The Best Recipe Cisco"s Coffe

FROM ZERO TO EXPERT

PESANTREN NETWORKERS

Coffee

cisco

THE BEST

ALI ZAINAL A. BARAQBAH

FOREWORD

Bismillahirrahmaanirrahiim…

Assalamualaikum warohmatullahi wabarokaatuh..

All Praise to Allah Subhanahu Wata'ala who has given His infinite Blessings, Sholawat be with him Greetings poured out to the Islamic Revolutionary Prophet Muhammad Salallahu Alaihi Wasallam, to his friends, his family, his habits and habits, and up to the Muslim and Muslim women as his ummah.

With the pleasure of Allah Subhanahu wata'ala, alhamdulillah I have made a writing entitled "The Best Cisco coffee" which contains labs with CCNA and CCNP material. I chose the title of this book because it is in this book contains 50 Cisco labs with a **GREAT** mix of material so it's easy to understand and produces Cisco coffee recipes which is great for both laypeople and those who have experienced Cisco configuration.

I am very grateful to all those who support and motivate me, thank you say to Family, Friends, Friends, teachers at school, teachers at ID-Networkers, Mas Rofiq Fauzi and to Mr. Dedi Gunawan as my supervisor at ID-Networkers who always encourages me in making this book.

My message to readers, take advantage of the contents of this book, upgrade your skills, frequently configure because that can make it easier to dig skills and hopefully the reader will be able to stick to studying this book. If the reader wants to convey something to the writer, including constructive messages, suggestions and corrections, bias send to the e-mail address **z.abidin1995@gmail.com**

That's all I can say.

Billahitaufiq wal guidance...

Peace be upon you...

Jakarta, 24 April 2015

Ali Zainal A. Baraqbah

ISI EDIT

THE FUNDAMENTAL

The Best Cisco Coffe

Introduction Networking

NETWORK : Computers that are interconnected and can communicate using certain protocols and using tools, for example Network Internet Card (NOTHING), modem, etc. An example is the internet.

There are 3 types of internet connection: • Physical: With modem or NIC • Logic: Protocol, for example TCP/IP (Transmission Control Protocol/Internet Protocol) • Application: Using a browser, for example Internet Explorer or Netscape Navigator

Protocols are used as rules in communicating.

Example protocol:

FTP to send and open data on an FTP server.

1. TFTP for system recovery on routers or switches.
2. DHCP untuk dynamic IP address.
3. DNS to map domain names to IP addresses.
4. 5. Telnet for remote login to another computer.

6. SNMP for network management.
7. SMTP to handle email.
8. HTTP to handle web page requests.

TCP/IP

TCP/IP is the network protocol most often used for networks, one of which is the Internet network. The TCP/IP layer consists of: 1. Application: Combining the Application, Presentation and Session layers in OSI Layer.

2. Transport: The same as the Transport layer in the OSI Layer.
3. Internet: Same as the Network layer of the OSI Layer.
4. Network Access: Combining the Data Link and Physical layers at the OSI Layer.

Bandwidth

Bandwidth is the size of the data path.
T = S / Bw T
= time for transfer S = size of file Bw = Bandwidth

Network equipment:

1. End-user device

Equipment such as computers, NICs, printers for users, now even mobile.

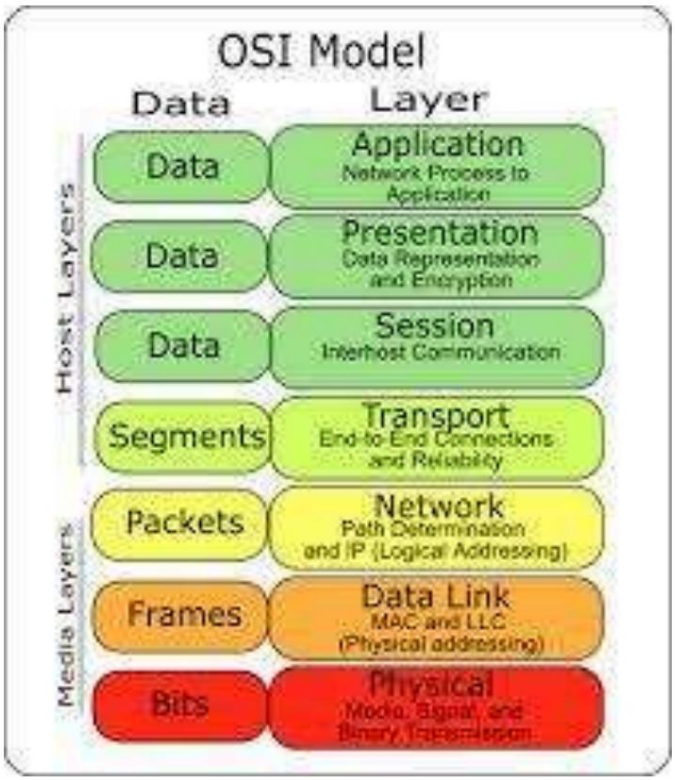
2. Network device

- Repeater / hub: layer 1 OSI layer, sends data to everything connected besides the port the data originates from.

- Bridge / switch: layer 2 OSI layer, sends data in the form of frames to the destination based on the MAC address.

- Router: layer 3 OSI layer, connects 2 different networks; send data to the destination based on the IP address.

7 AXES LAYER



OSI Layer is the most common network layer standardization, consisting of:

1. Physical: The first layer that describes network point connections, for example cables. Data is sent in the form of bits.
2. Data Link: Data is sent in the form of frames and includes MAC address information.
3. Network: Breaks segments into several packets. In the packet there is IP address information to be sent via the routing table.
4. Transport: The data is in segment form.
5. Session
6. . Presentation
7. Application

We as Networkwer Engineers at least memorize layers 1 – 3...

LAYER	NO	DATA DEVICE ADDRESSING UNIT HUB BIT 0 1 1
LAYER 1	PYSICAL	1 0 01 1 1 0 SWITCH FRAME MAC Address
LAYER 2	DATA	ROUTER DATA/Packets IP Address OK,
LAYER 3	NETWORK	friends, we as Networkers are most

obliged to memorize these 3 layers, why? because we usually only use layer 3 often because it suits our use.

LAYER DEVICE	CONNECTIVITY	DATA SENDING	MEMORY
HUB	LAYER 1 BETWEEN THE SAME NETWORK	BROADCAST TO ALL PORTS DOES NOT HAVE	
SWITCH	LAYER 2 BETWEEN THE SAME NETWORK	BASED ON MAC Address OBJECTIVE	MAC Adress TABLE
ROUTER	LAYER 3 BETWEEN DIFFERENT NETWORKS BASED ON IP ADRESS	OBJECTIVE	ROUTING TABLE

Therefore, we have to understand these 3 Osi layers, because we will use them every day.

Network type

OK, after understanding the 3 layers, let's move on to the types of Network that you need to know?

There are 3 types of networks that you must know, namely: 1. **LAN**

(Local Area Network); small scale network, usually in 1 building or area (With high bandwidth speeds, limited coverage and usually cable UTP / Optic)

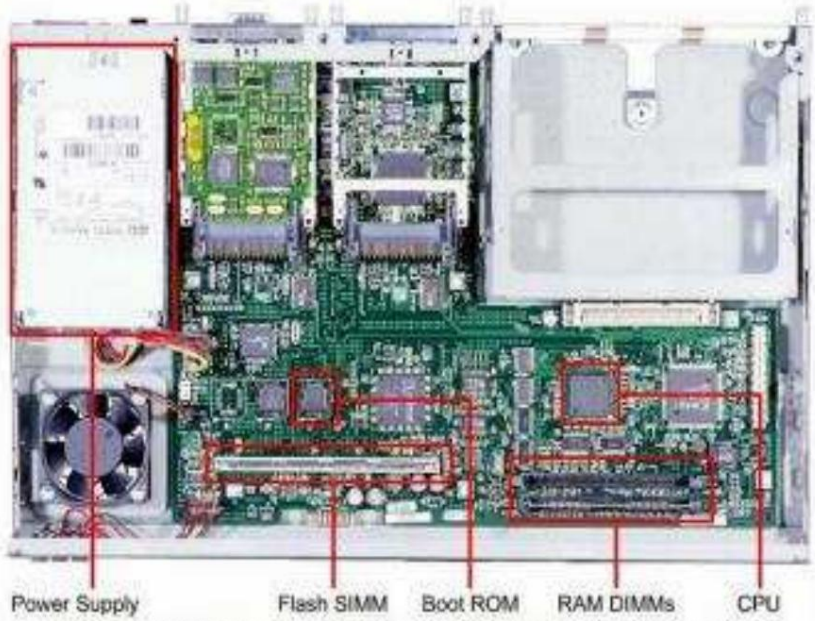
2. MAN (Metropolitan Area Network): medium scale network, usually used between city or between different branch companies (high Bandwidth speed, usually Optical cable)

3. WAN (Wide Area Network): large scale network between islands or even between countries (bandwidth speed is low, the cable is usually serial)

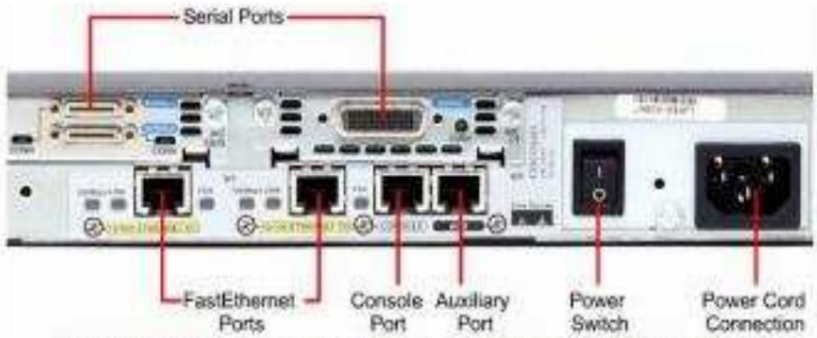
INTRODUCTION TO CISCO DEVICES

CISCO DEVICE COMPONENTS

2.3 Pengenalan Router/Switch Cisco



Gambar 2.3 Contoh Komponen internal Cisco router 2600



Gambar 2.4 Contoh Komponen external Cisco router 2600

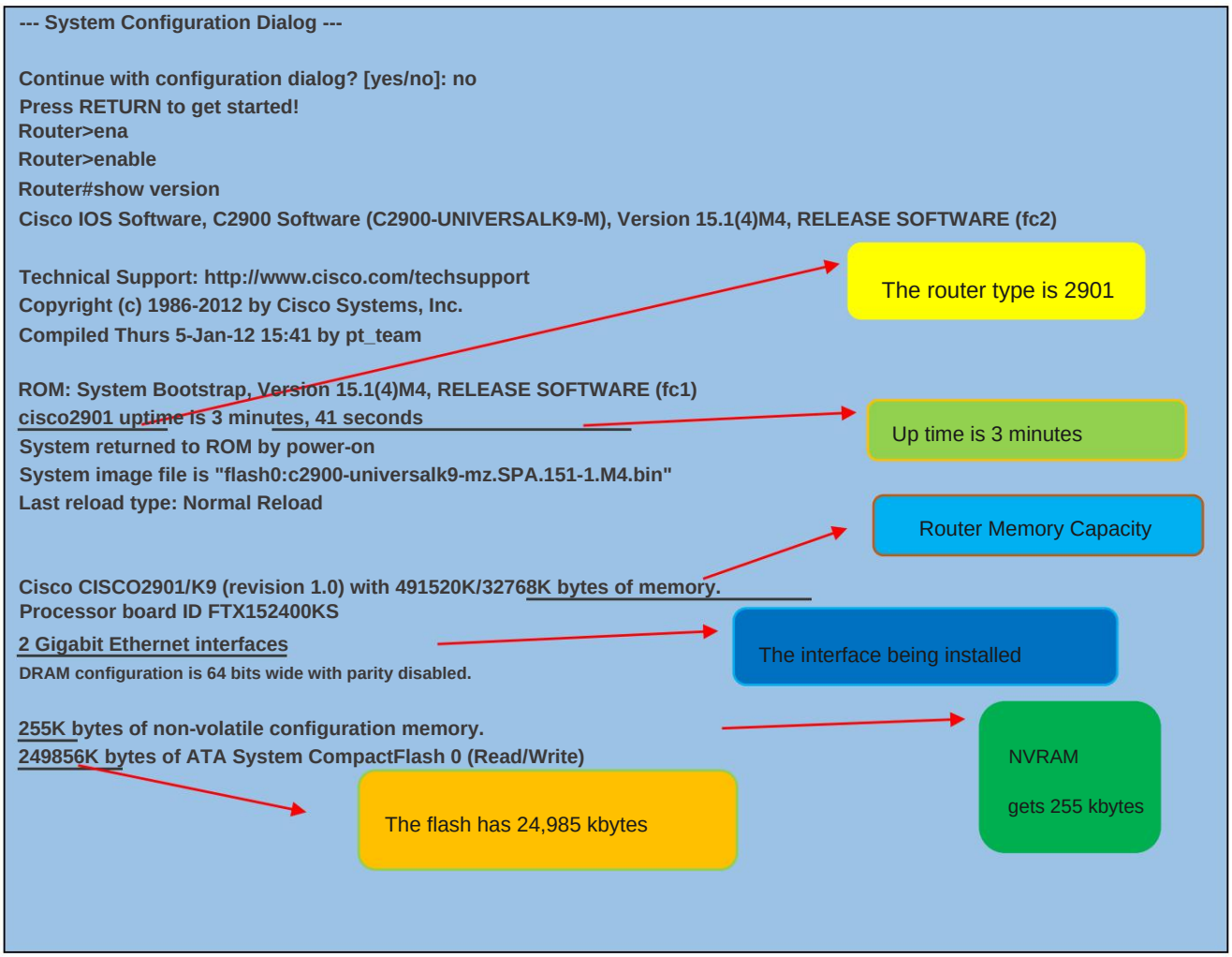
CISCO DEVICE PRICE LIST

1. Router
   - 1700 series (harga bekas 1jt-an)
   - 2500 series (harga bekas dibawah 1jt-an)
   - 2600 series (harga bekas 1jt-an)

2. Switch
   - 2950 series (harga bekas dibawah 1jt-an)
   - 3550 series (harga bekas 2-3jt-an), Switch Layer3

Masing-masing series juga ada berbagai macam sesuai jumlah port interfaceyang dimilikinya seperti berikut untuk cisco 1700 series.

HARDWARE / VERSION CHECK



NOTE:

> NVRAM is a permanent storage medium, however it can still be replaced, if we save the configuration here then when the router dies the configuration will still be there.

NVRAM is used as the main configuration storage area. When the router/switch is first turned on, the configuration in NVRAM is what will be read and executed by the router (STARUP CONFIGURATION Command written:

```
Router#write Building
configuration...
 [OK]
```

This command will immediately save the configuration in our Router's NVRAM

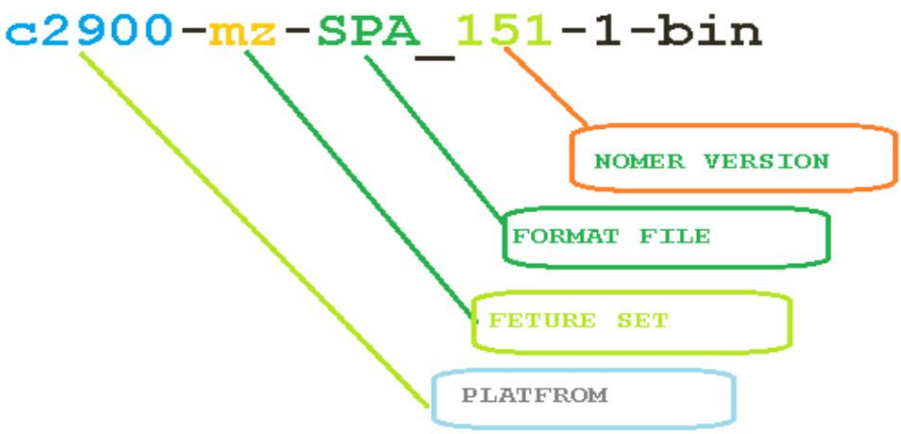
> Flash is used to store IOS (INTERNETWORK OPREATING SYSTEM) believed to be the operating system used by Cisco devices

> RAM/Memory is used as a temporary configuration storage place (running Configuration)

SOFTWARE AND IOS CHECK

```
Router>and
Router#show version
Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(4)M4, RELEASE
SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2012 by Cisco Systems, Inc.
Compiled Thurs 5-Jan-12 15:41 by pt_team

ROM: System Bootstrap, Version 15.1(4)M4, RELEASE SOFTWARE (fc1)
cisco2901 uptime is 2 hours, 15 minutes, 8 seconds
System returned to ROM by power-on
System image file is "flash0:c2900-universalk9-mz.SPA.151-1.M4.bin"
Last reload type: Normal Reload


A summary of U.S. laws governing Cisco cryptographic products may be found at:

http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.
Cisco CISCO2901/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
2 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)
Configuration register is 0x2102
```

1. This is the IOS file **"flash0:c2900-universalk9-mz.SPA.151-1.M4.bin". which** is in the flash directory 2. The configuration register value is **0x2102**



Berikut beberapa contoh file IOS

Name	Date modified	Type	Size
c1700-advsecurityk9-mz.124-19.bin	11/12/2010 7:43 AM	VLC media file (.bi...	13,344 KB
C1700-K9o3sy7-Mz_20122-11_20T.bin	11/28/2010 6:25 PM	VLC media file (.bi...	7,287 KB
c2600-advsecurityk9-mz.124-12c.bin	8/28/2010 10:16 AM	VLC media file (.bi...	16,051 KB
c2600-ipbasek9-mz.124-21.bin	8/28/2010 10:42 AM	VLC media file (.bi...	13,304 KB
c2600-is5-mz.123-26.bin	7/28/2009 7:17 PM	VLC media file (.bi...	15,151 KB
c2800nm-advipservicesk9-mz.150-1.M1.bin	2/19/2010 10:21 AM	VLC media file (.bi...	58,680 KB
c2800nm-entbase-mz.124-19.bin	3/14/2008 5:44 PM	VLC media file (.bi...	21,100 KB
c2800nm-ipbase-mz.124-24.T2.bin	12/16/2009 7:58 PM	VLC media file (.bi...	28,414 KB
c3640.bin	3/6/2007 9:05 PM	VLC media file (.bi...	63,664 KB
c3640-ik9o3s-mz.124-25c.bin	11/12/2010 12:10 ...	VLC media file (.bi...	31,723 KB
c3640-ik9s-mz.123-11.YZ2.bin	8/3/2009 6:17 PM	VLC media file (.bi...	25,047 KB
c3640-ik9s-mz.124-25a.bin	8/3/2009 6:30 PM	VLC media file (.bi...	31,117 KB
c3640-jk9o3s-mz.123-14.T7.bin	10/5/2010 11:20 AM	VLC media file (.bi...	71,479 KB
c3660-telco-mz.123-26.bin	1/6/2010 6:40 AM	VLC media file (.bi...	12,410 KB
c3725-adventerprisek9-mz.124-15.T11.bin	10/5/2010 10:04 AM	VLC media file (.bi...	45,317 KB
c3750-advipservicesk9-mz.122-46.SE.bin	8/28/2010 9:59 AM	VLC media file (.bi...	10,875 KB
c3750-ipservices-mz.122-52.SE.bin	12/18/2009 6:11 AM	VLC media file (.bi...	11,324 KB
c3825-advipservicesk9-mz.150-1.M1.bin	2/19/2010 3:26 PM	VLC media file (.bi...	61,110 KB
c3825-ipbase-mz.124-24.T2.bin	12/16/2009 10:08 ...	VLC media file (.bi...	31,505 KB
c7200-adventerprisek9-mz.124-4.T1.bin	8/6/2006 12:57 PM	VLC media file (.bi...	28,386 KB
c7200-advipservicesk9-mz.124-2.T.bin	6/13/2010 12:44 PM	VLC media file (.bi...	25,765 KB

BASIC CONFIGURATION

- USER MODE: mode where we command before configuring

```
Router>?
Exec commands:
  <1-99>      Session number to resume
  connect     Open a terminal connection
  disable     Turn off privileged commands
  disconnect  Disconnect an existing network connection
  enable      Turn on privileged commands
  exit        Exit from the EXEC
  logout      Exit from the EXEC
  ping        Send echo messages
  resume      Resume an active network connection
  show        Show running system information
  ssh         Open a secure shell client connection
  telnet      Open a telnet connection
  terminal    Set terminal line parameters
  traceroute  Trace route to destination
Router>enable
```

The ">" sign indicates that we are in user mode

- Priveled mode

```
Router#enable
Router#?
  debug       Debugging functions (see also 'undebug')
  delete      Delete a file
  disable     Turn off privileged commands
  disconnect  Disconnect an existing network connection
  enable      Turn on privileged commands
  erase       Erase a filesystem
  exit        Exit from the EXEC
  mkdir       Create new directory
  more        Display the contents of a file
  no          Disable debugging informations
  ping        Send echo messages
  resume      Resume an active network connection
  rmdir       Remove existing directory
  show        Show running system information
  ssh         Open a secure shell client connection
  telnet      Open a telnet connection
  terminal    Set terminal line parameters
  traceroute  Trace route to destination
  undebug     Disable debugging functions (see also 'debug')
  vlan        Configure VLAN parameters
  write       Write running configuration to memory, network, or terminal
```

SIGN "#" Enters us into privileged mode

Global configure mode: mode where we have entered the configure stage on the router, usually there is a sign

“(config)” :

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#?
Configure commands:
  aaa                  Authentication, Authorization and Accounting.
  access-list          Add an access list entry
  banner               Define a login banner
  boot                 Modify system boot parameters
  cdp                  Global CDP configuration subcommands
  class-map clock      Configure Class Map
                       Configure time-of-day clock
  config-register crypto do  Define the configuration register
                       Encryption module
                       To run exec commands in config mode
  dot11                IEEE 802.11 config commands
  enable               Modify enable password parameters
  end                  Exit from configure mode
  exit                 Exit from configure mode
  hostname             Set system's network name
  interface ip ipv6    Select an interface to configure
                       Global IP configuration subcommands
  license              Global IPv6 configuration commands
                       Configure license features
  line                 Configure a terminal line
  logging              Modify message logging facilities
  login                Enable secure login checking
```

Show command: to see whatever we want to see, for example we want to see the configuration currently running on our router or something else

```
Router#show ?
Router#show run
Router#show flash
Router#show start
Router#show version
Router#show interface brief
```

For your information, this company's business operates in two segments, namely products and services. And in the future, products will be further divided into 4 sections, namely; routers, switches, the latest technology and others.

Cisco routing products offer leading features to increase system capabilities, security, stability and good performance in sending information data. Routing technology was created for the Internet and intranets. Routers are used to connect several computer networks, delivering information, including data, voice and video from one network to another. The Cisco company offers routers with several offerings, for companies engaged in network infrastructure, for ISPs (Internet Service Providers) and large companies that use routers to be accessed by everyone.

Cisco Switching products offer various connection models used by customers. A collection of computers and servers, and functions to collect all LAN (Local Area Network), MAN (Metropolitan Area Network) and (Wide Area Network). Switch is a product that combines several technologies networks used for buildings and campuses which are usually called LANs, and for passing through several cities usually called MANs, as well as technology that goes through several areas which are usually called WANs. Cisco introduced several products including, Ethernet, gigabit Ethernet, 10-gigabit Ethernet , synchronous data transfer, SONET (packet over synchronous optical network). and multi-protocol label switching.

The advantages of Cisco technology in the future are offering products and services via computer networks and communications. The categories of products and services offered include network service applications, home networks, small companies, optical networks, security, data center networks, communications, video systems and wireless technology.

CHAPTER 1

SUBNETING

Subnet mask quick reference							
Host Bit length	math	Max hosts	Subnet mask	Mask octet	Binary mask	Mask length	Subnet length
0	2^0=	1	255.255.255.255	4	11111111	32	0
1	2^1=	2	255.255.255.254	4	11111110	31	1
2	2^2=	4	255.255.255.252	4	11111100	30	2
3	2^3=	8	255.255.255.248	4	11111000	29	3
4	2^4=	16	255.255.255.240	4	11110000	28	4
5	2^5=	32	255.255.255.224	4	11100000	27	5
6	2^6=	64	255.255.255.192	4	11000000	26	6
7	2^7=	128	255.255.255.128	4	10000000	25	7
8	2^8=	256	255.255.255.0	3	11111111	24	8
9	2^9=	512	255.255.254.0	3	11111110	23	9
10	2^10=	1024	255.255.252.0	3	11111100	22	10
11	2^11=	2048	255.255.248.0	3	11111000	21	11
12	2^12=	4096	255.255.240.0	3	11110000	20	12
13	2^13=	8192	255.255.224.0	3	11100000	19	13
14	2^14=	16384	255.255.192.0	3	11000000	18	14
15	2^15=	32768	255.255.128.0	3	10000000	17	15
16	2^16=	65536	255.255.0.0	2	11111111	16	16
17	2^17=	131072	255.254.0.0	2	11111110	15	17
18	2^18=	262144	255.252.0.0	2	11111100	14	18
19	2^19=	524288	255.248.0.0	2	11111000	13	19
20	2^20=	1048576	255.240.0.0	2	11110000	12	20
21	2^21=	2097152	255.224.0.0	2	11100000	11	21
22	2^22=	4194304	255.192.0.0	2	11000000	10	22
23	2^23=	8388608	255.128.0.0	2	10000000	9	23
24	2^24=	16777216	255.0.0.0	1	11111111	8	24

The first formula I use to calculate subnetting the old way, the second is a formula using prefixes for example 192.168.1.52 /28. Come on, let's calculate to get the Subnet Mask, Number of Subnets, Number of Hosts per Subnet, Network Address, and Broadcast Address.

The prefix /28 is the number of binaries 1 so it is 1111111.1111111.1111111.11110000 and is class C. To find the Netmask, you can use the following table:

128	64		16	8	4	2	
1	1		1	0	0	0	10

32 1 128+64+32+16 = 240 so the subnetmask is 255.255.255.240

Now we look for the number of Subnets and Hosts, namely using the formula above 2 ^{4} = 16

2^{4} - 2 = 16 – 2 = 14 host

Next we look for the Network Address and Broadcast Address
256-240 = 16

16 + 16 =

32 32 + 16

= 48 48 + 16

= 64 and so on until the result of the sum is 256 **Network**

192.168.1.0 192.168.1.16 192.168.1.32 192.168.1.48 Initial IP 192.168.1.1 192.168.1.17
192.168.1.33 192.168.1.49 End IP 192.168.1.14 192.168.1.30 192.168.1.46 192.168.1.62
Broadcast 192.168.1.15 192. 168.1.31 192.168.1.47 192.168.1.63 The IP address in the
example case above is 192.168.1.52 / 28 so, the Network Address is **192.168.1.48** and

the Broadcast Address is **192.168.1.63**

IP Addressing is divided into 2, namely:

• Private

Private IP is used for local networks connected to the internet Class A: 10.0.0.0 – 10.255.255.255 Class B:

172.16.0.0 - 172.31.255.255 Class

C: 192.168.0.0 – 192.168.255.255

• Public

Used for Internet Networks, for example for Sites/websites.

There are 3 ways to assign an IP to a computer.

1. Static, set manually 2. Dynamic,

set using DHCP 3. Reservation, also with DHCP and

permanently SubNet Mask is useful for knowing which

network an IP is on.

The method is to AND the IP with the SubNet Mask, which will produce a Network ID.

LAB 1 # Basic configurasi

Basic
configuration: some general or basic commands that are often used when we are dealing with Cisco routers. For some cases, if you want to display help by adding a question mark (?) in the console, several commands will appear that you can use.

Before ordering, please note that Cisco has 3 levels

```
router> (you are in user EXEC Mode)
router>enable

then Privilege Mode here is a medium configuration mode regarding the operating system that
you can see here

router# (you are in Privilege Mode)
router# configure terminal

then Global Configuration Mode here is configuration regarding routing addresses and many
more and this is the highest level
router(config)#
```

Keyboard
Shortcuts • CTRL-N shows the next
command. • CTRL-P shows the previous
command. • CTRL-Z exits the config terminal to
privileged mode. • CTRL-C to
cancel. • SHIFT-
CTRL-6 Break. • Tab
completes your command. • Q to exit.

Router Configuration

You will be able to learn the basic commands to configure the router. •
show running-config – details of the running configuration
file (RAM) • show startup-config – displays the configuration stored
in NVRAM • show controller serial 0/0/0 to check whether serial 0/0/0 is DCE
or DTE
• Setup – Does start automatic setup; same as when you first boot the router •
config t – use to run configuration commands from the terminal

• config mem – executes configuration commands stored in NVRAM; copy • startup-config to run-config • config net – used to retrieve configuration information from the TFTP server • copy running-config startup-config copy is stored in running config (RAM) to NVRAM (storing the running configuration).

• copy startup-config running-config- copy of non-volatile (NVRAM) for that configuration running (RAM) • boot system flash – which tells the router IOS files to boot from within the flash • boot system tftp – which tells the router IOS files on the server to boot from tftp • boot system rom – tells the router to boot from ROM at the next boot • copy flash tftp – Copy flash to tftp server • copy tftp flash – Restore flash from tftp server • copy run tftp – Copy current running config for tftp server • copy tftp run – Restore running config from tftp server Process Router & Statistics With this command you can view statistics and different processes of the router. • show processes – Displays active processes on the router • show process cpu – Displays CPU statistics • show mem – Displays Memory statistics • show flash – depicts flash memory and displays file size and amount of memory free flash

• show buffers – displays statistics for the router's buffer area; show size Small, Medium, Large, Very Large, Large and large Buffers

• show stacks – shows the reason for the last reboot, monitors the stack using processes and interrupt routines

Privilege Mode router commands

Learn how to work in the Privilege Mode of a router. • enable – Enables the privileged mode • disable – Disables the privileged mode • no shutdown – (Enables the interface) • reload – Restarts the Router • show ver – Cisco IOS version, uptime of the router, how the router is started, where the system is retrieved from, POST interface discovered, and register configuration

• show clock – Displays the time and date on the router • show history – Displays a list of commands you have given • show debug – shows all debugs that are currently enabled • no debug all – Turns off all debugging

• show users – Displays the Users connected to the Router

• show protocols – shows which protocols have been configured • clear counters – clear interface counters

#LAB 2 # How to change the name (Hostname)

router configuration in Global Configuration

Mode Learn how to work in Global Configuration Mode of a router. • banner motd # your custom message here # – SSet/change banner • hostname – to configure the hostname of the router

```
Router>and
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname ali
ali(config)#
or#
```

#LAB 3#Setting Password

Setting Password on router

Here you will be able to learn how to set password on router. • enable secret – set an encrypted password for Privilege mode • enable password – set a password for Privilege mode (which is used when does not enable secret password weakness enable password has not been encrypted)

```
(config)#line console 0
(config-line)#password
(config-line)#login
```

Set a password for console access

#LAB 4# Setting Password for Telnet

Set password for virtual terminal (telnet) access

```
(config)#line vty 0 4
(config-line)#password
(config-line)#login
```

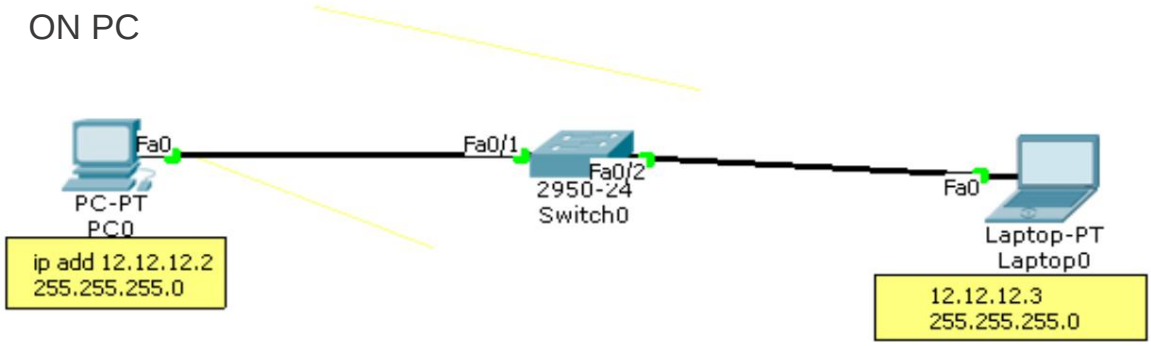
Set password for auxiliary (modem) access:

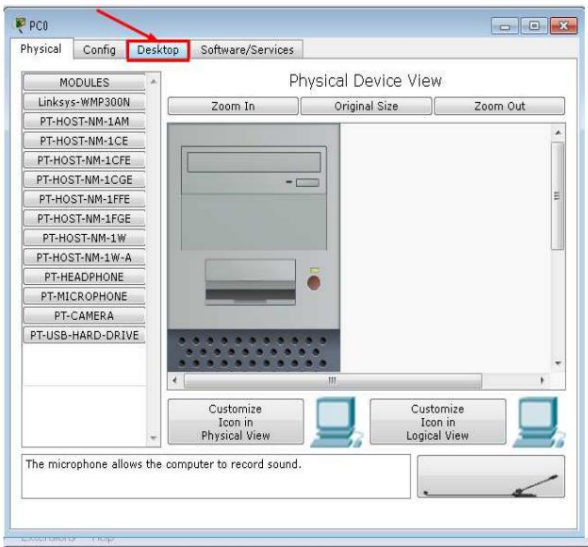
```
(config)#line to 0s
(config-line)#password
(config-line)#login
```

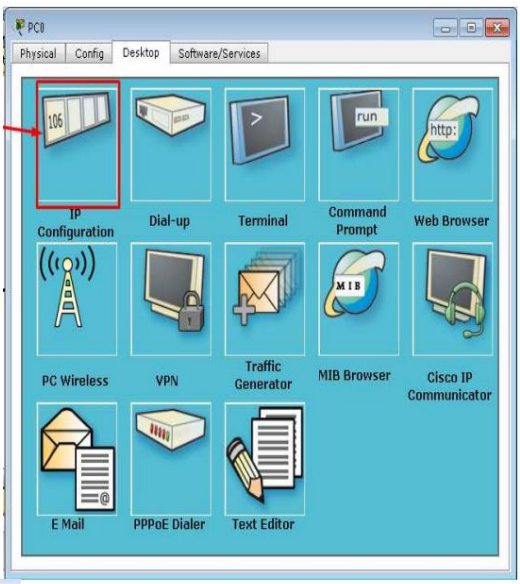
#LAB 5 # IP command

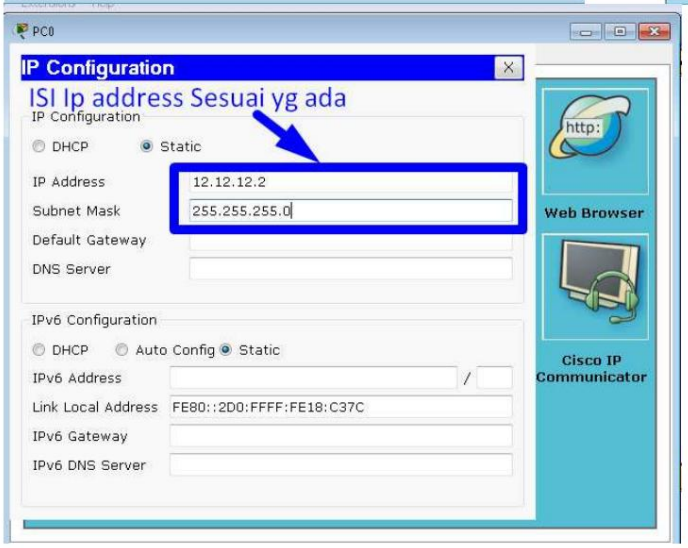
How to install IP on PC and router:

ON PC

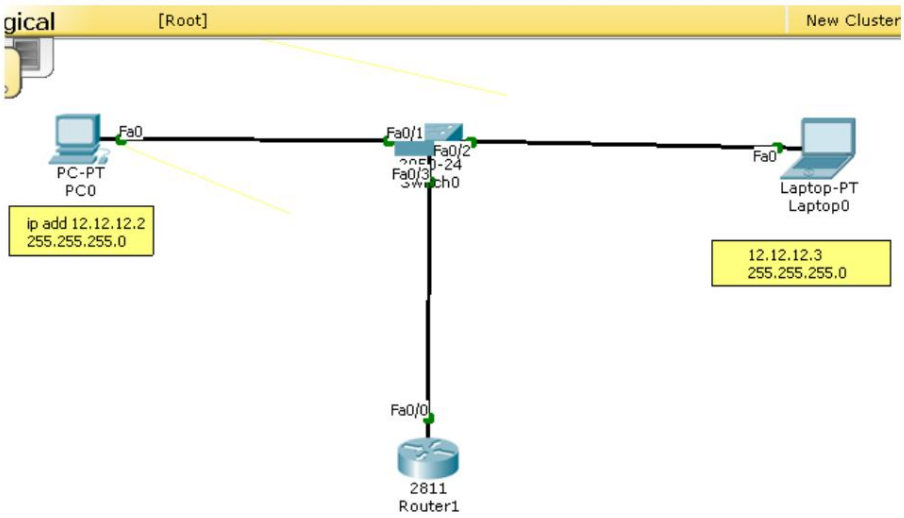








Meanwhile on the router:




