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Simulation of LAN Network Design at Al Mustawa Vocational School Using Ciscom Packet Tracer

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Abstrak

Penelitian ini bertujuan untuk melakukan simulasi perancangan jaringan LAN pada SMK Al Mustawa dengan memanfaatkan Cisco Packet Tracer. Metode simulasi digunakan untuk mengoptimalkan konfigurasi jaringan, termasuk pemilihan perangkat dan pengaturan topologi. Penelitian ini berfokus pada peningkatan efisiensi dan keamanan jaringan sekolah. Cisco Packet Tracer digunakan sebagai alat utama untuk mengimplementasikan dan menguji desain jaringan. Hasil simulasi diharapkan dapat memberikan gambaran menyeluruh mengenai kinerja jaringan yang diusulkan.
Kata Kunci: *Simulasi, Jaringan LAN, Cisco Packet Tracer, SMK Al Mustawa, Perancangan Jaringan*

Abstract

This research aims to simulate LAN network design at Al Mustawa Vocational School by utilizing Cisco Packet Tracer. Simulation methods are used to optimize network configuration, including device selection and topology arrangement. This research focuses on improving the efficiency and security of school networks. Cisco Packet Tracer is used as the primary tool for implementing and testing network designs. The simulation results are expected to provide a comprehensive view of the performance of the proposed network.
Keyword: *Simulation, LAN Network, Cisco Packet Tracer, Al Mustawa Vocational School, Network Design*

INTRODUCTION

In today's digital era, the need for flexible, fast and seamless connectivity has become very important. One technology that answers these needs is a wireless-based LAN (Local Area Network) or better known as Wireless Local Area Network (WLAN). Unlike traditional LANs that use cables to connect devices, WLANs allow devices to connect to a network via radio waves. LAN is a computer network that connects computers and other devices in a limited geographic area, such as a home, office, school or campus. In the current world of network technology, the implementation of wireless-based LAN (Local Area Network) networks is increasingly dominating because of the flexibility and ease of installation it offers. The range limit of wireless use is only limited to a small area.

At first, the founders of Cisco only conducted research for scientific and educational purposes, but with investment from Leonard Bosack and Sandy K Lerner, they began to develop multi-protocol routers that were embedded in hardware and then given the Cisco label. In 2005

At the beginning, Cisco started developing simulation applications for its hardware under the name Packet Tracer, from here the new history of device promotion began using simulation applications. Users can freely use this application to carry out experiments and research, to find out several series of Cisco devices, and Cisco deliberately gives the device names according to the original.

So until now this application is very attached to the world of computer network education, almost every university and school that concentrates in the field of networks, uses and explains this application to help understand network planning in the form of simulations. According to Dian et al (2016:3) Cisco Packet Tracer is a computer network tool simulation software based on a GUI (Graphic User Interface) which is often used as a learning or training medium and is also commonly used in the field of computer network simulation research. As the name suggests, Cisco Packet Tracer was created by Cisco Systems and is provided free of charge for the educational sector. The main goal of Packet Tracer is to provide tools for students and teachers to understand the principles of computer networks and also build skills in the field of Cisco networking tools.

The use of information technology and computer networks has become an integral part of the learning process and school administration. Al Mustawa Vocational School, as an educational institution committed to providing the best service to its students and staff, must ensure that its existing network infrastructure supports this growing need. In order to improve the school network infrastructure, the author has decided to carry out a LAN network design simulation using Cisco Packet Tracer software. This simulation aims to design a LAN network that is efficient, safe and in accordance with the needs of Al Mustawa Vocational School. This approach is an important step in responding to the challenges faced by schools in terms of technological growth, high internet access requirements, and the need

to maintain school data security. In this report, the author will outline the steps the author took in designing a LAN network, including selecting appropriate hardware and software, network configuration, and the security measures implemented. In addition, the author will explain how simulations using Cisco Packet Tracer can be used as a learning tool for Al Mustawa Vocational School students who are studying computer network concepts. This simulation will help schools to optimize their network infrastructure, increase efficiency, and plan a better future in the face of technological developments. With this, the author presents this LAN network design simulation report as a form of the author's commitment to improving the quality of education and information technology management at Al Mustawa Vocational School.

