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Application of OSPF Network in Spanning Tree Protocol Method to Prevent Looping Routing

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ABSTRACT

Network is a basic thing that must exist in an agency or company, because the network can facilitate us in terms of data exchange and data transfer. In this study the application of the OSPF network to the Spanning Tree Protocol method to maintain Looping Routing using the Graphical Network Simulator 3 (GNS 3) simulator is expected to be the main objective in facilitating work completion, especially in terms of communication system data collection. With the help of Routing which serves to determine the route traveled by a packet that originates from a source node to the destination node on the network. Open shortest path first (OSPF) is one of the dynamic routing protocols that uses a link-state algorithm to build and calculate the shortest path to all known destinations. STP functions as a protocol for managing connections using the spanning tree algorithm.

Keyword : OSPF network, Spanning tree protocol (STP), Looping routing, GNS 3

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1. INTRODUCTION

The computer network is the main device that must exist in the world of work, because the network can facilitate the exchange of data and sharing of hardware. Along with the times, especially in the era of computerization where the use of time as efficiently and as well as possible is the main goal in facilitating completion of work, especially in terms of data collection communication systems are needed (Wiguna & Santoso, 2013).

Routing is a mechanism for determining the route traveled by a packet originating from a source node to the destination node on that network. Open Shortest Path First (OSPF) is a dynamic routing protocol that uses a link-state algorithm to build and calculate the shortest path to all known destinations. OSPF distributes routing information between autonomous system (AS) routers. OSPF has a focus on processor performance, memory requirements and bandwidth consumption. The purpose is to examine the route and the time results achieved from the source data packet that will be sent to the destination packet data received (Ahmad, 2013; Jadi, Nurwasito & Data, 2018).

STP is a network protocol that guarantees looping free network topologies for LAN Ethernet connections. Without an STP on an ethernet frame, it will cause loops for an unlimited period of time in a network with physically redundant links. STP Serves as a protocol for managing connections using the spanning tree algorithm. That STP is a link management protocol at layer 2 that provides a backup path system and also prevents unwanted loops and broadcast storms on networks that have multiple paths to the destination of a host (Rifai & Supriyanto, 2017).

The purpose of this study is to create a network topology that will implement the fastest route so that the network does not redundant. Prevents looping in the network. And to improve the performance of communication between multiple networks.

2. LITERATURE REVIEW

A. Classless Routing Protocol

Classless can simply be interpreted as "classless" or "not using class". Then if it is associated with IP addressing, then classless IP addressing can be interpreted as "IP addressing without knowing the class", that is by using classless inter-domain rouing (CIDR) or it can also be known as long prefixes. The

classless routing protocol is a supporter of CIDR, a scheme newer than IPv4 by using a subnet mask or to show how routers must identify the network ID. IP subnet masks represent network IDs not limited to routers defined by address classes (Husein, Bouk & Javaid, 2018).

B. Open Shortest Path First (OSPF)

OSPF is a link-state routing protocol and functions to connect the router to a router that is in an autonomous system (AS) so that this routing protocol includes the IGP category. Generally OSPF is applied to large scale networks because it has the ability to achieve convergence conditions very quickly, both when the first network is turned on and when a network change occurs. To handle large scale networks, OSPF uses the concept of area in its implementation. OSPF uses the dijkstra algorithm to run routing protocols, so OSPF is better used to manage data traffic on medium and wide area networks. The dijkstra algorithm makes OSPF better used on large networks because it has advantages over the bellman-ford algorithm (Prismana, 2015).

C. BGP (Border Gateway Protocol)

BGP is the core of the routing protocol used on the internet. This protocol is the backbone of the world internet network. BGP is used to exchange routing information between world internet connections. BGP is a type of routing protocol that functions to exchange information between autonomous systems (AS). BGP is one type of dynamic routing on the proxy itself there are several kinds of dynamic routing features besides BGP such as OSPF and RIP. For the exchange of BGP information, it utilizes the TCP protocol so there is no need to use another type of protocol to handle fragmentation, retransmission, and sequencing (Diansyah, 2017).

