IMPLEMENTATION VOICE OVER INTERNET PROTOCOL (VOIP) AS A COMMUNICATION MEDIA BETWEEN UNIT AT UNIVERSITY MUHAMMADIYAH METRO

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Abstract

VOIP (Voice over Internet Protocol) is the theology that makes the intranet network even the internet to be able to do voice communications remotely directly. Analog voice signals, such as those heard when communicating on the phone is converted into digital data and transmitted over the network in the form of data packets in real time. In VoIP communications, the user makes a phone connection through a terminal in the form of a PC or a regular telephone (smartphone). With telephones using VoIP, many benefits can be taken include: 1) in terms of cost obviously cheaper than traditional phone rates, 2) network-free, if the internet network is broken VOIP can still be used with notes connected to wifi or wired network, 3) maintenance costs can be pressed due to voice and network data apart, so IP Phone   added, moved and changed. In this research, VOIP is implemented at UM Metro. UM Metro has 3 campuses (Campus 1, Campus 2 and Campus 3) are different areas of location, but still in one City. The result of Voice Over Internet Protocol (VOIP) as communication media between units at UM Metro shows the result of 85, 7% (Strongly Agree) and 14, 3 (Agree), it can be concluded with the existence of VOIP   is very feasible for use as a medium of communication.

Keywords: VOIP Server, VOIP UM Metro, Voice over Internet Protocol.

1. INTRODUCTION

Technology in telecommunications is regarded as everything related to the use of tools to process and transfer information. The rapidly growing technological advances require IT, developers, to continuously improve various innovations in various aspects. With the innovation of telecommunication technology is expected to provide efficiency of time, cost and energy and mind. Even in communication, the benefits of technology can be easily implemented. Geographic and demographic factors do not become an obstacle for people to communicate. A telephone is the most important telecommunication needs. This is because, in the office environment and the company, the phone can almost be equated with basic human needs. Nowadays with the rapid development of technology and communication devices, it brings changes to the process of communication activity, where changes have eliminated the boundaries of the communication process, such as deadlines and distance. This can be seen from the installation of analog telephone communication infrastructure and the installation of computer networks (internet) in the company. On the other hand, communications enforced by some companies, putting communication costs at

top priority in corporate operational expenses. Voice over Internet Protocol (also called VoIP, IP Telephony, Internet telephony or Digital Phone) is a technology that enables voice conversations over long distances through internet media. VoIP in its application using a LAN network system and supported VoIP protocols such as SIP standardization (Session Initiation Protocol). The use of more VoIP technology efficient will be further simplified as it can combine with telephone network PSTN (Public Switched Telephone Network) local there, using the VoIP gateway will be connected to PABX (Private Automatic Branch eXchange). The working principle of VoIP this is what will turn the sound into code digitally through the network of data packets instead ordinary telephone analog circuits. Network usage IP allows suppression of costs due to no need to build a new infrastructure for voice communication and the use of smaller bandwidth than the phone ordinary.

Some research done on VOIP is, the research-like as done by Muhammad Noval Riswandha in 2017 entitled Utilization of VOIP Technology And PABX For Optimization of PSTN Phone Implementation. In this study discusses how to use VOIP Technology And PABX For Optimization of PSTN Phone Implementation. The purpose of this research VoIP to communicate with voice traffic. In addition, this research also produces a combination of VoIP and PABX, and need known even so telephone local in a company can contribute to handles calls from all the phones listed on the PABX. I implementation of this research that can handle the call from and to the PSTN number outside the company without using the area code in the location each.

Another second study refers to issues raised by Dandy Pramana Hostiadi and Wayan Nasemantho in 2017 entitled Design of Infrastructure VoIP On Multiple Network Soho Network. This study discusses how to design and build VOIP Infrastructure On Multiple Network Soho Network. A result of research and analysis in this research yield conclusion that result of the design of Infrastructure VOIP there Multiple Network SOHO can be implemented and run well. Based on the test conducted, the highest communication spends bandwidth is at the time of VOIP communication with Conference communication type, and spend the least bandwidth on communication between PC and PC.

Another third study refers to the issues raised by Kristian Widiyanto and Taufik Rahman in 2017 entitled the design of Voice Over Internet Protocol network to reduce costs communication at PT. Electronic City Indonesia. In this study discuss how to design and build Voice Over Internet Protocol network to reduce cost communication at PT. Electronic City Indonesia. The results of the design of VoIP network is made to reduce the cost of corporate communication and convenience for all employees to communicate and exchange information effectively and efficiently, that the design of VoIP network is one of the answers to the problems faced by the company that is the cost of communication, in the presence of the design of this VoIP network makes it easy for outlets/stores to communicate directly and exchange information with head office, VPN technology can be one way to secure from tapping the voice during communication through VoIP network.