Al Mustawa Vocational School is a vocational high school that focuses on the fields of information technology and computer networks. In an effort to improve the quality of education and facilitate more effective learning, the school plans to redesign their local network (LAN). Using Cisco Packet Tracer is a wise choice because this tool allows easy network simulation and design without having to spend a lot of money on physical hardware.

METHOD

In this journal research using a descriptive method with data collection techniques in the form of literature studies by utilizing reading sources as bibliography from the internet such as journals and books. To make a design on a LAN network design simulation at SMK AL MUSTAWA using Cisco packet tracer, where in this symlation the author will design a network model which will later be used to develop a network model that is already available at SMK AL MUSTAWA to improve the quality of network model planning at SMK AL MUSTAWA, in the simulation there are several parts, namely computer / CLIENT, Hub, Router,.

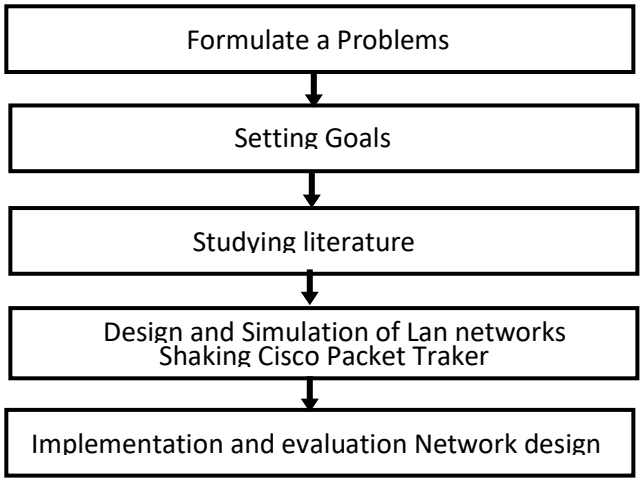


Figure 1. Framework of thinking

In the picture above, it is described sequentially from the work steps as follows

1. Formulate a problem, This stage is the first step in this research. At this stage will formulate the problems that occur in the system so that at this stage the process of observation, definition and exploration will be carried out which will later be detailed and further.
2. Setting Goals, The purpose of this study is how to apply LAN network simulation to SMK Al Mustawa using Cisco Packet Tracer, analyze data, and design network patterns so as to help in decision making in building a network simulation at SMK AL MUSTAWA.
3. Studying literature, Literature study is conducting a literature study with the aim of knowing what methods will be used to solve problems and get strong reference bases for researchers in applying the right and correct methods.
4. Applying LAN network simulation design using Cisco package traker, Cisco packet tracker is one of the software that is usually used in computer network experiments, in the use of this application it helps the author in terms of knowing about existing network systems. On this occasion, the author will carry out a LAN network simulation at SMK AL MUSTAWA.
5. System implementation and evaluation, Implementation and evaluation are carried out on the design of LAN network simulation at SMK AL MUSTAWA using Cisco traker packages produced at the LAN network analysis and design stage.

RESULTS AND DISCUSSION

LAN network system design in the form of simulation in packet tracer 6.2 at SMK AL-MUSTAWA. SMK AL-MUSTAWA is a state school located in Soko, Tuban regency. This school has several rooms that connect more than 10 Personal Computers (PCs) in one network, of course, experiencing a lot of traffic on the network. Therefore, bus topology becomes something that can solve problems. Because by using this topology local networks will be grouped, it will help further optimize network work and speed up configuring it.