3. RESEARCH METHOD

The stages of research carried out in completing this design are:

1). Library Research

At this stage, searching for information and references through books, the internet, or other materials related to the topics discussed, such as the application of the spanning tree method on a network

2). Data collection

At this stage collecting materials in the form of hardware, software and books relating to the design made.

3). Systems design analysis

At this stage, using the stages of the SDLC methodology which includes the stages of planning, system requirements, system design and system testing and summarizing them so that conclusions can be drawn as benchmarks for the manufacture and development of spanning tree networks

4). System implementation and testing

At this stage, the system is implemented and tested based on the design carried out in the previous stage.

At this stage what needs to be done from making STP methods on OSPF networks is design. In building the OSPF network software simulation system, the authors designed it using UML, to be more specific in its application.

A. Use Case Diagrams

Use case diagrams are used to structurally illustrate the steps in a system's interaction with its users. There are actors in the system that are designed, namely the user. Users have an important role in running or operating a complex network system. In this case the user acts as a system user to configure the network. Use case diagram can be seen in Figure 1 as follows:

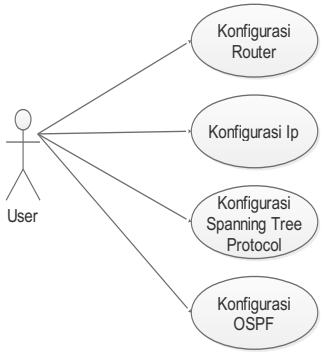

Fig 1. Use case diagram

Description of the picture 1 use case diagram above explains that the network simulation system that will be built will involve the user in setting up router configuration, proxy configuration, IP address configuration on each device, spanning tree protocol configuration and OSPF configuration.

In writing this research, the author discusses the application of OSPF network protocol using STP which aims to prevent looping on a network, in this study the authors use 4 routers, 3 switches, 1 server and 9 computers. Network simulators use GNS 3 which can help implement OSPF networks with spanning trees. In the above usecase the author will configure the router, spanning tree protocol configuration, OSPF configuration and IP address configuration.

B. Router Configuration Activity Diagram

Router configuration activity diagram illustrates the logic of the user when wanting to make configuration or router configuration settings on an OSPF network that uses the spanning tree protocol method. The following router configuration activity diagram that I designed in Figure 2:

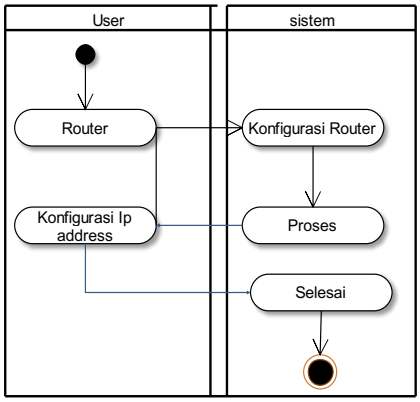

Fig 2. Router configuration

In figure 2 the author first configures the router to set the IP address for each component of the router used.

C. Activity Diagram of OSPF Network Configuration

The following activity diagram of the OSPF network configuration that I designed in Figure 3 follows:

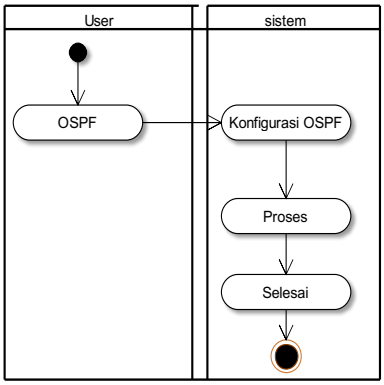

Fig 3. OSPF Network configuration

The OSPF network diagram illustrates the user's logic when wanting to make OSPF network settings on a network that applies the STP method.

