Jurnal Ilmiah Komputer dan Informatika (KOMPUTA)
Edisi. 1 Volume. 1 Februari 2016 ISSN : 2089-9033

NETWORK MONITORING SYSTEM APPLICATION DEVELOPMENT ANDROID BASED SMARTPHONE USING OPENNMS (CASE STUDY PT. SKYLINE SEMESTA)

Muhamad Usman Rusmana

Teknik Informatika – Universitas Komputer Indonesia
Jl. Dipatiukur 112-114 Bandung
E-mail : man_33us@yahoo.co.id

ABSTRACT

PT. Skyline Semesta is a company running on information and communication technology, one of the service provided is Internet Service Provider (ISP). The Dude monitoring system application is a desktop-based application, so that monitoring can only be done in the workspace. Administrators can not monitor the network in front of a computer screen continuously.

Network monitoring system illustrates how a system can monitor network conditions either server, router, or other network devices connected to the network can be monitored constantly. Network Monitoring System Applications Android-Based is an application that using OpenNMS as the Network Monitoring System. Monitoring data will be accessed by the application. The application is expected to help the Administrator in monitoring network that the Administrator manage and when there are problems on the network can be dealt immediately.

Based on the results that obtained from the research that is done, so it can be concluded that the application can assist for the administrators in monitoring the network while in the office and outside of the office. Availability remote facility for the Administrator to configure the device remotely.

Keywords: monitoring system, network, OpenNMS, remote, android

1. INTRODUCTION

Network monitoring system illustrates how a system can monitor network conditions either server, router, or other network devices connected to the network can be monitored constantly. Any changes that occur on the server can be monitored by the monitoring system. If there is a device on the network that is not working or there are problems on the network, then the system will provide a notification to the administrator as an alarm.

System monitoring application The Dude still based on desktop that requires a computer to see the results of the network monitoring. Problems accour when an administrator can't monitor the condition of the network for 24 hours straight. As we know that the Administrator is human being as well who need a break and not always in the work place for the other activities so the administrator can't monitor in front of the computer screen continuously.

Notice some of those issues, and after did an interview with Administrators of PT. Skyline Universe all Network administrator using smartphone android, so the network monitoring system application based on android can be considered as a solution of this problem. OpenNMS will be used as a Network Monitoring System, the monitoring records is accessible by the android platform. The results of this research is Development a **Network Monitoring System Application Based Android Smartphone Using OpenNMS**.

1.1 Sistem Monitoring

The monitoring system is a process to collect data from some resources. Typically data that collected is a real time data. Speaking to the point in a monitoring system is divided into three big processes as shown in Figure 1, namely:

1. The process of collecting monitoring data.
2. The Process of monitoring data analysis.
3. The Process of displaying the result of monitoring data.

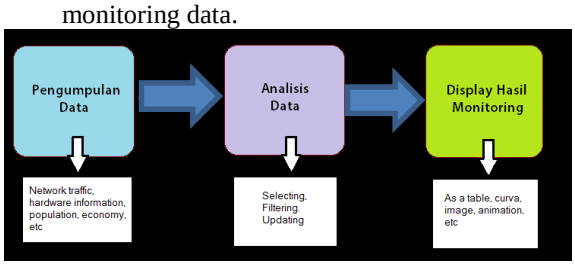


Figure 1. Monitoring Sytem Process

The action, which occurs between the processes in a monitoring system is a service, which is a process that running constanly at the certain time intervals. The processes that occur in a monitoring system starting from collecting data such as data on network traffic, hardware information, and others that the data will be analyzed on process analyzing data and in the final the data will be displayed.

In some applications monitoring system, the access is completely restricted from terminal local host. The question is whether it can be monitored

from a distance, where all the data is collected from a terminal computer which is in the different location with the instrument, for example by using a LAN (Local Area Network) or even internet. To run a monitoring system like this, very possibly can be done using program interface that can bridge the user through a web browser on a remote terminal. This Interface program is called CGI (Common Gateway Interface) that usually available on linux [1].