Network Simulation Design

This network simulation will use the help of the Tools on the Cisco Packet Tracer menu as software, simulation for lan network development at SMK MUSTAWA, as for the stages, namely:

1. Cisco Packet Tracer Initial View

Open the installed Packet Tracer, then a workspace screen will appear as shown below.

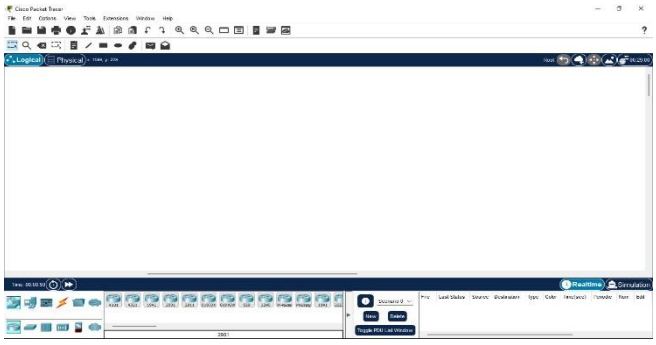


Figure 2. Initial View of Cicso Packet Tracer

2. Select New File or Ctrl+N to start the simulation

After that select the type of Router, Switch or End Device, as well as the device for simulation you want to use, select the option at the bottom of the workspace.

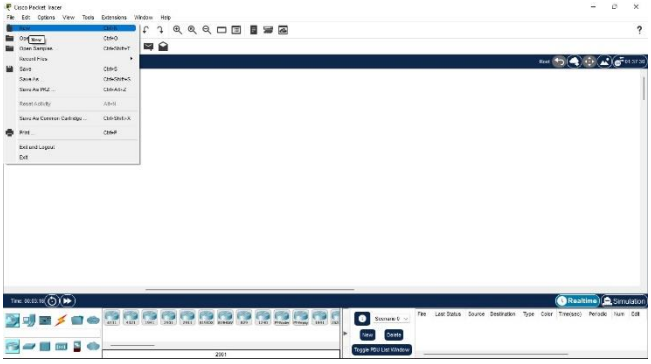


Figure 3. Initial View of Cisco Treacer Package

3. Proposed topological planning.

The first thing to do is select the router device then click and name it according to the Packet Tracer to be used. As follows. At this stage explain the process of setting up routers, switches, clients / pcs and components that will be used in lan network simulation.

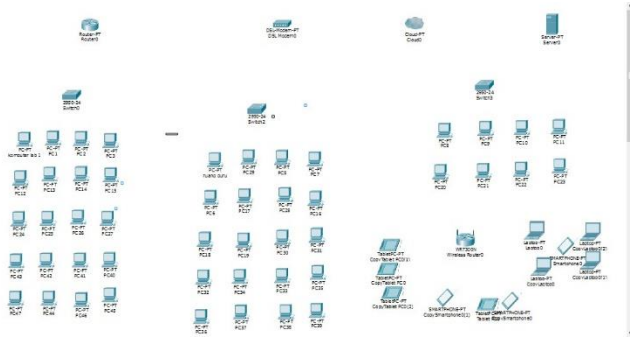


Figure 4. Proposed Network Simulation Design

The above components consist of 1 router, 5 switches, 1 server, and 40 PC users as clients

4. The stage of connecting the cable from the client to the switch.

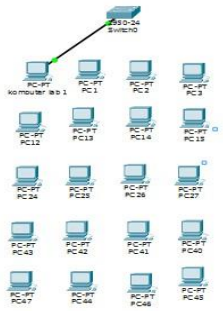


Figure 4. Process of Connecting the Lien Daric Cable to the Switch

At this stage explain the processes of connecting cables from each client to the switch starting from lab room 1, lab 2 and the teacher's room using straight cables. This process is done by connecting the cable from the pc to the switch from the initial pc to all PCs in lab 1, the same is done on every pc from lab room 2 and the teacher's room. In this process, the word PC is a term for clients in Cisco network simulations.