```
Router>and
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname ID-NETWORKERS
ID-NETWORKERS(config)#int f0/0
ID-NETWORKERS(config-if)#ip add 13.13.13.1 255.255.255.0
ID-NETWORKERS(config-if)#no shut

ID-NETWORKERS(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up


ID-NETWORKERS(config-if)#
```

NOTE: **Don't forget that after installing the IP on our router, we have to turn on the "NO Shutdown" command to** turn off our interface.

#show ip route –: view the ip routing table
#show ip address brief: melihat ip address list.
#ip route[administrative_distance] – Router static IP configuration
#show ip route 0.0.0.0 0.0.0.0 [next hops] – Mensttinf gateway dasar
#ip classless – used with static routing to allow packets destined for unrecognized subnets to use the best route
#show arp – view arp cache; shows the MAC address of the connected router

#show ip address x.x.x.x y.y.y.y untuk menambah ip address format x.x.x.x (ip address) y.y.y.y (subnetmask).

CDP command (Cisco Discovery Protocol using layer 2 multicast over a SNAP-capable link to send data):

- show cdp neighbor – shows directly connected network neighbors •
  show cdp int – shows which CDP interface is running • show
  cdp int eth 0/0 – shows CDP info for a particular interface • show cdp
  entry – shows CDP details of other networks • cdp timer
  120 – change how often CDP info is sent (default cdp timer is 60) **cp** holdtime 240
  – how long to wait before issuing another network CDP
  (default CDP holdtime is 180)
- show cdp run – shows CDP is enabled • no
  cdp run – turns off CDP for all routers (global config) • no cdp
  enable – turns off CDP on a specific interface

Any tips if you are in Global Configuration Mode and want to use the commands provided

example:
router(config)# (you are in Global configuration mode)
router(config)# do ping www.google.com
different if you are already in Privilege mode
router# (you are in Privilege mode)

in Privilege mode you can add a command in front of the command do

CHAPTER 1

SWITCING....

SWITCH

Is a tool used to divide IP and device supplies. A switch is the same as a bridge, but a switch is a transformation of a bridge which is equipped with more advantages, one of which is that it is equipped with more ports, and the switch works on layer 2, but in the next chapter there is a multilayer switch, namely a switch that is on the layer between 3 and two .

- Flooding, spread to all ports except the origin port, if the destination Mac is not yet in the CAM table - Forward,

the frame is immediately sent to the destination based on the destination Mac, if the destination already exists.

- Filter, frames are not sent to ports that do not contain the destination Mac address.

NOTE:

CAM is memory which essentially works from the back compared to conventional memory (backup memory)

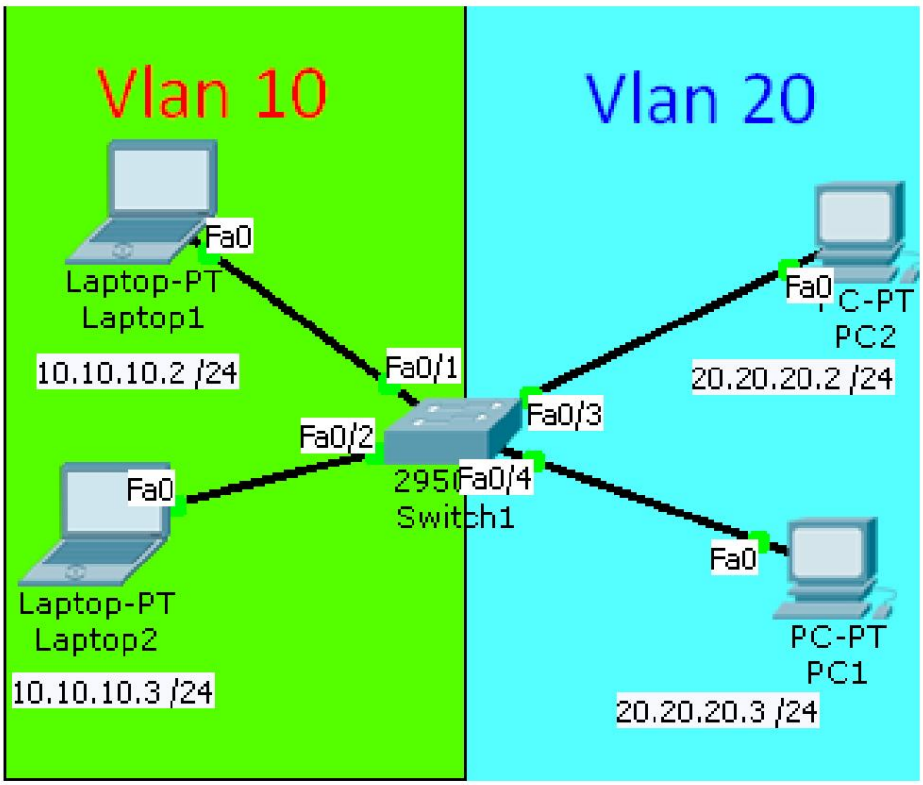
#LAB 6# Creating a VLAN (Virtual LAN)

OK, this time we will discuss VLAN (Virtual LAN). What is VLAN?

VLAN is grouping one LAN network into several groups as if the group had a LAN network, for example usually in schools.

For example, the IDN IT Vocational School has a 3-story building with Multi Media children. in the Office. Etc

The 2nd floor is occupied by RPL children, and the second floor three of them are filled by TKJ The first floor is filled with children. In one building there is one LAN network group of different LAN names, for example LAN 10 (MM Cool) LAN 20 (RPL SMART) LAN 30 (TKJ COOL ABIS) This is also where OK, with this VLAN we will create several the **VLAN is used so that when broadcasting data there is no carelessly sending data instead of using the VLAN that was created earlier (the same VLAN).**



Configure :

Create a vlan and name first

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name TKJ
Switch(config-vlan)#ex
Switch(config)#Vlan 20
Switch(config-vlan)#name MM
```

Assign the VLAN to the port:

```
switch(config)#int f0/1
switch(config-if)#switchport mode access
switch(config-if)#switchport access vlan 10
switch(config)#int f0/2
switch(config-if)#switchport mode access
switch(config-if)#switchport access vlan 10
switch(config)#int f0/3
switch(config-if)#switchport mode access
switch(config-if)#switchport access vlan20
switch(config)#int f0/4
switch(config-if)#switchport mode access
switch(config-if)#switchport access vlan20
```

OK, to verify, we use the "show vlan" command...:

```
Switch(config-if)#do sh vlan

VLAN Name                                Status    Ports
---- -------------------------------     --------- -------------------------------
1    default                             active    F0/5, F0/6, F0/7,
F0/8
                                                   F0/9, F0/10, F0/11,
F0/12
                                                   F0/13, F0/14, F0/15,
F0/16
                                                   F0/17, F0/18, F0/19,
F0/20
                                                   F0/21, F0/22, F0/23,
F0/24
10 TKJ                                   active    F0/1, F0/2
20 MM                                    active    F0/3, F0/4
1002 fddi-default                        act/unsup act/
1003 token-ring-default 1004 fddinet-    unsup act/
default
1005 trnet-default                       unsup act/
                                         unsup
```

Try pinging the same vlan:

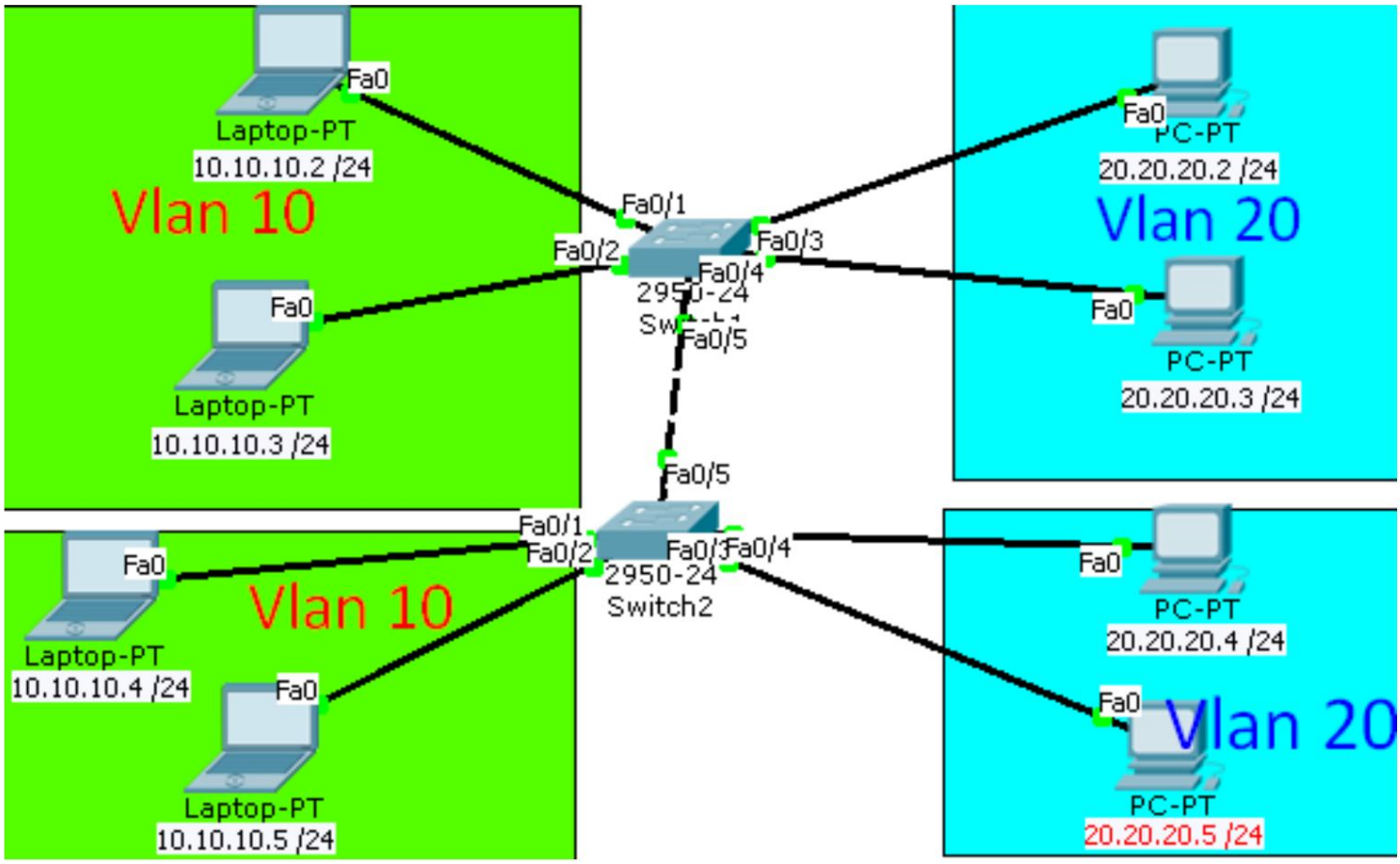
PC 1 VLAN 10 to PC 2 VLAN 10 one VLAN (same VLAN) or vice versa

```
PC>ping 10.10.10.3

Pinging 10.10.10.3 with 32 bytes of data:

Reply from 10.10.10.3: bytes=32 time=64ms TTL=128
Reply from 10.10.10.3: bytes=32 time=0ms TTL=128
Reply from 10.10.10.3: bytes=32 time=0ms TTL=128
Reply from 10.10.10.3: bytes=32 time=0ms TTL=128

Ping statistics for 10.10.10.3:
        Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 64ms, Average = 16ms
```

Ping Also vice versa to test whether everything is correct

#LAB 7 # Connecting Between Switches with TRUNK

To connect a switch to a switch, use a cross cable. Connect the cross to each switch. The connection between switches that is used to pass several VLANs is called a trunk. So that the VLAN can ping neighboring VLANs, which of course are the same, we can use this trunk



CONFIGURE:

Still continuing the previous lab but this time we do the same thing as we did earlier, create the VLAN and enter (Asign VLAN), just add the Trunk command

Switch 1 :

```
Switch(config)#int f0/5
Switch(config-if)#switchport mode trunk
```

Switch 2 :

```
Switch(config)#int fa0/5
Switch(config-if)#switchport mode trunk
```

Try checking:

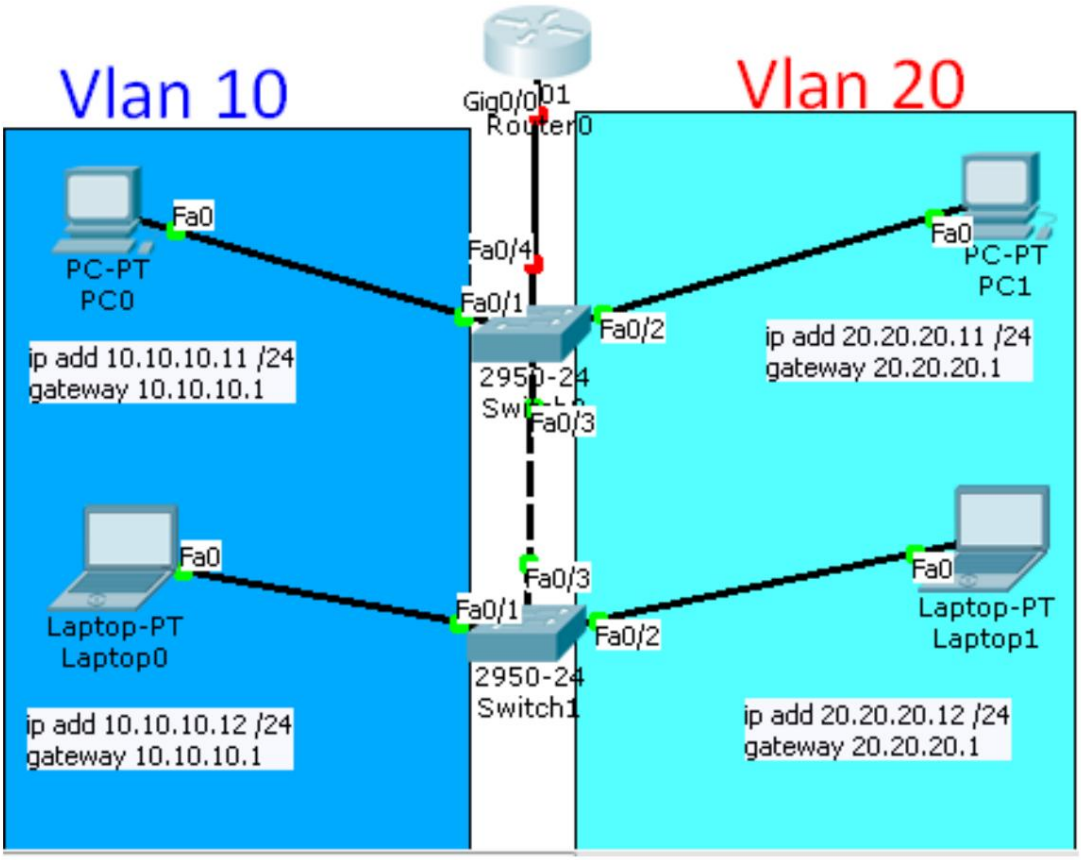
```
Switch#show int trunk
Port        Mode         Encapsulation Status 802.1q        Native vlan
F0/5        on           trunking                           1

Port        Vlans allowed on trunk
F0/5        1-1005

Port        Vlans allowed and active in management domain
F0/5        1,10,20

Port        Vlans in spanning tree forwarding state and not pruned
F0/5        1,10,20
```

Try pinging the same VLAN but different Switch: Ping from PC 10. 10. 10. 2 to 10. 10. 10. 5 or even from 20. 20. 20. 2 to 20. 20. 20. 5

```
PC>ping 10.10.10.5

Pinging 10.10.10.5 with 32 bytes of data:

Reply from 10.10.10.5: bytes=32 time=27ms TTL=128
Reply from 10.10.10.5: bytes=32 time=0ms TTL=128
Reply from 10.10.10.5: bytes=32 time=15ms TTL=128
Reply from 10.10.10.5: bytes=32 time=18ms TTL=128

Ping statistics for 10.10.10.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 27ms, Average = 15ms
```

If you can, it means we can connect to the same VLAN on a different switch

#LAB 8# Connecting Different VLANs With Routers



To connect different VLANs we need a router (which functions as a tool that connects different networks) so that we can introduce different VLANs by creating a gateway for VLANs 10 and 20 by creating a sub interface which is useful for introducing different VLAN IPs. ,yes(gatway for valan)

Connfigure:

Switch 1

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config)#vlan 20
```

Switch 2

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
```

```
Switch(config)#vlan 20
```

Assign its Port Vlan

Switch 1

```
Switch(config)#int fa0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#int fa0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
```

Switch 2

```
Switch(config)#int fa0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#int fa0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
```

Trunking ;

Switch 1

```
Switch(config)#int fa0/3
Switch(config-if)#switchport mode trunk
Switch(config)#int fa0/4
Switch(config-if)#switchport mode trunk (Trunk Untuk Ke router)
```

Switch 2

```
Switch(config)#int fa0/3
Switch(config-if)#switchport mode trunk
Switch(config-if)#
```

OK, this time we will touch the router, we will create a sub interface which functions as a gateway:

```
ROUTER(config)#int Fa0/0
 ROUTER(config-if)#no shut
 ROUTER(config)#int Fa0/0.10                    <<< (This is the SUB INTERFACE)
 ROUTER(config-subif)#encapsulation dot1q 10
 ROUTER(config-subif)#ip addr 10.10.10.1 255.255.255.0
 ROUTER(config)#int Fa0/0.20 <<<(Ini SUB INTERFACE nya)
 ROUTER(config-subif)#encapsulation dot1q 20
 ROUTER(config-subif)#ip addr 20.20.20.1 255.255.255.0
```

Verification is Chek;

```
Router#sh ip int br
Interface                  IP-Address OK? Method Status Protocol
FastEthernet0/0            unassigned YES unset up 10.10.10.2 YES manual up    up
FastEthernet0/0.10         20.20.20.1 YES manual up                            up
FastEthernet0/0.20                                                             up
```

KemudianPing:

```
PC>ping 20.20.20.11

Pinging 20.20.20.11 with 32 bytes of data:

Reply from 20.20.20.11: bytes=32 time=14ms TTL=127
Reply from 20.20.20.11: bytes=32 time=17ms TTL=127
Reply from 20.20.20.11: bytes=32 time=16ms TTL=127
Reply from 20.20.20.11: bytes=32 time=30ms TTL=12
```

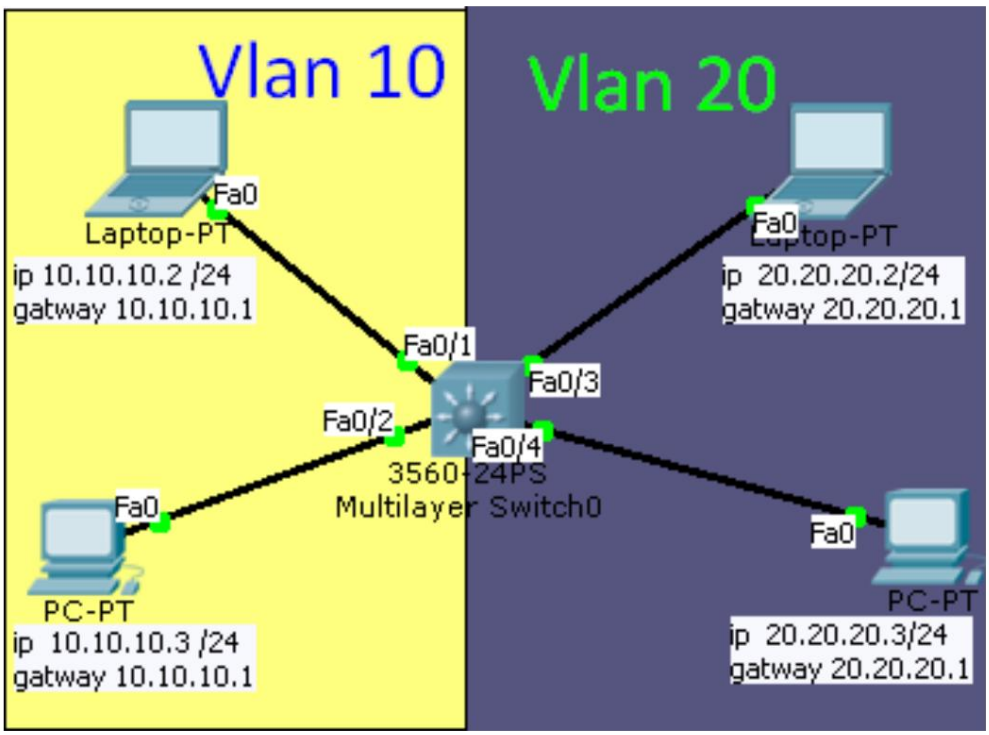
```
PC>ping 10.10.10.11

Pinging 10.10.10.11 with 32 bytes of data:

Reply from 10.10.10.11: bytes=32 time=44ms TTL=127
Reply from 10.10.10.11: bytes=32 time=13ms TTL=127
Reply from 10.10.10.11: bytes=32 time=10ms TTL=127
Reply from 10.10.10.11: bytes=32 time=28ms TTL=127
```

OK, this time we can ping to a different vlan….

Sip,,,,

#LAB 9#Creating VLANs in Multilayer Switches

This time we will use a unique device, namely a multi layer switch, this switch works on layers between 2-3 and/or layer 2.5 because, using the switch's skability and router's data transfer speed, so with this tool we can connect different networks just with this switch alone without a router, but this tool is still inferior to a router because it can only create and introduce VLANs. How cool is this tool? Let's just try it;



Make the

```
Vlan switch(config)#vlan 10
switch(config)#vlan 20
```

As usual Asign To port

```
switch(config)#int fa0/1
Switch(config-if)#switchport mode access
switch(config-if)#switchport access vlan 10
switch(config)#int fa0/2
Switch(config-if)#switchport mode access
switch(config-if)#switchport access vlan 10
switch(config)#int fa0/3
Switch(config-if)#switchport mode access
switch(config-if)#switchport access vlan 20
```

```
switch(config)#int fa0/4
Switch(config-if)#switchport mode access
switch(config-if)#switchport access vlan 20
```

Configure each different VLAN

```
switch(config)#int vlan 10
switch(config-if)#ip address 10.10.10.1 255.255.255.0
switch(config)#int vlan 20
switch(config-if)#ip address 20.20.20.1 255.255.255.0
```

Enable ip route to be able to route to different vlans:

```
switch(config)#ip routing
```

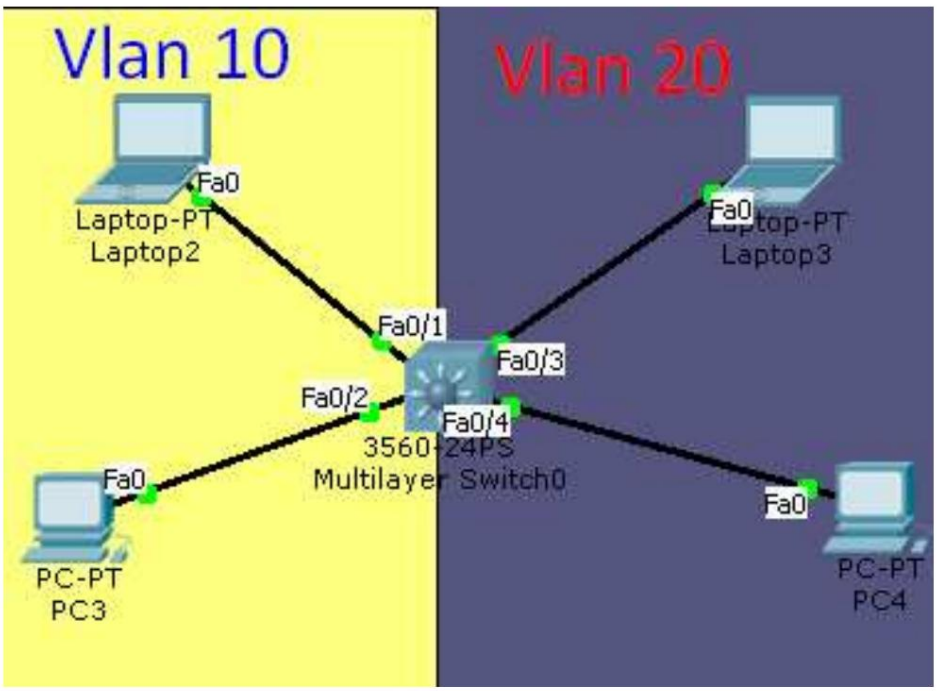
Verify it

```
Switch#show ip int br
Interface IP-Address FastEthernet0/1 unassigned          OK?   Method      Status Protocol
FastEthernet0/2 unassigned FastEthernet0/3 unassigned    YES   unset         up        up
FastEthernet0/4 unassigned FastEthernet0/5 unassigned    YES   unset         up        up
FastEthernet0/6 unassigned FastEthernet0/7 unassigned    YES   unset         up        up
FastEthernet0/8 unassigned FastEthernet0/9 unassigned    YES   unset         up        up
FastEthernet0/10 unassigned FastEthernet0/11 unassigned  YES   unset         down      down
FastEthernet0/12 unassigned GigabitEthernet0/1           YES   unset         down      down
unassigned GigabitEthernet0/2 unassigned Vlan1           YES   unset         down      down
unassigned Vlan10 10.10.10.1                             YES   unset         down      down
                                                         YES   unset         down      down
                                                         YES   unset         down      down
                                                         YES   unset         down      down
                                                         YES   unset         down      down
                                                         YES   unset         down      down
                                                         YES   unset         down      down
                                                         YES   unset administratively down down
                                                         YES   manual up     up
Vlan20                      20.20.20.1                   YES   manual        up        up
```

You can definitely ping each different VLAN...

#LAB 10#Creating DHCP on a Multilayer switch

Apart from being able to use it to connect different networks, we can also create DHCP (i.e. create an automatic (dynamic) IP add distribution). Just go straight to the scene, still using the configuration above. so just configure it straight away

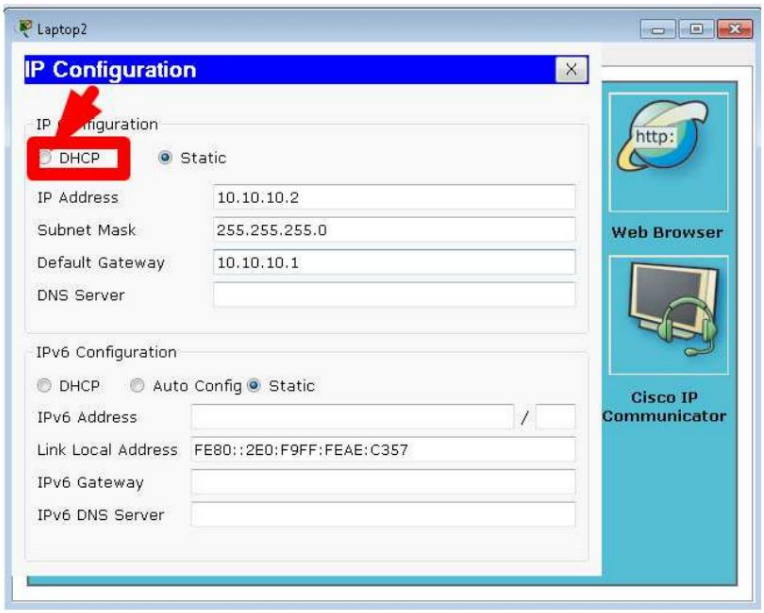


Configure:

Add the DHCP server configuration

```
switch(config)# ip dhcp pool VLAN10
switch(dhcp-config)# network 10.10.10.0 255.255.255.0
switch(dhcp-config)# dns-server 8.8.8.8
switch(dhcp-config)# default-router 10.10.10.1
switch(config)# ip dhcp pool VLAN20
switch(dhcp-config)# network 20.20.20.0 255.255.255.0
switch(dhcp-config)# dns-server 8.8.8.8
switch(dhcp-config)# default-router 20.20.20.1
```

After that, we just need to obtain from static download to DHCP download on each PC:



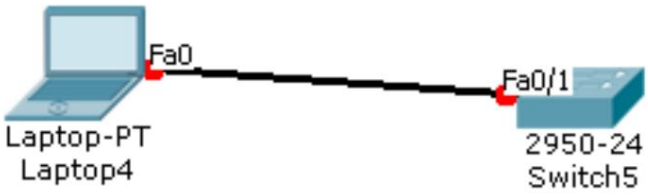
Just wait a moment then we will get the DHCP IP

If we want not to allocate some IPs that are blinded by the DHCP server, the then we add configuration is below:

```
switch(config)# ip dhcp excluded-address 10.10.10.1 10.10.10.10
switch(config)# ip dhcp excluded-address 20.20.20.1 20.20.20.20
```

With this configuration we allocate the IP according to what we want, if from VLAN 10 then starting from **10.10.10.11- 10.10.10.255 (because 10.10.10.1- 10.10.10.10) in Exclude** cannot be allocated, likewise Vlan 20 can have an IP starting from **20.20.20.21-20.20.20.255 .**

#LAB 11# Spanning Tree Portfast



In real situations, when we first turn on the switch and then plug it into our switch port, basically it will take time, which has been determined by the switch itself, where when we first plug in the cable, the port will not be as fast as green (forwarding). but orange first. Therefore, there is a way that we can quickly **turn the light green with "Port fast".**

In the switch there are processes carried out by the switch itself, of which at this time there are stages of the process, starting from blocking ÿ listening ÿ learning ÿ Forwarding and each of these processes requires time and the total time required is 50 seconds:

```
Blocking ----------> Listening ----------> Learning ----------> Forwarding
     (Max Age;optional)          (Forward Delay)          (Forward Delay)
          20 S                        15 S                     15 S
```

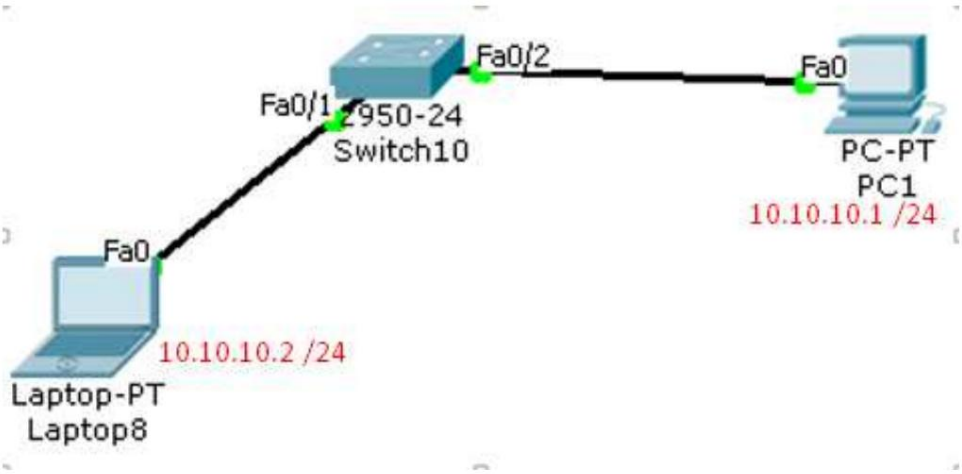
CONFIGURE :

```
SW1(config)# interface range fastethernet0/1 - 4
SW1 (config-if)# spanning-tree portfast
```

Immediately we try to remove the PC cable and Enter it again and see the difference faster then why?

Because this fast port skips directly from the blocking process directly to the forwarding process, that is what causes the fast port to be green (forwarding).

#LAB 12# Securing Ports



One day we are in a situation where we act as a server, then we want this port not to be accessible to other clients, or suddenly someone enters the port directly without knowing (creeaker) we can provide a security system for our port. to deal with undesirable events.

First, give each PC an IP then try pinging it, then configure it like this:

```
PC>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time=14ms TTL=128
Reply from 10.10.10.1: bytes=32 time=1ms TTL=128
Reply from 10.10.10.1: bytes=32 time=10ms TTL=128
Reply from 10.10.10.1: bytes=32 time=10ms TTL=128

Ping statistics for 10.10.10.1:
        Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 14ms, Average = 8ms
```

CONFIGURE

```
interface FastEthernet0/1
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security violation shutdown

interface FastEthernet0/2
switchport mode access
switchport port-security
switchport port-security mac-address sticky
switchport port-security violation Restrict
```

Verification : **"** show **port-security"**

Secure Port	MaxSecureAddr (Count)	CurrentAddr (Count)	SecurityViolation (Count)	Security Action
F0/1	1	1	4	Restrict
F0/2	1	1	1	Shutdown

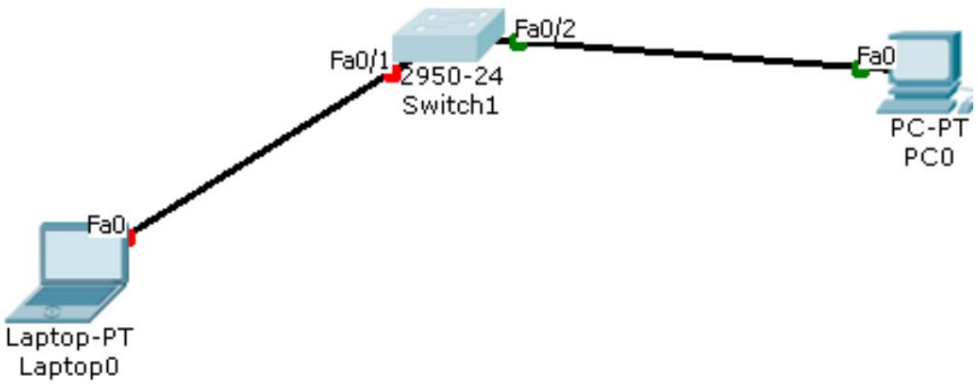
There are 3 Violations that we can choose according to our needs:

1.protect: data sent via this port will not be sent

2.restrict: like protect but by sending notifications with SNMP

3.shutdown: the port will be shutdown automatically to return it to shutdown again, the port will be manually then "no shutdown" again.