1.2 Computer Network

According Ardiansyah (2010), computer networks (Computer Network), called briefly to the network is a collection of computers and other devices that are linked together using a particular communications media. The information passed along the communication medium, allowing network users to exchange data or use the software and hardware sharing. Each - each computer or device - any other means of connecting to the network are called nodes. The network can consist of tens, hundreds or even thousands of nodes.

1.3 *Network Monitoring System* (NMS)

NMS is a tool for monitoring / supervision of the elements within the computer network. The function of the NMS is to monitor the ku alitas SLA (Service Level Agreement) of the bandwidth used (Fachruddin, 2009). The results of the monitoring are usually used as an ingredient in decision-making by the management, on the other hand is used by network administrators (technical person) to analyze whether there were irregularities in the operation of the network.

1.3.1 NMS Applications

There are several applications Network Management System (NMS) used in the execution of this study are as follows:

a. The Dude

The Dude Network Monitor is an application MikroTik which can significantly increase the reach of administrators to manage the network environment. The Dude will automatically scan all devices within specified subnets, draw and layout a map of the network, providing service monitors devices connected in a network and provides a warning if a network service having problems. NMS The Dude forms of monitoring can be seen in Figure 2.

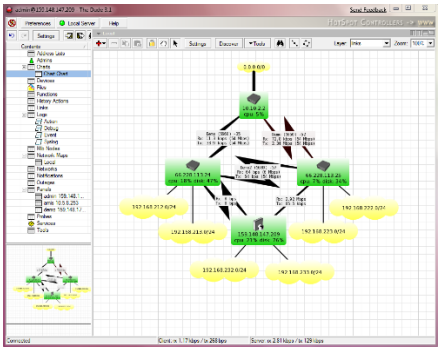


Figure 2. The Dude NMS Display

b. OpenNMS

OpenNMS is a network management tool based on open source enterprise scale. OpenNMS help a network administrator to monitor the services that are impaired in equipment or devices at the remote side (away) and collected formation of the remote node devices using SNMP. OpenNMS provides. OpenNMS is written in JAVA language however, the configuration data is provided directly through the data extensible markup language (XML). One thing that is important is OpenNMS able to work on a tiered system (hierarchical) and being able to monitor multiple service / services such as: ICMP, SNMP, FTP, HTTP, SMTP, DNS, Router TCP, Sybase (TCP), MySQL, Postgres, Oracle (TCP), DHCP, MS Exchange, IMAP, POP3 and others. OpenNMS also offers services, support, and development and training to create a custom made solution to fit the business process [3].

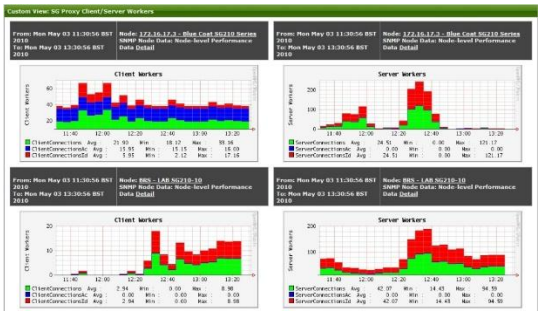


Figure 3. OpenNMS NMS Display

1.4 *Remote Access*

Remote access is a mechanism which is used in controling of a network device, where the administrator can easily control and supervise computer servers, backup data, or other activities that has something to do to server [4].

Nowdays a lot of media that can be used to perform this remote access such as computer / laptop, smartphone and other computerized devices.to perform remote access is required in order to be involved remote must be connected to the Internet or intranet.

Jurnal Ilmiah Komputer dan Informatika (KOMPUTA)
Edisi. 1 Volume. 1 Februari 2016 ISSN : 2089-9033

1.5 *Virtual Private Network* (VPN)

According to Andri (2010), VPN (Virtual Private Network) is a network security techniques by creating a tunnel for example on a public network or Internet so that the network is private and secure. VPN must be private because when will the establishment of a VPN connection authentication needed to ensure that both points of the connection is the appropriate user who is authorized to access a server. After creating formation of a VPN connection, the data will be encrypted to maintain the confidentiality of transmitted packets. The use of authentication and encryption integrated into the VPN to create a better security system as in figure 4.