D. Activity Diagram IP Address Configuration

IP diagram configuration activity diagram illustrates the logic of the user when he wants to make settings on the IP address on the OSPF network that uses the spanning tree protocol method. The following activity diagram settings in Figure 3.5 follows

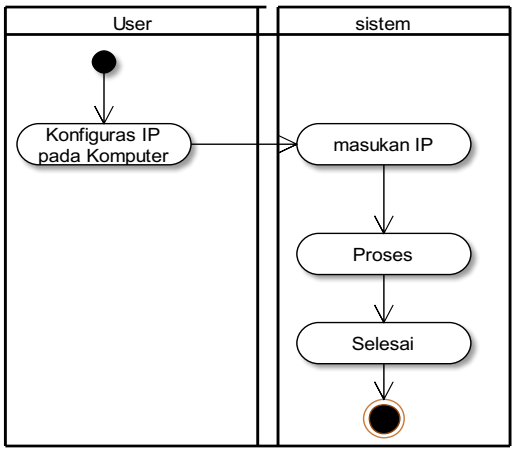

Fig 4. Configure IP address

E. Activity Diagram of the Spanning Tree Protocol Configuration

The STP configuration diagram illustrates the user's logic when wanting to make configuration settings that apply the spanning tree protocol method. The following activity diagram configuration spanning tree protocol that I designed in Figure 5 follows:

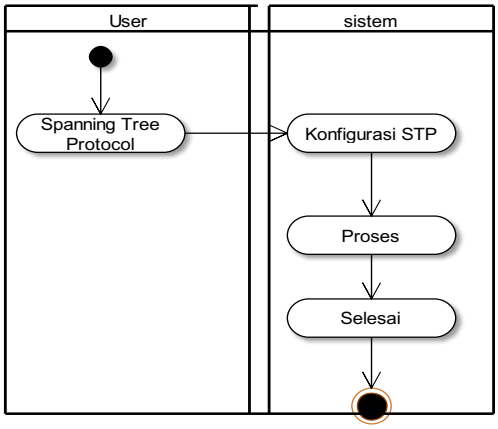

Fig 5. Configuring the Spanning Tree Protocol

4. RESULTS AND DISCUSSION

The implementation of the OSPF network application on the STP method to prevent looping routing, the authors use the GNS3 simulator to be able to implement the OSPF network implementation and the spanning tree protocol, as for the hardware and software used as follows:

A. Hardware Requirements

Hardware is a component or element of equipment used to apply OSPF networks to the STP method to prevent routing looping, using the GNS3 simulator. The hardware used optimally requires the following minimum computer specifications:

1. Core i3 Processor.
2. 4 GB RAM capacity.
3. VGA monitor resolution of 1024 x 768.
4. Keyboard and Mouse.

Overall the existing computer hardware specifications meet the requirements that will be implemented for the OSPF network. In the spanning tree protocol method to prevent looping routing, use the GNS3 simulator.

B. Software Requirements

Software is a command that is executed by a computer in carrying out its work. Broadly speaking software can be interpreted as an operating producer, and can also be interpreted as all kinds of programs used to operate computers and equipment. The software used is the minimum computer specifications as follows:
1. Windows 10 64 bit.
2. GNS3 2.1.21.
3. Os images of the 7200 router.
4. Os switch 3600 images.
5. Wireshark

C. Display of OSPF Network Architecture
In the OSPF network architecture display by applying the spanning tree protocol method consisting of 1 Cisco router connected by 3 other Cisco routers. Then each router is connected to 3 switches, where each switch has 3 computers as clients or hosts as shown below:

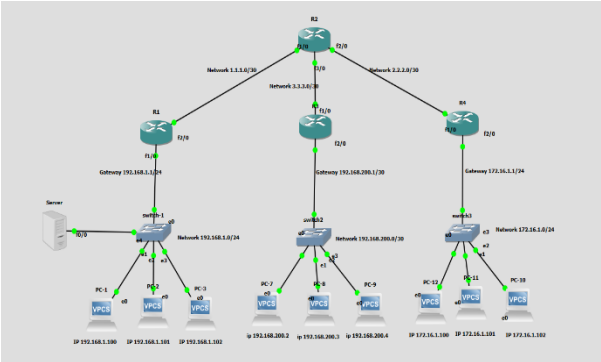

Fig 6. OSPF network display.