Based on the results of research on the failover that has been described above, then conducted further research by title Implementation of Voice Over Internet Protocol (VOIP) as communication media between units at UM Metro. The problem formulation of this research is how to implement VOIP as a communication media between units on the intranet network of UM Metro, while the goal is to implement VOIP unit on the intranet network of UM Metro. The research method used is the method of PPDIOO (*Prepare, Plan, Design, Implement, Operate and Optimize),* analytical methods to develop the network of computers that define continuously the service life cycle required for *Networking* development. In the early stages of *preparation* where in this stage there are some things done is making a flow that explains the stages of the device.
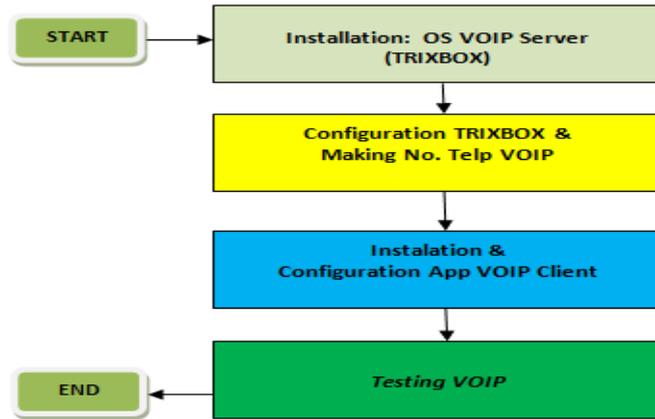
Figure 2. Initial Configuration Diagram

Starting from preparing and *designing* VOIP network topology. For this study it takes one PC *Server* with *Trixbox* operating system (OS). If preparing and designing network topology has been completed then it can continue the application of analysis on devices connected on *PC Server VOIP*.

VOIP Network Topology at UM Metro in figure 3 it uses IP Distribution (DHCP Server) from the Central Router. Then the Central Router distributes the IP to the workstation through the concentrator, Router and Access Point on each unit. In the design of picture 3. above there are devices such as: 1 PC *(OS Trixbox), Switch, Mikrotik Router, Notebook/Client, Access Point, Smartphone* . The created dash is implemented using pre-built *hardware*.
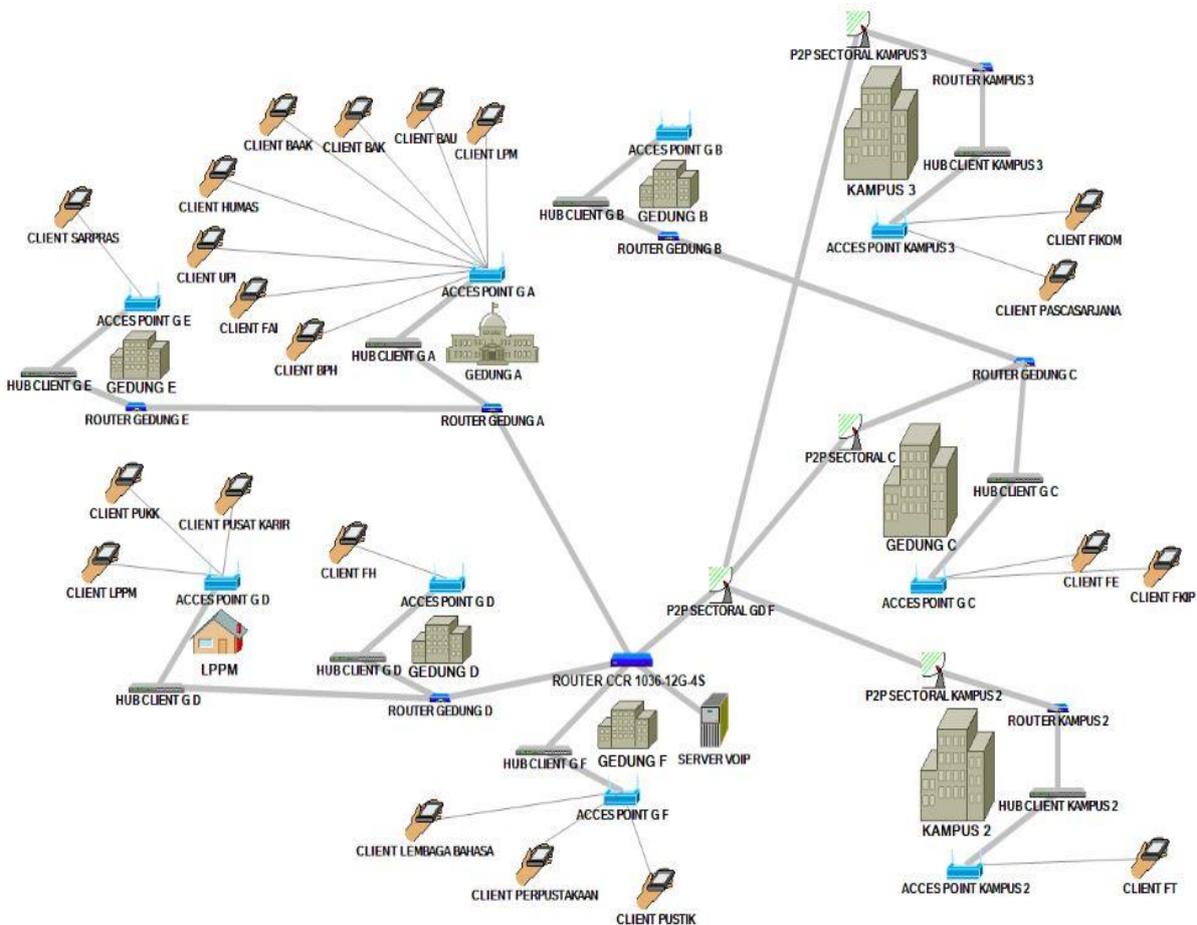