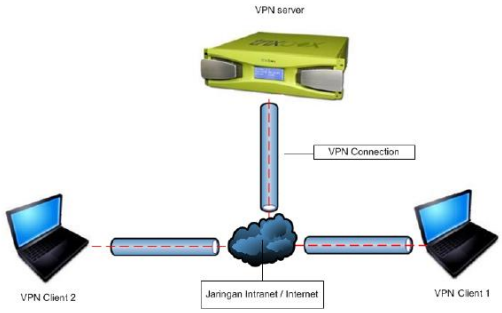


Figure 4. Communication Data with VPN

2. RESEARCH CONTENT

2.1 System Description

The system will be built using the concept in a client server architecture, where the architecture of the system consists of Android Client Application Server OpenNMS as a client and as a server. Client Application Android devices access the network through the VPN network.

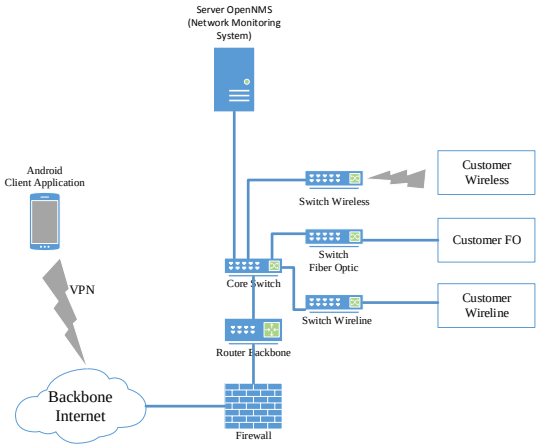


Figure 5. Overall System Architecture

OpenNMS server is a system that analyzes network from core router to a network that connected to the Customer. OpenNMS will be monitoring network elements such as switches, routers and other network devices. OpenNMS will identify, isolate, correct and record errors occurring in the network. It aims to predict the error so that the network can always be provided. Server OpenNMS as well as a data provider of network analysis results. Data provided by the API OpenNMS is the alarm data, the data network availability (availability), event data, the data outages, the data nodes that are connected to the network. The data will be accessed by Android Client Application form of JSON data.

Android Client Application is an application used by administrators to know the condition information in monitoring by OpenNMS server. The application will perform a data request to the server OpenNMS then the data is processed on the application. Network information obtained is network performance, the list of problems on the network as data alarm, a list of recent history occurred on the network as data event, a list of nodes that are connected to the network and data outages. The application will perform a data request alarm every minute and if there is data alarm, the application will display a notification so the administrator can know that there is a problem on the network managed by the administrator.

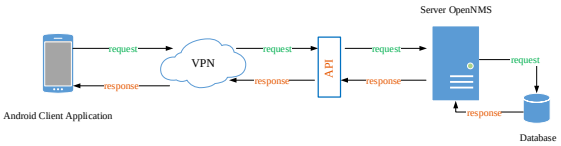


Figure 6. Monitoring System Architecture With Android

Below is a description of figure 6 architecture monitoring system with android:

1. Android Client Application connected to the VPN and then perform the data request to the OpenNMS server via the API.
2. The server receives the data request from the Android Client Application and determine the type of request that is requested.
3. After the server receives the data requested data will be returned in the form of JSON to be processed on the Android Client Application.

There are a remote features that can be used to access remotely and configure the device directly to a network or server. The concept for remote use third-party applications that can be accessed through the ConnectBot which applications are built. In order to perform remote network to all devices that are in good company the Local IP and Public IP android device must be connected to the company VPN network as illustrated in figure 7 below.

