.Si., M.T., Mochammad Fahru Rizal S.T., M.T. Pembuatan Sistem Monitoring Untuk Mendeteksi Gangguan Komunikasi Pada Jaringan Menggunakan Cacti. e-Proceeding of Applied Science : Vol.4, No.3 Desember 2018 | Page 2076. 2018
[5] Dwi Risza Budi Raharja, Periyadi, Anang Sularsa Implementasi Monitoring jaringan Mengunakan Cacti Dan Web Authentication menggunakan Kerberos Pada Man 1 Bojonegoro. e-Proceeding of Applied Science : Vol.1, No.3 Desember 2015 | Page 2323. 2015
[6] E A Z Hamidi1, L S Dzudi, A Faroqi, and M A Ramdhani. The Implementation of Alert System for LAN Network Monitoring Using the Dude Based Email. IOP Conf. Series: Materials Science and Engineering 288 (2018) 012054. 2018
[7] Ian Sommerville, Software Engineering (Ninth Edition). 2010.