5. The stage of connecting the cable from the switch to the router.

At this stage explains the process of connecting the cable from switch to router with straight cable from switch 1, 2 and 3. In this process 22 straight cable indicators show red and green when the router has been set.

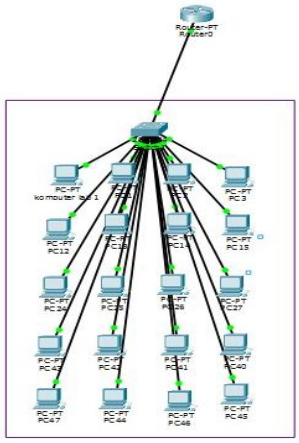


Figure 5. Process of Connecting Switch to Router

6. Stages of connecting cables from the router to the modem.

At this stage explains the process of connecting the cable from the router to the modem with a straight cable.

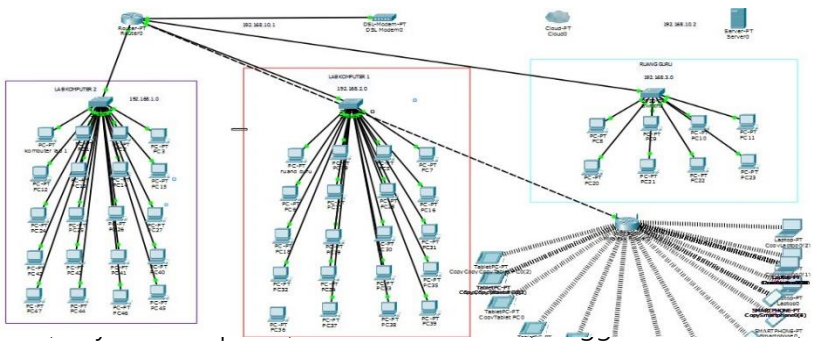


Figure 6. Process of Connecting the Router to the Modem

7. Stages of connecting modem cable to the cloud

At this stage explains connecting the cable from the modem to the cloud using the cross cable type

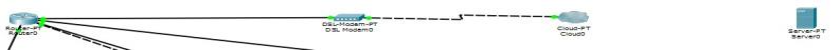


Figure 7. The Process Of Connecting Modems To The Cloud

8. The stages of connecting the cable from the cloud to the server.

At this stage, connecting cables from the cloud to the server aims to be a data deviation and cost efficiency in using data in this connection, straight cables are used.

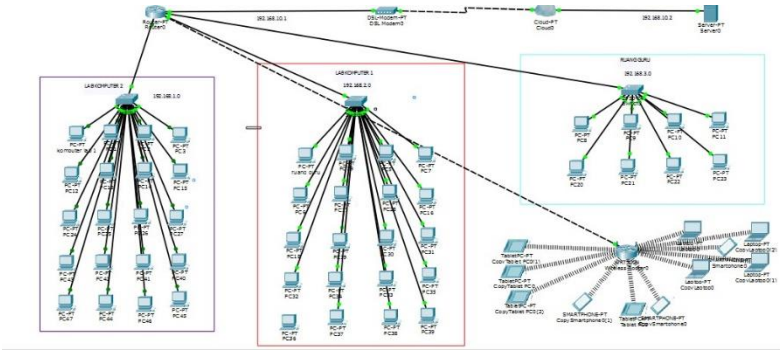


Figure 8. Cable Connection Process From Cloud To Server

IP Configuration Stage, Subnet Mask, and Default Gateway

This stage will explain the configurations carried out on the user's computer, along with the subnet mask and Default Gateway. Where the IP setting is done manually using the Statistical configuration with the subnet mask 255.255.255.0 and the default gateway 8.8.8.8 as a reference for assigning the IP manually or statistics.