Jurnal Ilmiah Komputer dan Informatika (KOMPUTA)
Edisi. 1 Volume. 1 Februari 2016 ISSN : 2089-9033

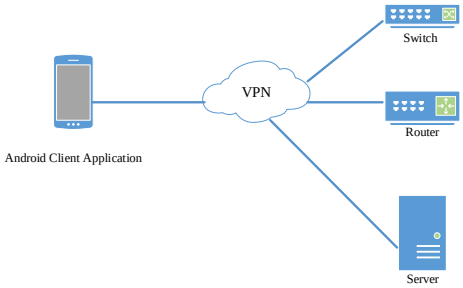


Figure 7. Remote Architecture With Android

2.2 Functional Needs Analysis

Analysis of functional requirements using use case diagrams to portray the existing functionality in perangakat software to be built.

1. *Use Case Diagram*

Use case diagrams are used to explain what will be done and the system of actors that will be associated with the processes in the system. Connectedness owned line use case Retrieve data via the API can not be described to facilitate the reading of the diagram.

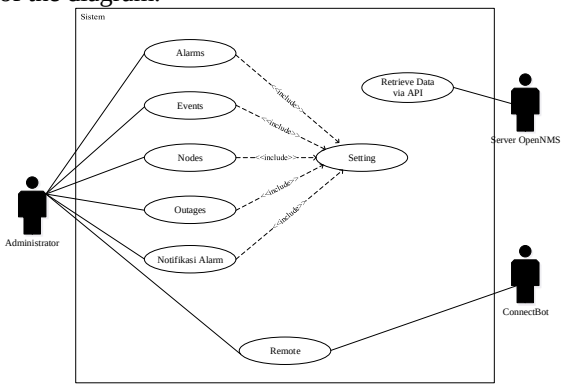


Figure 8. *Use Case Diagram*

2.3 OpenNMS Server Installation

OpenNMS Server is a computer hardware that is used as a server. Required to install and configure the server for the system to function properly. In this process will be done in several steps, tere are:

1. In the first process that begins with the installation of the operating system on the server computer as a network monitoring. The system used is Linux Ubuntu 12:04.
2. Furthermore, the installation of supporting software to run the Java Development Kit OpenNMS and PostgreSQL.
3. Snmp and snmpd installation on Linux.
4. Then installation and configuration of OpenNMS.

2.4 System Builders Hardware Implementation

The hardware which is implemented by the system monitoring network application development based on android is hardware requirements specified in the analysis phase.

1. Hardware Builder Application

Here is the hardware used in system monitoring network application development based on android

Table 1. Hardware Builder Application

No	Hardware	Spesification
1	Prosesor	Intel Core i3 2.4Ghz
2	RAM	6 GB
3	VGA	AMD Radeon 1 GB
4	Hardisk	500 GB
5	Screen	14 inch
6	Input Device	Mouse and Keyboard

2. Hardware builders OpenNMS Server

Here is the specification of the hardware used in the OpenNMS server.

Table 2. OpenNMS Server Hardware

No	Harware	Spesification
1	Prosesor	Intel Xeon E5-2667 3.3Ghz
2	RAM	4 GB
3	VGA	VGA compatible controller
4	Hardisk	SCSI 20 GB

3. Smartphone Hardware

Here are the hardware specs of smartphones used is smartphone android as a client to access the system.

Table 3. Smartphone Hardware

No	Hardware	Spesification
1	Prosesor	Quad Core 1.2Ghz
2	RAM Memory	1 GB
3	Screen	540x960 piksel 4.5 inch
4	Internal Memory	4 GB
5	Input Device	Touch Screen

2.5 Software Implementation System Builders

Software that is implemented on system monitoring network application development based on android is software requirements decided in the analysis phase.

Here is the software used in the construction of a system monitoring network application development based on android.