Figure 3. *VOIP Server* Network Topology at University of Muhammadiyah Metro

2. RESULANTS AND DISCUSSION

2.1. Analysis

At the stage of analysis and discussion , the implementation of *Voice Over Internet Protocol* (*VOIP*) as a medium of communication between units at the UM Metro this uses SWOT to identify opportunities and SWOT as a quick tool in finding possibilities related to the early development of new innovation programs.

Table 1. *SWOT Analysis*

Internal Factors / Eksternal Factors	Strength (S)	Weakness (W)
	1. There desire UM Metro for implement voice over internet protocol (VOIP) 2. There amenities and source power for implement voice over internet protocol (VOIP)	1. The absence of voice over internet protocol (VOIP) As a medium of communication between units on UM Metro network . 2. Still use the traditional way of telp as a medium of communication media
Opportunity (O)	**Strategy (SO)**	**Strategy (W-0)**
1. If existence system voice over internet protocol (VOIP) on UM Metro network then users could do communication inter unit though Internet network experience down, due to VOIP only need network link path wifi or UM Metro wired network 2. Progress technology that can made as solutions problems in p communication , and VOIP can made it as emergency call UM Metro campus	1. Realize desire UM Metro for apply system voice over internet protocol (VOIP) 2. Utilize amenities and source power for implement the stem fail over protection with rstp system voice over internet protocol (VOIP)	1. Create and Implement system voice over internet protocol (VOIP) 2. Implement *management* system voice over internet protocol (VOIP) if the internet UM Metro experience Down
Threat (T)	**Strategy (ST)**	**Strategy (WT)**
1. The attack is indeed have intention evil for damaging system voice over internet protocol (VOIP). 2. System voice over internet protocol (VOIP) can only an error occurs without suspected	1. Apply configuration security on Link management 2. Apply backup management on system server system voice over internet protocol (VOIP)	1. Create and Implement system voice over internet protocol (VOIP) with look aspect security 2. Assure confidence user / agency in order not to blocking Implemented yes system voice over internet protocol (VOIP) as a communication medium between units.

2.2. Data Requirement and Network System Requirement

From the data collection that has been done with observation and interview process with IT Network UM Metro, and the units UM Metro with data obtained in the form of data resources, network topology and data inputs related to UM Metro network.

While analysis requirement of this system is obtained from interview process with IT Network PUSTIK UM Metro and obtained network system specifications that will be implemented into *the* VOIP *server*, as for the functional needs that need include:

a. The VOIP Server of UM Metro Network should be able to facilitate the users to provide the means communicate between units.

b. VOIP system should be used as an *emergency call* if the Internet network on the *workstation* does not work or if the pulse and even data packets are not

sufficient. (For example, if LPPM unit wants to report internet disruption then PUSTIK unit, LPPM Unit can call to Phone Number PUSTIK using VOIP).

c. VOIP must be able to change the analog sound obtained from the speakers on the Computer/ smartphone into digital data packets, then from the PC forwarded through *Hub/Router/ AP* transmitted over the intranet network and will be received by the destination through the same media.