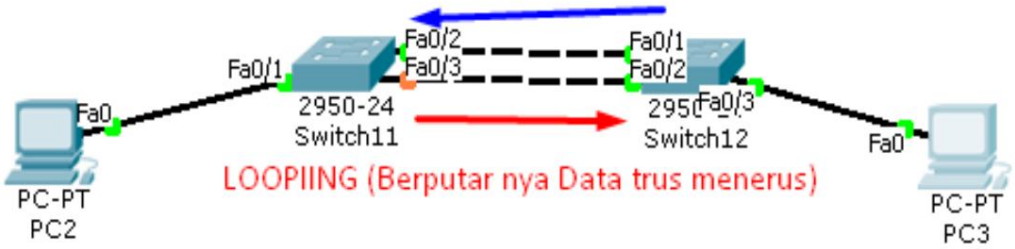
Then unplug the cable from the laptop, plug it back in and look at the port between the two, it will automatically be blocked



Try pinging again and you definitely won't be able to ping because the port has been blocked.

```
PC>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 10.10.10.2:
        Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

#LAB 13# Spanning Tree Protocol (STP)



One case is when we create two link lines which are useful for connecting two different switches, at this time it is prone to Looping (data rotating without reaching its destination) **which causes the final result to be "Down".**

The illustration is like this, when we first create a new topology like above, at that time PC2 and Switch 11 don't recognize each other yet, likewise, Switch 12 and PC 3 send data to PC 3, which and pc2 wants both of them don't recognize yet, the first thing What PC 2 does **is ask the identity of PC3 to switch 11 and SW 11 answers "I don't know" then ask** again via the first line (fa0/2- **F0/1) then ask SW 12 and SW 12 answers 'don't know either" then I will come back again and ask the link at the bottom** (fa0/2-fa0/3) and finally go to sw11 and so on until the final result is that the link will be down.

In this Cisco STP device, it is already the default without us setting it, but to overcome errors we can use **this STP so that "LooPing" does not occur .**

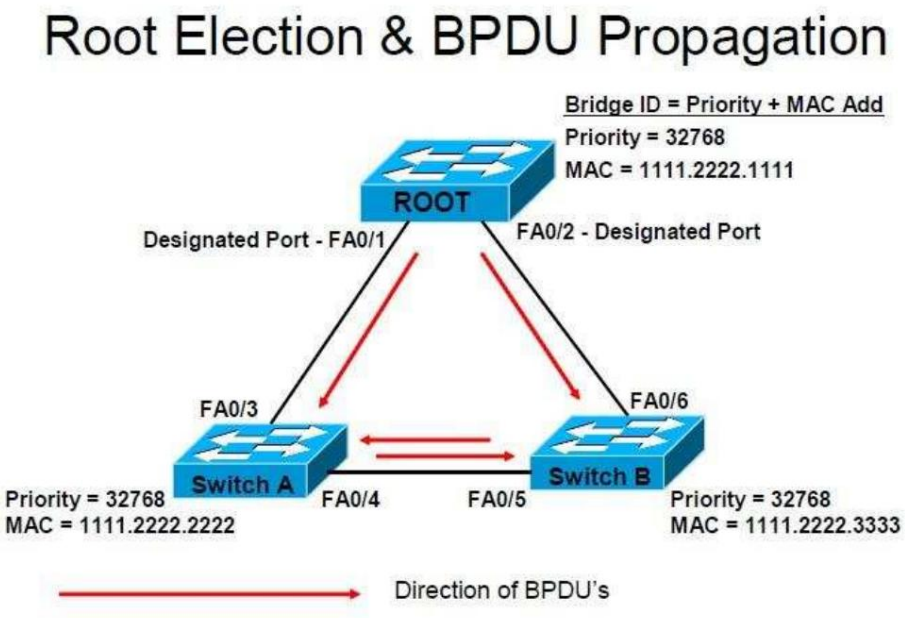
By using this STP mechanism, one of the ports becomes Port Blocking so that only one link is used to prevent loops (the second link is a backup). then if the main link suddenly goes down then the blocking port will become forward,

In the spanning tree there is a switch which becomes the root bridge (Mean Link/main link used):

1. The root bridge switch is selected based on the lowest priority, if all the values are the same then The lowest Mac will be selected (becomes the main link)

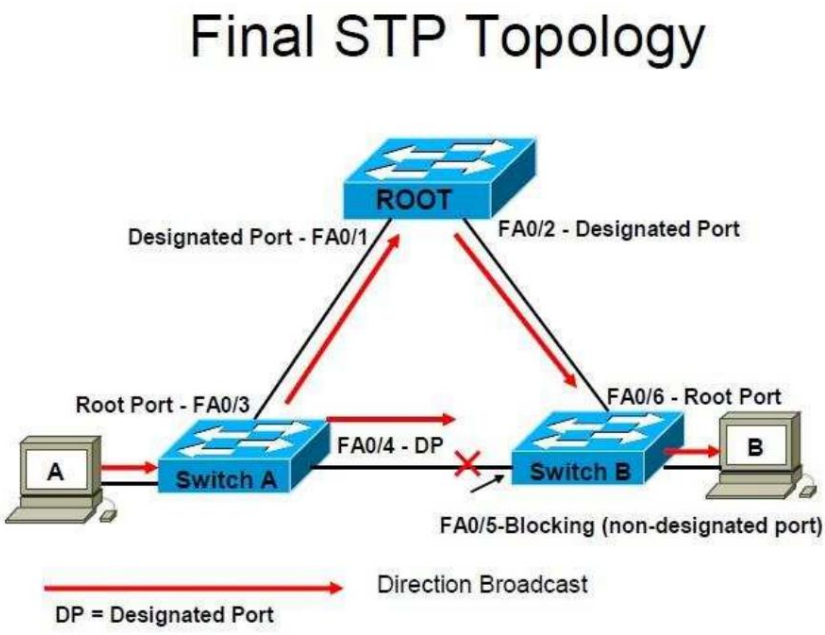
2. Meanwhile, on the switch that has the highest priority ma, the port will be blocked (the link is blocked/ one time it can be used as a backup link) if the main link suddenly goes down.

There are each ports, some are called root ports, designated ports, blocking ports 1. On the route bridge, all the ports are designated ports 2. Designated ports: ports on the switch whose direction is away from the root bridge 3. Rot ports are ports on switch whose direction is towards the root bridge



BPDU (Bridge Protocol Data Unit / Message for requesting information)

After the process of determining the root bridge is complete, port blocking will be carried out on the port that has been determined, namely the largest Mac and its priority.



Still the same topology as before:

CONFIGURE:

Sw 11

```
SW11#show spanning-tree
  VLAN0001
    Spanning tree enabled protocol ieee
                        Root ID Priority 32769
                        Address 0001.C926.B750
                        Cost 19 Port
                        1(FastEthernet0/1)
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

         Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
                        Address 0060.4713.D9D6
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
                        Aging Time 20

Interface               Role Sts Cost Prio.Nbr Type
----------------

F0/1                    Root FWD 19 128.1                P2p
F0/2                    Gold BLK 19 128.2                P2p
```

Indicates that a port is blocked

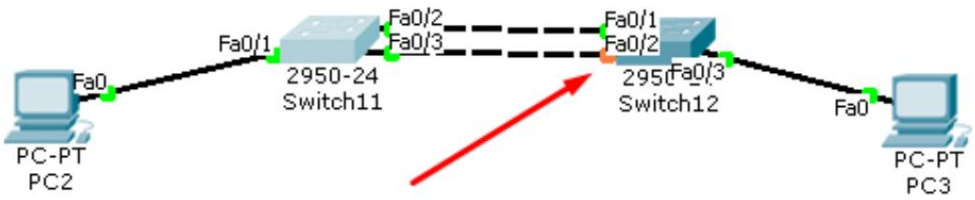
Sw12:

```
SW12#show spanning-tree
  VLAN0001
    Spanning tree enabled protocol ieee
                        Root ID Priority 32769
                        Address 0001.C926.B750
                        This bridge is the root
                        Cost 19
                        Port 1(FastEthernet0/1)
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

         Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
                        Address 0060.4713.D9D6
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
                        Aging Time 20

Interface               Role Sts Cost Prio.Nbr Type
----------------

F0/1                    Desk FWD 19 128.1 Desk FWD       P2p
F0/2                    19 128.2                         P2p
```

Now we try to move the rootbridge configuration to SW 11:

```
SW11(config)# spanning-tree vlan 1 priority 0
```

Note the change in port blocking:



Sw 11

```
SW11#show spanning-tree
 VLAN0001
   Spanning tree enabled protocol ieee
                        Root ID Priority 32769
                        Address 0001.C926.B750
                        This bridge is the root
                        Cost 19
                        Port 1(FastEthernet0/1)
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

       Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
                        Address 0060.4713.D9D6
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
                        Aging Time 20

Interface               Role Sts Cost Prio.Nbr Type
----------------
F0/1                    Desk FWD 19 128.1 Desk FWD      P2p
F0/2                    19 128.2                        P2p
```

Sw 12

```
SW12#show spanning-tree
 VLAN0001
   Spanning tree enabled protocol ieee
                        Root ID Priority 32769
                        Address 0001.C926.B750
                        Cost 19
                        Port 1(FastEthernet0/1)
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

       Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
                        Address 0060.4713.D9D6
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
                        Aging Time 20

Interface               Role Sts Cost Prio.Nbr Type
----------------
F0/1                    Root FWD 19 128.1               P2p
F0/2                    Gold BLK 19 128.2               P2p
```

#LAB 14# Adding Bandwidth Value

(Cost value will rise anyway)

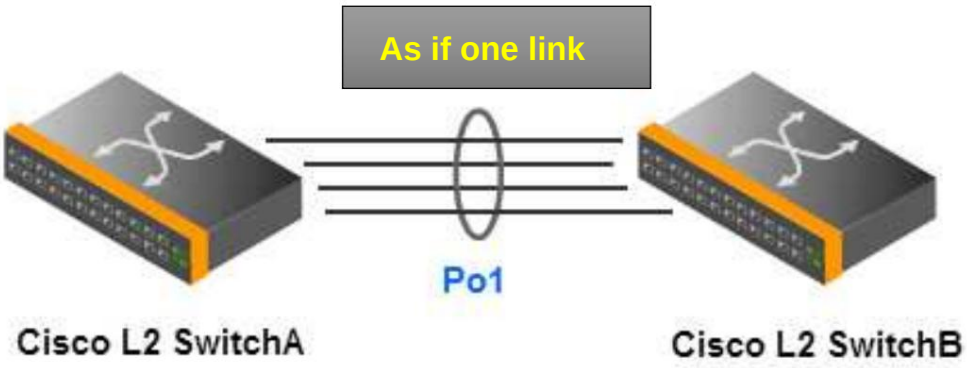
Ok, still continuing the lab above / the previous one, this time we will play around with it adding the Badwidth value which value will also add the Cost value.
Bandwidth value This is the data transfer speed when sending data, so if we add the bandwidth value, our data transfer will be faster.

CONFIGURE :

On Swa 12

```
SW11>enable
SW11#conf t
SW11(config)#int f0/1
SW11(config-if)#speed 10
SW11(config-if)#do show spanning-tree
VLAN0001
    Spanning tree enabled protocol ieee
                        Root ID Priority 32769
                        Address 0001.C926.B750
                        Cost 19
                        Port 1(FastEthernet0/1)
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

      Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
                        Address 0060.4713.D9D6
                        Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
                        Aging Time 20

Interface               Role Sts Cost Prio.Nbr Type
----------
-
F0/1                    Root FWD 100 128.1          P2p
F0/2                    Gold BLK 19 128.2           P2p
```

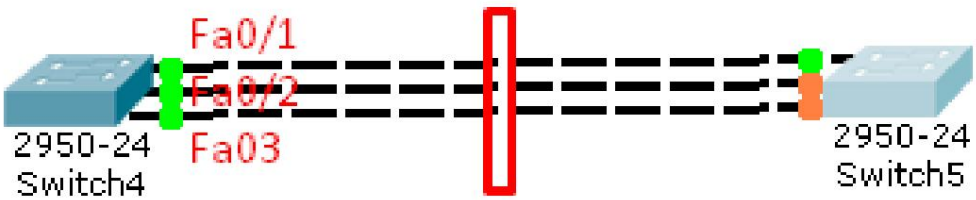
#LAB 15# ETHERCHANNEL



This time we will learn about Etherchannel, what Etherchannel is directly.
On a switch, if we connect several cables, because of the Spanning tree mechanism, not all links are used to transmit data because one of the ports is blocking, for that we can use this Etherchannel, namely by bundling these 3 links into just one link, with Thus all active links are used to transmit data.

There are 3 types of etherchannel:
1. L2 LACP (open standard) Available on all Vendors/
Devices 2. L2 PAGP (Cisco proprietary) Only available on
Cisco devices 3
L3 ETHerchannel Note: L2 (is Layer 2) and L3 (is Layer 3)

Let's try the L2 LACP:



CONFIGURE :

SW 4

```
SW4(config)#int range fa0/1 - 3
SW4(config-if-range)#channel-group 1 mode active
SW4(config-if-range)#int port-channel 1
SW4(config-if)#switchport mode trunk
```

SW 5

```
SW.KANAN(config)#int range fa0/1 - 3 SW.KANAN(config-if-
range)#channel-group 1 mode active
SW.KANAN(config-if-range)#int port-channel 1
SW.KANAN(config-if)#switchport mode trunk
```

The mode we choose can be active-passive or active-active. The port except Passives should not be used because will not function like Etherchannel.

Verification:

```
Switch>en
Switch#sh et
Switch#sh etherchannel su
Switch#sh etherchannel summary
Flags: D - down                    P - in port-channel
       I - stand-alone s - suspended
       H - Hot-standby (LACP only)
       R - Layer3                  S - Layer2
       U - in use f - failed to allocate aggregator
       u - unsuitable for bundling
       w - waiting to be aggregated
       d - default port


Number of channel-groups in use: 1
Number of aggregators: 1

Group Port-channel Protocol                    Ports
------+-------------+-----------+-----------------------------------------------
_

1          Po1(SU)                 LACP Fa0/1(P) Fa0/2(P) Fa0/3(P)
```

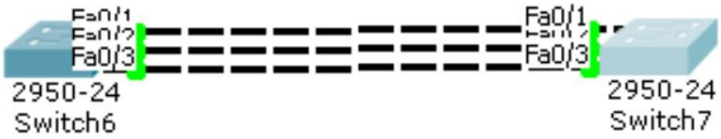
NOTE:

"Po 1 **is a collection of three links which are made into one link"**

#LAB 16# Etherchannel Part 2

OK, thanks for the above / before, this time we will try how to use the other two ether channels, we will try configuring the Etherchannel L2 PaGP

Create a new topology again:



CONFIGURE:

SW 6

```
Switch>en
Switch#conf t Enter
configuration commands, one per line. End with CNTL/Z.
SW6(config)#int range fa0/1 - 3 SW6(config-if-
range)#channel-group 1 mode desirable
SW6(config-if-range)#int port-channel 1 SW6(config-if)#switchport mode
trunk
```

SW 7

```
Switch>en
Switch#conf t Enter
configuration commands, one per line. End with CNTL/Z.
SW7(config)#int range fa0/1 - 3 SW7(config-if-
range)#channel-group 1 mode desirable
SW7(config-if-range)#int port-channel 1 SW7(config-if)#switchport mode
trunk
```

Verification

```
Switch#sho etherchannel summary
Flags: D - down                    P - in port-channel
       I - stand-alone s - suspended
       H - Hot-standby (LACP only)
       R - Layer3                  S - Layer2
       U - in use f - failed to allocate aggregator
       u - unsuitable for bundling
       w - waiting to be aggregated
       d - default port
Number of channel-groups in use: 1
Number of aggregators: 1

Group Port-channel Protocol                    Ports
------+-------------+-----------+-----------------------------------
_

1          Po1(SU)                 PAgP Fa0/1(P) Fa0/2(P) Fa0/3(P)
```

#LAB 17# VTP (Virtual Trunking Protocol)

If we are in a task where we have to create many VLAN configurations with different switches, what should we do? Do we have to create all the VLANs or one by one? This time I will tell you that there is a faster way to handle cases like that, we just **solve the problem straight away...**

With VTP, we can create a large number of VLANs on just one switch and the others will automatically be created the same. (Same data base for all switches)

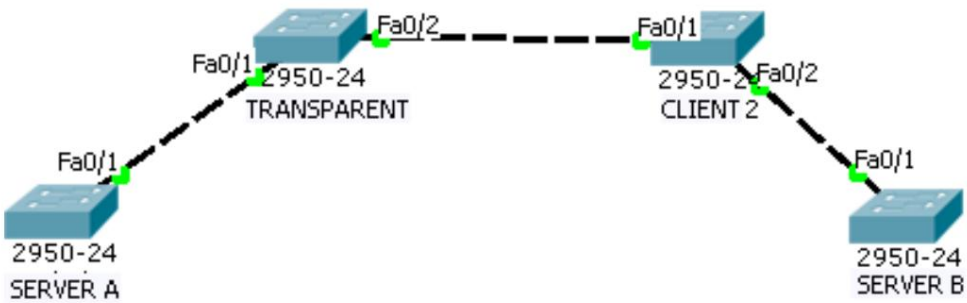
In this VTP there are 3 modes:

1. server: usually creates, edits and deletes, as well as processes VTP updates accept it. (If in this mode, for example, the server mode creates VLAN 10, the VTP update will automatically be sent to all switches and in client mode the same VLAN will be created as the one created by the server, namely VLAN 10).

2. VTP Transparent: usually create and change it, but only for yourself, not others (individual and manual), not advertised to other switches, the use of this VTP is only for forwarding (to skip) or just continue.

3. Client: cannot create and you can't change it, you can only process it, which usually gets advertising (introduction) from the server mode and then processes it.

The condition that this VTP can run must be on the same domain that will forward the VTP updates it receives to other switches.



CONFIGURE :

Make a trunk on each switch (sw **1-4)** the same:

```
SW1-4(config)# interface range fastethernet0/1 - 2
SW1-4(config-if)# switchport mode trunk
```

Create an IP on Vlan 1 (native Vlan/vlan automatically exists without being created):

SW1
```
SW1(config)# interface vlan 1
SW1(config-if)# ip address 10.10.10.1 255.255.255.0
SW1(config-if)#no shutdown
```

SW2
```
SW2(config)# interface vlan 1
SW2(config-if)# ip address 10.10.10.2 255.255.255.0
SW2(config-if)#no shutdown
```

SW3
```
SW3(config)# interface vlan 1
SW3(config-if)# ip address 10.10.10.3 255.255.255.0
SW3(config-if)#no shutdown
```

SW4
```
SW4(config)# interface vlan 1
SW4(config-if)# ip address 10.10.10.4 255.255.255. 0
SW4(config-if)#no shutdown
```

VTP configuration:

SW1
```
SW1(config)# vtp mode server
SW1(config)# vtp domain learn
SW1(config)# vtp password galau
```

SW2
```
SW2(config)# vtp mode transparent
SW2(config)# vtp learning domain
SW2(config)# vtp password galau
```

SW3
```
SW3(config)# vtp mode client
SW3(config)# vtp domain belajar
SW3(config)# vtp password galau
```

SW4

```
SW4(config)# vtp mode server
SW4(config)# vtp learning domain
SW4(config)# vtp secret password
```

Creating a New Vlan:

SW1

```
SW1(config)# vlan 10
SW1(config)# vlan 20
```

SW2

```
SW2(config)# vlan 30
SW2(config)# vlan 40
```

SW3

```
SW3(config)# vlan 50
SW3(config)# vlan 60
```

SW4

```
SW4(config)# vlan 70
SW4(config)# vlan 80
```

Verification: Look at all the switches. This time I checked on Switch 2 (transparent) Check on the other switches too:

```
Sw1#show vtp status
VTP Version capable : 1 to 3
VTP version running : 2
VTP Domain Name : learn
VTP Pruning Mode : Disabled
VTP Traps Generation : Disabled
Device ID : aabb.cc00.0600
Configuration last modified by 1.1.1.1 at 0-0-00 00:00:00
Feature VLAN:
—
VTP Operating Mode : Transparent
Maximum VLANs supported locally : 1005
Number of existing VLANs : 35 <<<<< number of vlans
Configuration Revision : 0
```

CHAPTER 2

ROUTER

ROUTER

A router is a special computer, a router has the same basic components as a desktop PC, a router has a CPU, memory, bus system, and many input/output interfaces. Routers are designed to perform special tasks that desktop PCs cannot. For example, a router connects and allows communication between two networks and determines the data path through the network connection. So in essence a router is a connector for different networks.

And this router is closely related to WAN (Wide Area Network), because usually routers can be used on a scale that has a wide coverage. Between provinces – between countries, etc.

WAN characteristics:

a) Has a wide geographic area b) Uses
provider services c) Uses serial
connections of various types

Components in a WAN: a) Router b) Switch c)
Modem d)

Communication Server (Provider)

The WAN standard was developed by:
a) ITU-T (International Telecommunication U
Standardization Sector), originally named CCITT (CoInternational Telegraph and Telephone) b) ISO (International Organization for Standardization) OS switches and routers that do not have a keybody are configured with a PC with a rollover cable. c) IETF (Internet
Engineering Task Force) d) EIA (Electronic
Industry Association)

Physical layer component router : a)
RAM (DRAM)
b) NVRAM
c) Flash
d) ROM

e) Interface

Random Access Memory (RAM) / Dynamic RAM (DRAM
a) Menyimpan routing table
b) Menyimpan ARP cache
c) Fast-switching cache
d) Packet buffering
e) Sifatnya volatile
f) Running-config

Non Volatile Random Access Memory (NVRAM)
a) Menyimpan startup-configuration
b) Sifatnya non volatile

Flash memory
a) Stores the Internetworking Operating System (IOS) b)
is non-volatile

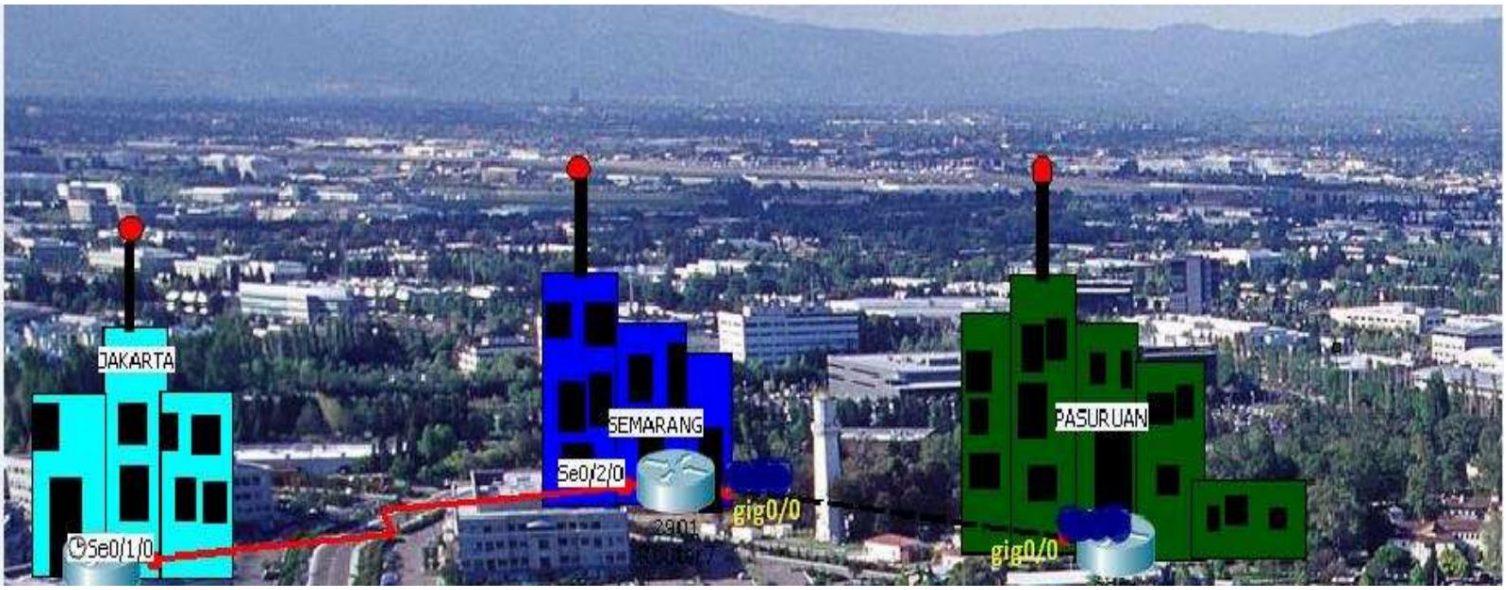
Read Only Memory (ROM)
a) Useful for Power On Self Test (POST) b)
Saves basic IOS configuration

Routers are at Layer 3 (network layer) and can perform routing functions which
include: a)
Best path (selection of the best path to skip) b) Switching
to destination based on network (in the routing table)

Routers have 3 main interfaces :

a) LAN interface: for example fast Ethernet
b) WAN interface: serial connection
c) Management port: console for router configuration

#LAB 18# Static Route



Static route is routing where the patch/path is determined by the network administrator into the router to determine how the router will reach a particular subnet using a particular path. IG:

```
router(config)# ip route A.B.C.D (destination network/host) A.B.C.D (subnet mask)
ABCD (Next Hop/Neighbor IP)
```

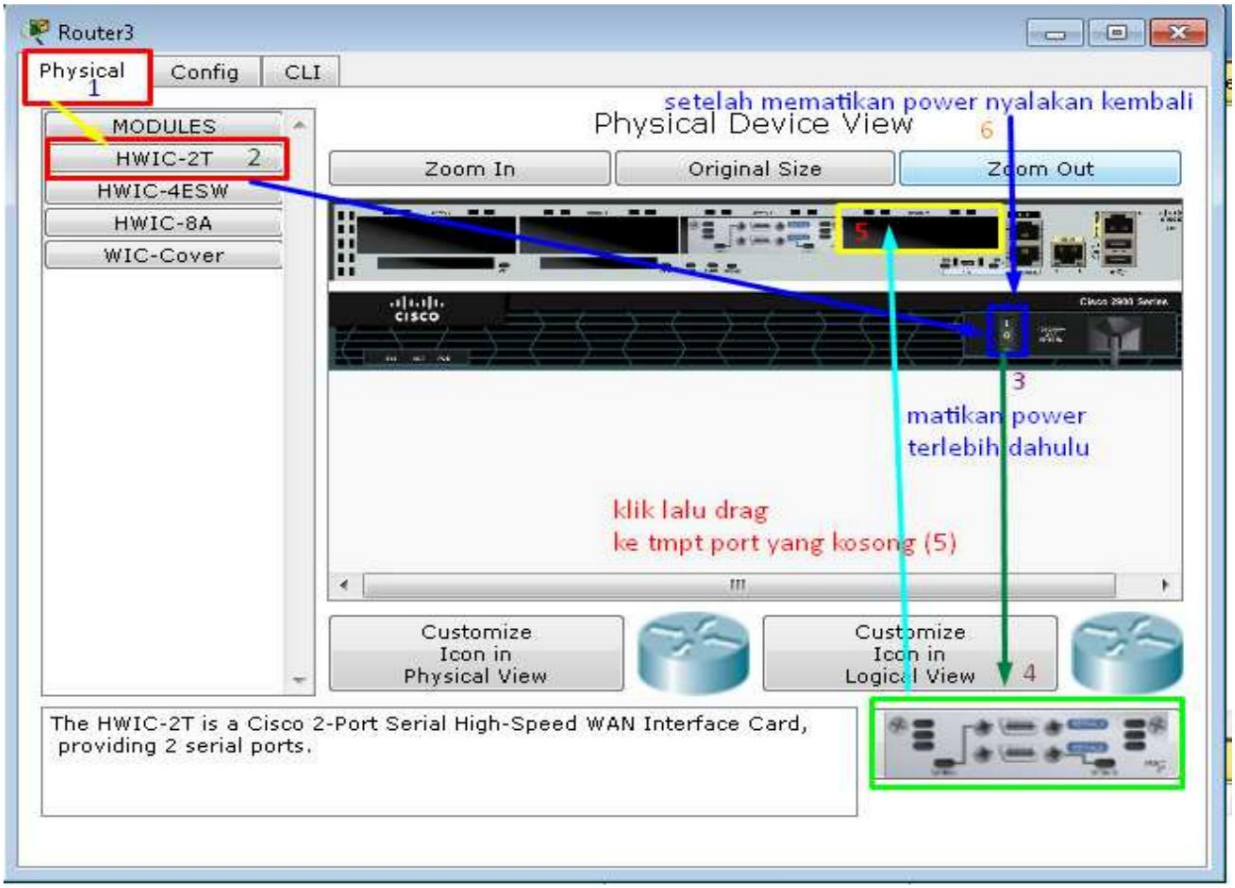
Another way to determine the next hop besides using IP add is to use the port name, for example: ethernet0, E0, s0/0, fa0/1 and others.

```
router(config)# ip route A.B.C.D (destination network/host) A.B.C.D (subnet mask)
   S 0/0 (Next Hop/IP Neighbor)
```

Just go straight to the lab, because we will practice it as in its original state, we will use a serial port and fast Ethernet, the topology is as above.

But beforehand, how to add a serial port or fe because usually the serial cable hasn't been installed in our port, so we have to install it first.

Router 1: follow the method below to add a port if it is not available:



Router 2 is the same as the one above!!! using and the third router is not necessary ,because we will the existing gigabit / gig port.

CONFIGURE :

Jakarta router

```
Router#conf t
Router(config)#line vty 0 4 Router(config-
line)#login local Router(config)#enable secret cisco
Router(config)#username cisco password cisco
Router(config)#hostname JAKARTA JAKARTA(config)#int se0/1/0
JAKARTA(config-if)#ip addr 10.10.10.2 255.255.255.252
JAKARTA(config-if)#no shutdown
JAKARTA(config-if)#exit JAKARTA(config)#ip route 192.168.0.0 255.255.255.252 10.10.10.1
```

This password is used for security on the router, the password is the same as a Cisco router _____

Semarang Routers

```
Router#conf term
Router(config)#line vty 0 4 Router(config-
line)#login local Router(config)#enable secret cisco
Router(config)#username cisco password cisco
Router(config)#hostname SEMARANG SEMARANG(config)#int se0/2/0
SEMARANG(config-if)#ip addr 10.10.10.1
255.255.255.252 SEMARANG(config-if)#no shut
SEMARANG(config-if)#exit SEMARANG(config)#int gig0/0 SEMARANG(config-if)#ip addr
192.168.0.1 255.255.255.252 SEMARANG(config-
if)#no shut SEMARANG(config-if)#exit
```

This password is used for security on the router, the password is the same as a Cisco router _____

Pasuruan Routers

```
Router#conf t
Router(config)#line vty 0 4 Router(config-
line)#login local Router(config)#enable secret cisco
Router(config)#username cisco password cisco
Router(config)#hostname PASURUAN PASURUAN(config)#int gig0/0
PASURUAN(config-if)#ip addr 192.168.0.2
255.255.255.252 PASURUAN(config-if)#no
shut PASURUAN(config-if)#exit PASURUAN(config)#ip route 10.10.10.0 255.255.255.252
192.168.0.1
```

Verification:

“Show ip route”

Jakarta

```
Jakarta#sh ip route
        10.0.0.0/30 is subnetted, 1 subnets
C           10.10.10.0 is directly connected, Serial0/0/0
        192.168.0.0/30 is subnetted, 1 subnets
S       192.168.0.0 [1/0] via 10.10.10.1
```

Semarang

```
Semarang#sh ip route
        10.0.0.0/30 is subnetted, 1 subnets
C           10.10.10.0 is directly connected, Serial0/0/0
        192.168.0.0/30 is subnetted, 1 subnets
C           192.168.0.0 is directly connected, FastEthernet0/0
```

Pasuruan

```
Pasuruan#sh ip route
        10.0.0.0/30 is subnetted, 1 subnets
S           10.10.10.0 [1/0] via 192.168.0.1
        192.168.0.0/30 is subnetted, 1 subnets
C           192.168.0.0 is directly connected, FastEthernet0/0
```

Static rotation is marked with an **"s" and the Administrative Dintencee value is** 1

Try pinging all cities, make sure Jakarta and Pasuruan can be pinged then routing is running well.

```
JAKARTA#ping 192.168.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/14/43 ms
```

```
Pasuruan#ping 10.10.10.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/9/18 ms

Pasuruan#
```

#LAB 19# Dynamic Routing EiGRP

EIGRP (Enhanced Interior Gateway Routing Protocol) is proper/only available on the vendor from Cisco0(cisco propareatary). The advantage is that it is the only routing protocol that can carry out recalculations to determine the best path/route because it can directly use the Backup route, the best recalculation will be carried out if the backup also fails.

Including EiGRP Advantages:

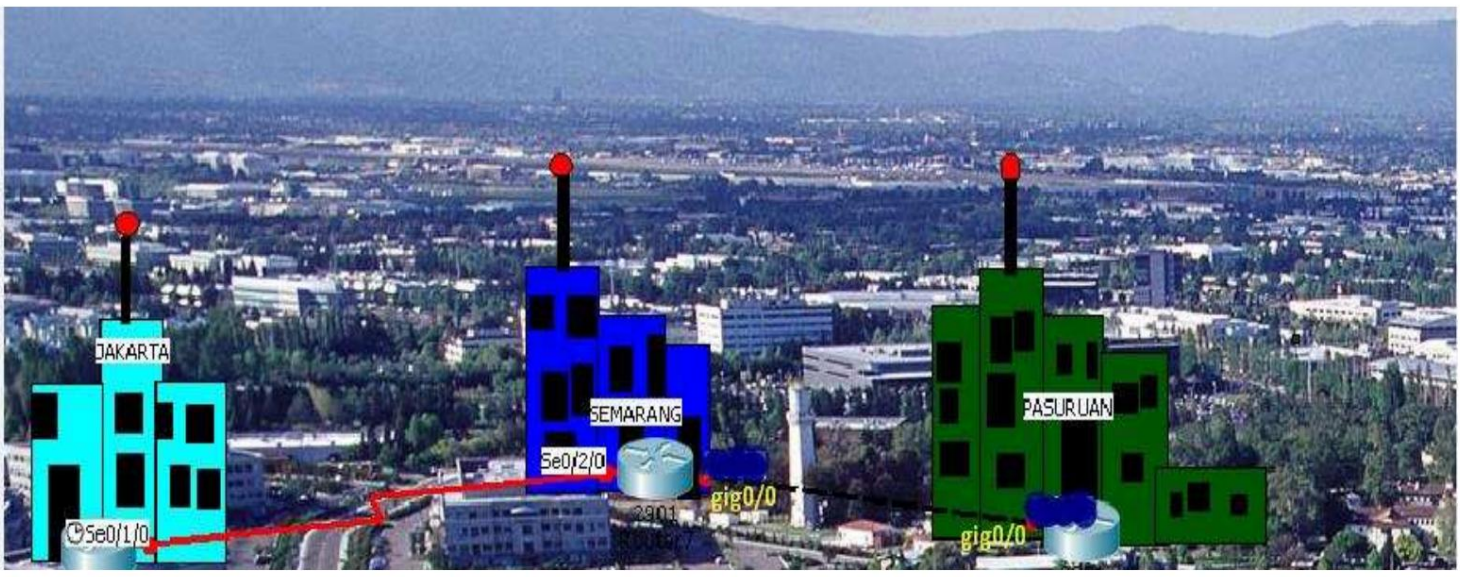
1. -Includes advanced distance vector protocol (Advanced distance Vector) 2. -Fast convergence time. 3. - supports VLSm
and discontiguous subnets (not contiguous/sequential)
4. -Load balancing, (via cost equal and Unequal routes) 5.
-selection of the best route using metrics

Metric Formula

$$256 * (K_1 * \mathbf{bw} + \frac{K_2 * \mathbf{bw}}{256 - \mathbf{load}} + K_3 * \mathbf{delay}) * \frac{K_5}{\mathbf{rel} + K_4}$$

- **bw** = 10^7 / minimum path bandwidth in kbps
- **delay** = interface delay in µsecs / 10

The topology still uses the previous one so that it doesn't take too long, delete the Static Route configuration Her:



Configure :

```
JAKARTA(config)#no ip route 192.168.0.0 255.255.255.252 10.10.10.1
```

```
PASURUAN(config)#no ip route 10.10.10.0 255.255.255.252 192.168.0.1
```

Jakarta

```
JAKARTA(config)#int loopback0
JAKARTA(config-if)#ip add 1.1.1.1 255.255.255.255
JAKARTA(config)#router eigrp 10
JAKARTA(config-router)#network 10.10.10.0
JAKARTA(config-router)#network 1.1.1.1
JAKARTA(config-router)#no auto-summary
```

Semarang

```
SEMARANG(config) #int loopback0
SEMARANG(config-if)#ip add 2.2.2.2 255.255.255.255
SEMARANG(config)#router eigrp 10
SEMARANG(config-router)#network 10.10.10.0
SEMARANG(config-router)#network 192.168.0.0
SEMARANG(config-router)#network 2.2.2.2
SEMARANG(config-router)#no auto-summary
```

Pasuruan

```
PASURUAN(config)#int loopback0
PASURUAN(config-if)#ip add 3.3.3.3 255.255.255.255
PASURUAN(config)#router eigrp 10
PASURUAN(config-router)#network 192.168.0.0
PASURUAN(config-router)#network 3.3.3.3
PASURUAN(config-router) #no auto-summary
```

Verification:

```
Jakarta#sh ip route
        1.0.0.0/32 is subnetted, 1 subnets
C           1.1.1.1 is directly connected, Loopback0
        2.0.0.0/32 is subnetted, 1 subnets
D           2.2.2.2 [90/2297856] via 10.10.10.1, 00:02:03, Serial0/0/0
        3.0.0.0/32 is subnetted, 1 subnets
D           3.3.3.3 [90/2300416] via 10.10.10.1, 00:01:16, Serial0/0/0
        10.0.0.0/30 is subnetted, 1 subnets
C           10.10.10.0 is directly connected, Serial0/0/0
        192.168.0.0/30 is subnetted, 1 subnets
D           192.168. 0.0 [90/2172416] via 10.10.10.1, 00:02:03, Serial0/0/0
```

D indicates that Dynamic EIGRP

90 Administrative Distance

2297856 number of mecticks to destination

Try pinging:

```
Jakarta#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 31/31/32 ms
```

Ping :

```
Jakarta#ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 34/53/63 ms
```

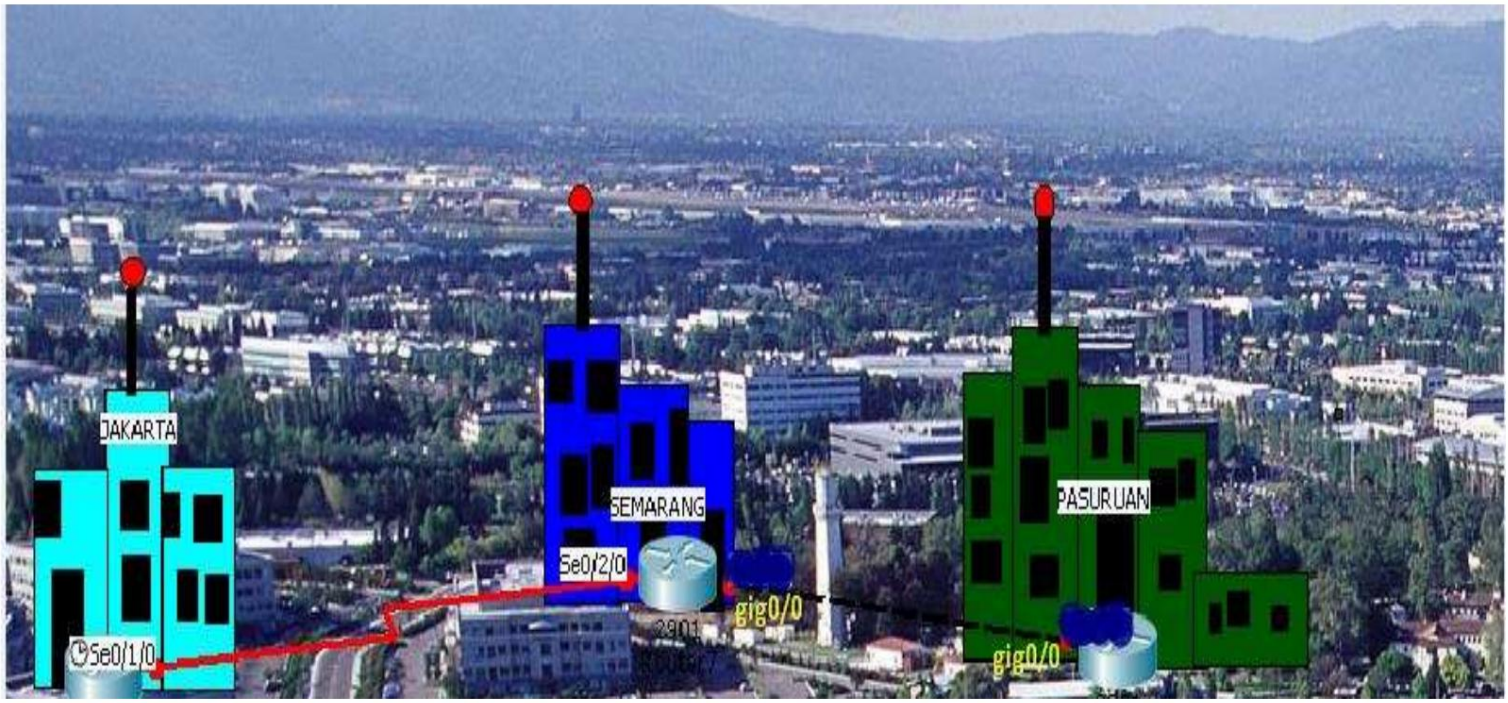
#LAB 20# RIP (Routing Information Protocol)

RIP is one of the distance vector type routing protocols, where RIP transmits Complete routing table to all active interfaces every 30 seconds. RIP uses to HOP COUNT determine the best path (best patch), the shortest hop count is chosen to be the path, but by default RIP has a maximum permitted hop count value, namely 15, if it exceeds that, for example 16, it is not considered (unreachable).

This RIP has a version that is updated every year so that it works even more optimally,

1. Version 1 only uses Classful Routing, which means all tools on the Network must use the same Subnet.
2. Version 2 provides something called prefix routing and usually sends subnet mask information along with Route updates (classful Routing).
3. RIPN (Rip Next Generation) is an update from version 2

However, even though this Rip is rarely used now because it is less efficient, namely (sending too many Routing Tables so that the router experiences Routing Table Flooding), it is good for us to learn about it too,



ConFigure :

Delete previous config:

```
JAKARTA(config)#no router eigrp 10
```

```
SEMARNG(config)#no router eigrp 10
```

```
PASURUAN(config)#no router eigrp 10
```

Jakarta

```
JAKARTA(config)#int loopback0
JAKARTA(config-if)#ip add 1.1.1.1 255.255.255.255 JAKARTA(config)#router
rip JAKARTA(config-router)#version 2
JAKARTA(config-router)#network 10.10.10.0
JAKARTA(config-router)#network 1.1.1.1 JAKARTA(config-
router)#no auto-summary
```

Semarang

```
SEMARANG(config) #int loopback0
SEMARANG(config-if)#ip add 2.2.2.2 255.255.255.255
SEMARANG(config)#router rip
SEMARANG(config-router)#version 2
SEMARANG(config-router)#network 10.10.10.0
SEMARANG(config-router)#network 192.168.0.0
SEMARANG(config-router)#network 2.2.2.2
SEMARANG(config-router)#no auto-summary
```

Pasuruan

```
PASURUAN(config)#int loopback0
PASURUAN(config-if)#ip add 3.3.3.3 255.255.255.255
PASURUAN(config)#router rip
PASURUAN(config-router)#version 2
PASURUAN(config-router)#network 192.168.0.0 PASURUAN(config-
router)#network 3.3.3.3 PASURUAN(config-router) #no
auto-summary
```

Try pinging between routers;

```
Jakarta#ping 3.3.3.3 Type
escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 34/53/63 ms
```

#LAB 21# OSPF (Open Shortest Path First)

OSPf: uses the Djikstra algorithm (where this algorithm calculates/ calculates all paths and looks for the shortest value/shortest path). First calculates the shortest path and selects the path by then collecting the routing table from each router and finally determining the destination (the goal).

OSPF has features:
-divided into areas and Autonomous systems (AS)
-minimizes routing update traffic -allows
scability (allows scability)
-Support VLSM/CIDR
-Unlimeted hop count
-Open standard (can be used other than Cisco protocol devices)

OSPf is a link-state routing protocol. The router knows exactly the topology of the network so as to minimize errors in routing decisions. This link-state algorithm is also known as the DJikstra algorithm or Shortest Path First (SPF) algorithm. OSPF is designed hierarchically, which means we can divide a large network into smaller networks or what are called Areas.

The reasons why OSPF is created hierarchically: -
reduce overhead routing - speed
up convergence - limit unstable
networks from spreading to other areas.
OSPF uses Cost to determine the best path

THE
FORMULA: Reference bandwidth is configured on the interface in Kbps. On Cisco routers, the default reference bandwidth is 100,000kbps.

CONFIGURE :

Same as before, just delete the previous config:

```
JAKARTA(config)#no router rip
```

```
SEMARANG(config)# no router rip
```

```
PASURUAN(config)# no router rip
```

Jakarta

```
JAKARTA(config)#router ospf 10
JAKARTA(config-router) #network 10.10.10.0 0.0.0.3 area 0
JAKARTA(config-router)#network 1.1.1.1 0.0.0.0 area 0
```

Semarang

```
SEMARANG(config)#router ospf 10
SEMARANG(config-router)#network 10.10.10.0 0.0.0.3 area 0
SEMARANG(config-router)#network 192.168.0.0 0.0.0.3 area 10
SEMARANG(config-router)#network 2.2.2.2 0.0.0.0 area 10
```

Pasuruan

```
PASURUAN(config)#router ospf 10
PASURUAN(config-router)#network 192.168.0.0 0.0.0.3 area 10
PASURUAN(config-router)#network 3.3.3.3 0.0.0.0 area 10
```

Verification:

```
Semarang#sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
Gateway of last resort is not set
     1.0.0.0/32 is subnetted, 1 subnets
O 1.1.1.1 [110/65] via 10.10.10.2, 00:08:02, Serial0/0/0
     2.0.0.0/32 is subnetted, 1 subnets
C 2.2.2.2 is directly connected, Loopback0
     3.0.0.0/32 is subnetted, 1 subnets
O 3.3.3.3 [110/2] via 192.168.0.2, 00:06:47, FastEthernet0/0
     10.0.0.0/30 is subnetted, 1 subnets
C 10.10.10.0 is directly connected, Serial0/0/0
     192.168.0.0/30 is subnetted, 1 subnets
c        192.168.0.0 is directly connected, FastEthernet0/0
```

0 means O SPF

110 number
of administrative Distance

6 5 Total cost to the destination/
destination

Ping :

```
Jakarta#ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 62/62/63 ms
```

#LAB 22#Standart Acess List

Standard ACL works as packet filtering to determine what a packet can do missed or not.

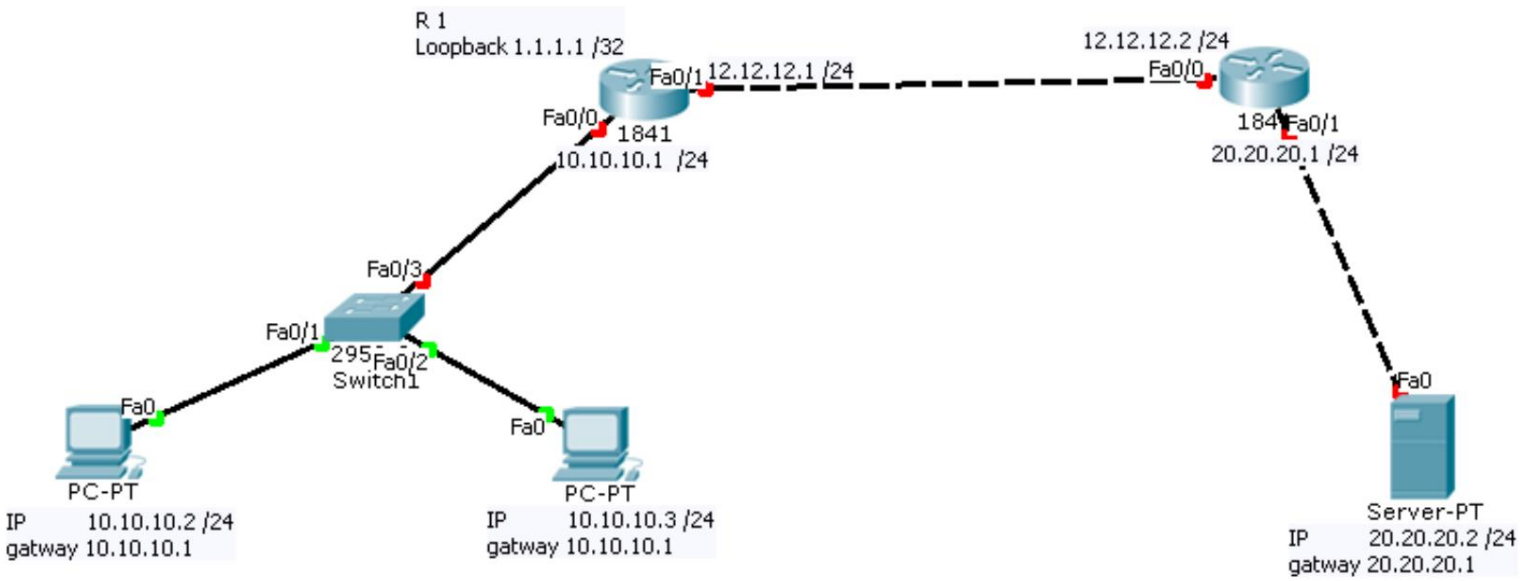
This ACL standard has the following characteristics:

-standard ACL can only use ACL numbers 1-99

-Acl configuration as close as possible to the destination.

-The in and out directions are determined based on the direction of the source to the destination.

OK, the topology is like this:



This time we try to set the config ourselves: >>

Create a topology according to the

above >> Install an IP on each PC and server according to the

topology >> Configure the Routing protocol on each router (Routing Protocol Use either EIGRP or OSPF.)

>>make sure you can ping from your PC to the server

Once finished, add the ACL on Router 2:

Route 2

```
Router(config)#access-list 1 deny 10.10.10.0 0.0.0.255
Router(config)#access-list 1 permit any Router(config)#ex

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/1
Router(config-if)#ip access-group 1 out
```

Now try pinging from the PC again to the server, is that possible?

```
PC>ping 20.20.20.2

Pinging 20.20.20.2 with 32 bytes of data:

Reply from 12.12.12.2: Destination host unreachable.
Reply from 12.12.12.2: Destination host unreachable.
Reply from 12.12.12.2: Destination host unreachable.
Reply from 12.12.12.2: Destination host unreachable.
```

Verification:

```
Router(config-if)#do sh acces-list
sh acces-list
             ^
% Invalid input detected at                '^'        marker.

Router(config-if)#do sh access-list
Standard IP access list 1
        deny 10.10.10.0 0.0.0.255 (8 match(es)) (blocked packets)
        permit any
```

We can still ping as long as we have created a loopback IP, and we use the loopback IP to ping without being blocked, the method is like this:

```
R1#ping (Enter)
Protocol [ip]: (Enter)
Target IP address: 20.20.20.2 (Enter)
Repeat count [5]: (Enter)
Datagram size [100]: (Enter)
Timeout in seconds [2]: (Enter)
Extended commands [n]: y (Enter)
Source address or interface: 1.1.1.1 (Enter)
Type of service [0]: Set DF bit                    (Enter)
in IP header? [no]: Validate reply data? [no]:     (Enter)
Data pattern [0xABCD]: Loose, Strict,              (Enter)
Record, Timestamp, Verbose[none]:                  (Enter)
(Enter)
Sweep range of sizes [n]: (Enter)
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.20.20.2, timeout is 2 seconds:
Packet sent with a source address of 1.1.1.1
 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/6/10 ms
```

Can you?..... sispp….

Check again now

```
R2#sh ip access-lists
Standard IP access list 1
        deny 10.10.10.0 0.0.0.255 (4 match(es))
        permit any (5 match(es))
```

#LAB 23#Extended Access list

ACLL EXtended was chosen because of specific requirements for the application, such as limiting telnet or web server access or email, ftp etc.

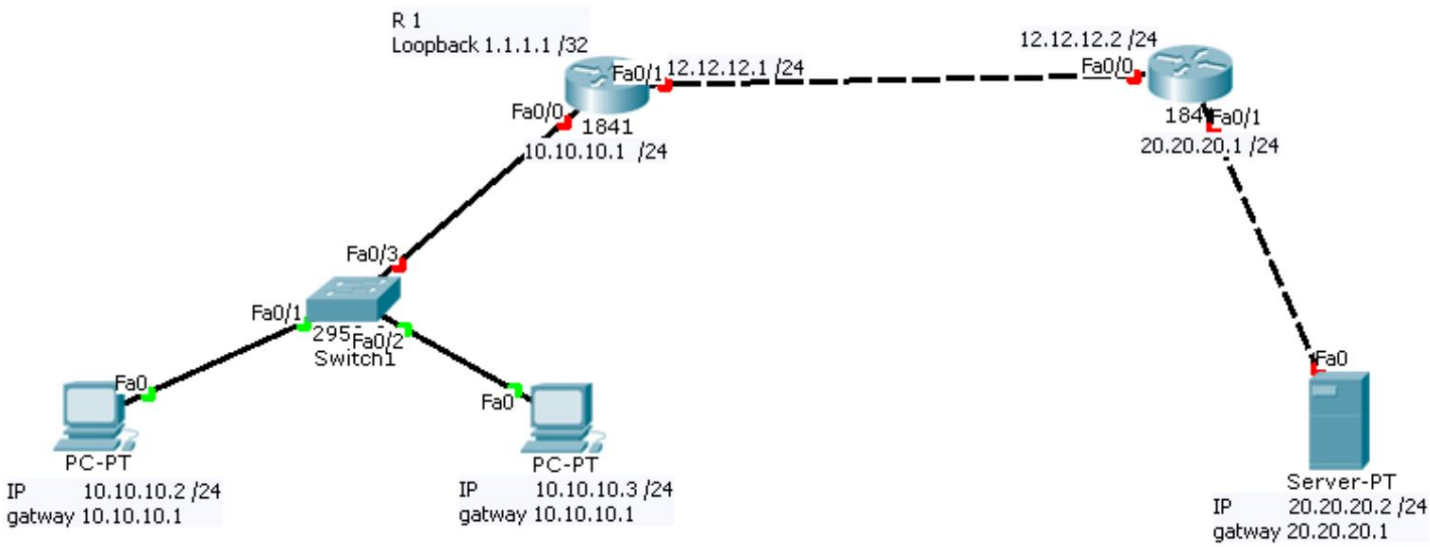
-ACL Extended can filter not only based on the source but also on the destination as well as the port and protocol used.

-Entended ACL uses ACL Number 100-199

-Configure as close as possible to the source/source

-The in and out directions are determined based on the direction of the packet from the source and towards the destination

Still using the previous topology, just delete the Standard ACL configuration:



```
R2(config)#no access-list 1
```

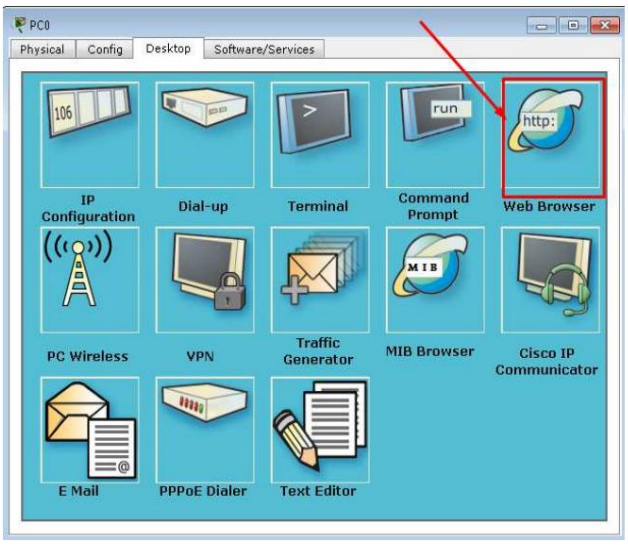
Now configure the Extended ACL (allows ping but does not allow access
Web server) :

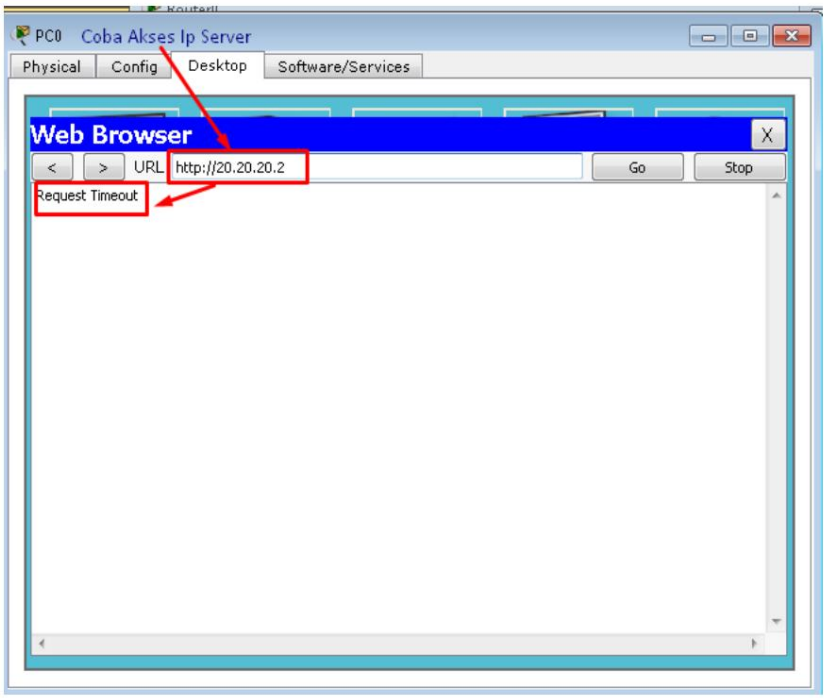
```
R1(config)#access-list 100 deny tcp 10.10.10.0 0.0.0.255 host 20.20.20.2 eq www
R1(config)#access-list 100 permit ip any any

R1(config)#int fa0/0
R1(config-if)#ip access-group 100 in
```

Ping ke server:

```
PC>ping 20.20.20.2

Pinging 20.20.20.2 with 32 bytes of data:

Reply from 20.20.20.2: bytes=32 time=91ms TTL=126
Reply from 20.20.20.2: bytes=32 time=31ms TTL=126
Reply from 20.20.20.2: bytes=32 time=42ms TTL=126
Reply from 20.20.20.2: bytes=32 time=38ms TTL=126

Ping statistics for 20.20.20.2:
        Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
        Minimum = 31ms, Maximum = 91ms, Average = 50ms
```

Now try accessing the Web, access using the server IP:



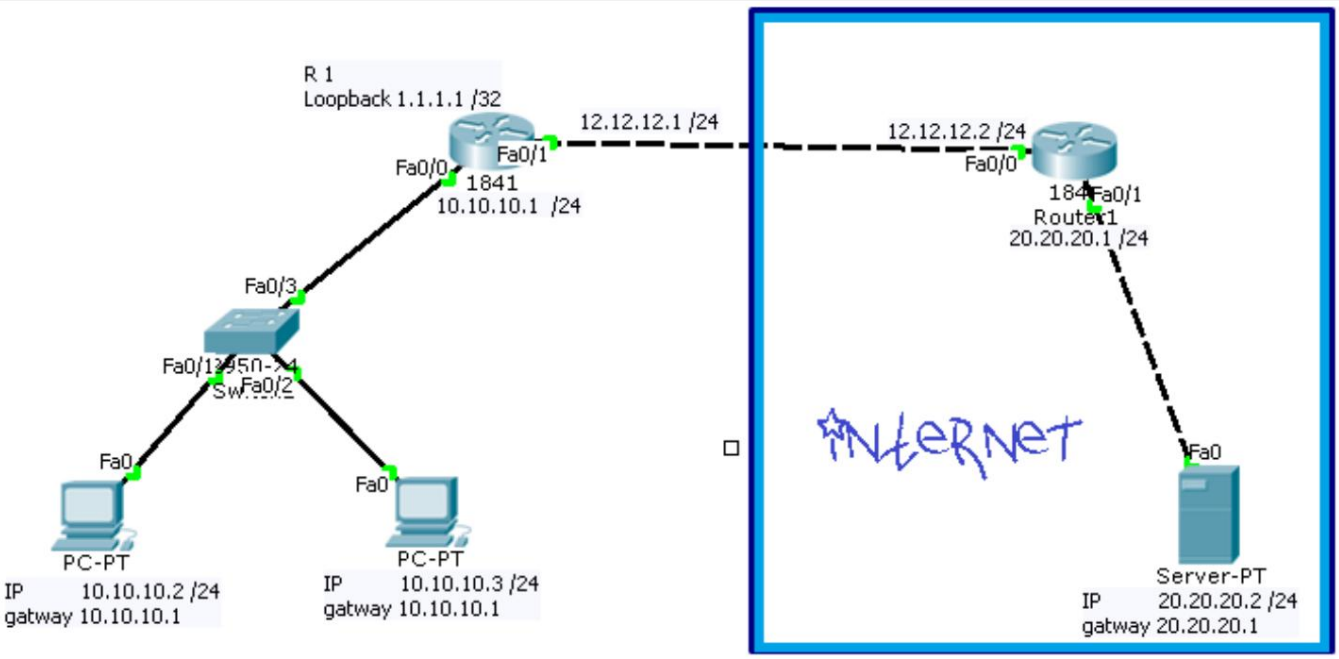



```
Router#sh access-lists Extended
IP access list 100
        deny tcp 10.10.10.0 0.0.0.255 host 20.20.20.2 eq www (24 match(es))
        permit ip any any (4 match(es))
```

#LAB 24#Static NAT

Static Nat is used to translate from local (private) IP to Public IP.
Static NAT is one to one mapping, (so private IP is translated to public IP).
the need is if there is a local server that you want to access from the internet (Public Network)

for example, from the office there is an email server 10.10.10.1 which of course this IP can only be accessed from the LAN because it is a private IP, if we go home but we want to access email from the office then we can use this Static Nat so we can still use it. For example, the IP is 200.200.200.5. If you want other servers to also be able to access it from the internet then add another static Nat.



Still using the previous toppology, just delete the previous configuration:

```
R1(config)#no access-list 100
```

Also delete the Routing configuration, because here I use Eigrp so I delete the configuration Eigrp in each Router:

```
R1(config)#no router Eigrp 10
R2(config)#no router Eigrp 10
```

Configure the Default Route first:

```
R1(config)#ip route 0.0.0.0 0.0.0.0 12.12.12.2
```

Konfigurasi NAT

nya : **R1(config)#ip nat inside source static 10.10.10.2 12.12.12.12 R1(config)#int fa0/0**
R1(config-if)#ip nat inside
R1(config)#int Fa0/1 R1(config-if)#ip
nat outside

Now try pinging the server via command prompt:

```
SERVER>ping 12.12.12.12

Pinging 12.12.12.12 with 32 bytes of data:

Reply from 12.12.12.12: bytes=32 time=26ms TTL=254 Reply from 12.12.12.12:
bytes=32 time=19ms TTL=254 Reply from 12.12.12.12: bytes=32 time=73ms
TTL=254 Reply from 12.12.12.12: bytes=32 time=23ms TTL=254


Ping statistics for 12.12.12.12:
        Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
        Minimum = 19ms, Maximum = 73ms, Average = 35ms
```

Verification:

```
Router#sh ip nat statistics
Total translations: 1 (1 static, 0 dynamic, 0 extended)
Outside Interfaces: FastEthernet0/1
Inside Interfaces: FastEthernet0/0
Hits: 7 Misses: 7
Expired translations: 7
Dynamic mappings:
Router#
```

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 12.12.12.2 to network 0.0.0.0

     1.0.0.0/32 is subnetted, 1 subnets
C       1.1.1.1 is directly connected, Loopback0
     10.0.0.0/24 is subnetted, 1 subnets
C       10.10.10.0 is directly connected, FastEthernet0/0
     12.0.0.0/24 is subnetted, 1 subnets
       12.12.12.0 is directly connected, FastEthernet0/1
C S* 0.0.0.0/0 [1/0] via 12.12.12.2
```

#LAB 25#Dynamic NAT Overload

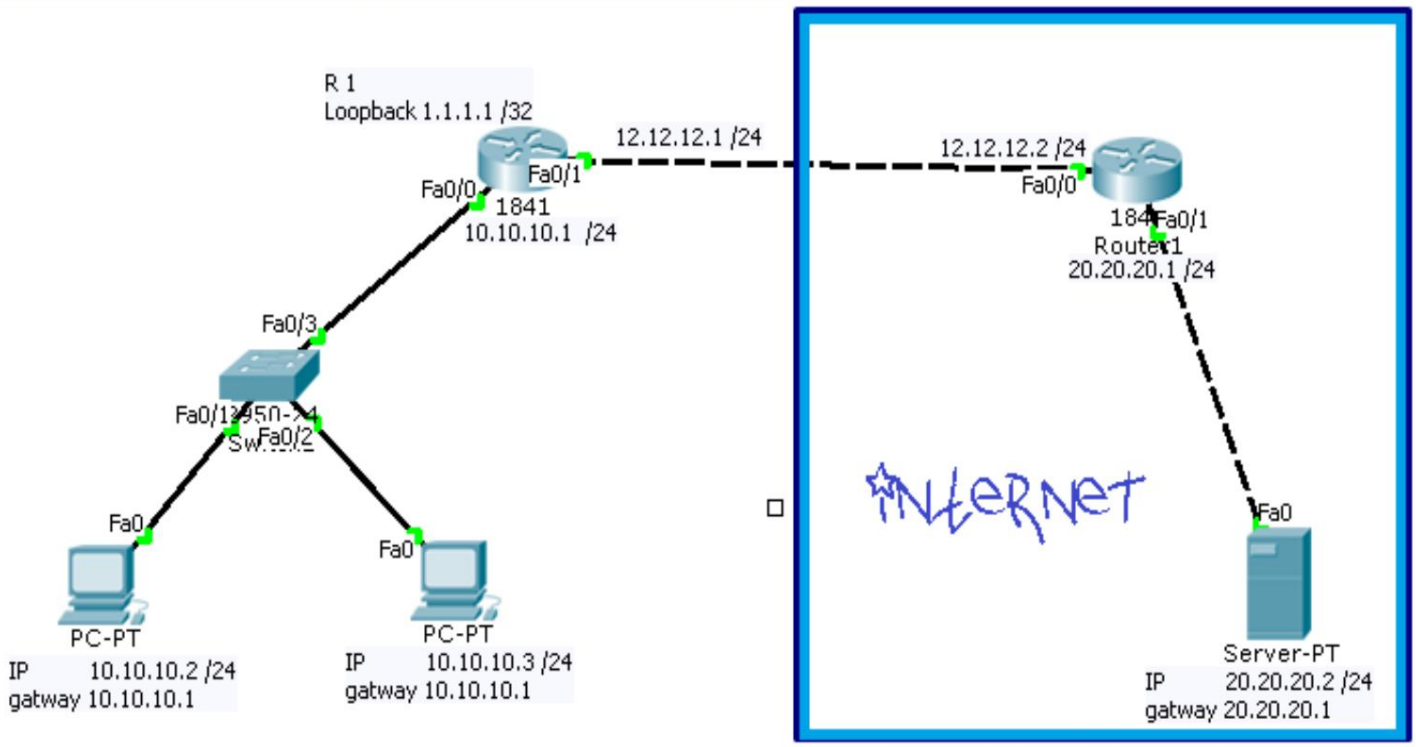
NAT Overload will translate many IPs with just one or a few public IPs. .

-NAT is useful if there are two users with private IPs who want to access the internet.

-This Nat laiya term is PAT (port Address Translation).

-Apart from Dynamic Nat with Overload, actually there is also Dynamic Nat without Overload, but this Dynamin NAT requires the same number of Private IPs and Public IPs so it is not used effectively.

The topology is still the same as before, just continue with the previous configuration without deleting the previous configuration:



Add the Overload Configuration:

```
R1(config)#ip nat inside source list 1 interface F0/1 overload
R1(config)#access-list 1 permit 10.10.10.0 0.0.0.255
```

To verify it, use debug on router 1 and try pinging from the PC:

```
R1# debug ip nat
```

Ping :

```
PC>ping 20.20.20.2

Pinging 20.20.20.2 with 32 bytes of data:

Reply from 20.20.20.2: bytes=32 time=15ms TTL=126 Reply from 20.20.20.2:
bytes=32 time=0ms TTL=126 Reply from 20.20.20.2: bytes=32 time=27ms
TTL=126 Reply from 20.20.20.2: bytes=32 time=87ms TTL=126


Ping statistics for 20.20.20.2: Packets: Sent = 4,
        Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 87ms, Average = 32ms
```

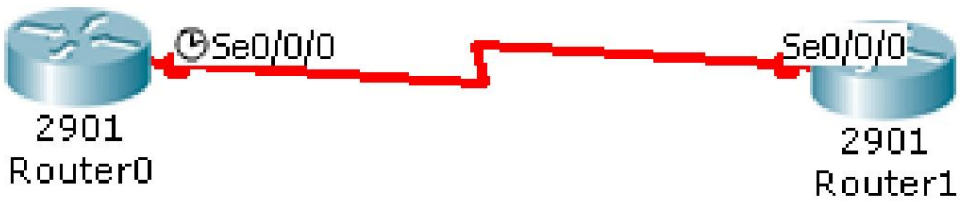
See debug on Router 1:

```
Router(config)# NAT:
s=10.10.10.3->12.12.12.1, d=20.20.20.2 [5]

NAT: s=10.10.10.3->12.12.12.1, d=20.20.20.2 [6]

NAT: s=10.10.10.3->12.12.12.1, d=20.20.20.2 [7]

NAT*: s=20.20.20.2, d=12.12.12.1->10.10.10.3 [29]

NAT: s=10.10.10.3->12.12.12.1, d=20.20.20.2 [8]
```

#LAB 26# HDLC

HDLC - WAn protocol which is used if we want to connect networks between locations that are far apart, for example Jakarta and Bandung offices.

-HDLC is a Cisco Proprietary Wan Protocol and is the default Encapsulation for its serial interface.




```
R1#conf t
R1(config)#int se0/0/0
R1(config-if)#no sh
```

```
R2#conf t
R2(config)#int se0/0/0
R2(config-if)#no sh
```

```
Router(config-if)#do sh int se0/0/0
Serial0/0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
```

```
    Input queue: 0/75/0 (size/max/drops); Total output drops: 0
    Queueing strategy: weighted fair
```

```
Router#show int se0/0/0
Serial0/0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
```

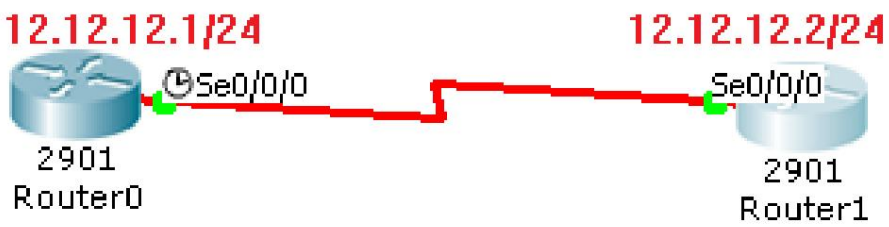
#LAB 26# PPP (Point to Point Protocol)

PPP is a WAN Protocol besides HDLC (Default Cisco Proprietary) and Frame Relay.

-PPP is open standard so it can be used on many platforms (Windows, Linux, 3G modem etc.)

-It is a protocol used to connect two network devices.

-PPP supports PAP (not transcribed) and CHAP (encrypted) authentication.
has compression features, authentication, error detection



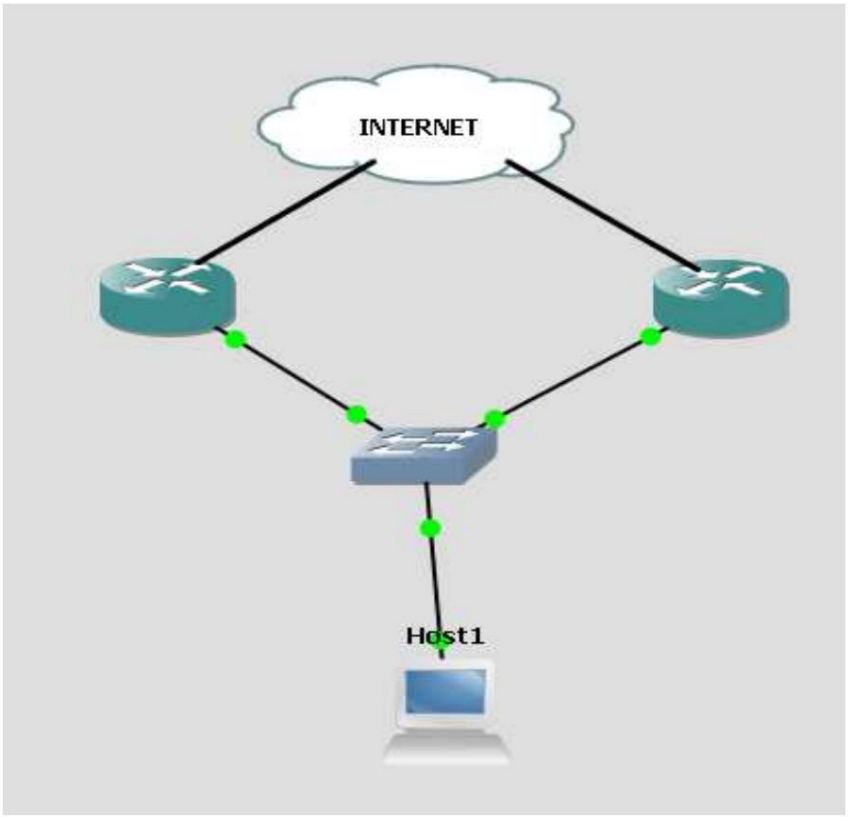

```
router(config)#hostname R1
R1(config)#username R2 password idn
R1(config)#int se0/0/0
R1(config-if)#encapsulation ppp
R1(config-if)# ppp authentication chap
```

```
router(config)#hostname R2
R2(config)#username R1 password idn
R2(config)#int se0/0/0
R2(config-if)#encapsulation ppp
R2(config-if)# ppp authentication chap
```

try pinging between routers.. it will work..

Chapter 3

Hight Avilability



Hight avalibility

When we have internet in the office, if the gateway goes down then the whole office can't get internet?... so that we can still get internet, make two gateways. but with two gateways it's still not efficient because we have to set one device for each PC, which gateway will be used. Moreover, if one of the gateways is down, then some PCs won't be able to surf the internet. With this High Availability (HA) we can make it look like It's as if there is one virtual gateway IP so that even if one of the gateways is down, the PC can still surf the internet as usual.

There are three types of

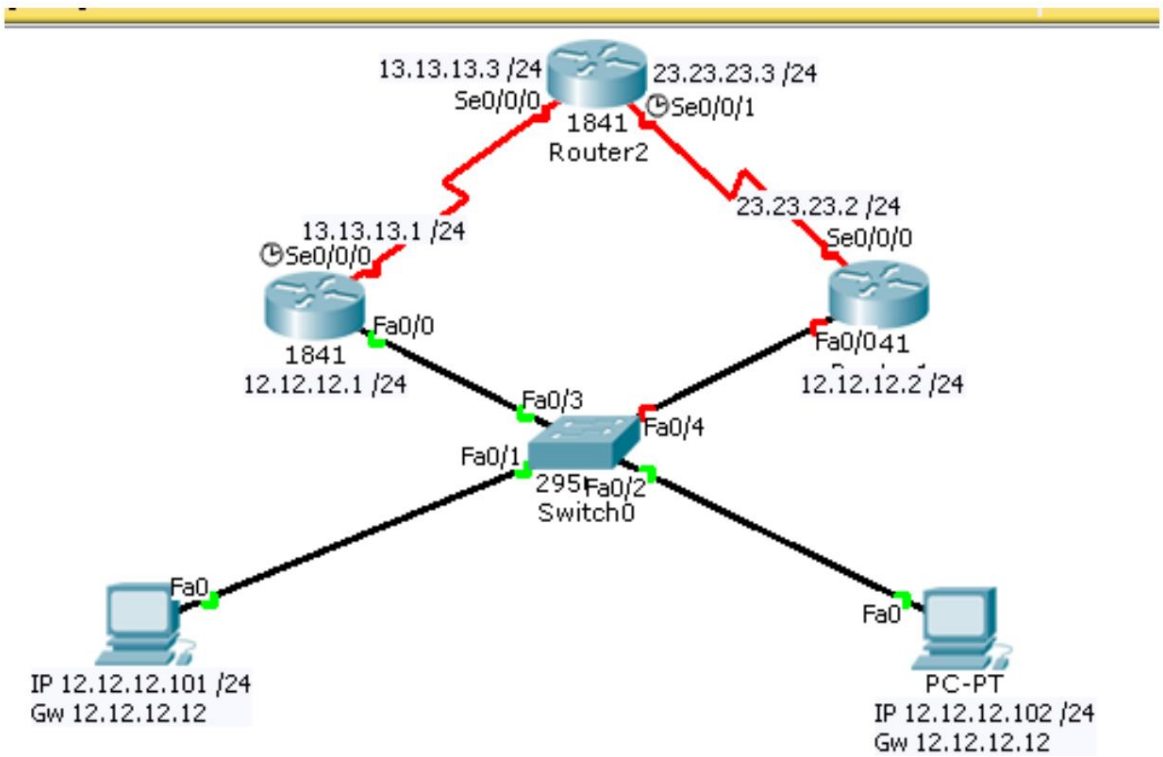
HA: 1, HSRP (cisco)

2,VRRP

3.GLBP (cisco)

#LAB 28# HSRP

This time we will do a full analysis for the HSRP configuration, which we imagine as if Router 3 is the internet.