1. Operating system Windows 7 64-bit
2. Android Studio version 1.4
3. Android SDK version 22
4. Java Development Kit (JDK) version 8

MeanWhile the software used on the OpenNMS server are:

1. Operating System Linux Ubuntu 12.04
2. OpenNMS version 16.0.3
3. PostgreSQL version 9.1
4. Java Development Kit (JDK) 8

2.6 Testing System

Testing is the step for doing to test and find out if the configuration parameters system and represent the basic study of the specification, design, and coding is implemented going well and according to the previous destination.

2.6.1 Test Result

2.6.1.1 Testing *Setting* Functionality Software

There are two mechanisms of testing that are test with appropriate data and testing data is wrong. The following functionality testing settings by entering the appropriate data.

1. Testing Setting Functionality with the correct Data

In this test, there are two components that are tested and VPN Connection Server Settings. Results of testing the VPN Connection by entering the correct data is marked with the status "Connected" can be seen in figure 9 below.

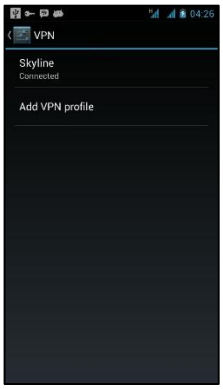


Figure 9. *VPN Connection* Display (True Data)

The next testing component is Server Settings. The test results Server Settings by entering the correct data can be seen in figure 10 below.



Figure 10. *Server Settings* Display(True Data)

2. Testing Functionality Setting with the incorrect Data

In this test, there are two components that are tested and VPN Connection Server Settings. Results of testing the VPN Connection by entering incorrect data marked with a status of "Unsuccessful" can be seen in figure 11 below.

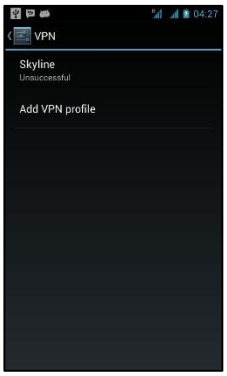


Figure 11. *VPN Connection* (False Data)

The next testing component is *Server Settings*. The test results Server Settings by entering incorrect data is marked by the emergence of a warning icon as shown in figure 12 below.

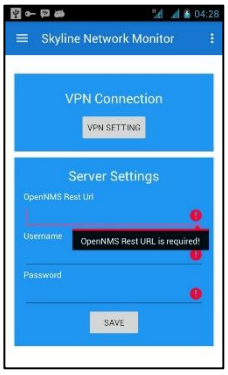


Figure 12. *Server Settings* Display (False Data)

Jurnal Ilmiah Komputer dan Informatika (KOMPUTA)
Edisi. 1 Volume. 1 Februari 2016 ISSN : 2089-9033

2.6.1.2 Software Functionality Test for Monitoring

Here it is the testing of all functionality that tested.

1. the functionality test of *the dashboard menu.*

On the system monitoring network application development based on android there are *dashboard menu.* Below the display when administrators access the menu.

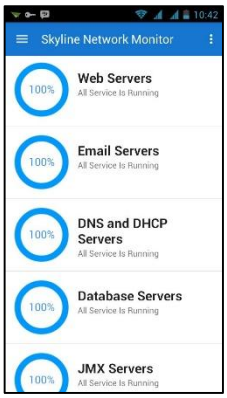


Figure 13. *Dashboard* Display

In figure 13 displaying network statistics that monitored overall. There is also information detail about the data. The following display detailed information.

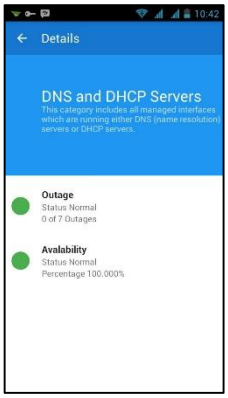


Figure 14. *DNS and DHCP Servers* Data In Detail

2. Test the access data alarms functionality.

On the system monitoring network application development based on android there are *alarms menu.* Below the display when administrators access the *alarms* menu.