1. Computer Lab 2

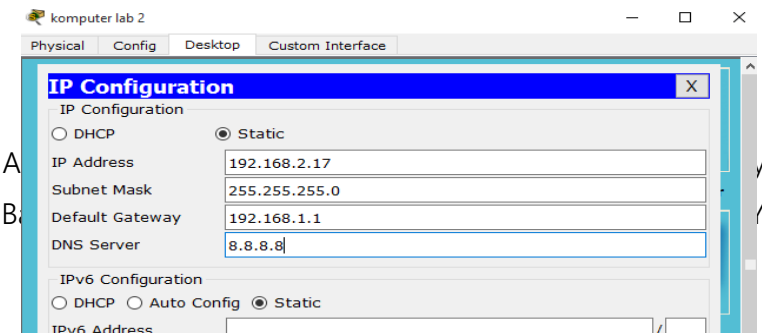
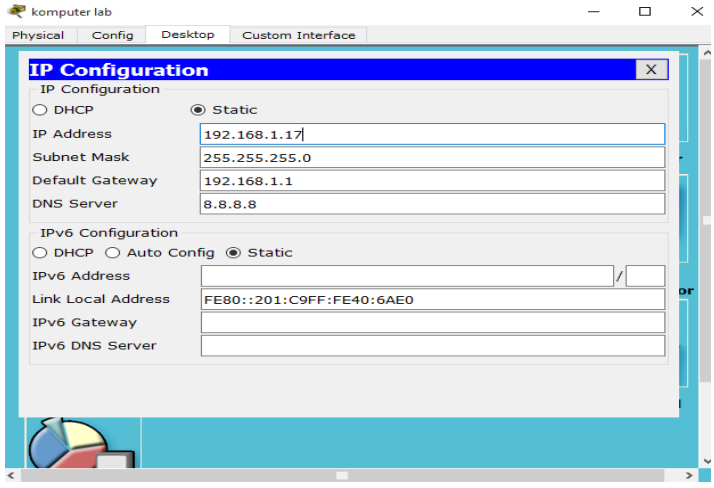


Figure 9. IP Configuration For Lab Room 2

Assigning IP to computer room 2 lab manually by assigning IP starting from 192.168.2.1 to assigning IP 192.168.2.30. In this process, ensure that each IP gets a different IP for each client so that errors do not occur when testing the network connection.

2. Computer Lab 1

Assigning IP to computer room 2 lab manually by assigning IP starting from 192.168.1.1 to assigning IP 192.168.1.30. In this process, ensure that each IP gets a different IP for each client so that errors do not occur when testing the network connection.



Figuare 10. Lab 1 IP Configuration

3. Teacher's Room

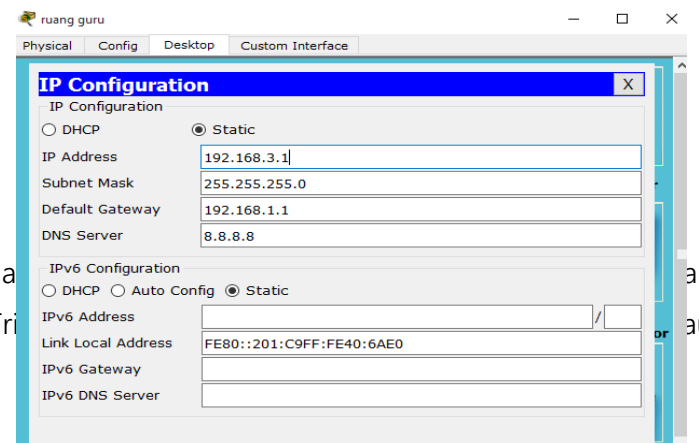


Figure 11. Teacher Room IP Configuration

Assigning IP to computer room 2 lab manually by assigning IP starting from 192.168.3.1 to assigning IP 192.168.3.30. In this process, ensure that each IP gets a different IP for each client so that errors do not occur when testing the network connection.

