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Implementation of cisco packet tracer as network simulation in educational environment at SMK Tarbiyatul Banin-Banat Montong School

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ABSTRACT

This journal aims to describe the implementation of using Cisco Packet Tracer as a network simulation tool in an educational environment al Tarbiyatul Banin-Banat Montong Vocational High School (SMK) Network simulation is an important method in information technology education, especially in the context of computer network learning This research covers the steps taken in implementing Cisco Packet Tracel at SMK Tarbiyatul Banın-Banat Montong, as well as the benefits that result from using this simulation tool. The research methods include student surveys, as well as classroom observations. The journal is ahead in the use of network simulation technology such as Cisco Packe Tracer in education. As technology continues to evolve, this approach has the potential to continuously improve network leaming and prepare students for the job demands of the digital age. The results showed that the use of Cisco Packet Tracer in network learning at SMK Tarbiyatul Banin-Banat Montong has improved students understanding networking concepts, allowed them to test theories in a safe simulation environment, arid stimulated their interest in pursuing a career in information technology. In addition, the use of this tool also assists teachers in teaching more effectively and efficiently. This article details the practical implementation of Cisco Packet Tracer in an educational environment, illustrates its benefits to students and educators, and provides recommendations for further development in network education at SMK Tarbiyatul Banin-Banat Montong as well as educational institutions in conclusion, the use of Cisco Packet Tracel as a network simulation tool in an educational environment can improve similar the quality of leaming and prepare students for careers in the world of information technology.

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1. INTRODUCTION

Today's world is filled with ever-evolving information technology, and computer networks play a central role in connecting this digital world. Therefore, effective computer networking education is becoming increasingly crucial in preparing the younger generation to succeed in various fields of work. The development of information technology is one of the important pillars in advancing society, and education is the key to achieving that. By continuously improving the use of network simulation technology in education, the authors can help create a generation that is ready to face the challenges of information technology in an ever-changing and rapidly evolving world.

The school being researched in this article is SMK Tarbiyatul Banin-Banat Montong, located in Jetak village, Montong sub-district, Tuban district. The majors in this school include Light

Vehicle Engineering (TKR) and Software Engineering (RPL). The implementation of Cisco Packet Tracer at SMK Tarbiyatul Banin-Banat Montong is one of the innovative efforts to improve the quality of computer network education. The implementation of Cisco Packet Tracer at SMK Tarbiyatul Banin-Banat Montong is the right step to bridge the gap between theory and practice in computer network learning.

Cisco Packet Tracer is a network simulation application developed by Cisco Systems. This device is specifically designed to help students, teachers, and network professionals understand, design, and simulate computer networks (Hardiani et al., 2023). With this tool, students can experience more practical and in-depth learning. Students can understand network concepts through realistic simulations.

Network simulation is a valuable technique in education, as it allows students to gain an in-depth understanding of computer networking principles, conducting practical experiments in a safe simulated environment. Therefore, the purpose of this study is to record the process and results of implementing Cisco Packet Tracer at SMK Tarbiyatul Banin-Banat Montong.

Network topology is a form of network structure with the aim of building it as a link between computers using wired or even wireless media. In determining the network topology, the desired network must be adjusted. In determining the network topology, it must be adjusted to the desired form of network topology.

The simulation used by researchers in this study is using a tree topology. Tree topology is the result of combining bus topology and star topology. Tree topology is a network structure in which each node in the network has exactly one node that becomes its parent, except for one particular node that becomes the root node or center (Muprot & Agus Sobari, 2023).

The expected benefits of this research in the field of science include students gain hands-on experience with network configurations and troubleshooting, By using tree topology in simulations, students learn complex network structures in a more manageable and comprehensible way. This research can inspire other educational institutions to adopt similar network simulation tools, fostering innovation in computer network education.

In this context, the researcher will discuss the steps taken in implementing Cisco Packet Tracer in the school environment of SMK Tarbiyatul Banin-Banat Montong. And the researcher hopes that this information can provide inspiration and guidance for other educational institutions interested in improving computer network learning and preparing students for an increasingly digital and opportunity-filled future.