CONFIGURE :

Router 1

```
Router>and
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se0/0/0
Router(config-if)#ip add 13.13.13.1 255.255.255.0 (to the top)
Router(config-if)#no shutdown
```

```
Router(config-if)#int fa0/0 Router(config-
if)#ip add 12.12.12.1 255.255.255.0 Router(config-if)#no sh Router(config-
if)#standby 1 ip 12.12.12.12
Router(config-if)#standby 1 preempt Router(config-if)#ex
Router(config)#router eigrp 1 Router(config-
router)#network 12.12.12.0
Router(config-router)#network 13.13.13.0
Router(config-router)# no auto-summary Router(config-
router)#passive-interface fa0/0 (menuju ke switch)
```

ROUTER 2

```
Router(config)#int se0/0/0 Router(config-
if)#ip add 23.23.23.2 255.255.255.0 Router(config-if)#no sh Router(config-
if)#int fa0/0 Router(config-if)#ip
add 12.12.12.2 255.255.255.0
Router(config-if)#no sh Router(config-if)#standby 1 ip 12.12.12.12
Router(config-if)#standby 1
preempt Router(config-if)#standby 1 priority 105 Router(config-
if)# %HSRP-6-STATECHANGE: FastEthernet0/0 Grp
1 state Standby -> Active


Router(config-if)#standby track se0/0/0 Router(config-
if)#router eigrp 1 Router(config-router)#network
23.23.23.0 Router(config-router)#network 12.12.12.0
Router(config-router)# no auto-summary Router(config-
router)#passive-interface fa0/0
```

ROUTER 3

```
Router(config)#int se0/0/0 Router(config-
if)#ip add 13.13.13.3 255.255.255.0 Router(config-if)#no sh Router(config-
if)#int se0/0/1 Router(config-if)#ip
add 23.23.23.3 255.255.255.0 Router(config-
if)#no sh Router(config-if)#int lo0 Router(config-if)#ip add 1.1.1.1
255.255.255.255
Router(config)#router eigrp 1
Router(config-router)#network 0.0.0.0 Router(config-router)#network
1.1.1.1 Router(config-router)# no auto-
summary
```

Try pinging from the PC to the Loopback that was created earlier on the 3rd router:

```
PC>ping 1.1.1.1

Pinging 1.1.1.1 with 32 bytes of data:
```

```
Reply from 1.1.1.1: bytes=32 time=16ms TTL=254
Request timed out.
Reply from 1.1.1.1: bytes=32 time=15ms TTL=254
Reply from 1.1.1.1: bytes=32 time=16ms TTL=254
```

That's a sign that we can access the internet via two routes, where if one of the routes is dead or down then we can still access the internet via the other route (the backup route).

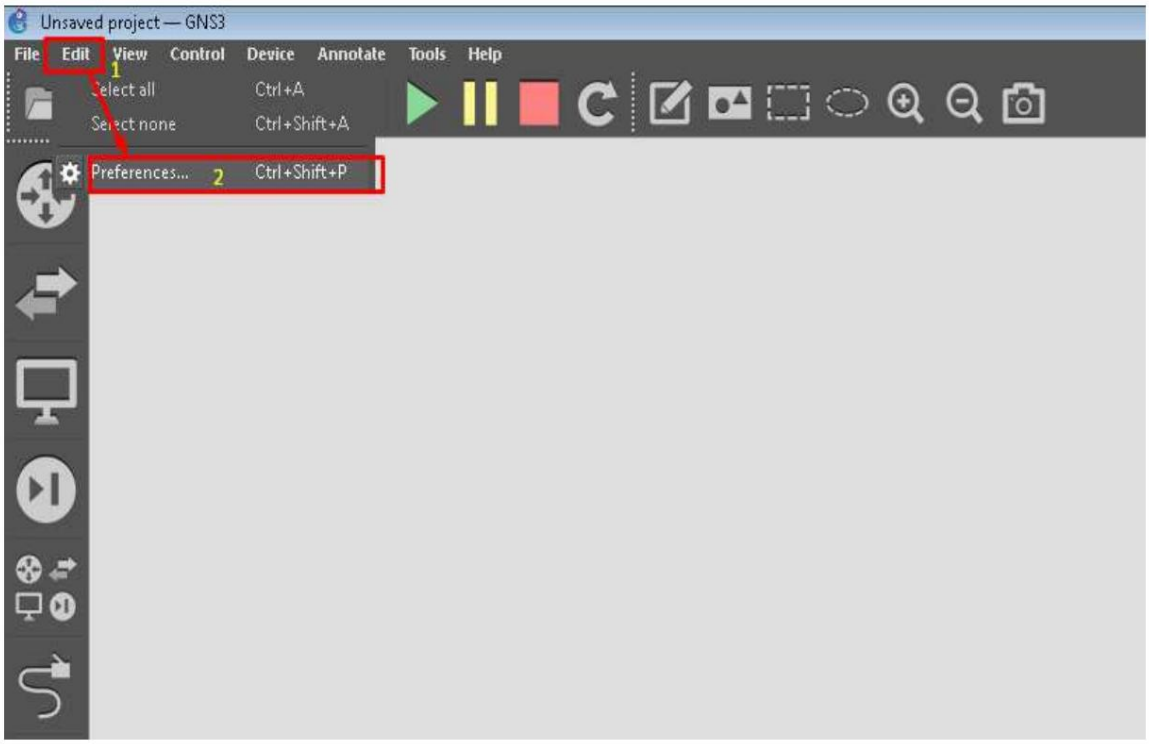
#LAB 29#Using the GNS3 Simulator

OK, we'll continue with what we said earlier, this time we will learn about VRRP configuration, but this time we can't use Cisco Packet Tracer anymore because it still doesn't support the real conditions when configuring. By using the GNS3 Simulator, we can configure it like a device that is in GNS. These 3, we can use original Cisco IOS routers or other devices such as Mikrotik or Juniper.

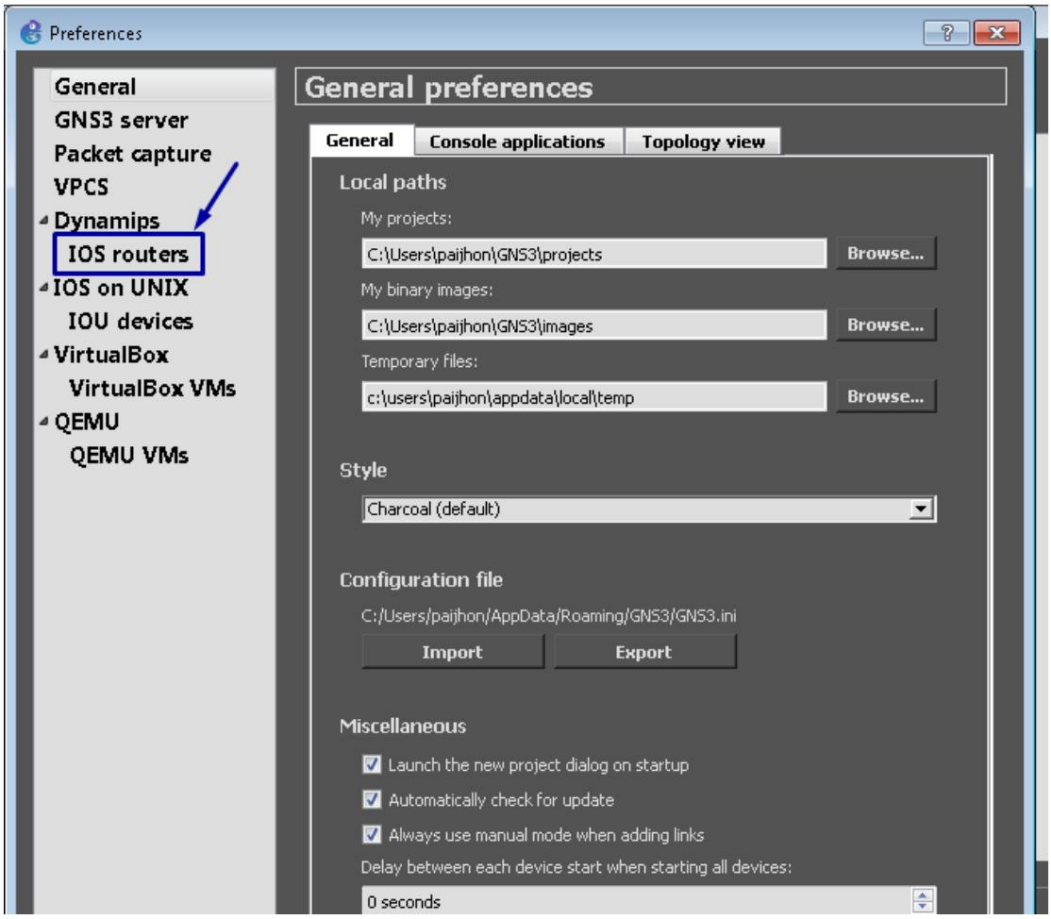
>>Okay, let's just install the GNS 3 Simulator first. This time I used the latest version of Gns3, namely Gns3 Jungle (lighter than the previous version). Don't forget to prepare the IOS router file.

>>After completing the installation, follow the instructions as follows:

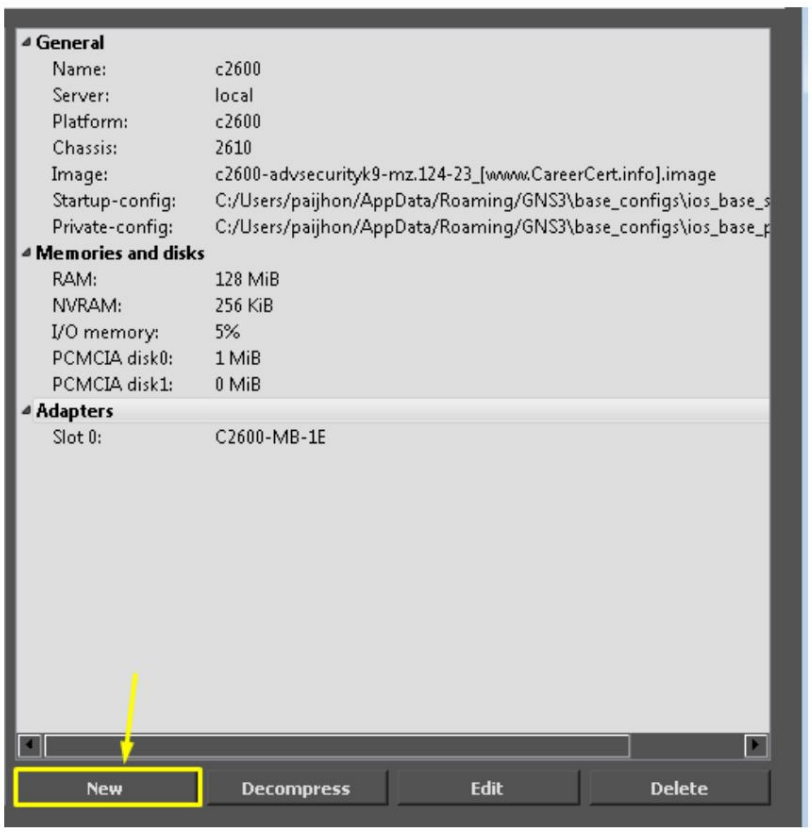
1.Editÿ>Preference



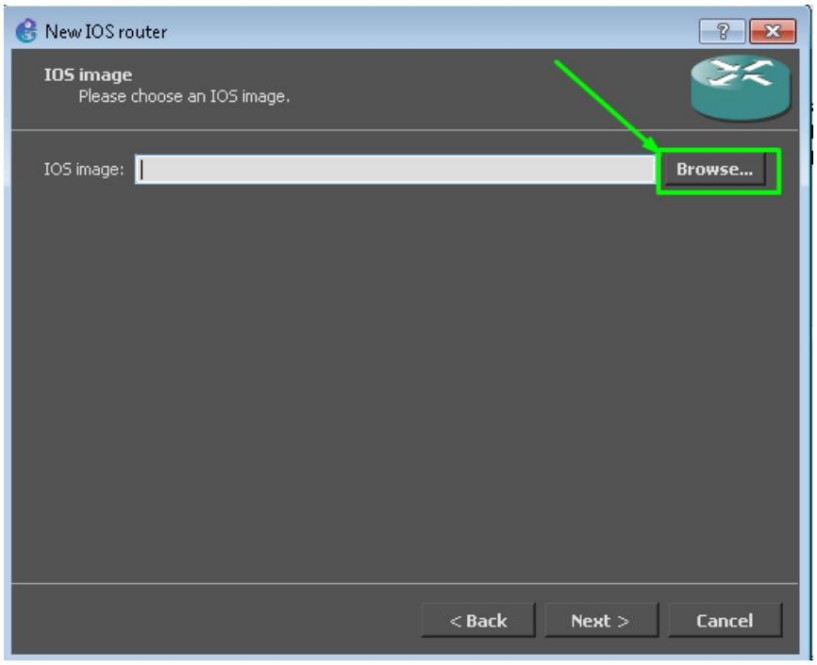
2.Pilh ÿIOS Routers

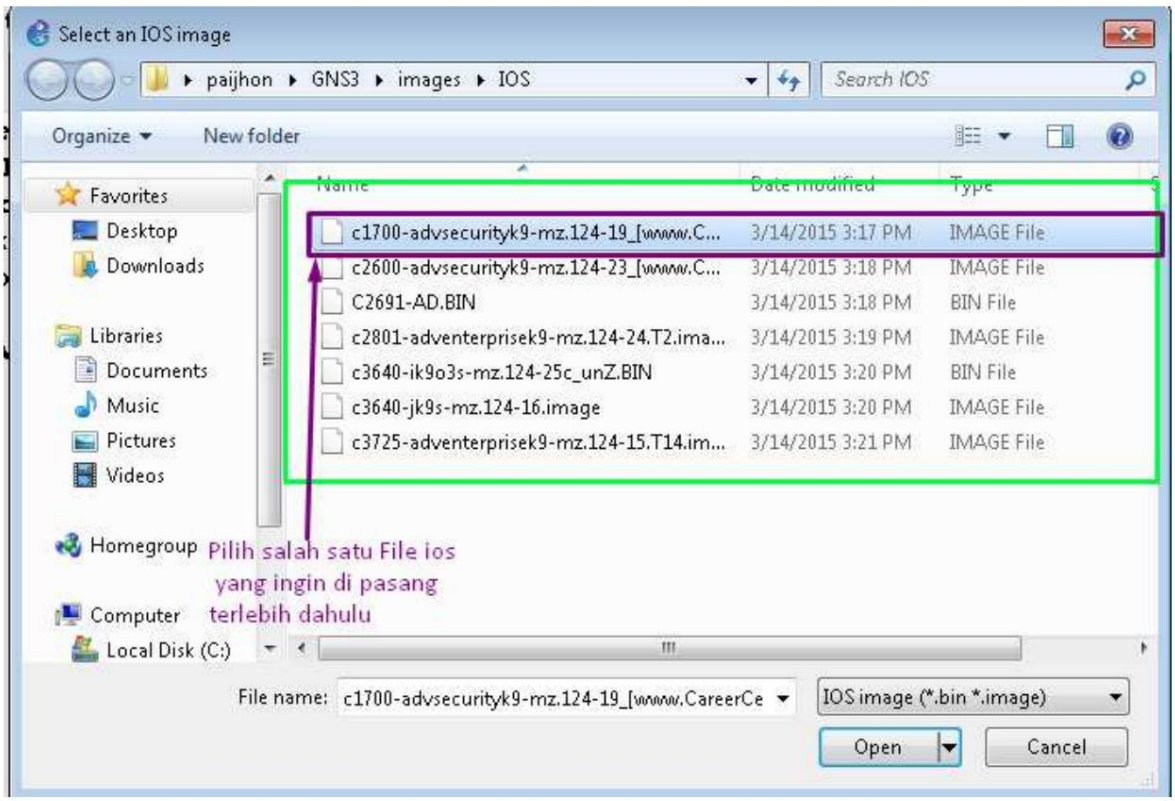


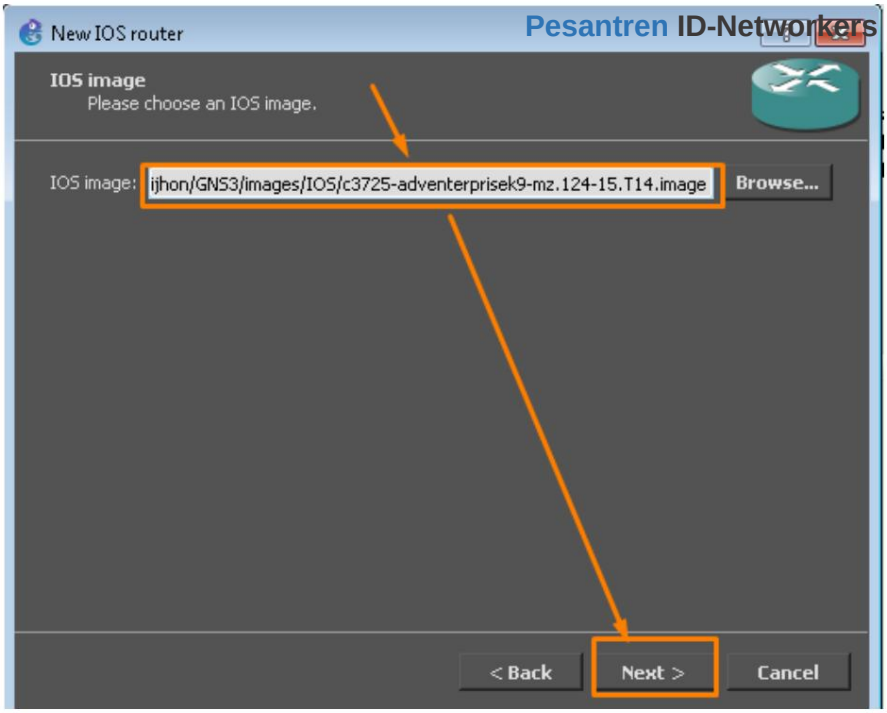
3,pilihÿ New

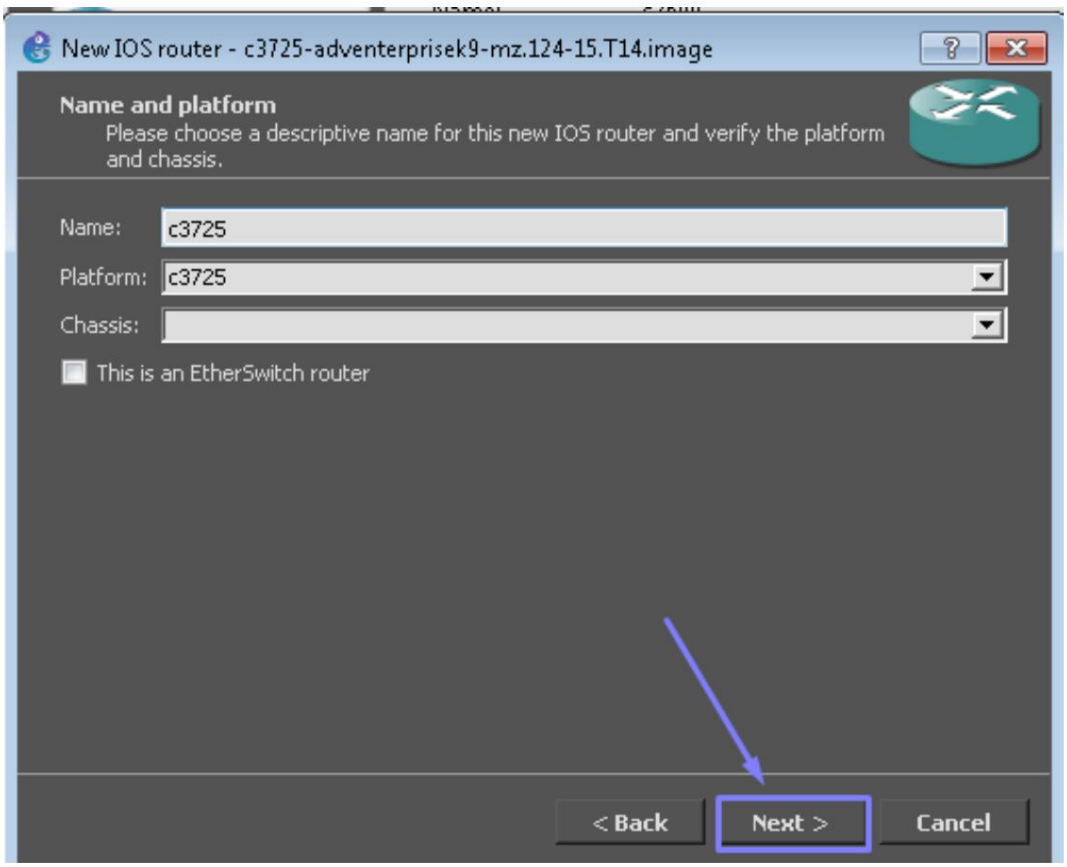


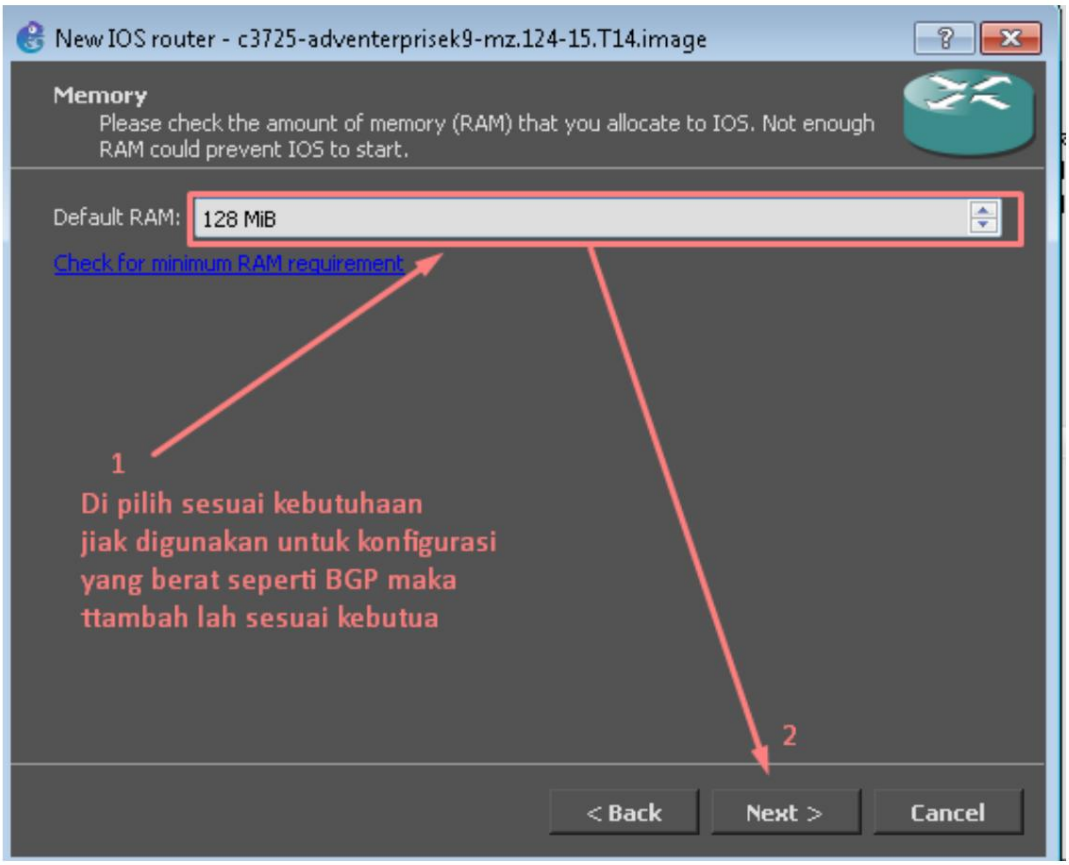
4. Browseÿ

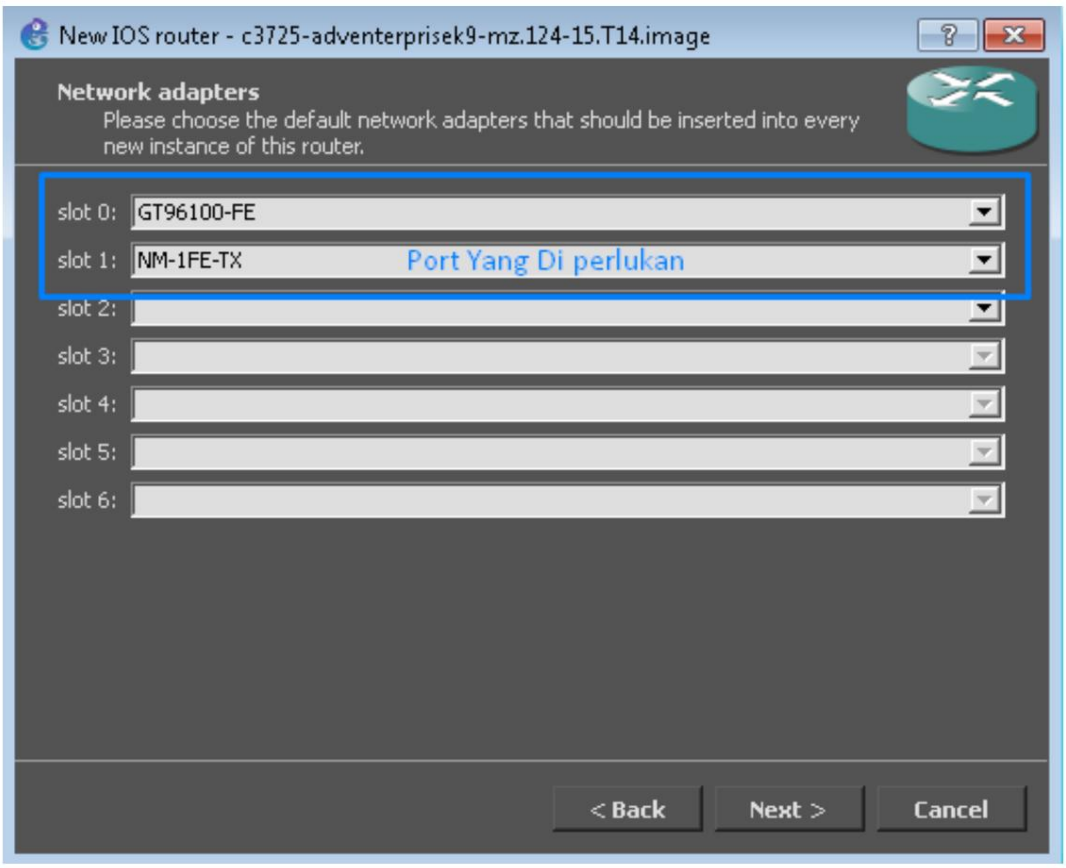


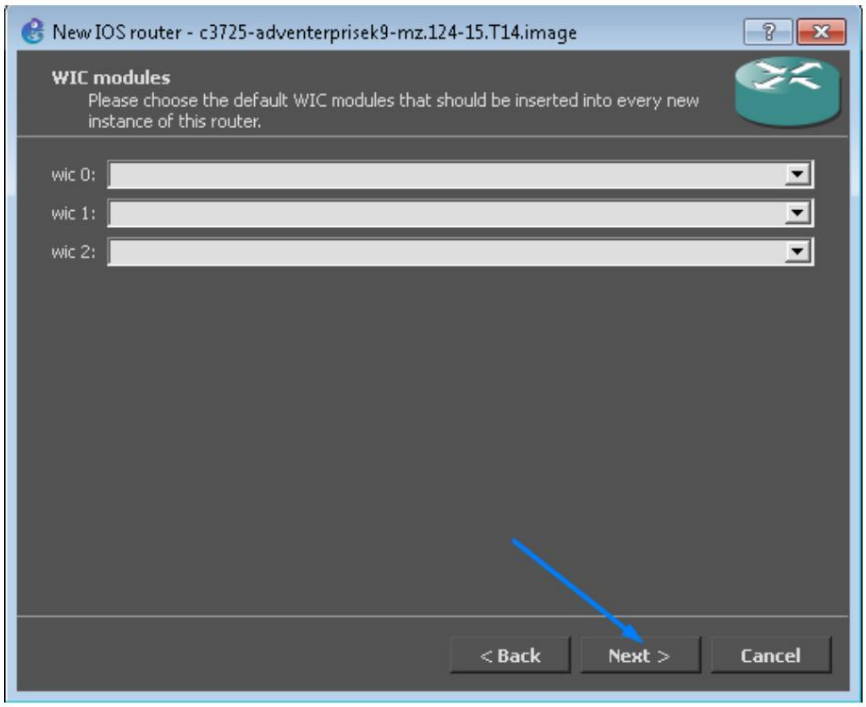


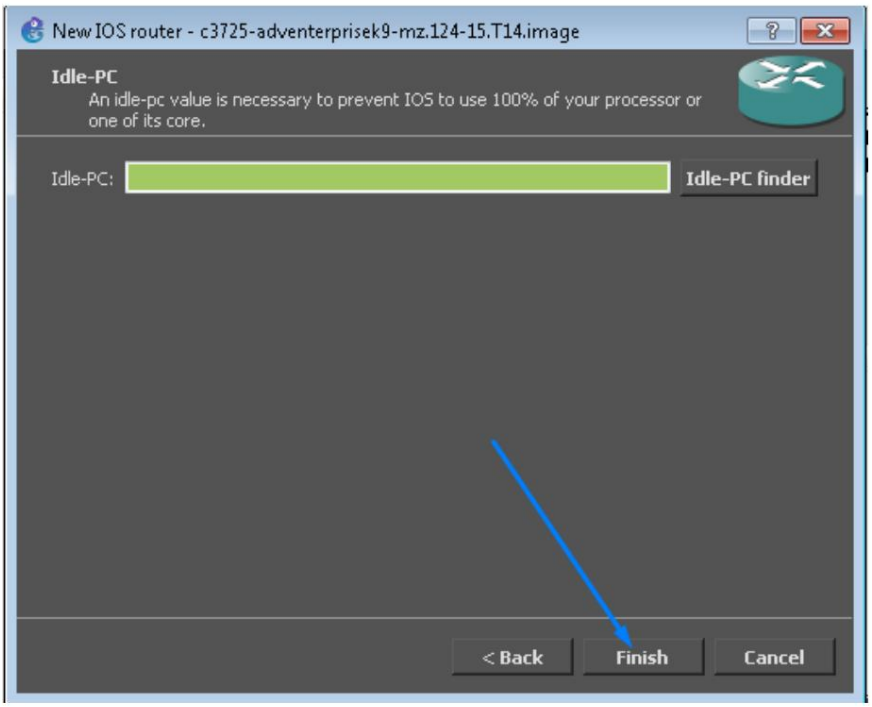


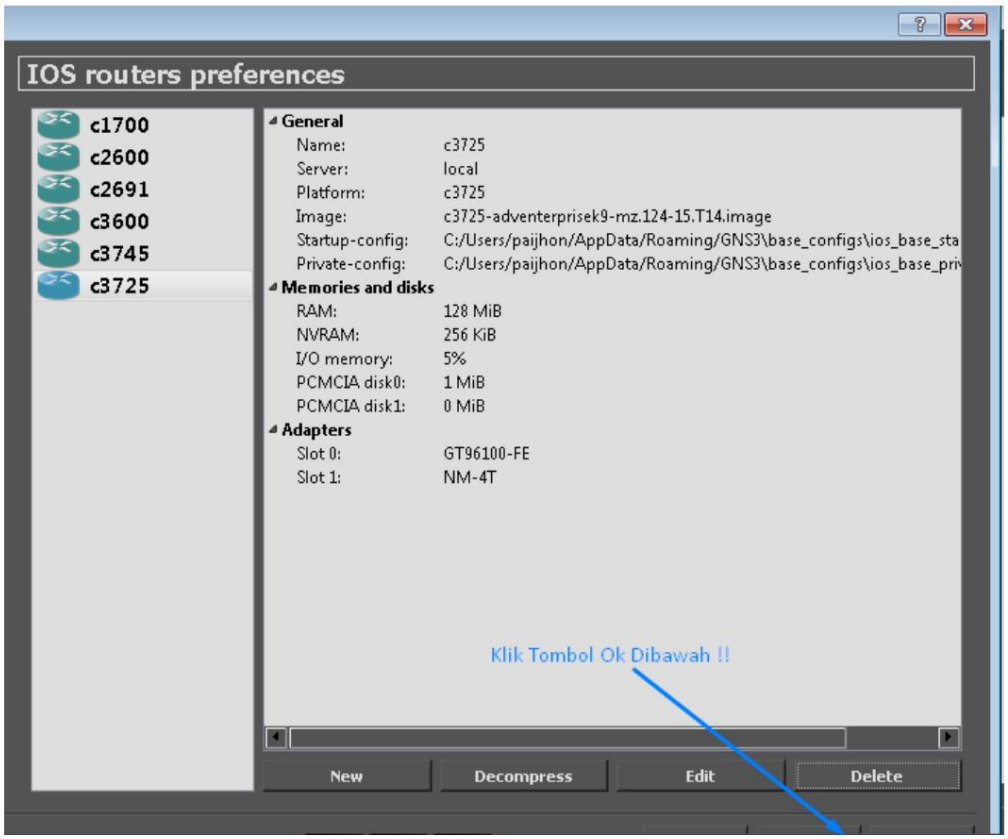


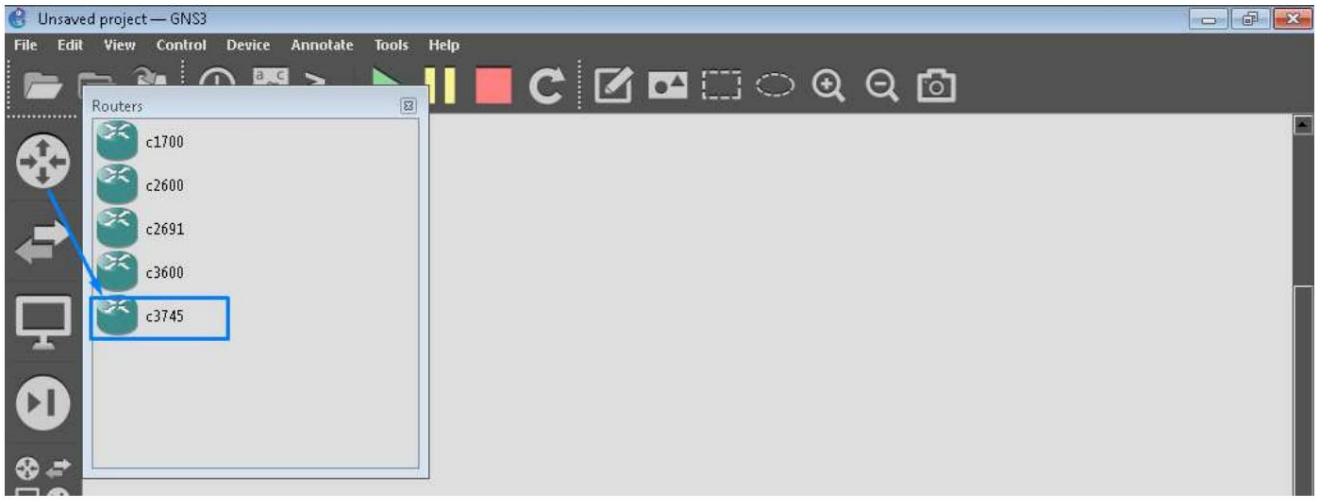






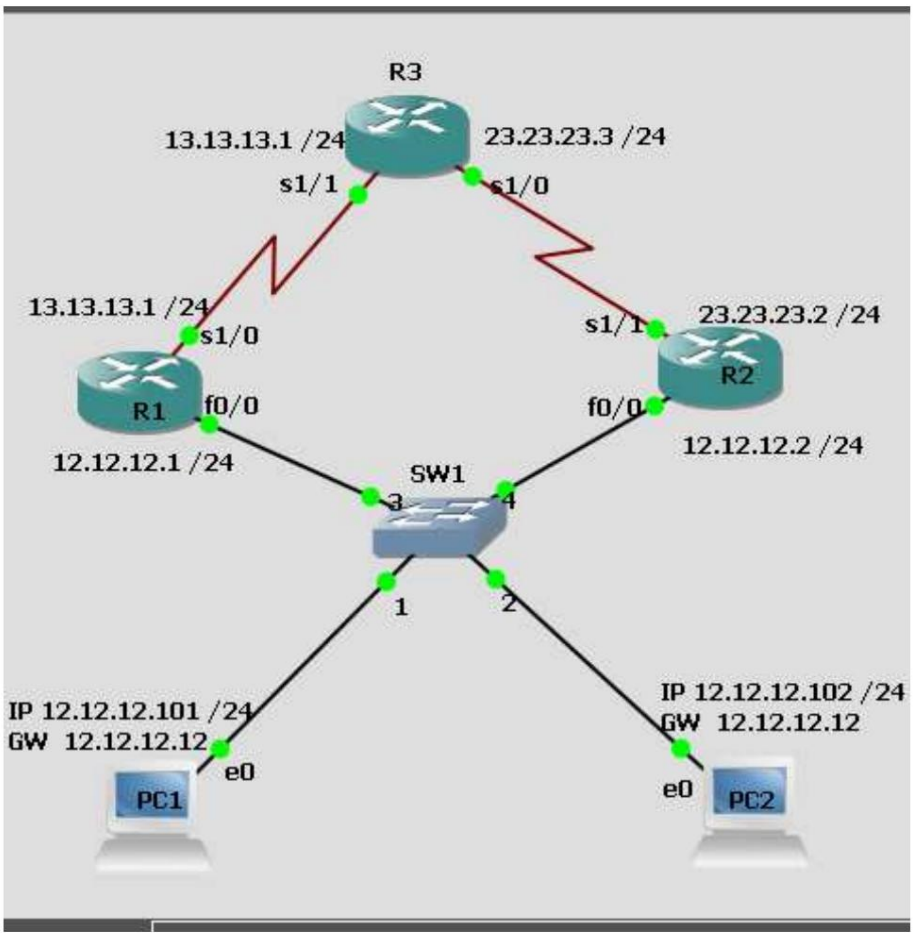




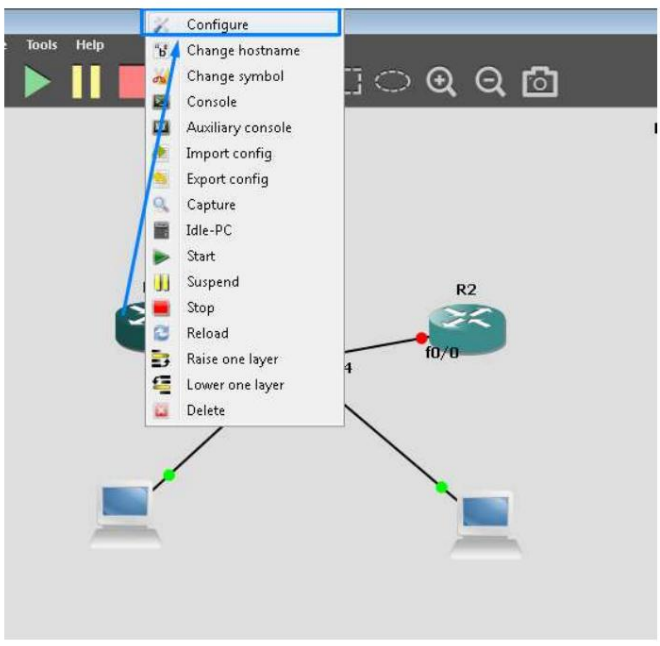


Now we can use.....