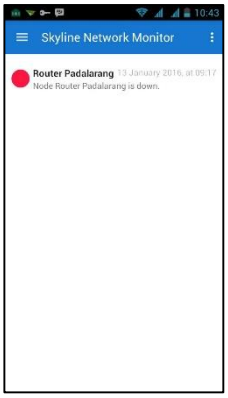


Figure 15. List Of *Alarms* Data

In figure 15 displaying the data alarm is a node information that have trouble, the node time troubled and short information about the problem that occurred. There is also detailed information about the data alrm. Alarm display in detail can be viewed in figure 16 below.

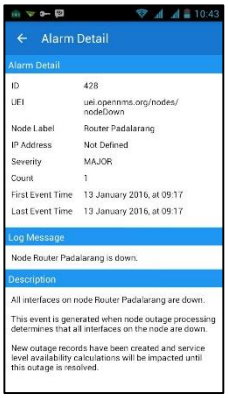


Figure 16. Alarm Data In Detail

3. Test access the functionality data node.

On the system monitoring network application development based on android there are navigation *nodes.* Below the display when administrators access the *nodes* menu.



Figure 17. *Node* List

In figure 17 displaying node data in a *node* name or *IP address of the node* that is monitored. There is

also detailed information about the *node's* data. Here's a detailed view *of nodes* and *node* performance.



Figure 18. *Node* Detail

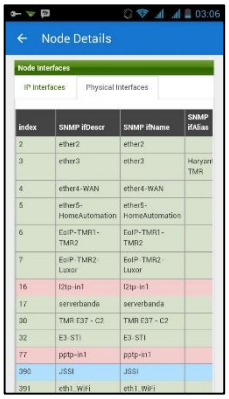


Figure 19. *Physical Interface Node* Office-tmr-e3

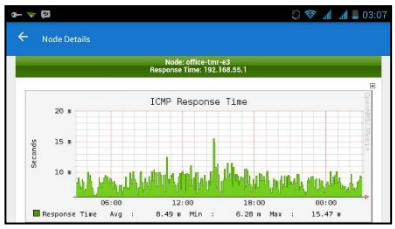


Figure 20. Node Graph *Response Time*

4. Test the access functionality *Event* data.

On the system monitoring network application development based on android, there are menu *Event.* Below the display when administrators access the *Events* menu.

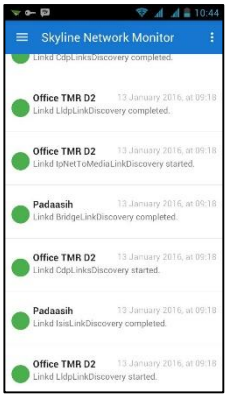


Figure 21. List Of *Events* Data

In figure 21, the display data is an *events* information that occur in the system, the time of the *event* and short infomation about the problem that occurred. There is also detailed information about the*event* data. The following *events* to see in detail.



Figure 22. *Event* Data in Detail

5. Test the access data functionality *Outages.*

On the system monitoring network application development based on android, there are menu *outages.* Below the display when administrators access the *outages* menu.



Figure 23. *Outages* Data List

In figure 23, the display data *outages* such as *node* name, *interface* and *service.* There is also

Jurnal Ilmiah Komputer dan Informatika (KOMPUTA)
Edisi. 1 Volume. 1 Februari 2016 ISSN : 2089-9033

detailed information about the data the *outage.* Here's the view *outage* in detail.

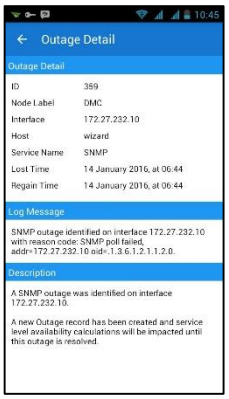


Figure 24. *Outage* Data In Detail

2.6.2.3 Testing Functionality Alarm Notification

At this step it will be trouble simulation trouble on the network by disbaling down FTF services to one of any routers that being monitored, to do this simulation using putty application on the computer to access the router, after success enter to the router, write this command "*ip service disable 1"* to disable FTP service, here there are illustration of disbaling down the simulation FTP service using putty application