The research limitations regarding the Implementation of the Use of Cisco Packet Tracer as a Network Simulation in the Educational Environment at SMK Tarbiyatul Banin-Banat Montong School can include several things, namely the geographical scope of this research is limited to SMK Tarbiyatul Banin-Banat Montong, the main research subjects are students of SMK Tarbiyatul Banin-Banat Montong, this research focuses on using Cisco Packet Tracer as a Network Simulation, this research will evaluate the benefits and impacts of using Cisco Packet Tracer.

The researcher took the title “Implementation of Using Cisco Packet Tracer as Network Simulation in Educational Environment at SMK Tarbiyatul Banin- Banat Montong School” to describe the successful implementation of Cisco Packet Tracer at SMK Tarbiyatul Banin-Banat Montong, providing a strong view of its benefits for students. And will provide inspiration for other educational institutions to explore the use of network simulation tools in education.

2. RESEARCH METHOD

This research uses descriptive methods and data collection techniques using literature studies. That is, supporting data is taken from various references, such as books and journals. In making a design on the LAN network design simulation at SMK Tarbiyatul Banin-Banat Montong using Cisco package tracer, which in this simulation the author will design a network model that will later be used to develop a network model that is already available at SMK Tarbiyatul Banin-Banat Montong to improve the quality of the design of the existing network model at SMK Tarbiyatul Banin-Banat Montong. This framework can be seen in the figure.

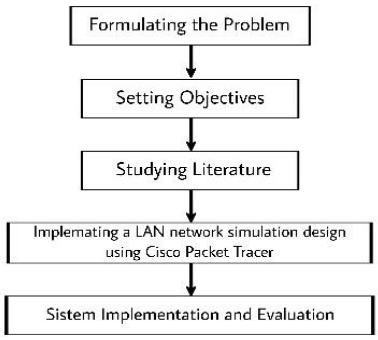

Figure 1. Thinking framework

Figure 1 is explained sequentially as follows: a) Formulating the Problem, the first stage in this research is formulating problems. At this stage the researcher records and formulates what problems occur in the system. Therefore, a systematic procedure of observation, description, and investigation will be carried out, which will then be further elaborated and refined. b) Setting Objectives, after formulating the research problem, the next stage is to determine the objectives that contain what steps must be taken in this research to be right on target. The purpose of this research is how to implement a simulation of the SMK Tarbiyatul Banin-Banat Montong LAN network using Cisco package tracer, as well as designing network patterns so that it helps in making decisions in building a network simulation at SMK Tarbiyatul Banin-Banat Montong. c) Studying Literature, researchers conduct literature studies by looking for literature studies from various sources. The purpose of this stage is to explore what methods are relevant to solving research problems and to obtain concepts or bases that can be used as a foundation to support the research being carried out. d) Implementing a LAN network simulation design using Cisco Packet Tracer, cisco Packet Tracer is a software application commonly used to conduct computer network experiments. The use of this program is very helpful for the author in gaining knowledge about the current network system. This research was conducted at SMK Tarbiyatul Banin-Banat Montong for LAN network simulation. e) System implementation and evaluation, implementation and evaluation are carried out on the LAN network simulation design at SMK Tarbiyatul Banin-Banat Montong using the Cisco Traker package produced at the Lan network analysis and design stage. The previous results will be checked to make sure there are no errors with the implementation using the Cisco packet tracer application carried out in the LAN network simulation, then the system will process the simulation design data so that the maximum network simulation is obtained even with the limitations on the network modeling of SMK Tarbiyatul Banin-Banat Montong.

3. RESULTS AND DISCUSSIONS

By using Cisco Systems' network simulation tool, Cisco Packet Tracer, users can create network topologies and simulate modern computer networks. The application allows users to replicate Cisco routers and switch configurations through a simulated command-line interface. Users can also add and remove simulated network devices as needed through a drag-and-drop interface. This application allows network administrators to accurately determine the composition of network systems.