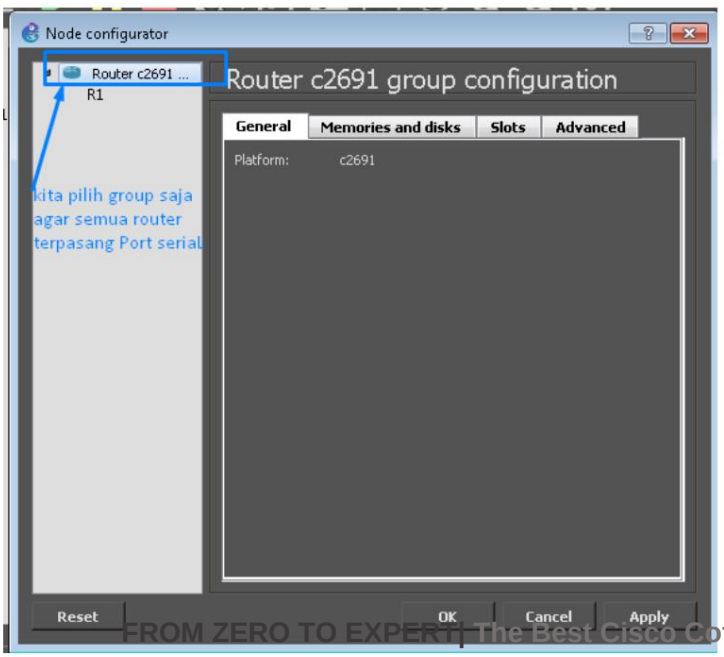
#LAB 30 # HSRRP

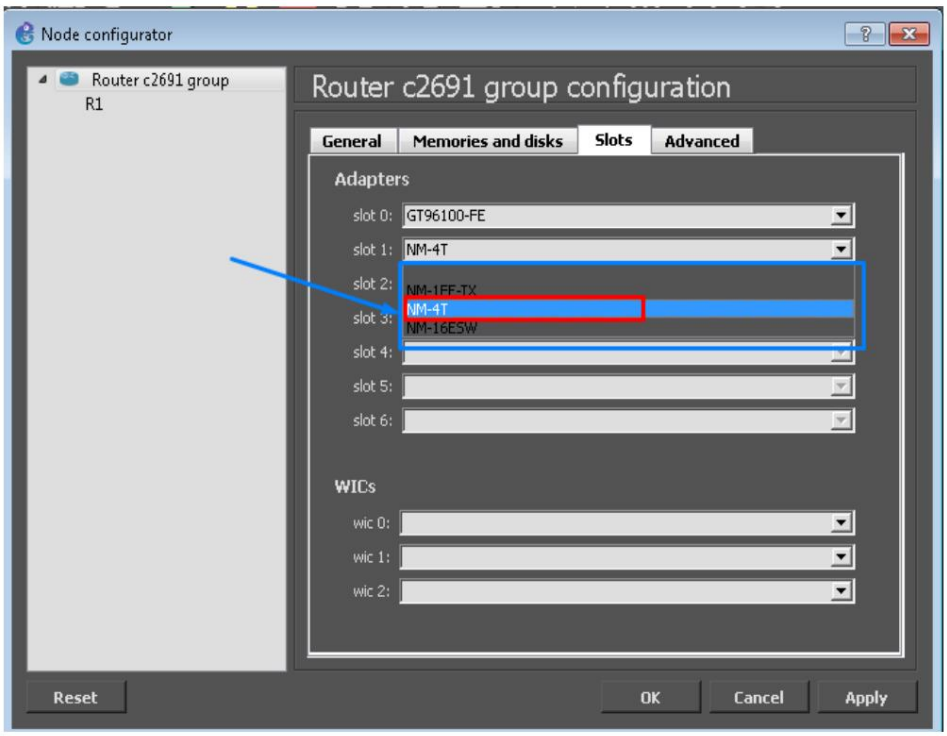


To add the serial cable:



ÿÿÿ





Immediately okay then immediately turn on the button  REMEMBER if you want to add a port So you must first turn off the router that you only want to add ports to, not all of them, by right clicking then selecting the stop button, then when you have finished turning it on, right click click the green triangle button again.

Configure as before, namely:

-Setting IP on each router and PC (select PC VPCS on Gns3)

-Eigrp or Ospf Routing Configuration

To install IP on PC GNS 3:

```
PC1> ip 12.12.12.101 255.255.255.0 12.12.12.12
Checking for duplicate address...
PC1 : 12.12.12.101 255.255.255.0 gateway 12.12.12.12
```

```
PC2> ip 12.12.12.102 255.255.255.0 12.12.12.12
Checking for duplicate address...
PC2 : 12.12.12.101 255.255.255.0 gateway 12.12.12.12
```

The rest is the same as the configuration in the packet tracker,

```
R1(config)#interface fa0/0
R1(config-if)#vrrp 1 ip 12.12.12.12
R1(config-if)#no vrrp 1 ip 12.12.12.12
R1(config-if)#no vrrp 1 priority 110

R1(config-if)#track 1 ip route 1.1.1.1/32 reachabil

*Mar 1 00:11:49.291: %IP-4-DUPADDR: Duplicate address 12.12.12.12 on FastEthernet0/0, sourced
by 0000.5e00.0101
R1(config-if)#no track 1 ip route 1.1.1.1/32 reachability
R1(config)#
```

Router 2 :

```
R2(config)#int fa0/0

R2(config-if)#vrrp 1 ip 12.12.12.12
```

Verify “show vrrp brief”

R 2 :

```
R2#show vrrp brief
Interface          Grp Pri Time Own Pre State   Master addr     1 100 3609            Group addr
F0/0                                     Y Master 12.12.12.1                        12.12.12.12
R2#
```

The main route chosen as the package delivery route

Now try turning off or shutdown interface **12.12.12.1 ,** we will see the data path will change direction: R 1 (which is here

as the main path):

```
R1(config)#int f0/0
R1(config-if)#shutdown
*Mar 1 03:56:07.083: %VRRP-6-STATECHANGE: Fa0/0 Grp 1 state Master -> Init
*Mar 1 03:56:09.087: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to
administratively down
```

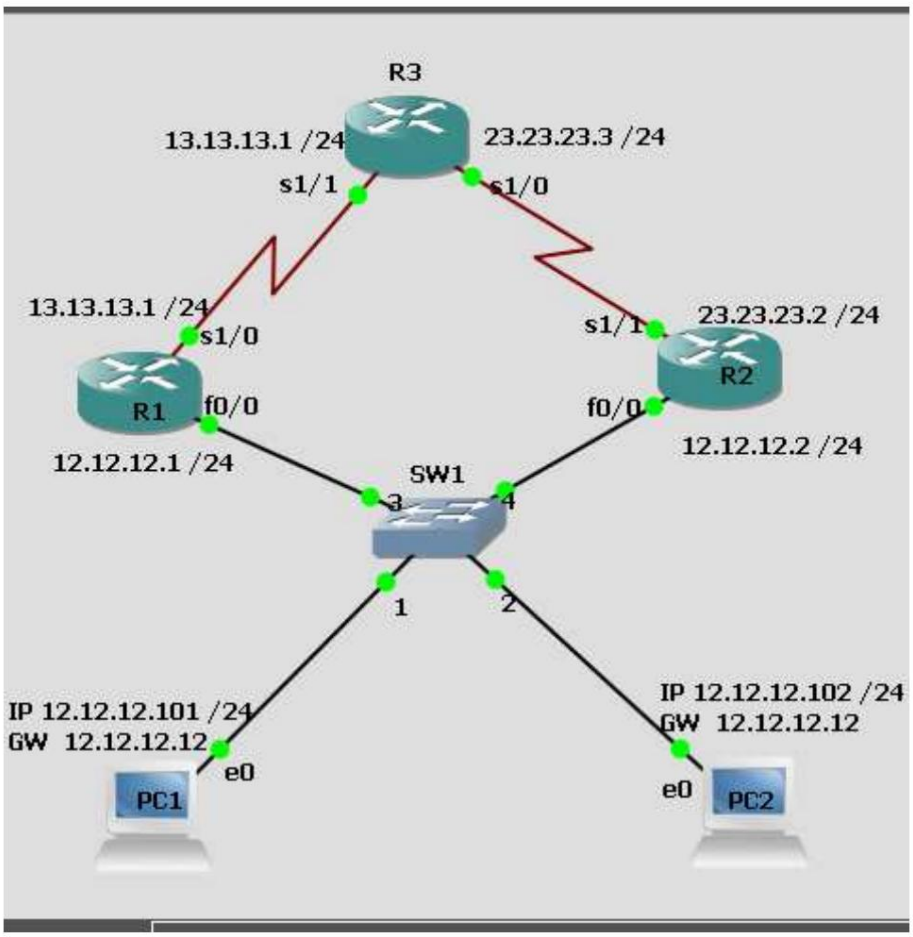
```
R2#show vrrp brief
Interface          Grp Pri Time Own Pre State   Master addr     1 100 3609            Group addr
F0/0                                     Y Master 12.12.12.2                        12.12.12.12
```

It will automatically **change... and if we turn it back on, the interface that was shutdown** will automatically **be selected again by VRRP...**

#LAB 31# GLBP

OK, continuing with the previous one, this time we will use HA(height capability) GLBP, just delete the previous configuration.

The topology is still the same as before:



Delete previous configuration on R1 and R2:

Router

```
1 R1(config)#int fa0/0
R1(config-if)#defau
R1(config-if)#default int fa0/0
Building configuration...

Interface FastEthernet0/0 set to default configuration
```

Router 2 :

```
R2(config)#int fa0/0
R2(config-if)#default int fa0/0
Building configuration...

Interface FastEthernet0/0 set to default configuration
R2(config)#
```

GLBP configuration:

```
R1(config)#int fa0/0
R1(config-if)#ip add 12.12.12.1 255.255.255.0
R1(config-if)#glbp 1 ip 12.12.12.12
R1(config-if)#no shutdown
```

```
R2(config)#int fa0/0
R2(config-if)#ip add 12.12.12.2 255.255.255.0
R2(config-if)#glbp 1 ip 12.12.12.12
R2(config-if)#
```

VERIFICATION:

```
R1#show glbp brief
Interface Grp Fwd Pri State router                Address         Active router Standby
F0/0      1       - 100 Speak 1 2                 12.12.12.12     12.12.12.2    unknown
F0/0      1       - Listen 0007.b400.0101 12.12.12.2 - Active 0007.b400.0102
F0/0      1       local
R1#
```

```
R2#show glbp brief
Interface Grp Fwd Pri State router                Address         Active router Standby
F0/0      1       - 100 Active 12.12.12.12        local         12.12.12.1
F0/0      1   1   - Active 0007.b400.0101 local - Listen 0007.b400.0102
F0/0      1   2   12.12.12.1
R2#
```

```
PC1> trace 1.1.1.1
trace to 1.1.1.1, 8 hops max, press Ctrl+C to stop
 1 12.12.12.2 124.801 ms 31.200 ms 15.600 ms
 2 *23.23.23.3 140.400 ms (ICMP type:3, code:3, Destination port unreachable)
```

```
PC2> trace 1.1.1.1
trace to 1.1.1.1, 8 hops max, press Ctrl+C to stop
 1 *12.12.12.1 93.600 ms 15.600 ms
 2 *13.13.13.3 202.800 ms (ICMP type:3, code:3, Destination port
unreachable)
```

It shows two paths that are both used for data transmission, this is what is called GLBP

CHAPTER 4

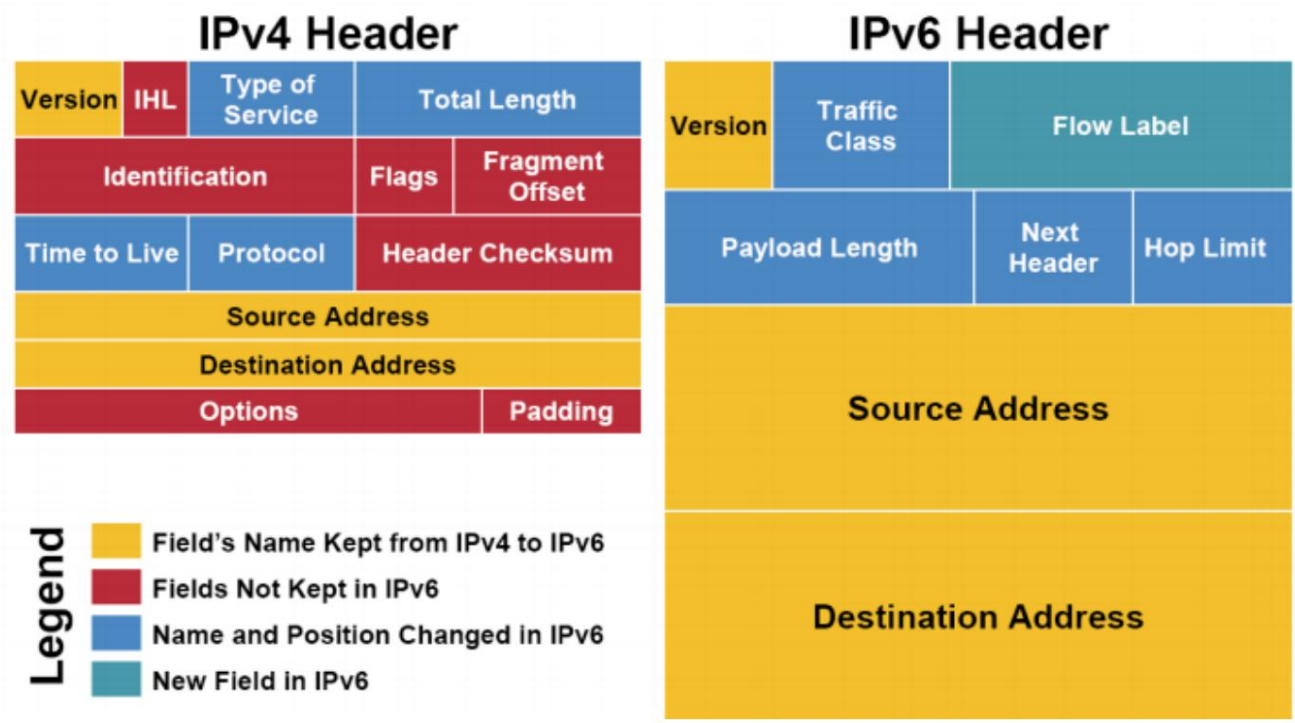
IPv6

As time progresses and our needs also develop, it is necessary to fulfill these needs. one of which is IPV6.
IPV 6 was created to meet the needs of large-scale networks, which this time its older brother IPV4 no longer suffices for the increasing needs in this world.

However, the problem is that IPv4 is different from IPv6 so many protocols are not compatible with each other. Many migrations from IPv4 to IPv6 have been carried out. Therefore we need to study IPv6. The following is ;
comparison of IPv4 and IPv6 space.

IPv4 32bit = 2^32 = 4.294.967.296

IPv6 128bit = 2^128 = 340.282.366.920.938.463.463.374.607.431.768.211.456



IPv6 consists of 16 bit hexadecimal and is case-insensitive which is divided into 8 fields, unlike IPv4 which consists of 12 bit and divided into 4 octets. In IPv4 there is an octet, in IPv6 there is a field, bro. In IPv4 the prefix is up to 32, in IPv6 the prefix is up to 128.
For example0000:360B:0000:0000:0020:875B:131B/64.

Long too, right? It's hard to memorize and definitely complicated if we want to ping or trace IPv6, right? If you want it to be easy, just use DNS. But... is there another solution? Don't worry, bro, you've thought about it all.
IPv6 can be summarized. Here are the rules.

The original : 2541:0000:360B:0000:0000:0020:875B:131B/64

If there is 0000, either lined up or not, it can be represented by a colon 2 (::).

The condition is once again, everything must be 0. There can't be any other number.

Summarized : 2541: 0000:360B:: 0020:875B:131B/64

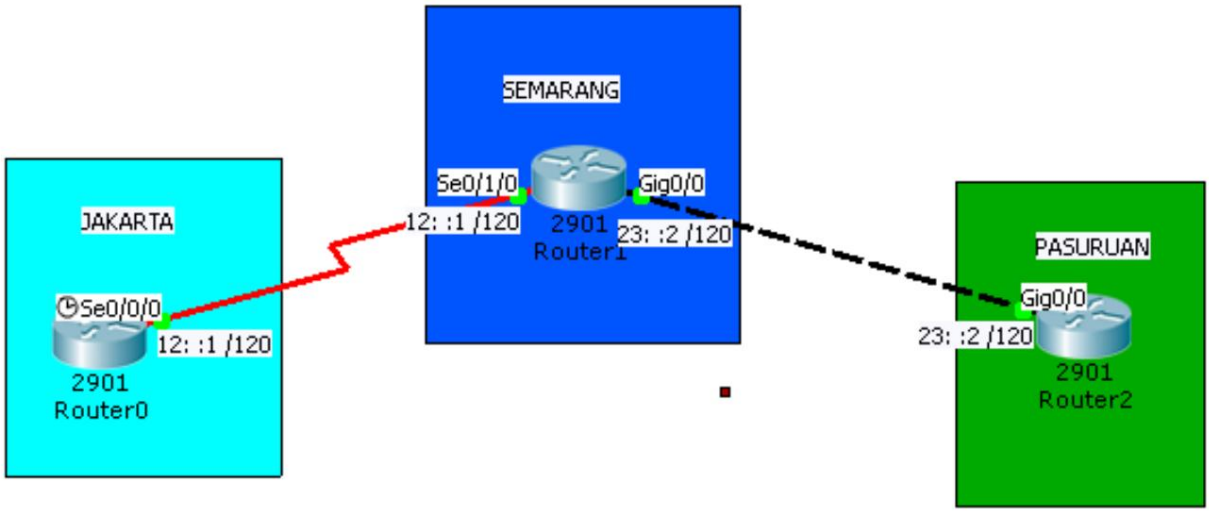
If there is already :: then if there is 0000 it cannot be represented :: anymore because there is only one :: in one IPv6. 0000 can be represented by just 0.
Apart from that, if there is a field whose front (left side) is 0, then 0 can be removed.

Summarized again : 2541:0:360B::20:875B:131B/64
keren kan ipv6 nya ..

#LAB 32# RIPnG (NEXT GENERATION)

RIPnG is designed so that routers can process IPV6 networks, especially the This RIPnG depends on certain information for each Network. Same as metrics. The RIPnG metrics are only 1 15 inclusive. Version 2. Hop count is 15 only after 16 then Uncreacble.

Every router that uses Ripng has a Routing Process which sends and receives datagrams (routing information, RIPnG Communication) on UDP Port Number 512.



CONFIGURE :

JAKARTA

```
JAKARTA(config)#ipv6 unicast-routing (to turn on IPv6)
JAKARTA(config)#int se0/0/0
JAKARTA(config-if)#ipv6 add 12::1/120
JAKARTA(config-if)#ipv6 rip 1 enable
JAKARTA(config-if)#no shut
JAKARTA(config)#int lo0
JAKARTA(config-if)#ipv6 add 1::1/128
JAKARTA(config-if)#ipv6 rip 1 enable
```

SEMARANG

```
SEMARANG(config)#ipv6 unicast-routing (to enable IPv6)
SEMARANG(config)#int se0/1/0
SEMARANG(config-if)#ipv6 add 12::2/120
SEMARANG(config-if)#ipv6 rip 1 enable
SEMARANG(config-if)#no shut
SEMARANG(config)#int lo0
SEMARANG(config-if)#ipv6 add 2::2/128
SEMARANG(config-if)#ipv6 rip 1 enable
SEMARANG(config)#int gig0/0
SEMARANG(config-if)#ipv6 add 23::2/120
SEMARANG(config-if)#ipv6 rip 1 enable
SEMARANG(config-if)#no shut
```

PASURUAN

```
PASURUAN(config)#ipv6 unicast-routing (to turn on IPv6)
PASURUAN(config)#int gig0/0
PASURUAN(config-if)#ipv6 add 23::3/120
PASURUAN(config-if)#ipv6 rip 1 enable
PASURUAN(config-if)#no shut
PASURUAN(config)#int lo0
PASURUAN(config-if)#ipv6 add 3::3/128
PASURUAN(config-if)#ipv6 rip 1 enable
```

Verification

```
JAKARTA #show ipv6 int br
JAKARTA #show ipv6 int brief
GigabitEthernet0/0 [administratively down/down]
GigabitEthernet0/1 [administratively down/down]
Serial0/0/0 [up/up]
        FE80::260:70FF:FE7E:4701
        12::1
Serial0/0/1 [administratively down/down]
Loopback0                              [up/up]
        FE80::210:11FF:FEC3:AC9C
        1::1
Vlan1                                  [administratively down/down]
Router#
```

```
Router#show IPv6 route
IPv6 Routing Table - 7 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
C 1::1/128 [0/0] via ::,
     Loopback0
R 2::2/128 [120/2] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
R 3::3/128 [120/3] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
C 12::/120 [0/0] via ::,
     Serial0/0/0
L 12::1/128 [0/0] via ::,
     Serial0/0/0
R 23::/120 [120/2] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
L FF00::/8 [0/0] via ::, Null0

Router#
```

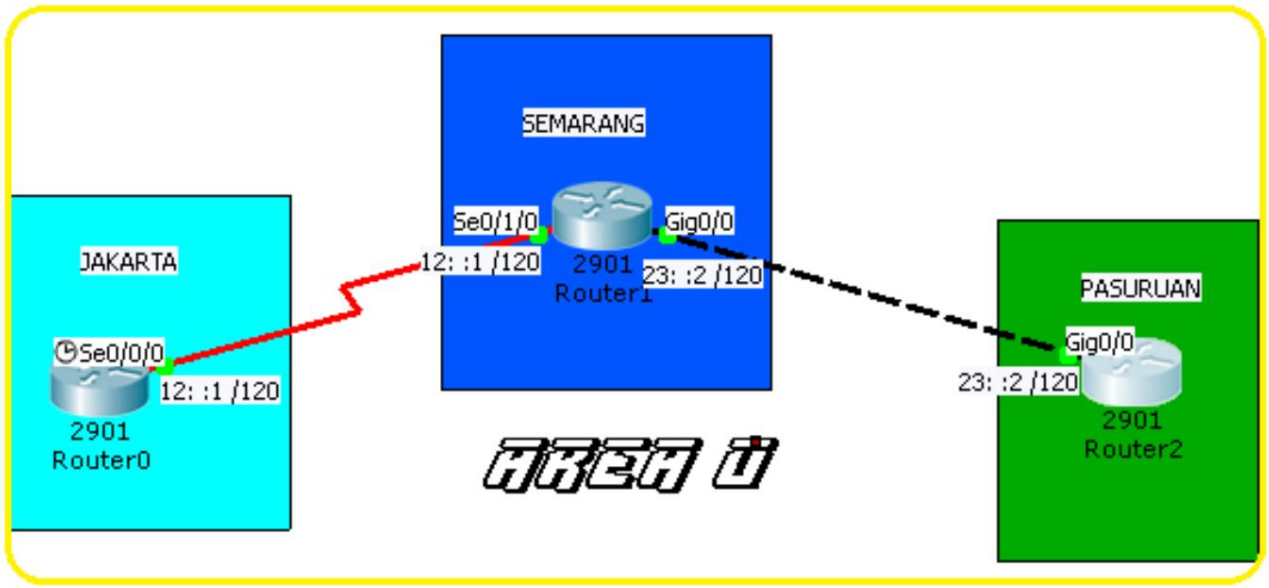
Try Ping:

```
JAKARTA #ping 2::2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2::2, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/11/55 ms

JAKARTA #
```

```
JAKARTA r#ping 3::3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3::3, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/14/70 ms

JAKARTA #
```

#LAB 33#OSPF v3

Ospfv3 is the same mechanism as ospf, we can use ospfv2 -ospf loading algorithm, DR area selection, and so on. Variables such as timers and metrics are also the same. If we want to run OSPF behind IPV4 or IPv6, we must run OSPV2 and OSPVF3.



CONFIGURE:

JAKARTA

```
JAKARTA(config)#ipv6 unicast-routing
JAKARTA(config)#int se0/0/0
JAKARTA(config-if)#ipv6 add 12::1/120
JAKARTA(config-if)# no shutdown
JAKARTA(config)#ipv6 router ospf 10
JAKARTA(config-router)#router-id 1.1.1.1
JAKARTA(config)#int se0/0/0
JAKARTA(config-if)#ipv6 add 12::1/120
JAKARTA(config-if)#ipv6 ospf 10 area 0
JAKARTA(config)#int Lo0
JAKARTA(config-if)#ipv6 add 1::1/128
JAKARTA(config-if)#ipv6 ospf 10 area 0
```

SEMARANG

```
SEMARANG(config)#ipv6 unicast-routing
SEMARANG(config)#int se0/0/0
SEMARANG(config-if)#ipv6 add 12::2/120
SEMARANG(config-if)# no shutdown
SEMARANG(config)#int gig0/0
SEMARANG(config-if)#ipv6 add 23::2/120
SEMARANG(config-if)# no shutdown
SEMARANG(config)#ipv6 router ospf 10
SEMARANG(config-router)#router-id 2.2.2.2
SEMARANG(config)#int se0/1/0
SEMARANG(config-if)#12::2/120
SEMARANG(config-if)#ipv6 ospf 10 area 0
SEMARANG(config)#int Ethernet0
SEMARANG(config-if)#23::2/120
SEMARANG(config-if)#ipv6 ospf 10 area 0
SEMARANG(config)#int gig0/0
SEMARANG(config-if)#2::2/128
SEMARANG(config-if)#ipv6 ospf 10 area 0
```

PASURUAN

```
PASURUAN(config)#ipv6 unicast-routing
PASURUAN(config)#int gig0/0
PASURUAN(config-if)#ipv6 add 23::/120
PASURUAN(config-if)# no shutdown
PASURUAN(config)#ipv6 router ospf 10
PASURUAN(config-router)#router-id 3.3.3.3
PASURUAN(config)#int gig0/0
PASURUAN(config-if)#23::3/120
PASURUAN(config-if)#ipv6 ospf 10 area 0
PASURUAN(config)#int Lo0
PASURUAN(config-if)#3::3/128
PASURUAN(config-if)#ipv6 ospf 10 area 0
```

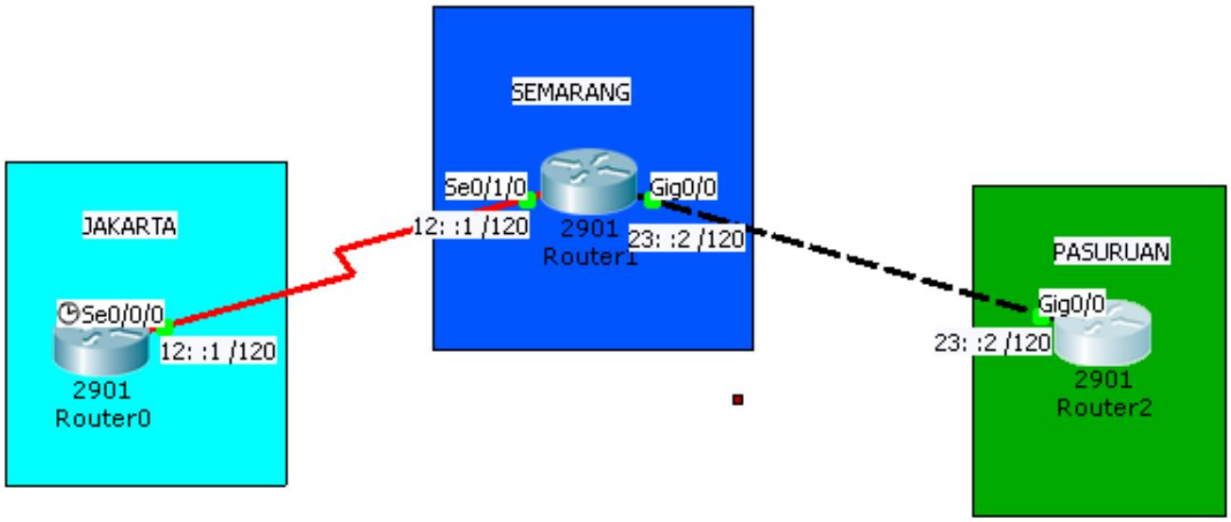
```
JAKARTA#show IPv6 route
IPv6 Routing Table - 7 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF
ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
C 1::1/128 [0/0] via ::,
     Loopback0
O 2::2/128 [120/2] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
O 3::3/128 [120/3] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
C 12::/120 [0/0] via ::,
     Serial0/0/0
L 12::1/128 [0/0] via ::,
     Serial0/0/0
O 23::/120 [120/2] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
L FF00::/8 [0/0] via ::, Null0
```

```
JAKARTA #ping 2::2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2::2, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/11/55 ms
```

```
JAKARTA r#ping 3::3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3::3, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/14/70 ms
```

#LAB 34# EIGRP IPV6

EIGRP ipv6 is configured on interfaces such as ospf v3 and Ripng and The network is also advertised (introduced) using the Comand interface.
-when configuring the interface, ipv6 for EIGRP is in shutdown mode -the same as ospf v3 ipv6 also requires Eigrp Router-id in IPV4 format. -Usually in the real world, when we want to configure like this, we have to have quite large memory and need IOS 12.4(6)T version.



CONFIGURE:

JAKARTA

```
JAKARTA(config)#ipv6 unicast-routing
JAKARTA(config)#int se0/0/0
JAKARTA(config-if)#ipv6 add 12::1/120
JAKARTA(config-if)# no shutdown
JAKARTA(config)#ipv6 router eigrp 10
JAKARTA(config-router)#router-id 1.1.1.1
JAKARTA(config-router)#no shutdown
JAKARTA(config)#int se0/0/0
JAKARTA(config-if)#ipv6 eigrp 10
JAKARTA(config)#int Lo0
JAKARTA(config-if)# ipv6 eigrp 10
```

```
SEMARANG SEMARANG(config)#ipv6 unicast-routing
 SEMARANG(config)#int se0/0/0
 SEMARANG(config-if)#ipv6 add 12::2/120
 SEMARANG(config-if)# no shutdown
 SEMARANG(config)#int gig0/0
 SEMARANG(config-if)#ipv6 add 23::2/120
 SEMARANG(config-if)# no shutdown
 SEMARANG(config)#ipv6 router eigrp 10
 SEMARANG(config-router)#router-id 2.2.2.2
 SEMARANG(config-router)#no shut
 SEMARANG(config)#int se0/1/0
 SEMARANG(config-if)# ipv6 eigrp 10
 SEMARANG(config)#int gig0/0
 SEMARANG(config-if)# ipv6 eigrp 10
 SEMARANG(config)#int Lo0
 SEMARANG(config-if)# ipv6 eigrp 10
```

PASURUAN

```
 PASURUAN(config)#ipv6 unicast-routing
 PASURUAN(config)#int gig0/0
 PASURUAN(config-if)#ipv6 add 23::/120
 PASURUAN(config-if)# no shutdown
 PASURUAN(config)#ipv6 router eigrp 10
 PASURUAN(config-router)#router-id 3.3.3.3
 PASURUAN(config-router)#no shut
 PASURUAN(config)#int gig0/0
 PASURUAN(config-if)# ipv6 eigrp 10
 PASURUAN(config)#int Lo0
 PASURUAN(config-if)# ipv6 eigrp 10
```

Verification:

```
JAKARTA#show IPv6 route
IPv6 Routing Table - 7 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route, M - MIPv6
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS
summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 -
OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
C 1::1/128 [0/0] via ::,
     Loopback0
D 2::2/128 [120/2] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
D 3::3/128 [120/3] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
C 12::/120 [0/0] via ::,
     Serial0/0/0
L 12::1/128 [0/0] via ::,
     Serial0/0/0
D 23::/120 [120/2] via
     FE80::2E0:A3FF:FEDC:E101, Serial0/0/0
L FF00::/8 [0/0] via ::, Null0
```

```
JAKARTA #ping 2::2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2::2, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/11/55 ms
```

```
JAKARTA r#ping 3::3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3::3, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/14/70 ms
```

CHAPTER 5

CCNP MATERIAL

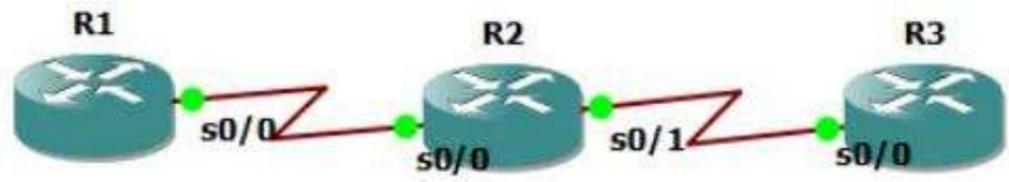
OK, in this chapter we have stepped into the CCNP (Cisco Certified Network Provider) material.
In this chapter, our kit continues like the previous labs and adds configuration.
So in this chapter it is a higher level than the previous one and we have gone up one level of certification to the next Cisco Certified...

In this chapter we will continue the configuration of several routings:

1. EIGRP
2. OSPF
3. Until IPV6
4. BGP (but this time we will not discuss it)

CCNP EIGRP

#LAB 35# Filtering distribute List



We create the Eigrp configuration as usual:

Install the IP as usual:

```
R1
interface Loopback0 ip address
1.1.1.1 255.255.255.255

interface Serial0/0 ip address
12.12.12.1 255.255.255.0 no shut

R2
interface Loopback0 ip address
2.2.2.2 255.255.255.255

interface Serial0/0 ip address
12.12.12.2 255.255.255.0 no shut interface Serial0/1 ip address
23.23.23.2
255.255.255.0 no shut



R3
interface Loopback0 ip address
3.3.3.3 255.255.255.255

interface Serial0/0 ip address
23.23.23.3 255.255.255.0 no shut
```

Eigrp configuration:

```
R1
router eigrp 10 network
1.1.1.1 0.0.0.0 network 12.12.12.1 0.0.0.0 no
auto-summary R2


router eigrp 10 network
2.2.2.2 0.0.0.0
network 12.12.12.2 0.0.0.0
network 23.23.23.2 0.0.0.0
```

```
no auto-summary
R3
router eigrp 10
network 3.3.3.3 0.0.0.0
network 23.23.23.3 0.0.0.0
no auto-summary
```

OK, before going to the lab, THIS is the function of Filtering Distribute List. Filtering networks based on network routes entering and leaving the interface.

In this case, the loopback IP 2.2.2.2 does not exist in R1's routing table.

OK, now let's create the Filtering Distribute List:

First way: filter network using the access list on R1 with IN

```
Route 1
access-list 10 deny 2.2.2.2
access-list 10 permit any
router eigrp 10
distribute-list 10 in Serial0/0
```

Chek

```
Check IP route
R1#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2 ia - IS-IS inter area,
                                          * - candidate default, U - per-user static
route
o - ODR, P - periodic downloaded static route

Gateway of last resort is not set
     1.0.0.0/32 is subnetted, 1 subnets
C 1.1.1.1 is directly connected, Loopback0
     3.0.0.0/32 is subnetted, 1 subnets
D 3.3.3.3 [90/2809856] via 12.12.12.2, 00:00:39, Serial0/0
     23.0.0.0/24 is subnetted, 1 subnets
D 23.23.23.0 [90/2681856] via 12.12.12.2, 00:00:39, Serial0/0
     12.0.0.0/24 is subnetted, 1 subnets
c        12.12.12.0 is directly connected, Serial0/0
```

No Roting table 2.2.2.2. right?