Wireless Router Beside Teacher's Room

1. Internet settings are done on the wireless next to the teacher's room

This process is carried out by giving an ID name to the WiFi that will be used, then selecting the security model that will be used on the WiFi. In this design simulation, using WiFi SSID and WPA2-PSK as the security model, then add a password so that WiFi can be accessed.

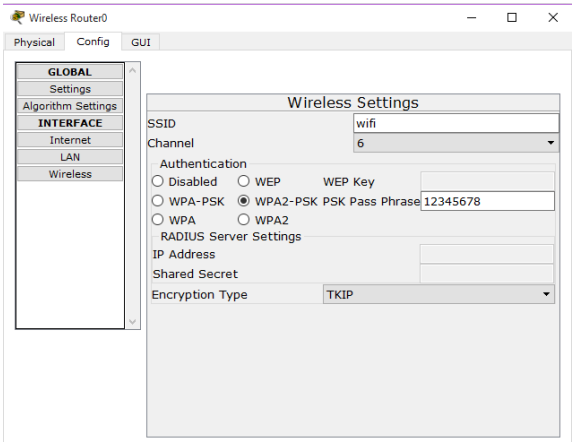
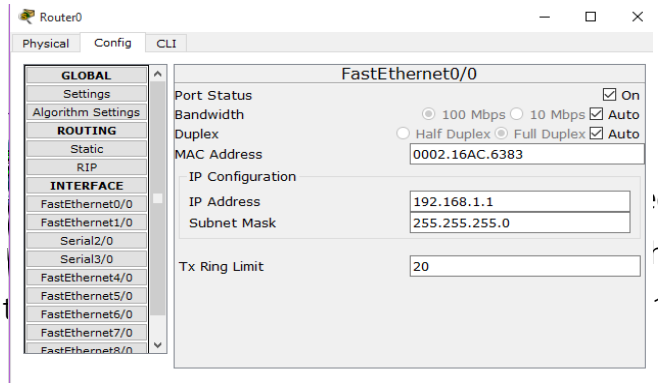


Figure 12. Wireless Internet Settings

2. Router settings used for lab 1, lab 2 and teacher's room



In this process, click d to connect the switch to the router in lab 2 n aims to activate the switch then give the IP 1

3. Switch settings used.

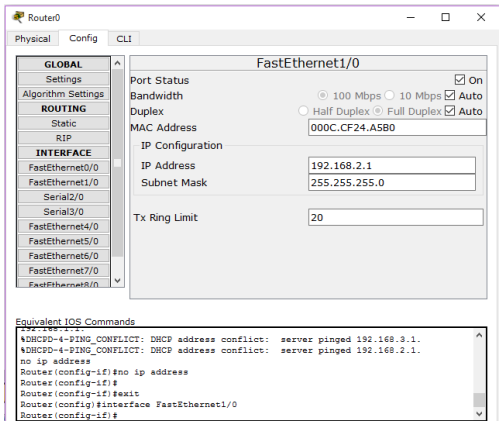


Figure 14. Internet Switch Settings

In this process, click router then click config then select the port used to connect the switch to the router in lab 2 using fast0/1 then check on the port status which aims to activate the switch then give the IP to the switch where the switch uses IP 192.168.2.1

Network Connection Testing

This stage is the stage of testing whether the computers are well connected to each other on a network by typing the command "ping" at the command prompt. If the PING process is successful, the destination network address will reply to the computer that performed the PING.

1. PING Computer LAB 2

Test the ping on Lab Room 2 Switch to the Switch, if the last status is successful, it means the VLAN is connected. If the last status fails, it means the VLAN has not been connected.