Preparation

In making computer network simulations, the tools used are: 30 pcs client computers, 1 server, 3 pcs switches, 1 Router Wireless (WRT300N), 1 pc Router-PT, Straight cable for connecting between client computers to switches and connectors between switches and routers as well as routers to workstations, Phone cable to connect the modem to the cloud, Crossover Cable to connect a Wireless Router (WRT300N) to a Router- PT.

Cisco Packet Tracer Simulation Design

a) The first step to create a network simulation is to open the Cisco Packet Tracer application on the computer you are using. click the *File menu* and then select *the "New File" option*.

b) Look for the "End Devices" option. Then click on it, select the "PC" option from the list of devices. Then drag and add in the workspace provided. Repeat steps 4 through 6 to add a total of 30 PCs to the simulation.
c) Look for the "Switch" option in the available device panel. Click and drag this switch icon to the work area.
d) Then Add PT-Router, to add a Router select the Routers menu then click PT-Router then drag & drop to the workspace.
e) Then add *modem and Cloud,* by clicking *Wan Emulation* then select *DSL-Modem-PT* and *PT-Cloud* and drag *& drop* on the *workspace.*
f) Then add *a Server*, by selecting *the End Devices menu* then clicking the *Server* icon then *drag & drop* on the work screen.
g) Arrange *Servers, PCs/Clients, Clouds, Modems, Routers,* and *Switches* neatly. The components below consist of 1 *server,* 1 *cloud*, 1 *modem*, 1 *router*, 3 *switches*, and 30 *pc users* as *clients*.

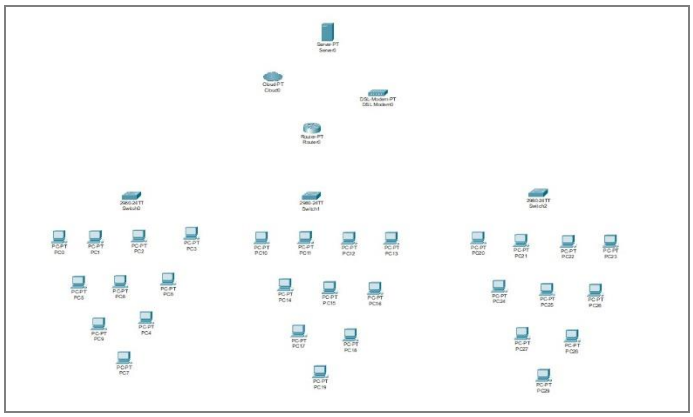

Figure 2. Computer network design

h) Furthermore, change the name of each *Switch* to a labcom room, a teacher's room, and a library room. Then connect the network devices one by one using the *connection* cable available on the *toolbar*.

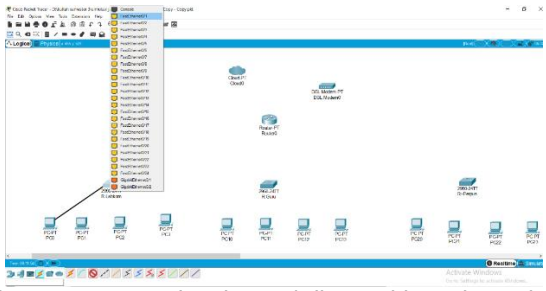

Figure 3. Connecting the PC/Client cable to the Switch

i) The next step is to connect *the Switch* with the *Router using* a straight *type cable*. Do the same to connect the *Switch* in the teacher room and library room to the *router*.
j) Then connect the Router with the modem using the straight cable type.
k) Next, connect the modem device to the *Cloud using a* Copper Straight-Through *type cable*, Click the modem select Port 0 then click on Cloud select *Modem4*.
l) The next step is to connect *the Cloud* with the Server using a straight cable type by double-clicking on the *Cloud,* selecting *Ethernet6*, then double-clicking on the Server, then selecting *Fast Ethernet0*.