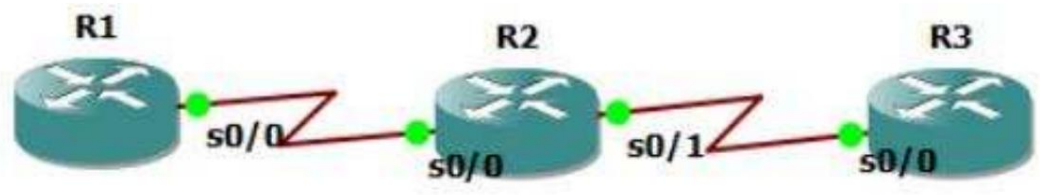
Second way: network filter using the access list on R2 with OUT.

Make sure the loopback IP 2.2.2.2 is again in R1's routing table. Remove the filter on router 1 then on R2:

```
router eigrp 10
access-list 10 deny 2.2.2.2
access-list 10 permit any
distribute-list 10 out Serial0/0
```

Check again and there will be no more Rotating table 2.2.2.2 sounds...

#LAB 36# EIGRP – FILTERING – AD



The aim is to filter routes with Administrative Distance 255. AD 255 will not be included in the routing table.

Delete the previous configuration or create a new one as before:

Add the Loopback IP:

```
R3(config)#int lo1
R3(config-if)#ip add 33.33.33.33 255.255.255.255
R3(config-if)#router eigrp 10
R3(config-router)#network 33.33.33.33 0.0.0.0
```

Chek Routing table di Router 2 :

```
Check IP route
R2#sh ip route
1.0.0.0/32 is subnetted, 1 subnets
D        1.1.1.1 [90/2297856] via 12.12.12.1, 00:04:36, Serial0/0
2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
33.0.0.0/32 is subnet ed, 1 subnets
D        33.33.33.33 [90/2297856] via 23.23.23.3, 00:00:12, Serial0/1
3.0.0.0/32 is subnetted, 1 subnets
D      3.3.3.3 [90/2297856] via 23.23.23.3, 00:00:12, Serial0/1
23.0.0.0/24 is subnetted, 1 subnets
C        23.23.23.0 is directly connected, Serial0/1
```

Now we try to eliminate network 33.33.33.33 by setting distance 255 on R2 so that network 33.33.33.33 does not appear in R2's routing table.

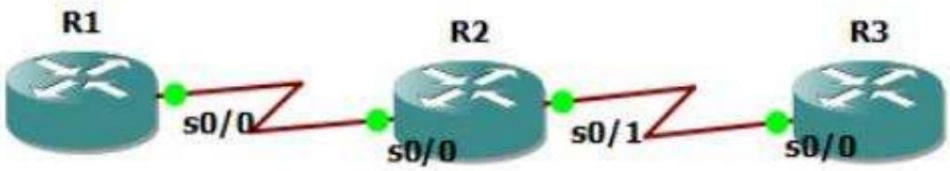
```
R2(config)#access-list 33 permit 33.33.33.33
R2(config)#router eigrp 10
R2(config-router)#distance 255 0.0.0.0 255.255.255.255 33
```

Now check again:

```
Check IP route
R2#sh ip route
1.0.0.0/32 is subnetted, 1 subnets
D       1.1.1.1 [90/2297856] via 12.12.12.1, 00:04:36, Serial0/0
2.0.0.0/32 is subnetted, 1 subnets
C       2.2.2.2 is directly connected, Loopback0
3.0.0.0/32 is subnetted, 1 subnets
D       3.3.3.3 [90/2297856] via 23.23.23.3, 00:00:12, Serial0/1
23.0.0.0/24 is subnetted, 1 subnets
C       23.23.23.0 is directly connected, Serial0/1
```

Network 33.33.33.33 will no **longer appear on the route table...**

#LAB 37# EIGRP – AUTHENTICATION (MD5)



For the security system when sending our data, when sending data it is encrypted (security system).

ROUTER 1

```
R1(config)#key chain EIGRP
R1(config-keychain)#key 1
R1(config-keychain-key)#key-string CISCO
R1(config-keychain-key)#int s0/0
R1(config-if)#ip authentication mode eigrp 10 md5
R1(config-if)#ip authentication key-chain eigrp 10 EIGRP
```

ROUTER 2

```
R2(config)#key chain EIGRP
R2(config-keychain)#key 1
R2(config-keychain-key)#key-string CISCO
R2(config-keychain-key)#int s0/0
R2(config-if)#ip authentication mode eigrp 10 md5
R2(config-if)#ip authentication key-chain eigrp 10 EIGRP
R2(config-if)#
```

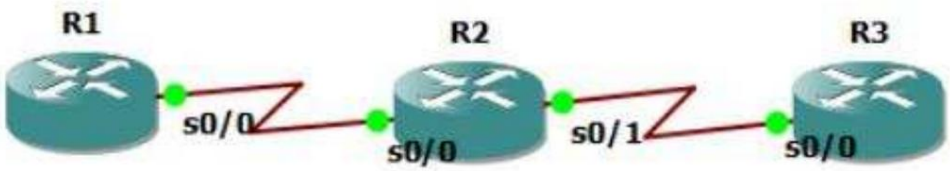
```
R1#debug eigrp packets EIGRP
Packets debugging is on (UPDATE, REQUEST,
 QUERY, REPLY, HELLO, IPXSAP, PROBE, ACK, STUB, SIAQUERY, SIAREPLY)

R1#
*Mar 1 00:01:15.211: EIGRP: received packet with MD5 authentication, key id = 1

*Mar 1 00:01:15.215: EIGRP: Received HELLO on Serial0/0 nbr 12.12.12.2 *Mar 1 00:01:15.215: AS 10, Flags 0x0,
Seq 0/0 idbQ 0/0 iidbQ un/rely 0/0 peerQ un/rely 0/0
```

Then turn it off

```
Turns off eigrp debug
R1#undebug eigrp packets
EIGRP Packets debugging is off
R1#
```

#LAB 38# EIGRP – SUMMARIZATION

If we are in a situation where we configure a router with many networks Then you get confused. There are too many networks. With this summarization we can summarize it, summarize several routing tables into one route in order to reduce the routing table.



CREATE On Router 2 Many Different Networks:

Create a loopback interface on R2 to be advertised to EIGRP.

```
R2(config)#interface Loopback1 R2(config-
if)# ip address 22.22.22.1 255.255.255.255 R2(config-if)# R2(config-if)#interface
Loopback2 R2(config-
if)#ip address 22.22.22.2 255.255.255.255
R2(config-if)# R2(config-if)#interface Loopback3 R2(config-if)#ip address
22.22.22.3
255.255.255.255 R2(config-if)# R2(config-
if)#interface Loopback4 R2(config-if)#ip address 22.22.22.4 255.255.255.255
R2(config-if)#
R2(config-if)#interface Loopback5 R2(config-
if)#ip address 22.22.22.5 255.255.255.255 R2(config-if)# R2(config-
if)#interface
Loopback6 R2(config-if)#ip address 22.22.22.6
255.255.255.255 R2(config-if)# R2(config-if)#interface Loopback7 R2(config-
if)#ip address
22.22.22.7 255.255.255.255 R2(config-if)#
R2(config-if)#interface Loopback8 R2(config-if)#ip address 22.22.22.8
255.255.255.255
```

Advertise kan :

Advertise ke EIGRP.

```
R2(config-if)#router eigrp 10 R2(config-
router)# network 22.22.22.1 0.0.0.0 R2(config-router)# network
22.22.22.2 0.0.0.0 R2(config-router)# network 22.22.22.3 0.0.0.0
R2(config-router)# network 22.22.22.4 0.0.0.0 R2(config-router)#
network 22.22.22.5 0.0.0.0 R2(config-router)# network 22.22.22.6
0.0.0.0 R2(config-router)# network 22.22.22.7 0.0.0.0 R2(config-
router)# network 22.22.22.8 0.0.0.0
```

Chek Di router 1 atau 3 :

```
     1.0.0.0/32 is subnetted, 1 subnets
D       1.1.1.1 [90/2809856] via 23.23.23.2, 00:07:53, Serial0/0
     2.0.0.0/32 is subnetted, 1 subnets
D       2.2.2.2 [90/2297856] via 23.23.23.2, 00:07:53, Serial0/0
     3.0.0.0/32 is subnetted, 1 subnets
C       3.3.3.3 is directly connected, Loopback0
     23.0.0.0/24 is subnetted, 1 subnets
C       23.23.23.0 is directly connected, Serial0/0
     22.0.0.0/32 is subnetted, 8 subnets
D          22.22.22.6 [90/2297856] via 23.23.23.2, 00:00:28, Serial0/0
D          22.22.22.7 [90/2297856] via 23.23.23.2, 00:00:31, Serial0/0
D          22.22.22.4 [90/2297856] via 23.23.23.2, 00:00:31, Serial0/0
D          22.22.22.5 [90/2297856] via 23.23.23.2, 00:00:31, Serial0/0
D          22.22.22.2 [90/2297856] via 23.23.23. 2, 00:00:32, Serial0/0
D          22.22.22.3 [90/2297856] via 23.23.23.2, 00:00:32, Serial0/0
D          22.22.22.1 [90/2297856] via 23.23.23.2, 00:00:32, Serial0/0
D          22.22.22.8 [90/2297856] via 23.23.23.2, 00:00:31, Serial0/0
```

Configure summarization on interface s0/1 on R2.

```
R2(config-router)# int s0/1
R2(config-if)#ip summary-address eigrp 10 22.22.22.0 255.255.255.248
```

Chek lagi :

```
     1.0.0.0/32 is subnetted, 1 subnets
D       1.1.1.1 [90/2809856] via 23.23.23.2, 00:07:53, Serial0/0
     2.0.0.0/32 is subnetted, 1 subnets
D       2.2.2.2 [90/2297856] via 23.23.23.2, 00:07:53, Serial0/0
     3.0.0.0/32 is subnetted, 1 subnets
C       3.3.3.3 is directly connected, Loopback0
     23.0.0.0/24 is subnetted, 1 subnets
C       23.23.23.0 is directly connected, Serial0/0
     22.0.0.0/32 is subnetted, 8 subnets
D          22.22.22.0/29 [90/2297856] via 23.23.23.2, 00:00:38, Serial0/0
D          22.22.22.8/32 [90/2297856] via 23.23.23.2, 00: 06:13, Serial0/0
```

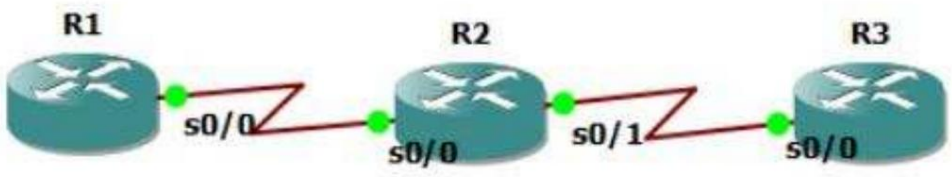
Is it lost? not still there. Just to summarize, try pinging one of the loopback IPs you created earlier:

```
R3#ping 22.22.22.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 22.22.22.1, timeout is 2 seconds:
 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 60/96/152 ms
R3#ping 22.22.22.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 22.22.22.8, timeout is 2 seconds:
 !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/52/92 ms
R3#
```

#LAB 39 # EIGRP – UNICAST UPDATE

His GOAL:

By default EIGRP updates via multicast IP 224.0.0.10, unicast update replaces updates from multicast to its unicast neighbors.




```
R1#debug ip packet detail
IP packet debugging is on (detailed)
R1#
*Mar 1 00:00:57.331: IP: s=12.12.12.2 (Serial0/0), d=224.0.0.10, len 60,
rcvd 2, proto=88
*Mar 1 00:00:58.079: IP: s=1.1.1.1 (local), d=224.0.0.10 (Loopback0), len
60, sending broad/multicast, proto=88
*Mar 1 00:00:58.083: IP: s=1.1.1.1 (Loopback0), d=224.0.0.10, len 60, rcvd
2, therefore=88
R1#
*Mar 1 00:01:00.271: IP: s=12.12.12.1 (local), d=224.0.0.10 (Serial0/0), len
60, sending broad/multicast, proto=88
```

```
R1#undebug ip packet detail
IP packet debugging is off (detailed)
```

Then configure the R1 to R2 link to be unicast:

Router

```
1 R1(config)#router eigrp 10
R1(config-router)#neighbor 12.12.12.2 s0/0
```

Router

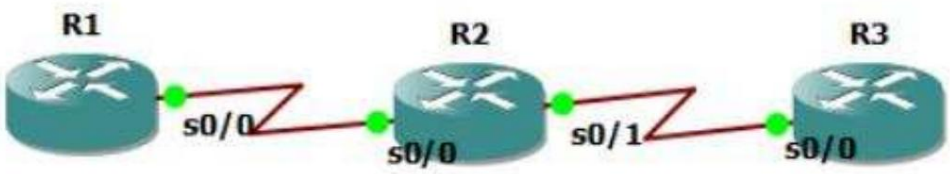
```
2 R2(config)#router eigrp 10
R2(config-router)#neighbor 12.12.12.1 s0/0
```

Then debug again:

```
R1#debug ip packet detail IP packet
debugging is on (detailed)
R1#
*Mar 1 00:15:51.467: IP: tableid=0, s=12.12.12.2 (Serial0/0), d=12.12.12.1 (Serial0/0), routed via RIB *Mar 1 00:15:51,471 : IP:
 s=12.12.12.2 (Serial0/0), d=12.12.12.1
(Serial0/0), len 60, rcvd 3, proto=88 R1# *Mar 1 00:15:52.711: IP: s=1.1 .1.1 (local), d=224.0.0.10 (Loopback0), len 60, sending
broad/multicast, proto=88 *Mar 1

00:15:52.715: IP: s=1.1.1.1 (Loopback0), d=224.0. 0.10, len 60, rcvd 2, proto=88 R1# *Mar 1 00:15:53.927: IP: s=12.12.12.1
(local), d=12.12.12.2 (Serial0/0), len 60, sending, proto =88cc
```

```
R1#undebug ip packet detail
IP packet debugging is off (detailed)
```

#LAB 40# EIGRP – DEFAULT ROUTE – SUMMARY ADDRESS



The goal: So that each router does not need to configure one default route one by one manually.

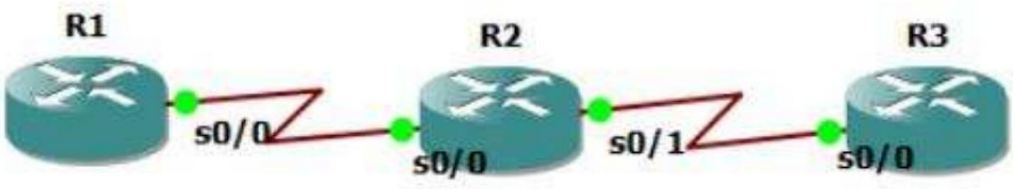
```
R1(config)#int s0/0
R1(config-if)#ip sum
R1(config-if)#ip summary-address eig
R1(config-if)#ip summary-address eigrp 10 0.0.0.0 0.0.0.0
R1(config-if)#
```

Chek:

```
R1(config-if)#do sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2 ia - IS-IS inter area,
                                        * - candidate default, U - per-user static
route
       o - ODR, P - periodic downloaded static route
Gateway of last resort is 0.0.0.0 to network 0.0.0.0
     1.0.0.0/32 is subnetted, 1 subnets
C       1.1.1.1 is directly connected, Loopback0
     2.0.0.0/32 is subnetted, 1 subnets
D       2.2.2.2 [90/2297856] via 12.12.12.2, 00:01:15, Serial0/0
     3.0.0.0/32 is subnetted, 1 subnets
D       3.3.3.3 [90/2809856] via 12.12.12.2, 00:01:14, Serial0/0
     23.0.0.0/24 is subnetted, 1 subnets
D       23.23.23.0 [90/2681856] via 12.12.12.2, 00:01:15, Serial0/0
     22.0.0.0/32 is subnetted, 8 subnets
D       22.22.22.6 [90/2297856] via 12.12.12.2, 00:01:17, Serial0/0
D       22.22.22.7 [90/2297856] via 12.12.12.2, 00:01:17, Serial0/0
D       22.22.22.4 [90/2297856] via 12.12.12.2, 00:01:17, Serial0/0
```

```
D        22.22.22.5 [90/2297856] via 12.12.12.2, 00:01:17, Serial0/0
D        22.22.22.2 [90/2297856] via 12.12.12.2, 00:01:18, Serial0/0
D        22.22.22.3 [90/2297856] via 12.12.12.2, 00:01:18, Serial0/0
D        22.22.22.1 [90/2297856] via 12.12.12.2, 00:01:18, Serial0/0
D        22.22.22.8 [90/2297856] via 12.12.12.2, 00:01:18, Serial0/0
     12.0.0.0/24 is subnetted, 1 subnets
C       12.12.12.0 is directly connected, Serial0/0
D* 0.0.0.0/0 is a summary, 00:00:17, Null0
```

#LAB 41# EIGRP – REDISTRIBUTION – OSPF



The goal:

Redistribute data from one protocol to another protocol, and this time we will use Ospf, so we redistribute Network Ospf to EIGRP.

Create a loopback on Router 2 first:

```
R2(config)#int lo1
R2(config-if)#ip add 22
R2(config-if)#ip add 222.222.222.222 255.255.255.255
*Mar 1 00:01:15.611: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Loopback1, changed state to up
```

Ospf configuration on Router

```
2: OSPF configuration on R2.
R2(config-if)#router ospf 11
R2(config-router)#net 222.222.222.222 0.0.0.0 area 0
```

Redistribution From OSPF To EIGRP:

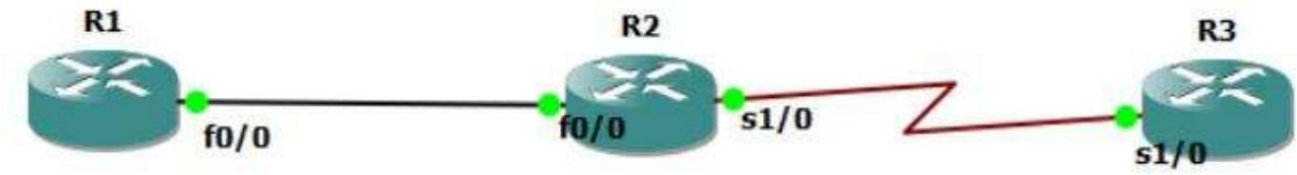
```
R2(config)#router eigrp 10
R2(config-router)#redistribute ospf 11 metric 1 1 1 1 1
```

Check Verification:

```
     222.222.222.0/32 is subnetted, 1 subnets
D EX 222.222.222.222 [170/2560512256] via 12.12.12.2, 00:00:52, Serial0/0
     1.0.0.0/32 is subnetted, 1 subnets
C       1.1.1.1 is directly connected, Loopback0
     2.0.0.0/32 is subnetted, 1 subnets
D       2.2.2.2 [90/2297856] via 12.12.12.2, 00:05:14, Serial0/0
     3.0.0.0/32 is subnetted, 1 subnets
D       3.3.3.3 [90/2809856] via 12.12.12.2, 00:05:14, Serial0/0
     23.0.0.0/24 is subnetted, 1 subnets
D       23.23.23.0 [90/2681856] via 12.12.12.2, 00:05:17, Serial0/0
```

CCNP OSPF

#LAB 42# OSPF SUMMARIZATION – AREA RANGE



Create an Ospf configuration like the previous lab:

```
R1
interface Loopback0 ip address
1.1.1.1 255.255.255.255

interface FastEthernet0/0 ip address 12.12.12.1
255.255.255.0

router ospf 1 router-id
1.1.1.1
network 0.0.0.0 255.255.255.255 area 0
```

```
R2
interface Loopback0 ip address
2.2.2.2 255.255.255.255

interface FastEthernet0/0 ip address 12.12.12.2
255.255.255.0

interface Serial1/0 ip address
23.23.23.2 255.255.255.0

router ospf 2 router-id
2.2.2.2
network 0.0.0.0 255.255.255.255 area 0
```

```
R3
interface Loopback0 ip address
3.3.3.3 255.255.255.255

interface Serial1/0 ip address
23.23.23.3 255.255.255.0

router ospf 3 router-id
3.3.3.3
network 0.0.0.0 255.255.255.255 area 0
```

```
R3(config)#int lo1
R3(config-if)#ip add 33.33.33.1 255.255.255.255
R3(config-if)#int lo2
R3(config-if)#ip add 33.33.33.2 255.255.255.255
R3(config-if)#int lo3
R3(config-if)#ip add 33.33.33.3 255.255.255.255
R3(config-if)#int lo4
R3(config-if)#ip add 33.33.33.4 255.255.255.255
R3(config-if)#int lo5
R3(config-if)#ip add 33.33.33.5 255.255.255.255
R3(config-if)#int lo6
R3(config-if)#ip add 33.33.33.6 255.255.255.255
```

Create a loopback which will later be summarized. :

```
R3(config)#router ospf 3
R3(config-router)#net 33.33.33.1 0.0.0.0 area 10
R3(config-router)#net 33.33.33.2 0.0.0.0 area 10
R3(config-router)#net 33.33.33.3 0.0.0.0 area 10
R3(config-router)#net 33.33.33.4 0.0.0.0 area 10
R3(config-router)#net 33.33.33.5 0.0.0.0 area 10
R3(config-router)#net 33.33.33.6 0.0.0.0 area 10
```

Chek;

```
R1(config-router)#do sh ip route

     1.0.0.0/32 is subnetted, 1 subnets
C       1.1.1.1 is directly connected, Loopback0
     2.0.0.0/32 is subnetted, 1 subnets
O       2.2.2.2 [110/11] via 12.12.12.2, 00:04:12, FastEthernet0/0
     33.0.0.0/32 is subnetted, 6 subnets
O IA       33.33.33.1 [110/75] via 12.12.12.2, 00:00:20, FastEthernet0/0
HE IS      33.33.33.3 [110/75] via 12.12.12.2, 00:00:20, FastEthernet0/0
HE IS      33.33.33.2 [110/75] via 12.12.12.2, 00:00:20, FastEthernet0/0
HE IS      33.33.33.5 [110/75] via 12.12.12.2, 00:00:20, FastEthernet0/0
HE IS      33.33.33.4 [110/75] via 12.12.12.2, 00:00:21, FastEthernet0/0
HE IS      33.33.33.6 [110/75] via 12.12.12.2, 00:00:12, FastEthernet0/0
     3.0.0.0/32 is subnetted, 1 subnets
O       3.3.3.3 [110/75] via 12.12.12.2, 00:02:51, FastEthernet0/0
   23.0.0.0/24 is subnetted, 1 subnets
O       23.23.23.0 [110/74] via 12.12.12.2, 00:04:15, FastEthernet0/0
   12.0.0.0/24 is subnetted, 1 subnets
C       12.12.12.0 is directly connected, FastEthernet0/0
```

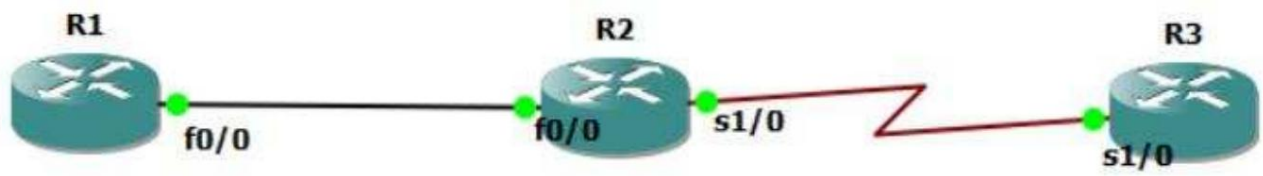
Summary configuration on

```
R3 : R3(config-router)#area 10 range 33.33.33.0 255.255.255.248
```

```
R1(config-router)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:05:34, FastEthernet0/0
      33.0.0.0/29 is subnetted, 1 subnets
O IA 33.33.33.0 [110/75] via 12.12.12.2, 00:00:06, FastEthernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/75] via 12.12.12.2, 00:04:12, FastEthernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/74] via 12.12.12.2, 00:05:36, FastEthernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
C        12.12.12.0 is directly connected, FastEthernet0/0
```

Check again

#LAB 43# OSPF SUMMARY ADDRESS



Still continuing with the previous one:

```
R3(config)#router eigrp 3
R3(config-router)#net 33.33.33.1 0.0.0.0
R3(config-router)#net 33.33.33.2 0.0.0.0
R3(config-router)#net 33.33.33.3 0.0.0.0
R3(config-router)#net 33.33.33.4 0.0.0.0
R3(config-router)#net 33.33.33.5 0.0.0.0
R3(config-router)#net 33.33.33.6 0.0.0.0
R3(config-router)#no auto-summary
```

```
R3(config)#router ospf 3
R3(config-router)#router-id 3.3.3.3
R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
R3(config-router)#network 23.23.23.3 0.0.0.0 area 0 e R3(config-
router)#redistribute eigrp 3 subnets
```

```
R1#sh ip route

     1.0.0.0/32 is subnetted, 1 subnets
C       1.1.1.1 is directly connected, Loopback0
     2.0.0.0/32 is subnetted, 1 subnets
O       2.2.2.2 [110/11] via 12.12.12.2, 00:04:26, FastEthernet0/0
     33.0.0.0/32 is subnetted, 6 subnets
O E2 33.33.33.1 [110/20] via 12.12.12.2, 00:01:08, FastEthernet0/0
O E2 33.33.33.3 [110/20] via 12.12.12.2, 00:01:08, FastEthernet0/0
O E2 33.33.33.2 [110/20] via 12.12.12.2, 00:01:08, FastEthernet0/0
O E2 33.33.33.5 [110/20] via 12.12.12.2, 00:01:08, FastEthernet0/0
O E2 33.33.33.4 [110/20] via 12.12.12.2, 00:01:09, FastEthernet0/0
O E2 33.33.33.6 [110/20] via 12.12.12.2, 00:01:09, FastEthernet0/0
     3.0.0.0/32 is subnetted, 1 subnets
O       3.3.3.3 [110/75] via 12.12.12.2, 00:03:15, FastEthernet0/0
  23.0.0.0/24 is subnetted, 1 subnets
O     23.23.23.0 [110/74] via 12.12.12.2, 00:04:36, FastEthernet0/0
  12.0.0.0/24 is subnetted, 1 subnets
C     12.12.12.0 is directly connected, FastEthernet0/0
```

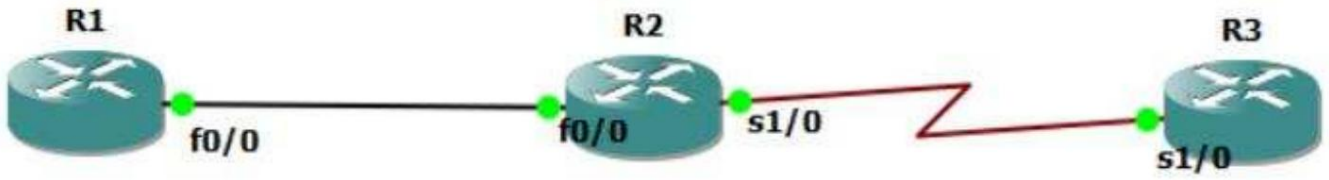
Configure external route summary in R3:

```
R3(config-router)#summary-address 33.33.33.0 255.255.255.248
```

Check Again:

```
R1#sh ip route
     1.0.0.0/32 is subnetted, 1 subnets
C            1.1.1.1 is directly connected, Loopback0
     2.0.0.0/32 is subnetted, 1 subnets
O            2.2.2.2 [110/11] via 12.12.12.2, 00:06:38, FastEthernet0/0
     33.0.0.0/29 is subnetted, 1 subnets
It is E2     33.33.33.0 [110/20] via 12.12.12.2, 00:00: 30, FastEthernet0/0
     3.0.0.0/32 is subnetted, 1 subnets
O            3.3.3.3 [110/75] via 12.12.12.2, 00:05:25, FastEthernet0/0
     23.0.0.0/24 is subnetted, 1 subnets
O            23.23.23.0 [110/74] via 12.12.12.2, 00:06:39, FastEthernet0/0
     12.0.0.0/24 is subnetted, 1 subnets
C            12.12.12.0 is directly connected, FastEthernet0/0
```

#LAB 44#OSPF DEFAULT ROUTE



Still using the previous lab. Create 1 IP loopback on R3 and don't need to advertise it.

```
R3(config)#int lo11
R3(config-if)#ip add 113.113.113.113 255.255.255.255
```

To access the unadvertised loopback 113.113.113.113, use the default route

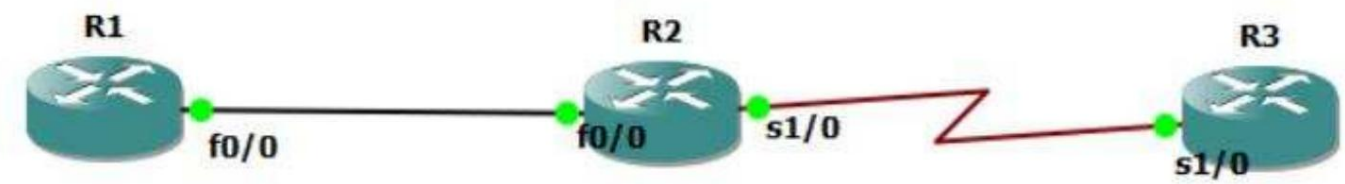
```
R3(config)#router ospf 3
R3(config-router)#default-information originate always
```

```
R1#sh ip route
     1.0.0.0/32 is subnetted, 1 subnets
C            1.1.1.1 is directly connected, Loopback0
     2.0.0.0/32 is subnetted, 1 subnets
O            2.2.2.2 [110/11] via 12.12.12.2, 00:02:49, FastEthernet0/0
     33.0.0.0/29 is subnetted, 1 subnets
O E2 33.33.33.0 [110/20] via 12.12.12.2, 00:02:49, FastEthernet0/0
     3.0.0.0/32 is subnetted, 1 subnets
O            3.3.3.3 [110/75] via 12.12.12.2, 00:02:49, FastEthernet0/0
     23.0.0.0/24 is subnetted, 1 subnets
O            23.23.23.0 [110/74] via 12.12.12.2, 00:02:51, FastEthernet0/0
     12.0.0.0/24 is subnetted, 1 subnets
C            12.12.12.0 is directly connected, FastEthernet0/0
O*E2         0.0.0.0/0 [110/1] via 12.12.12.2, 00:00:09, FastEthernet0/0
```

Try pinging:

```
R1#ping 113.113.113.113
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 113.113.113.113, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/164/280 ms
```

#LAB45# OSPF AUTHENTICATION



There are 2 authentications in
OSPF: 1. Clear Text

Authentication 2. MD5

Authentication **Still continuing the previous Lab**

Configure Clear Text Authentication between R1 and R2:

```
R1(config)#int f0/0
R1(config-if)#ip ospf authentication
R1(config-if)#ip ospf authentication-key CISCO123
```

```
R2(config)#int f0/0
R2(config-if)#ip ospf authentication
R2(config-if)#ip ospf authentication-key CISCO123
```

Check Verification:

```
R1(config-if)#do sh ip ospf int f0/0 FastEthernet0/0 is up, line
protocol is up Internet Address 12.12.12.1/24, Area 0 Process ID 1, Router ID
    1.1.1.1, Network Type BROADCAST, Cost: 10 Transmit Delay is 1 sec,
    State BDR, Priority 1 Designated Router (ID) 2.2.2.2, Interface address 12.12.12.2 Backup Designated router (ID) 1.1.1.1,
    Interface address 12.12.12.1 Timer intervals configured, Hello 10, Dead 40, Wait 40,
    Retransmit 5 oob-resync timeout 40 Hello due in 00:00:00 Supports Link-local Signaling (LLS)




    Cisco NSF helper support enabled IETF NSF helper support
    enabled Index 1/1, flood queue length 0 Next 0x0(0)/0x0(0)


    Last flood scan length is 1, maximum is 1 Last flood scan time is 0 msec,
    maximum is 0 msec Neighbor Count is 1, Adjacent neighbor count is 1

        Adjacent with neighbor 2.2.2.2 (Designated Router)
    Suppress hello for 0 neighbor(s)
    Simple password authentication enabled
```

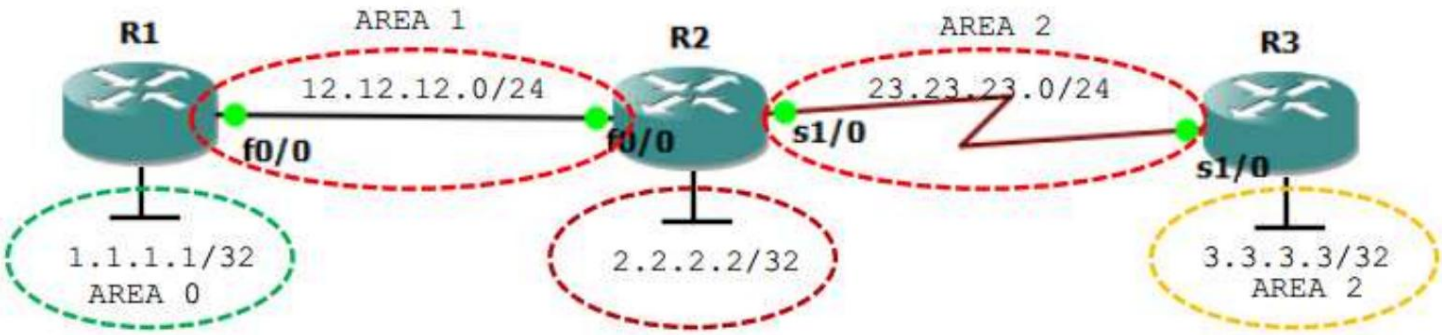
Configure MD5 Authentication on Routers between 2 and 3;

```
R2(config-if)#int s1/0
R2(config-if)#ip ospf authentication message-digest
R2(config-if)#ip ospf message-digest-key 13 md5 CISCO123
```

```
R3(config)#int s1/0
R3(config-if)#ip ospf authentication message-digest
R3(config-if)#ip ospf message-digest-key 13 md5 CISCO123
```

```
R3(config-if)#do sh ip ospf int s1/0 (config-if)#do sh ip ospf int f0/0
 FastEthernet0/0 is up, line protocol is up Internet Address
12.12.12.1/24, Area 0 Process ID 1, Router ID 1.1.1.1, Network Type
    BROADCAST, Cost: 10 Transmit Delay is 1 sec, State BDR, Priority 1
    Designated Router (ID) 2.2.2.2, Interface address 12.12.12.2 Backup Designated router (ID) 1.1.1.1, Interface address
    12.12.12.1 Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5 oob-
    resync timeout 40 Hello due in 00:00:00




    Supports Link-local Signaling (LLS)
    Cisco NSF helper support enabled
    IETF NSF helper support enabled
    Index 1/1, flood queue length 0
    Next 0x0(0)/0x0(0)
    Last flood scan length is 1, maximum is 1
    Last flood scan time is 0 msec, maximum is 0 msec
    Neighbor Count is 1, Adjacent neighbor count is 1
        Adjacent with neighbor 2.2.2.2 (Designated Router)
    Suppress hello for 0 neighbor(s)
    Message digest authentication enabled
            Youngest key id is 13
```

#LAB 46# OSPF -VIRTUAL LINK



OK, first create the OSPF configuration as usual:

```
R1
interface Loopback0 ip address
1.1.1.1 255.255.255.255

interface FastEthernet0/0 ip address
12.12.12.1 255.255.255.0

router ospf 13 router-id
1.1.1.1
network 1.1.1.1 0.0.0.0 area 0
network 12.12.12.0 0.0.0.255 area 1
```

```
R2
interface Loopback0 ip address
2.2.2.2 255.255.255.255

interface FastEthernet0/0 ip address
12.12.12.2 255.255.255.0

interface Serial1/0 ip address
23.23.23.2 255.255.255.0

router ospf 13 router-id
2.2.2.2
network 2.2.2.2 0.0.0.0 area 1
network 12.12.12.0 0.0.0.255 area 1
network 23.23.23.0 0.0.0.255 area 2
```

```
R3
interface Loopback0 ip address
3.3.3.3 255.255.255.255

interface Serial1/0 ip address
23.23.23.3 255.255.255.0

router ospf 14 1.1.1.1/32
2.2.2.2/32 3.3.3.3/32 12.12.12.0/24 23.23.23.0/24


router-id 3.3.3.3
network 3.3.3.3 0.0.0.0 area 2
network 23.23.23.0 0.0.0.255 area 2
```

```
R1(config)#router ospf 13 R1(config-
router)#area 1 virtual-link 2.2.2.2
```

```
R2(config-router)#area 1 virtual-link 1.1.1.1 R2(config-router)#area
2 virtual-link 3.3.3.3
```

```
R3(config-router)#area 2 virtual-link 2.2.2.2
```

Now try ping :

```
R1#ping 2.2.2.2 Type escape
sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 56/100/204 ms
```