In Figure 6 where the switch as a media liaison between computers 1 on switch 1 to computer 12 on switch 3 and also as executor of the spanning tree algorithm that aims to control media access to communicate with each other in order to detect and manage redundant links in the network.

D. OSPF network configuration
OSPF network is an automatic routing protocol (dynamic routing) that is able to maintain, manage and distribute routing information between networks. The following displays the OSPF network configuration:

1) Network on Router 1
In the router network configuration 1 in setting the ip address command performed as below:
R1 # config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line. End with CNTL / Z.
R1 (config) #int fa 0/0
R1 (config-if) #ip add 1.1.1.1 255.255.255.0
R1 (config-if) #no shut
After the configuration is done, information will appear that the ip has been configured as shown below:

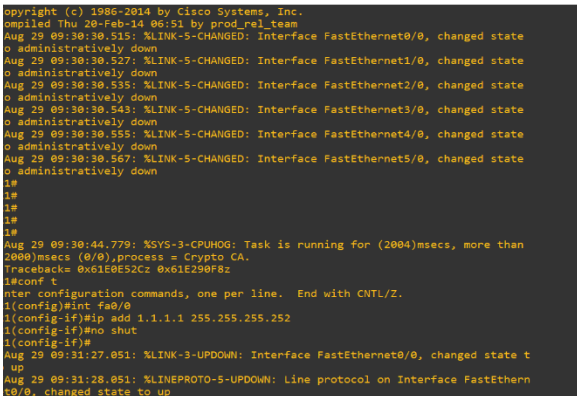

Fig 7. Provision of IP Address on the Router 1.

The information in Figure 7 explains that router 1 must be given an IP address that functions to forward packets from one network to another so that hosts on a network can communicate with hosts on another network.

2) Network on Router 2

In the router network configuration 1 in setting the ip address command is performed as follows:
R2 # config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line. End with CNTL / Z.
R2 (config) #int fa 0/0
R2 (config-if) #ip add 2.2.2.2 255.255.255.0
R2 (config-if) #no shut
After the configuration is done, information will appear that the ip has been configured.

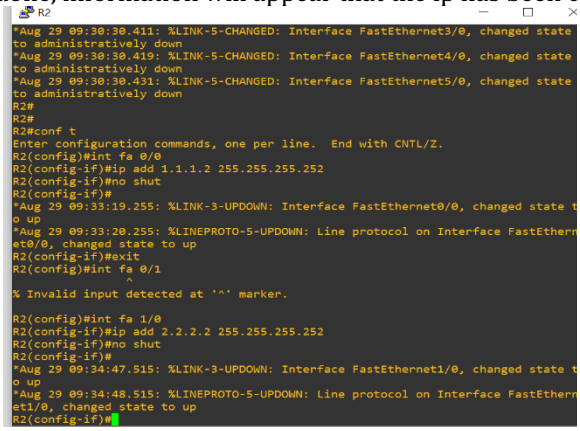

Fig 8. Provision of IP Address on the Router 2.

The information in Figure 8 explains that on router 2 an IP address must be given which functions to forward packets from one network to another so that hosts on a network can communicate with hosts on another network.

3) Network on Router 3

In the router network configuration 1 in setting the ip address command is performed as follows:
R3 # config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line. End with CNTL / Z.
R3 (config) #int fa 0/0
R3 (config-if) #ip add 172.16.1.1 255.255.255.0
R3 (config-if) #no shut
After the configuration is done, information will appear that the ip has been configured.