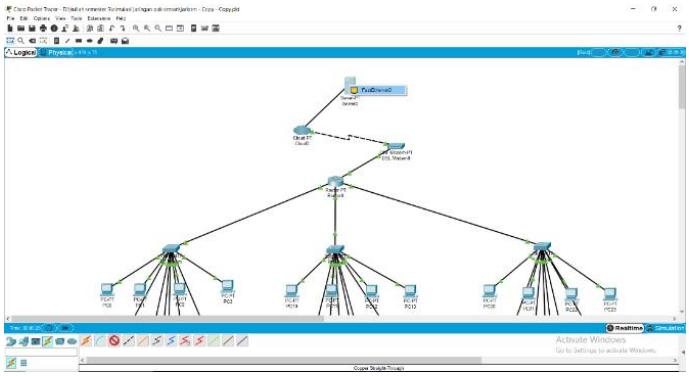

Figure 4. View of the Cloud's relationship with the Server

m) After all devices are connected, then set up the network so that the devices can connect to each other properly. First, we set up the router first. To set up the router, follow these steps: first, click on the router after logging in, then select the CLI menu. Next, type the required command in the *IOS Command Line Interface* window, as follows: Type *no* then press *enter*, Type *enable*, then press *enter*, Then type *Config* terminal, then press *enter*, Type int fa 0/0 then press enter, Then type ip dhcp pool R_Labkom, then press enter, Type network 192.168.1.0 255.255.255.0 then press enter, Then type default-router 192.168.1.1 and then press enter, Type dns-server 8.8.8.8 then press enter, Type exit, then press enter, Then press Ctrl+C, then press *enter*, Then type *write*, then press *enter*, If the sentence Building *configuration [OK] appears,* then the *router* configuration is successful.

Settings can be seen in the *config menu on FastEthernet 0/0*. Then *the ip adress input* of the *switch* that will be connected to the *router* then *the subnet mask* will automatically fill then click *on* and *close.*

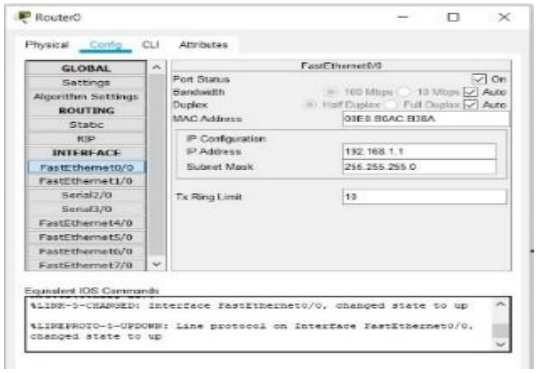

Figure 5. Input router

The Ip adress input from the switch to the router should conform to the following table:

Table 1. IP adress & subnet mask switch

No.	Device	IP Adress	Subnet Mask
1.	Switch ruang Labkom	192.168.1.1	255.255.255.0
2.	Switch Ruang guru	192.168.2.1	255.255.255.0
3.	Switch ruang Perpustakaan	192.168.3.1	255.255.255.0

n) Setting *the IP Adress PC/Client*

To assign *an IP address* to a device, just double-click on the device and select *IP configuration* from the *desktop menu*, select *DHCP* and the IP address will be

automatically populated. Then do the same on each *PC/Client* to set its *IP Address*. This configuration will be done using the *DHCP* configuration, with *a subnet mask* of 255.255.255.0 and *dns server* 8.8.8.8.

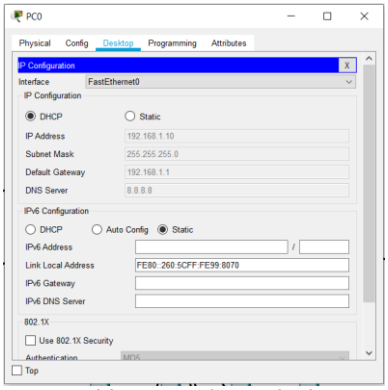

Image 6. IP Address Settings Display on PC/Client

IP settings are done manually using Statistics or manual configuration according to the following table.

Table 2. IP adress server

Device	IP Adress	Subnet Mask	Default Gateway	DNS Server
Server	192.168.10.2	255.255.255.0	192.168.10.1	8.8.8.8.