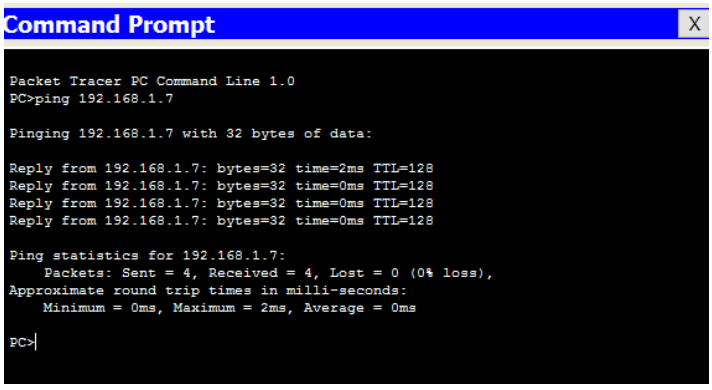


Figure 15. Lab 2 IP Configuration

From Figure 15 the ping test from PC 0 to PC 1 in 1 VLAN is connected with a total of 4 data sent and all data received.

2. PING Computer LAB 1

Test the ping on Lab Room Switch 1 to the Switch, if the last status is successful, it

means the VLAN is connected. If the last status fails, it means the VLAN has not been connected.

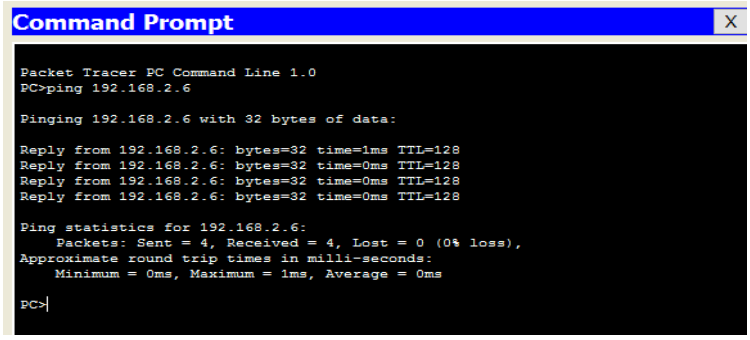


Figure 16. Lab 1 IP Configuration

From Figure 16 the ping test from PC 0 to PC 1 in 1 VLAN is connected with a total of 4 data sent and all data received.

3. TEACHER'S ROOM Computer PING

Test the ping on the teacher's room switch to the switch, if the last status is successful, it means the vlan is connected. If the last status fails, it means the VLAN has not been connected.

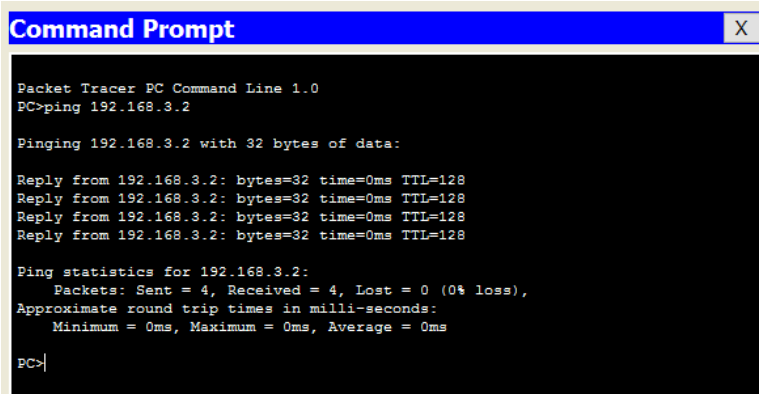


Figure 17. Lab 1 IP Configuration

From Figure 17. the ping test from PC 0 to PC 1 in 1 VLAN is connected with a total of 4 data sent and all data received.

CONCLUSION

From the results of the computer network configuration simulation at AL-MUSTAWA Vocational School with Cisco Package Tracer, it can be concluded: Designing a Local Area Network (LAN) architecture for a certain scope can be done using tools, one of which is Packet Tracer, which is issued by the Cisco vendor. The configuration simulation carried out

at AL-MUSTAWA Vocational School can be carried out well. Client computers can connect well to each other even in different rooms

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