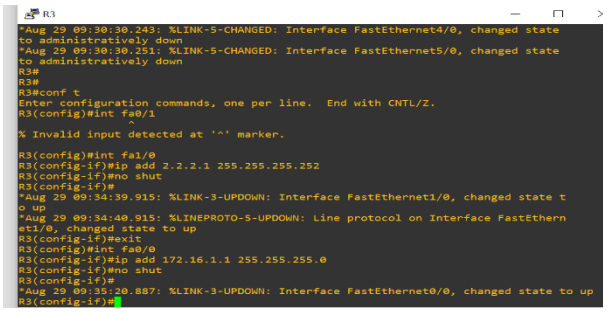

Fig 9. Provision of IP Address on the Router 3.

The information in Figure 9 explains that router 3 must be given an IP address that functions to forward packets from one network to another so that hosts on a network can communicate with hosts on another network.

4) OSPF Network Routing

In the OSPF routing configuration in setting the ip address command performed as follows:

R3 # config

Configuring from terminal, memory, or network [terminal]?

Enter configuration commands, one per line. End with CNTL / Z.

R3 (config) #router ospf 10

R3 (config-if) #network 2.2.2.0 0.0.0.3 area 1

R3 (config-if) #network 172.16.1.0 0.0.0.255 area 1

After the configuration is done, the results will appear as shown below:

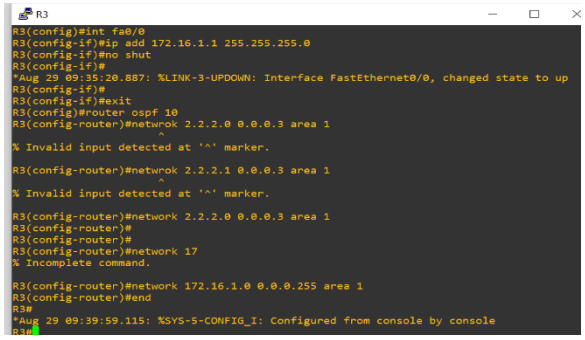

Fig 10. Configuring OSPF on the Router

The information in Figure 10 explains that router 3 has to configure the OSPF network protocol to distribute network information from one router to another.

5) VLAN configuration

In the OSPF routing configuration in setting the IP address commands are performed as follows:

Switch1> enable

Switch1 # configure terminal

Switch1- (config) #vlan database

Switch1- (config) #vlan 10 name roy1

After the following configuration, the vlan behaves successfully in the configuration named roy1

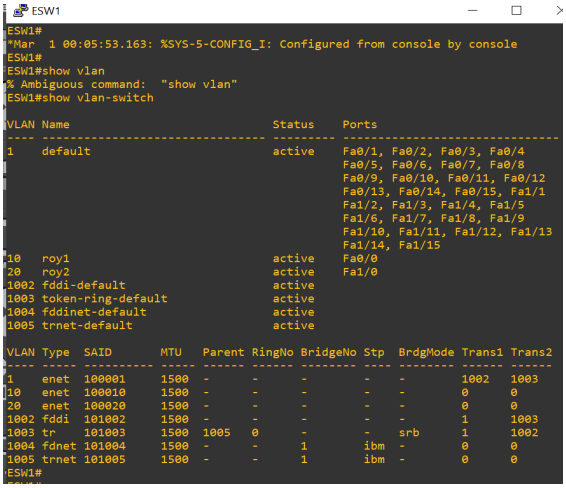

Fig 11. VLAN configuration.

The description of Figure 11 explains that a switch must be configured in a vlan that functions to run the spanning tree.