2.3. Implementation

To start the implementation of *Voice Over Internet Protocol* (*VOIP*) as a communication medium between units at UM Metro, started by installing the VOIP Server operating system with the name Trixbox. Please note that Trixbox is *VoIP Phone System* is based on *open source PBX* systems *(private brance excange)* which when once installed on a PC with an appropriate interface will be in gun a right as a full feature PBX for home users, organizations, and others. Trixbox was created by Andrew Gillis in November 2004 with the goal of making ordinary computer users able to make the most of the Asterisk PBX system without the need for teachers or more knowledge about VoIP. Previously Trixbox used the name Asterisk @ home, but because Asterisk is a trade name of Digium.Ltd and @home companies do not match the functionality of Trixbox that can serve more than home users or small and medium-sized businesses. The stages in the implementation of VOIP on the metro UM network are:

1) Installing *Trixbox OS*

For this trixbox OS installation is installed on UM Metro VOIP Server PC. The first view that appears when the Trixbox installation. Press ENTER to continue the installation process.

- The next stage appears Display *Keyboard Type*, select US, select OK. Then will display *Time Zone Selection* , select *System clock uses UTC*, select Asia/Jakarta, select OK. Next appears Root Password view, enter the root password, eg 123456, select OK. Then display Package Installation, wait a few minutes until finished until reboot itself. After the installation process is complete, then the next stage display appears *Welcome to Trixbox CE*. Do login using user: *root* , and *root* password which previously been made is: 123456. Trixbox itself by default using *DHCP* system . When Trixbox is installed there is no IP Addressnya then do *the settings* manually *Trixbox* IP Address. If trixbox has got IP Address in *DHCP* (automatic) from router in UM Metro Center network the next*step* is *Trixbox* configuration.
- Log in to the *Trixbox* Operating System and after logging in to the trixbox system, then type the system-config-network command to configure the IP address. After that will appear as follows: select Edit *Device*, press *Enter*.
- The next step appears *Devernet* display *Configuration*. Adjust IP Address with network , can use *USE DHCP* or use *Manual*, then Click OK and click Save.
- The next step appears DNS Configuration display, input IP DNS (8.8.8.8) and hostname trixbox (trixbox1.lan), select OK , then the Trixbox Server installation is complete and ready to be configured via webconfig.

2) Configure *VOIP Server*

Configure *the Trixbox server* via *the* user's *web browser* by entering *the Trixbox IP Address* in *the browser's address bar* . Then select *User mode [switch]* to enter trixbox *administrator mode*.
Enter *username: maint* and *password* : *password* . Select *Log In.* After successfully login into administrator mode, Then setting/add extension (phone number that can be used by client / users). Select *PBX >> PBX Settings >> Extensions >> Device: Generic SIP Device >> Submit.*
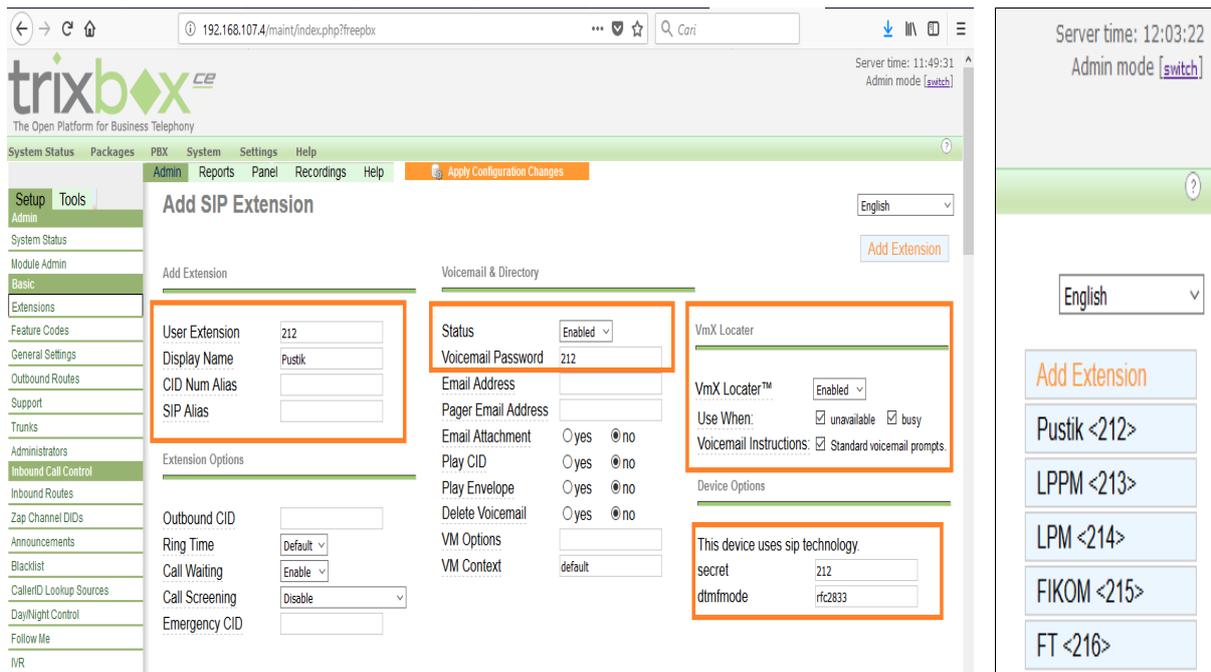
Figure 5. View *Add SIP Extension*