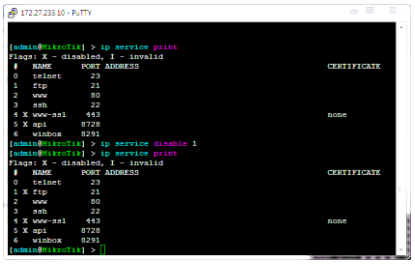


Figure 25. Disabling FTP Service

After successful changes configuration on *routers*, the *router* in *monitoring* has *access disab le* FTP parameters are considered as interference in the network. Then system monitoring network application development based on android will display a notification as notice to the Administrator that there is a trouble. Next display notifications on android *smartphone*.

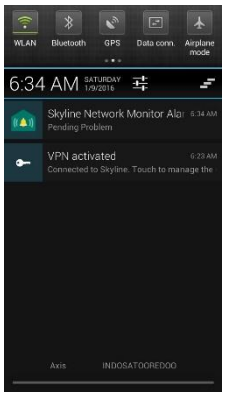


Figure 26. Alarm Notification For Network Problem

2.6.2.4 Testing Remote Access

At this point will be tested *remote access* of software that is built into the network device to be configured as a treatment in tackling the problems that occur on the network.

Previous interference simulations have been done by disabaling the FTP service in one of the routers. At this step it will do the configuration on the router to revive the troubled service. To perform the necessary ssh remote login to the router with input username, IP address, port and password. The following description of login to the router.

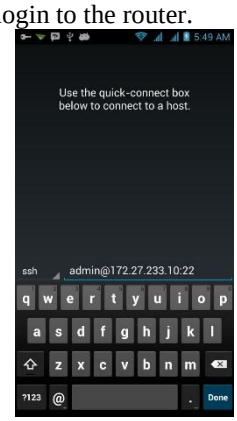


Figure 27. *Remote Login to Router*

Once the authentication process is successful, typing the command *"ip service print"* it will show the FTP *service* with parameters *disable* ("X"). To enable the *service* typing the command *"ip service enable 1"*. Then check that the *service* has been *enabled* in the parameters with the command *"ip service print"*. The following picture set *service* ftp configuration on the *router* that is accessed *remotely* via an application on android *smartphone*.



Figure 28. Enabling FTP Service Configuration

3. CLOSING

3.1 Conclusions

Accroding on the test results and the system monitoring network application development based on android then it could be concluded as follows:

1. System monitoring network appliction development based on android is already helping administrators in monitoring the network it manages.
2. Administrators get a notification when get a trouble through the application.
3. System monitoring network application development based on android provides information server performance that being monitored.
4. Administrators can perform remote server or network device via an application.

3.2 Advise

system monitoring network application development based on android still has some lacks. Therefore, there are some advices that can be used as a guide to application development to a better future. As for advices that the development of this application are as follows:

1. Using Google Cloud Messaging as push notification for alarm notifications.
2. Remote on this application using third party applications. It would be better if build your own modules to remote server so no need to install third party applications.
3. *Dashboard Display* only displays the overall statistics system. It would be more if the dashboard there is a realtime graph of each node monitor.

BIBLIOGRAPHY

[1] Ohara, Gheyb Jhuana, Aplikasi Sistem Monitoring Berbasis Web Untuk Open Cluster, Bandung : 2005.
[2] Kristanto, Andri, Jaringan Komputer, Graha Ilmu, 2006.
[3] Wikipedia.org, “Wikipedia.org” 2015. [Online]. Available: https://en.wikipedia.org/wiki/OpenNMS. [Accessed 5 April 2015].
[4] I Made Yonatan Wijaya Ndon Eko Satriyo Utomo, "IMPLEMENTASI VISUAL BASIC 6 UNTUK PEMBUATAN APLIKASI REMOTE ACCESS BERBASIS TCP/IP," p. 1, 2010.