6) Network Configuration Spanning Tree

The spanning tree configuration will start with commands on switch 1 and switch 2. The following is the spanning tree protocol configuration command:

switch-1 # show spanning-tree vlan 1
Switch1-> enable
Switch1- #configure terminal
Switch1- (config) # spanning-tree vlan 20 primary root
Switch1- (config) # spanning-tree vlan 30 secondary root
Switch1- (config) #end
Switch2-> enable
Switch2- #configure terminal
Switch2- (config) # spanning-tree vlan 20 priority (0-61440)
Switch2- (config) #end
After the configuration is done, the display will appear as follows:

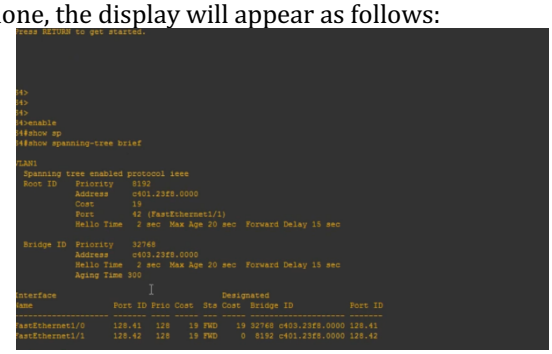

Fig 12. Configurasion Spanning Tree

In Figure 12 we can see that the switch network must be configured with a spanning tree method that can prevent looping routing on an OSPF network.

7) Network Server Configuration

The server configuration will start with commands on the server. The following is the spanning tree protocol configuration command:

Server # conf t
Server (config) #int fa 0/0
Server (config-if) #ip add 192.168.200.5 255.255.255.0
Server (config) #no shut
Server (config) #end
Server # conf t

Server (config) #router ospf 10
Server (config-router) #network 2.2.2.0 0.0.0.3 area 1
Server (config-router) #network 2.2.2.1 0.0.0.3 area 1
Server (config-router) #network 2.2.2.0 0.0.0.3 area 1
Server (config-router) #network 17
After the command is performed it will display the image as follows:

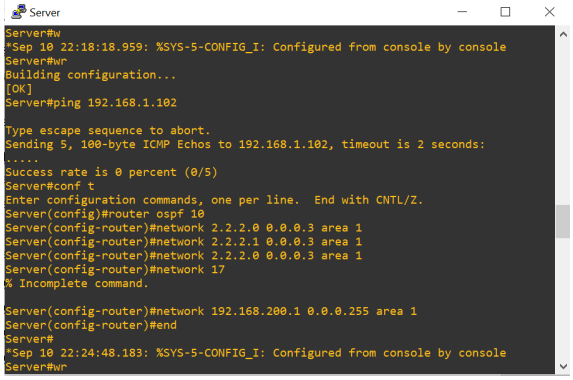

Fig 13. Configurasion server

8) Route on Router 1

The configuration displays the routing configuration on the router device in applying OSPF network using the following command:

R3 # show ip router

The main purpose of the following command is to tell the router which path to cross to go to a different destination, as shown below:

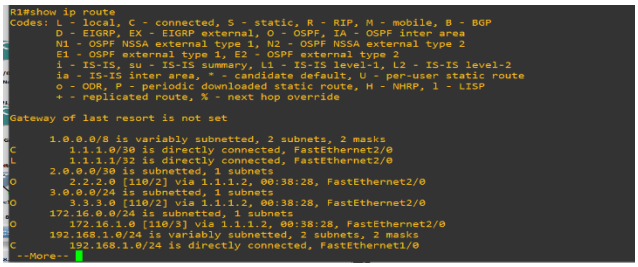

Fig 14. Show IP route.

In Figure 14 will explain in a routing table that contains a list of known network address data, where the data determines which network will be connected to a router.

5. CONCLUSION

In the description of the series starting from the manufacturing process In the description of the series starting from the process of applying the OSPF network to the spanning tree protocol method to prevent looping routing, several important conclusions can be drawn including: (1) In this study the OSPF network protocol is implemented that is capable of communicating between networks. (2) OSPF network protocol for communicating with clients by performing the ping command (packet internet gopher). (3) The spanning tree protocol method in the applied research is able to prevent looping between networks so it is very useful on a network.

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