Next, go back to the service menu and select *DHCP*. Configure the *default gateway* and specify the *initial IP address* to be assigned to the customer. Specify the number of users and save the settings.

o) *Cloud* Settings
To set up *the Cloud* on a computer network, the first step is to double-click on the *cloud*, then select *the DSL* menu, fill the port with *Modem4* and *Ethernet 6*, then click *ADD* and *close*.

p) Setting Up the *Modem*
To set *the modem*, click *the router*, select *FastEthernet7/0*, then enter *the IP Addres* with the number 192.168.4.1, then click the *subnet mask* and it will automatically fill in, then select *on*, then *close*.

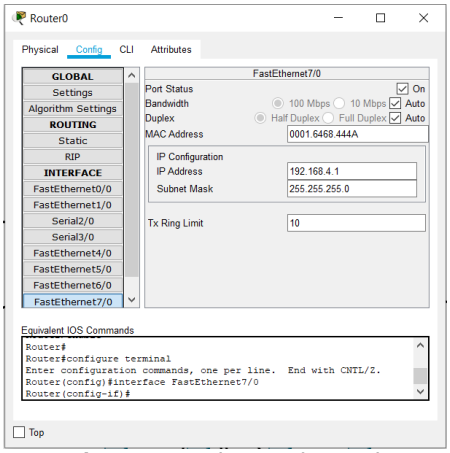

Figure 7. Setting Up the Modem

q) Wifi Addition And Settings, To set up wifi can use WRT300N model as a *router* option. By clicking the *Wireless Devices menu*, then select *the* router, WRTN300N *then drag & drop* to the *workspace*.

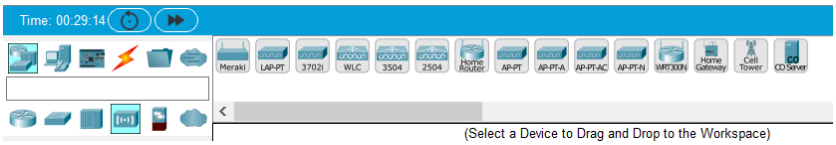

Figure 8. Wireless devices menu display

Then add 3 PCs to connect the network to *Wireless,* click the *End Devices menu* to add *PCs* then *drag & drop* on the *workspace.* Next, click *on Wireless Router* (WRT300N), fill in *the IP Address*, then select *disable*, then *save settings*. Then select the *wireless menu* then fill in the SSID with *"MyHomeNetwork"* then *save settings*.

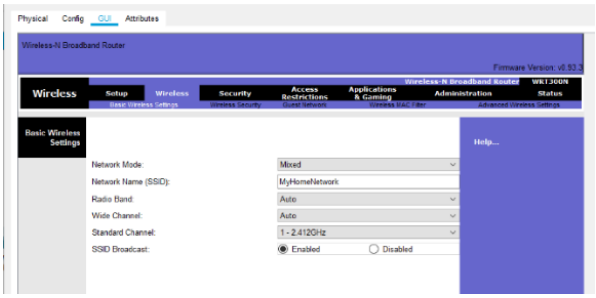

Figure 9. Setting SSID

The next step is to select *security mode* with WEP, then fill *in key1* with the numbers 0-9, then *save settings.* Next, *set up the PC* by clicking *PC,* select the *Desktop menu,* select *IP Configuration*. Fill in *the IP address*, then click *the subnet mask* and fill in *the default gateway* according to the *IP Adrres wireless router* (WRT 300N) then press *close*. Do the same for *the other* 2 PCs.

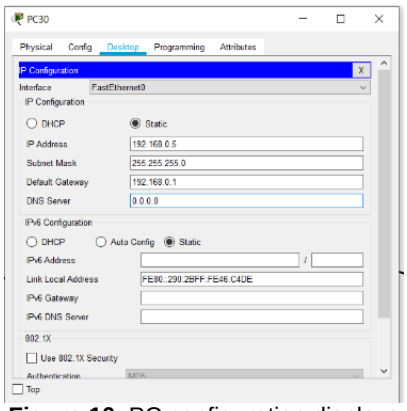

Figure 10. PC configuration displays

Next, select *physical*, after that turn off *the PC*. And *scroll* down click and drag the *LAN card* to the *modules* box, after it is empty, pull the WMP300N box, insert it into the empty box, then turn on the computer again.