3)   Configure *VOIP Client* on *Smartphone*

Install *VOIP* app on *smartphone* can be downloaded from *Google Playstore*. Then if it is installed open Zoiper Application and fill *username* and *password*. After that on the field *hostname* fill in *IP Server VOIP* Center, which is 192.168.107.4 In *Account Setup Configuration* select *SIP UDP* and if successful will appear *Accoun t is Ready*

4)   VOIP Testing between Work Units at UM Metro Via **Smartphone**

Here is a sample of successful VOIP testing on *smartphone* devices between the PUSTIK unit (212) and the LPPM Unit (213).
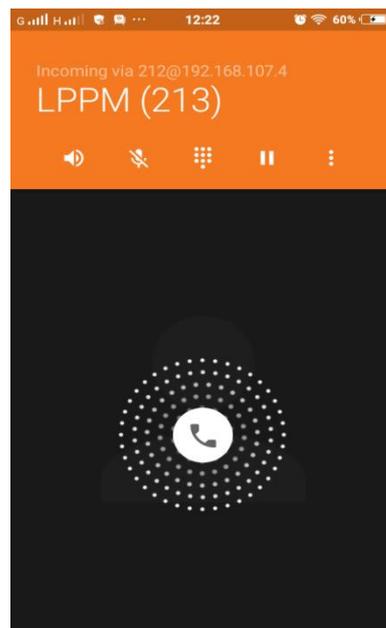

Figure 8. *Preparing Calling* View

Figure 9. *Incoming Calling* Display

3. Testing

The last stage in network design is *testing*. This test is performed to test and determine whether the *VOIP* network system running well and correctly as expected. The researcher uses one type of examiner that is *Alfa Test*.

Testing of *Alfa Test is* done by giving questionnaire to 21 user of VOIP system at UM Metro. Testing *AlfaTest* very dipe because as a confirmation of agreement between the developer network to *server* frequent users the VOIP. Besides testing *Test Alfa* also has important benefits are as observations for to search the findings of error on *VOIP* UM Metro system. The questions and assessment results can be seen in table 2.

Table 2. *Alpha Test* Questions

No.	Question	Assessment			
		SS	S	KS	TS
1.	System (*Voice over Internet Protocol*) VOIP can be operated and implemented on UM Metro network	18	3	-	-
2.	System View (*Voice over Internet Protocol*) VOIP on the *client* side is easy to *manage*	20	1	-	-
3.	Communication process between telphon unit at UM Metro using VOIP easy to do	17	4	-	-
4.	Operation of VOIP app is easy for users	16	5	-	-
5.	System (*Voice over Internet Protocol*) VOIP when run does not occur problem or *error* .	20	1	-	-
6.	System (*Voice over Internet Protocol*) This VOIP can help to solve communication between Units at UM Metro	19	2	-	-
7.	System (*Voice over Internet Protocol*) This VOIP has benefits for UM Metro users	16	5	-	-
	amount	126	21		

Based on the test results, can be obtained percentage assessment of the implementation of *VOIP* as a medium of communication on the UM Metro, namely:

SS Answers	: 126/147 * 100% = 85.7 %
Answer S	: 21/147 * 100% = 1 4.3 %
Answer KS	: 0/175 * 100% = 0%
Answers TS	: 0/175 * 100% = 0%

From the results of the assessment of the implementation of the VOIP system, it can be concluded *VOIP* implementation is very feasible to use for communication media at the UM Metro.

3. CONCLUSION

Based on the discussion, it can be concluded things as follows:

1) From the research resulted a *Voice over Internet Protocol (VOIP) system* as communication media at UM Metro.
2) VOIP Communications uses *smartphone* to *Desktop PC* and *smartphone* to *smartphone* successfully done.
3) Based on the results of testing VOIP system by the user is 85.7% answered Strongly Agree and 14.3% answered Agreed, therefore with the VOIP system it can be concluded VOIP implementation is very feasible to be used as a medium of communication at UM Metro.

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