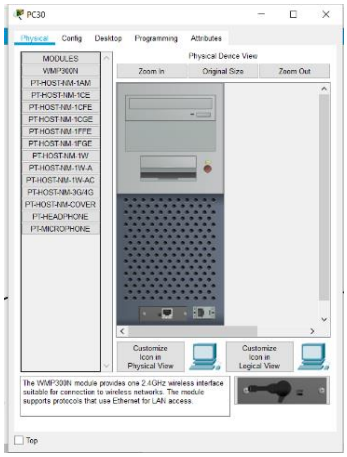

Figure 11. Replacing LAN Card with Wirelles

Then select the *desktop menu*, click Wireless *PC*. Select the *connect menu* then click the *wireless mode* option & connect by clicking *connect.*

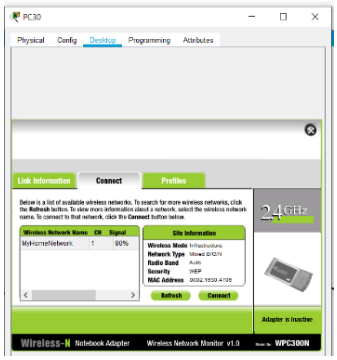

Figure 12. Setting wireless mode

Fill in *WEP KEY 1* with the password, and then click *connect* to connect. Do the same to connect *Wireless.* The next rare is to select the *Link Information menu*. Then connect it to the main router using *a cross-over cable.* By clicking on Wireless *Router (WRT300N)* then select *Internet.* Once both devices are connected, and all *the IP settings* are done, the Cable will turn green. Then the computer network that was created was completed and could be used.

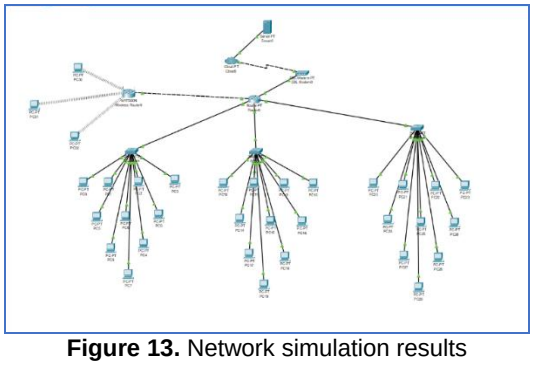

Figure 13. Network simulation results

r) Ping Test

The ping test can be done by clicking on the pc to be tested then select *the desktop* menu then select *run* then type the code according to the image below.

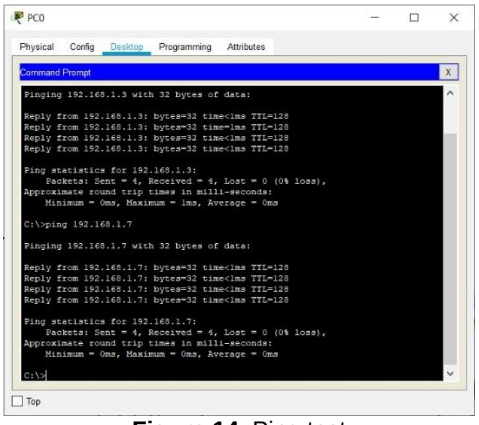

Figure 14. Ping test

4. CONCLUSION

The use of network simulation with Cisco Packet Tracer at Tuban Institute of Technology and Business still requires further development. Although the network configuration is successful and functioning properly, there are shortcomings when the server experiences maintenance which causes the network to go down. However, this network simulation has the advantage of having a larger network with immediate access because this network simulation uses a topology (tree). This network simulation also has better stability, and provides information about the health condition of computers in the network to detect damage quickly. Theoretically, this research suggests that network simulations can greatly aid in understanding and improving network management and efficiency, serving as a valuable educational tool. Traditional digital financial management systems face challenges such as security, transparency, and trust, which blockchain technology can address by providing a decentralized and immutable ledger system. Further development is expected to improve efficiency, reliability, and the ability to detect network damage quickly. In addition, this simulation can be used as a basis for new research in improving efficiency.

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