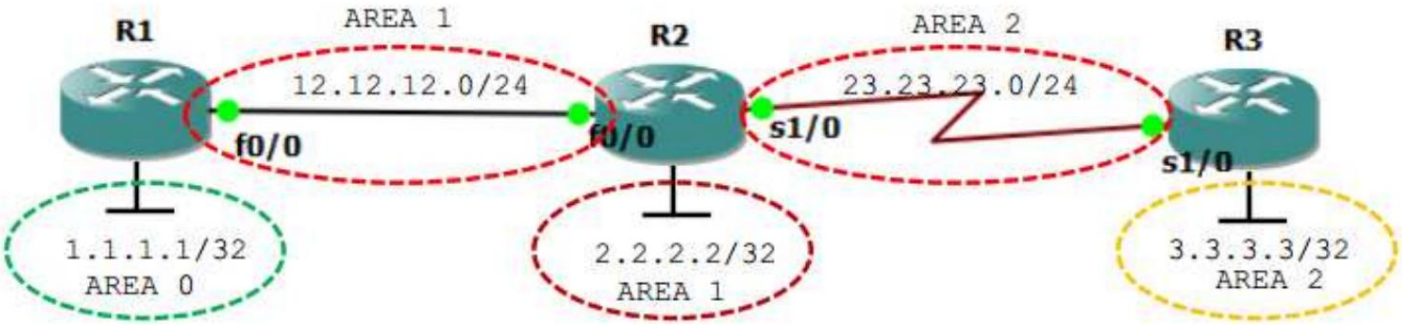
```
R1#ping 3.3.3.3 Type escape
sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 24/148/204 ms
```

Verification:

```
R1#sh ip ospf virtual-links Virtual Link
OSPF_VL0 to router 2.2.2.2 is up
    Run as demand circuit
    DoNotAge LSA allowed.
    Transit area 1, via interface FastEthernet0/0, Cost of using 10 Transmit Delay is 1 sec, State
    POINT_TO_POINT, Timer intervals configured, Hello 10, Dead 40,
    Wait 40, Retransmit 5
      Hello due in 00:00:09
      Adjacency State FULL (Hello suppressed)
      Index 1/2, retransmission queue length 0, number of retransmission 0
      First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
      Last retransmission scan length is 0, maximum is 0
      Last retransmission scan time is 0 msec, maximum is 0 msec
```

```
R2#sh ip ospf virtual-links Virtual
Link OSPF_VL0 to router 3.3.3.3 is up
    Run as demand circuit
    DoNotAge LSA allowed.
    Transit area 1, via interface FastEthernet0/0, Cost of using 10 Transmit Delay is 1 sec, State
    POINT_TO_POINT, Timer intervals configured, Hello 10, Dead 40,
    Wait 40, Retransmit 5
      Hello due in 00:00:09
      Adjacency State FULL (Hello suppressed)
      Index 1/2, retransmission queue length 0, number of retransmission 0
      First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
      Last retransmission scan length is 0, maximum is 0
      Last retransmission scan time is 0 msec, maximum is 0 msec
```

#LAB47 # OSPF GRE TUNNEL



Delete the virtual link first.

```
R1(config)#router ospf 13 R1(config-
router)#no area 1 virtual-link 2.2.2.2
```

```
R2(config)#router ospf 13 R2(config-
router)#no area 1 virtual-link 1.1.1.1 R2(config-router)#no area 2
virtual-link 3.3.3.3
```

```
R3(config)#router ospf 14 R3(config-
router)#no area 2 virtual-link 2.2.2.2
```

Configure GRE Tunnel

nya : **R1(config)#int tun1**

```
R1(config-if)#ip add 102.102.102.1 255.255.255.0 R1(config-if)#tunnel
source 12.12.12.1 R1(config-if)#tunnel destination
12.12.12.2 R1(config-if)#router ospf 13 R1(config-router)#net
102.102.102.1 0.0.0.0 area 0
```

```
R2(config)#int tun1
R2(config-if)#ip add 102.102.102.2 255.255.255.0 R2(config-if)#tunnel
destination 12.12.12.1 R2(config-if)#tunnel source 12.12.12.2
R2(config-if)#router ospf 13 R2(config-router)#net
102.102.102.2 0.0.0.0 area 0
```

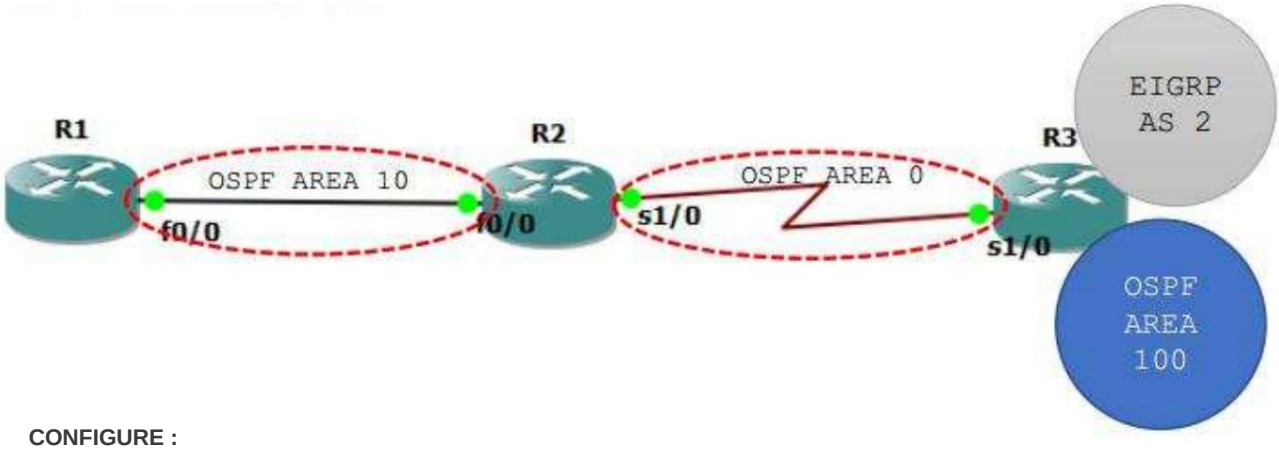
```
R1#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2 i - IS-IS, su - IS-IS summary,
       L1 - IS-IS level-1, L2 - IS-IS level-2 ia - IS-IS inter area,
                                          * - candidate default, U - per-user static
route
       o - ODR, P - periodic downloaded static route
  Gateway of last resort is not set

     102.0. 0.0/24 is subnetted, 1 subnets 102.102.102.0 is
C       directly connected, Tunnel1 1.0.0.0/32 is subnetted, 1 subnets
     1.1.1.1 is directly connected, Loopback0 2.0.0.0/32
C       is subnetted, 1 subnets 2.2.2.2 [110/11] via 12.12.12.2,
     00:11:26, FastEthernet0/0 3.0.0.0/32 is subnetted, 1
O       subnets

O IA 3.3.3.3 [110/11176] via 102.102.102.2, 00:03:52, Tunnel1
     23.0.0.0/24 is subnetted, 1 subnets
O IA 23.23.23.0 [110/11175] via 102.102.102.2, 00:03:52, Tunnel1
   12.0.0.0/24 is subnetted, 1 subnets
C      12.12.12.0 is directly connected, FastEthernet0/0
```

Ping :

```
R1#ping 2.2.2.2 Type escape
sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/96/284 ms
```

```
1#ping 3.3.3.3 Type
escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds: !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 92/200/312 ms
```

#LAB48# OSPF STANDARD AREA



CONFIGURE :

```
R1
interface Loopback0 ip address
1.1.1.1 255.255.255.255

interface FastEthernet0/0 ip address 12.12.12.1
255.255.255.0

router ospf 13 router-id
1.1.1.1 network 1.1.1.1 0.0.0.0
area 10
network 12.12.12.0 0.0.0.255 area 10
```

```
R2
interface Loopback0 ip address
2.2.2.2 255.255.255.255

interface FastEthernet0/0 ip address 12.12.12.2
255.255.255.0

interface Serial1/0 ip address
23.23.23.2 255.255.255.0

router ospf 13 router-id
2.2.2.2 network 2.2.2.2 0.0.0.0
area 0
network 12.12.12.0 0.0.0.255 area 10 network 23.23.23.0 0.0.0.255
area 0
```

```
R3
interface Loopback0 ip address
3.3.3.3 255.255.255.255

interface Serial1/0 ip address
23.23.23.3 255.255.255.0

router ospf 14 router-id
3.3.3.3 network 3.3.3.3 0.0.0.0
area 0 network 23.23.23.0 0.0.0.255 area 0
```

Buat interface loopback di ruter3 interface

```
Loopback1 ip address 33.33.33.1
255.255.255.255

interface Loopback2 ip address
33.33.33.2 255.255.255.255

interface Loopback3 ip address
33.33.33.3 255.255.255.255

interface Loopback4 ip address
33.33.33.4 255.255.255.255

interface Loopback5 ip address
33.33.33.5 255.255.255.255

interface Loopback6 ip address
33.33.33.6 255.255.255.255

interface Loopback7 ip address
33.33.33.7 255.255.255.255

interface Loopback8 ip address
33.33.33.8 255.255.255.255
```

Enter several interfaces into EIGRP.

```
router eigrp 2 net
33.33.33.1 0.0.0.0 net 33.33.33.2 0.0.0.0
net 33.33.33.3 0.0.0.0

net 33.33.33.4 0.0.0.0
no auto-summary
```

Insert another interface into OSPF with area 100 and redistribute EIGRP to OSPF:

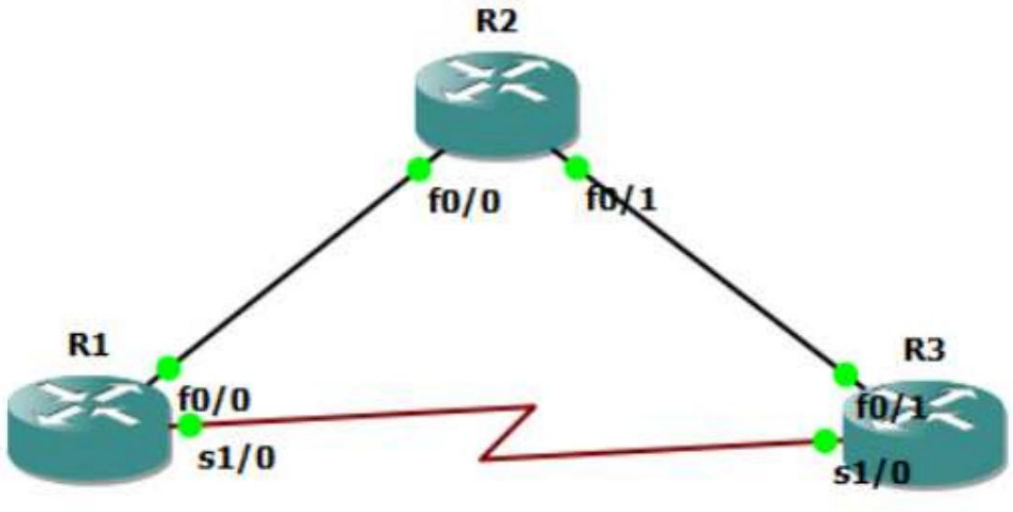
```
router ospf 14
net 33.33.33.5 0.0.0.0 area 100
net 33.33.33.6 0.0.0.0 area 100
net 33.33.33.7 0.0. 0.0 area 100
net 33.33.33.8 0.0.0.0 area 100
redistribute eigrp 2 subnets
```

CHEK :

```
R1(config-router)#do sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2 ia - IS-IS inter area,
                                          * - candidate default, U - per-user static
route
       o - ODR, P - periodic downloaded static route
Gateway of last resort is not set

     1.0.0.0/32 is subnetted, 1 subnets
C       1.1.1.1 is directly connected, Loopback0
     2.0.0.0/32 is subnetted, 1 subnets
O IA 2.2.2.2 [110/11] via 12.12.12.2, 00:00:28, FastEthernet0/0
     33.0.0.0/32 is subnetted, 8 subnets
It is E2    33.33.33.1 [110/20] via 12.12.12.2, 00:00:03, FastEthernet0/0
It is E2    33.33.33.3 [110/20] via 12.12.12.2, 00:00:03, FastEthernet0/0
It is E2    33.33.33.2 [110/20] via 12.12.12.2, 00:00:03, FastEthernet0/0
HE IS       33.33.33.5 [110/75] via 12.12.12.2, 00:00:08, FastEthernet0/0
It is E2    33.33.33.4 [110/20] via 12.12.12.2, 00:00:04, FastEthernet0/0
HE IS       33.33.33.7 [110/75] via 12.12.12.2, 00:00:09, FastEthernet0/0
HE IS       33.33.33.6 [110/75] via 12.12.12.2, 00:00:09, FastEthernet0/0
HE IS       33.33.33.8 [110/75] via 12.12.12.2, 00:00:09, FastEthernet0/0
     3.0.0.0/32 is subnetted, 1 subnets
O IA 3.3.3.3 [110/75] via 12.12.12.2, 00:00:11, FastEthernet0/0
     23.0.0.0/24 is subnetted, 1 subnets
O IA 23.23.23.0 [110/74] via 12.12.12.2, 00:00:31, FastEthernet0/0
     12.0.0.0/24 is subnetted, 1 subnets
C       12.12.12.0 is directly connected, FastEthernet0/0
```

```
R1(config-router)#do sh ip ospf database
OSPF Router with ID (1.1.1.1) (Process ID 13)


Router Link States (Area 10)

Link ID ADV Router Age Seq# 1.1.1.1 1.1.1.1 2.2.2.2                    Checksum Link count
2.2.2.2                                  127 0x80000002 0x0015AB 2
                                         127 0x80000002 0x00F9D1 1
```

#LAB 49#OSPF MOVE LANE



This time we will learn how to change paths in the OSPF protocol:

CONFIGURE :

Router

```
1 R1(config)#interface Loopback0
R1(config-if)#ip address 1.1.1.1 255.255.255.255 R1(config-
if)#interface FastEthernet0/0 R1(config-if)#ip address
12.12.12.1 255.255.255.0 R1(config-if)#no sh R1(config-if)#interface
Serial1/0 R1(config-if)#ip
address 13.13.13.1 255.255.255.0 R1(config-
if)#no sh R1(config-if)#router ospf 1 R1(config-router)#router-id 1.1.1.1
R1(config-router)#network
0.0.0.0 255.255.255.255 area 0
```

Router

```
2 R2(config)#interface Loopback0
R2(config-if)#ip address 2.2.2.2 255.255.255.255 R2(config-
if)#interface FastEthernet0/0 R2(config-if)#ip address
12.12.12.2 255.255.255.0 R2(config-if)#no sh R2(config-if)#interface
FastEthernet0/1 R2(config-
if)#ip address 23.23.23.2 255.255.255.0 R2(config-if)#no
sh R2(config-if)#router ospf 2 R2(config-router)#router-id 2.2.2.2
R2(config-router)#network
0.0.0.0 255.255.255.255 area 0
```

ROUTER 3

```
R3(config)#interface Loopback0
R3(config-if)#ip address 3.3.3.3 255.255.255.255
R3(config-if)#interface FastEthernet0/1
R3(config-if)#ip address 23.23.23.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#interface Serial1/0
R3(config-if)#ip address 13.13.13.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#router ospf 3
R3(config-router)#router-id 3.3.3.3
R3(config-router)#network 0.0.0.0 255.255.255.255 area 0
```

Check the path:

```
R1#traceroute 3.3.3.3
Type escape sequence to abort.
Tracing the route to 3.3.3.3
1 12.12.12.2 208 msec 4 msec 8 msec
2 23.23.23.3 276 msec 80 msec 216 msec
```

```
R1#sh ip route 3.3.3.3
Routing entry for 3.3.3.3/32
Known via "ospf 1", distance 110, metric 21, type intra area
Last update from 12.12.12.2 on FastEthernet0/0, 00:02:07 ago
Routing Descriptor Blocks:
* 12.12.12.2, from 3.3.3.3, 00:02:07 ago, via FastEthernet0/0
Route metric is 21, traffic share count is 1
```

It turned out to be via router line 2.. Why...??

Because OSPF uses bandwidth, the preferred path is via FastEthernet.

FastEthernet has metric 10 obtained from 100.000.000:10.000.000 (lowest bandwidth 10Mbps).

It says that the metric is 21, obtained from the FastEthernet metrics R1-R2 and R2-R3, each 10 and loopback R3 1, so the total is 21.

Now try shutting down the interface on router 2:

```
R2(config)#interface FastEthernet0/0
R2(config-if)#shutdown
```

Then check again:

```
R1#sh ip route 3.3.3.3
Routing entry for 3.3.3.3/32
Known via "ospf 1", distance 110, metric 65, type intra area
Last update from 13.13.13.3 on Serial1/0, 00:00:18 ago
Routing Descriptor Blocks:
* 13.13.13.3, from 3.3.3.3, 00:00:18 ago, via Serial1/0
Route metric is 65, traffic share count is 1
```

So moving on to the series. Serial has a metric of 64 obtained from 100,000,000:1,544,000 (rounding serial bandwidth).

Metric 65 is obtained from the R1-R3 serial link, which is 64 and the R3 1 loopback is a total of 65.

If you want to choose the route from router 2 then turn it back on.

CHAPTER 6

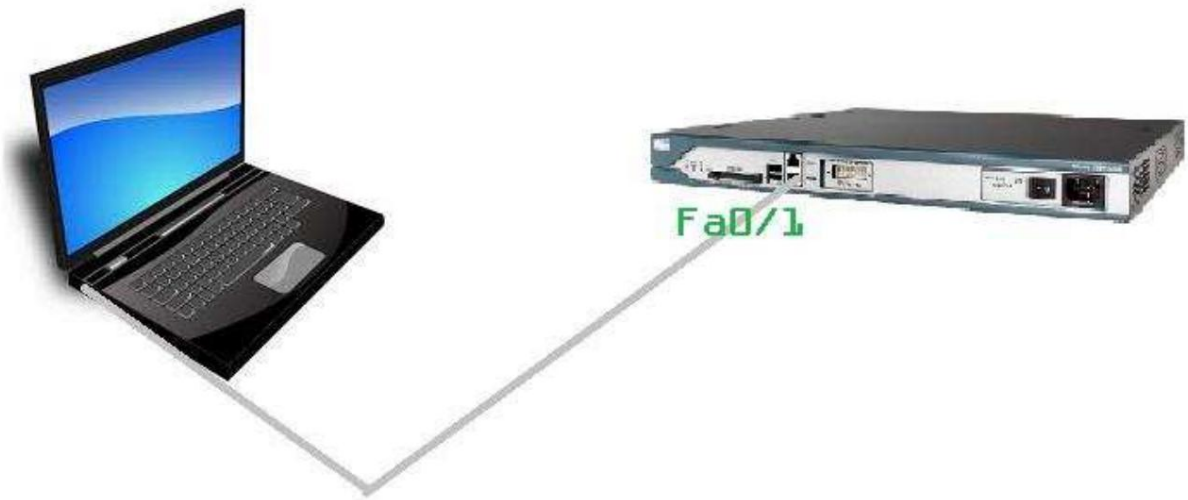
NMS (Network Management System)

This time we move on to the NMS (Network Management System) chapter, where in this chapter we will use monitoring software to manage our network.
We can monitor all our network devices with this NMS software and according to its useful function.

There are several NMS that we will study:

1.PRTG
2.WhatsupGold
3.kiwiCattols 4.Netflow

Topology like this;

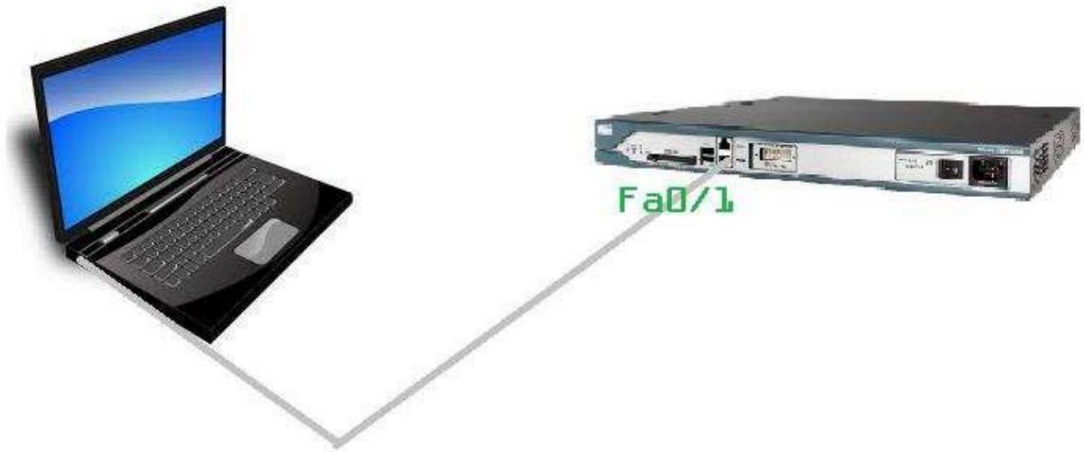


#LAB 50#

PRTG

This time we use PRTG as Bandwidth monitoring,

Prepare the original router and one PC according to this topogy:

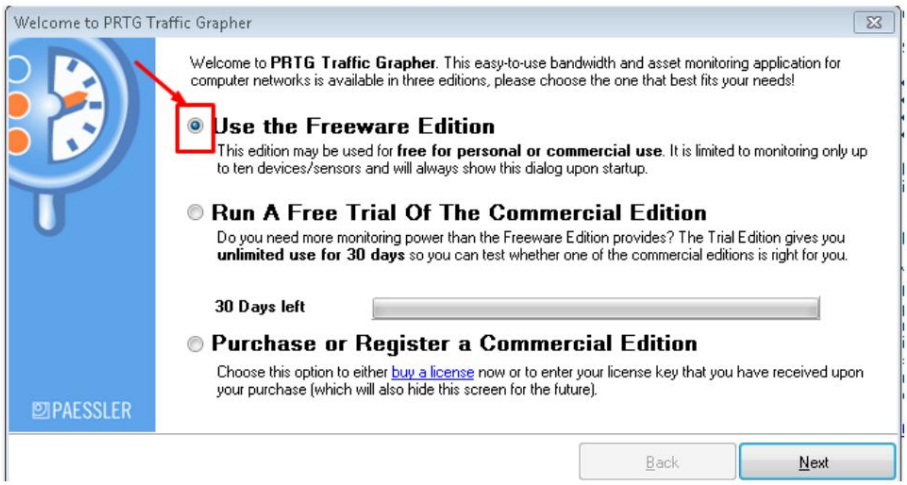


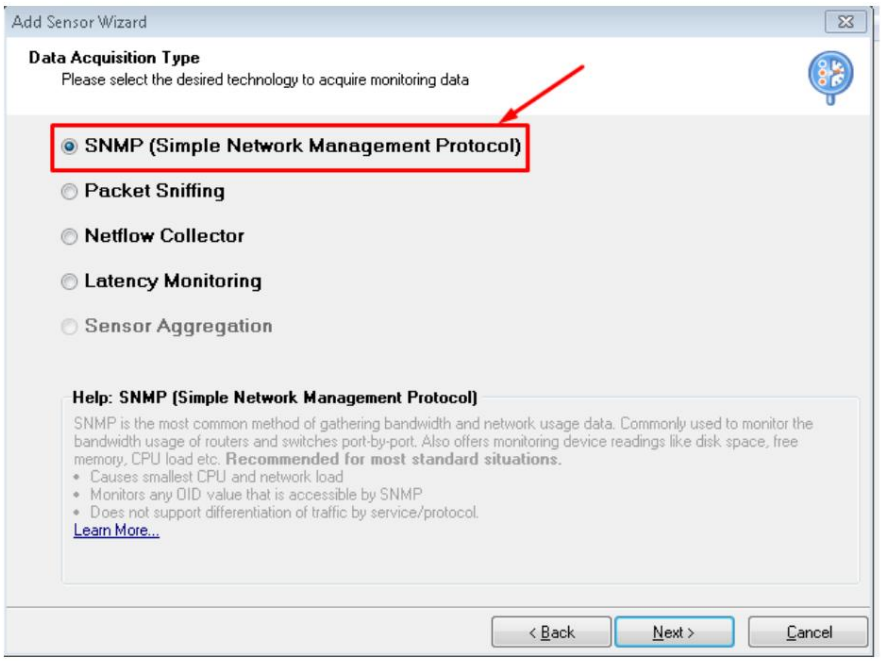
STEPS:

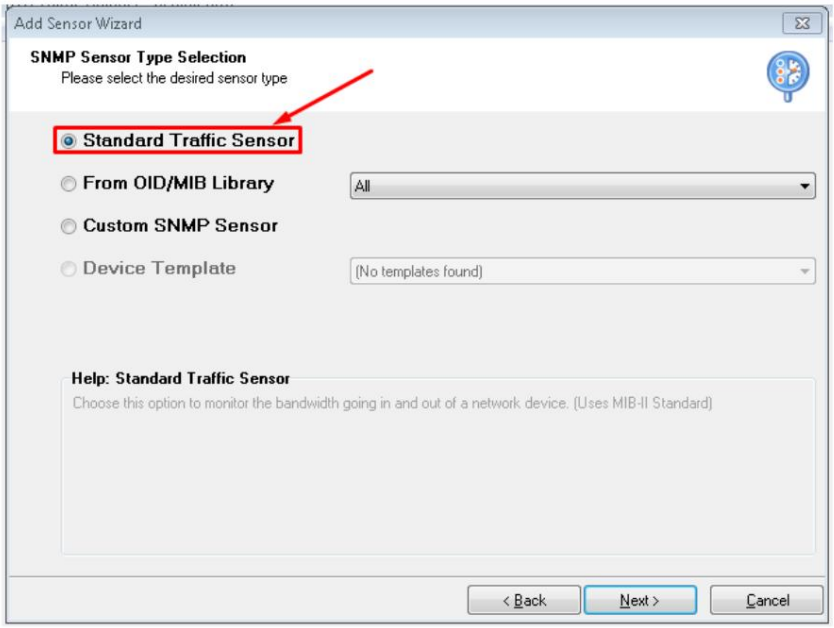
ÿ Create an IP address on the PC / laptop interface, for example 10. 10 .10 .1 /24 ÿ Create an IP address on our Router interface, for example 10. 10. 10. 2 /24 ÿ Then configure the SNM router

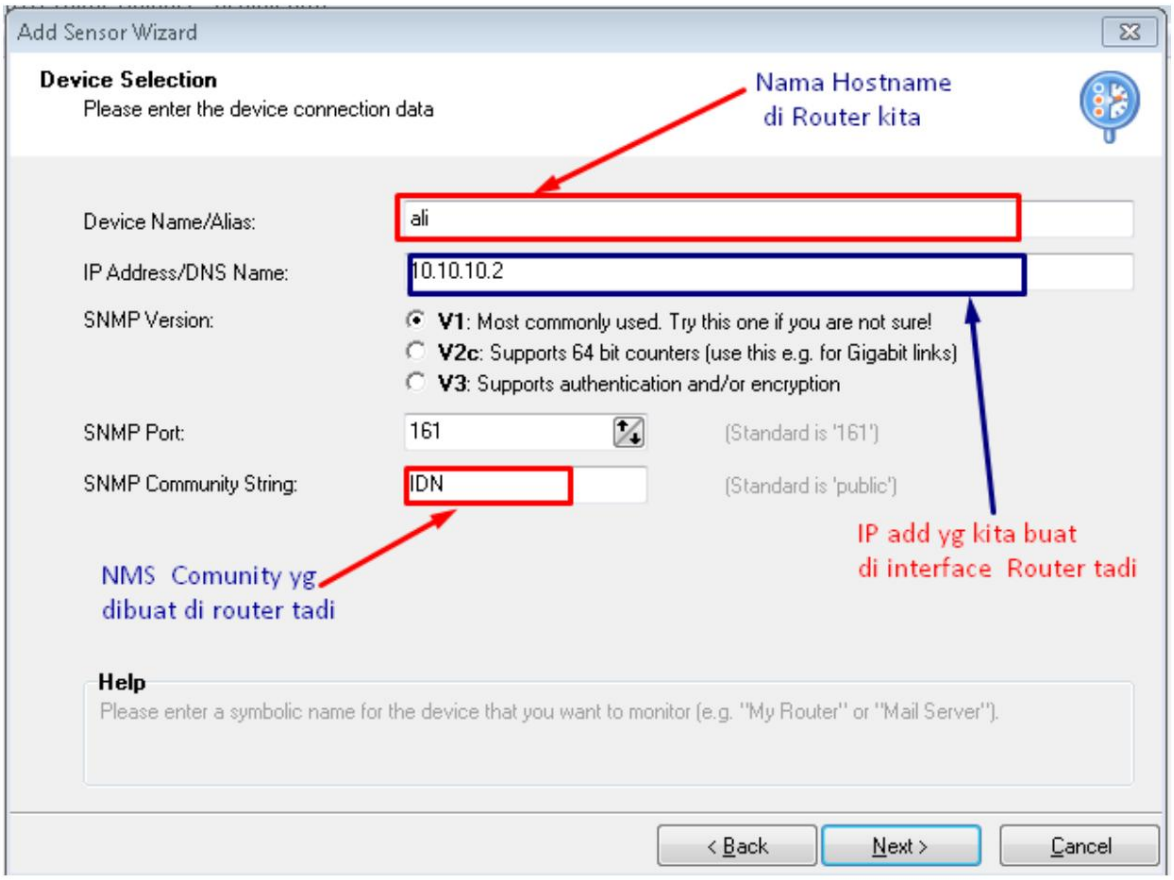
```
ali(config)#snmp-server community IDN
```

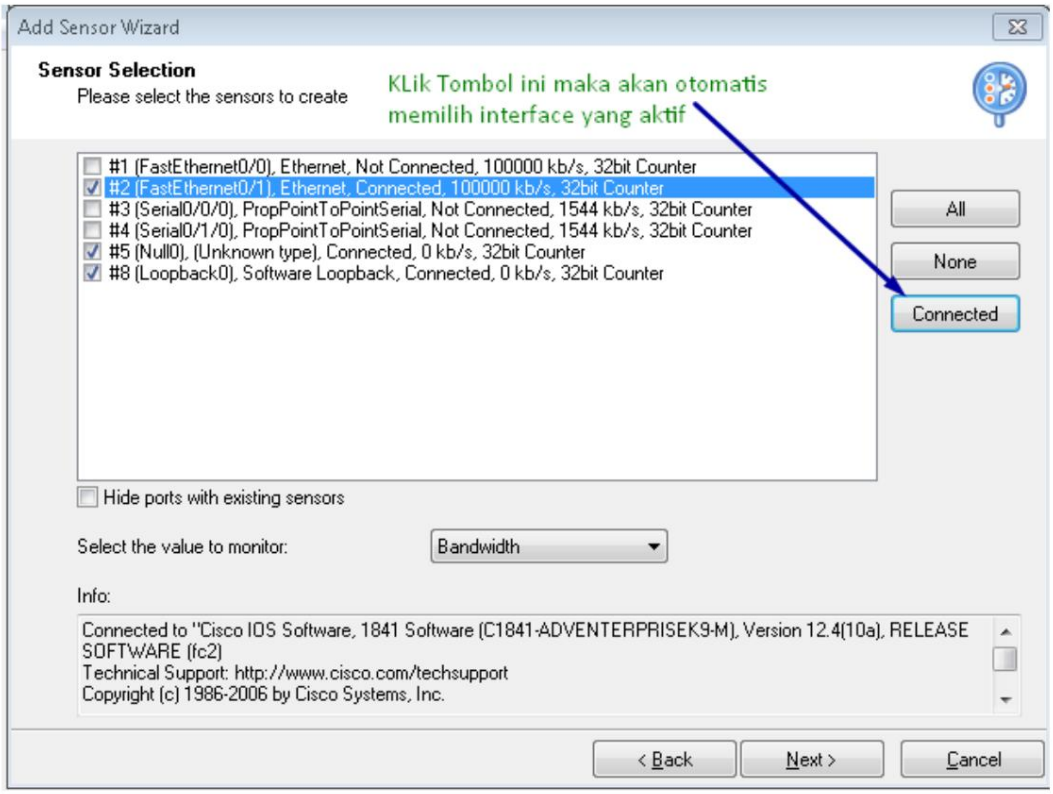
Open the PRTG application;

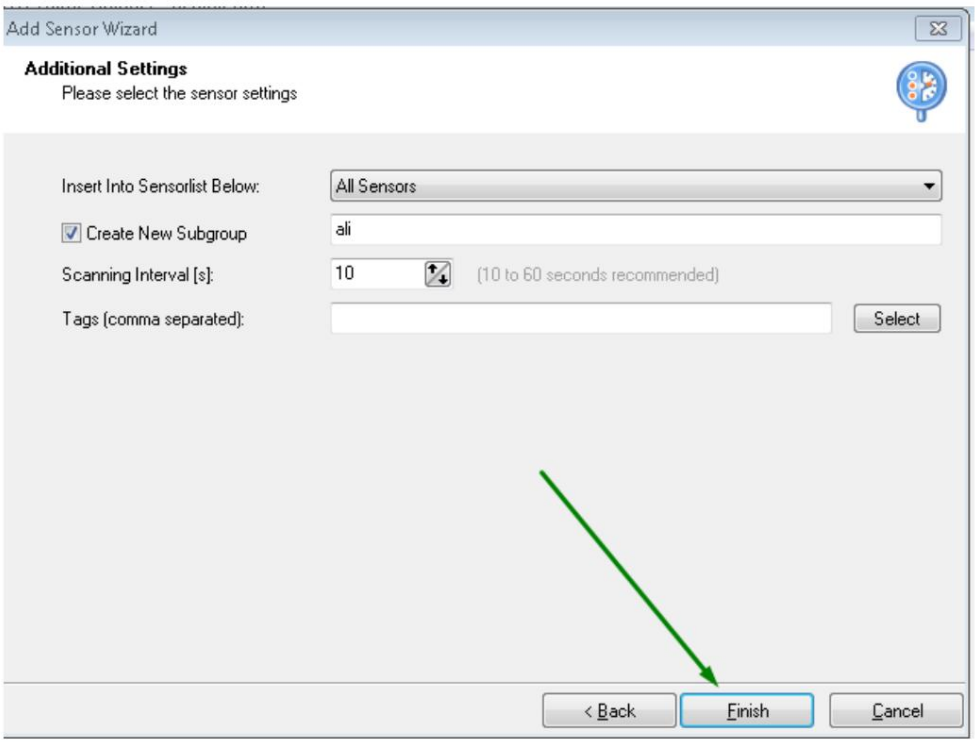




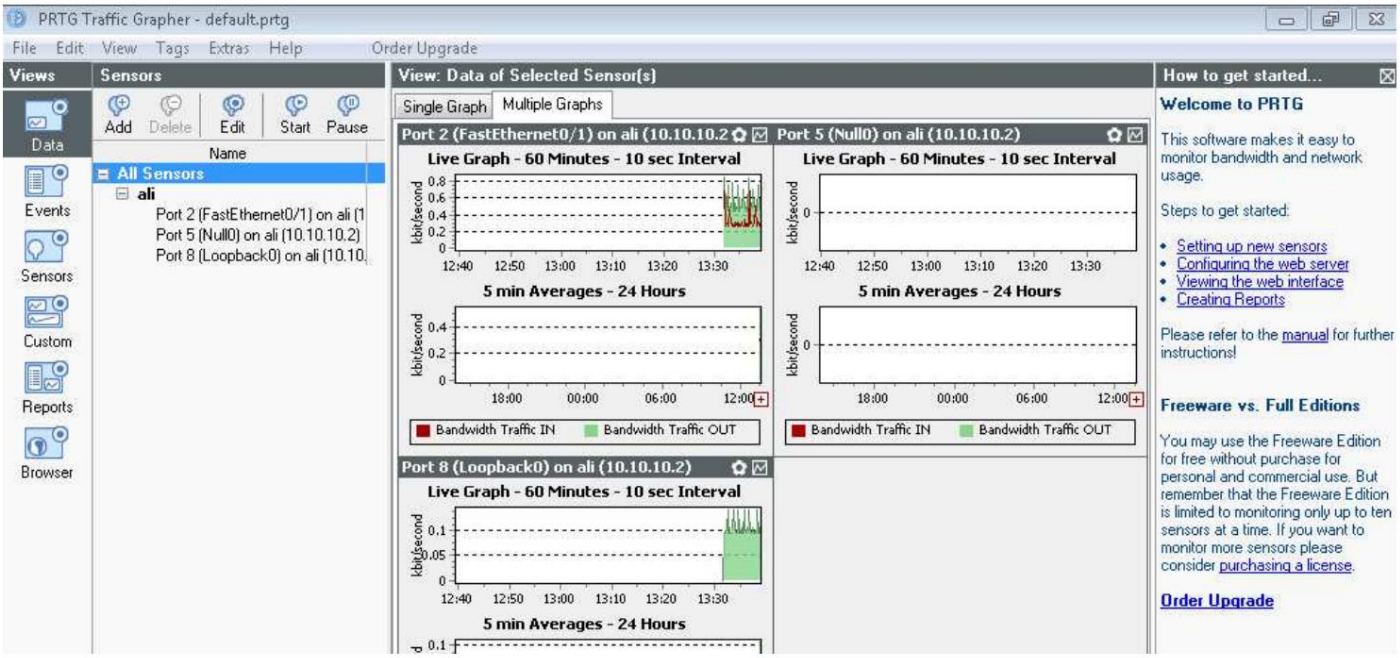




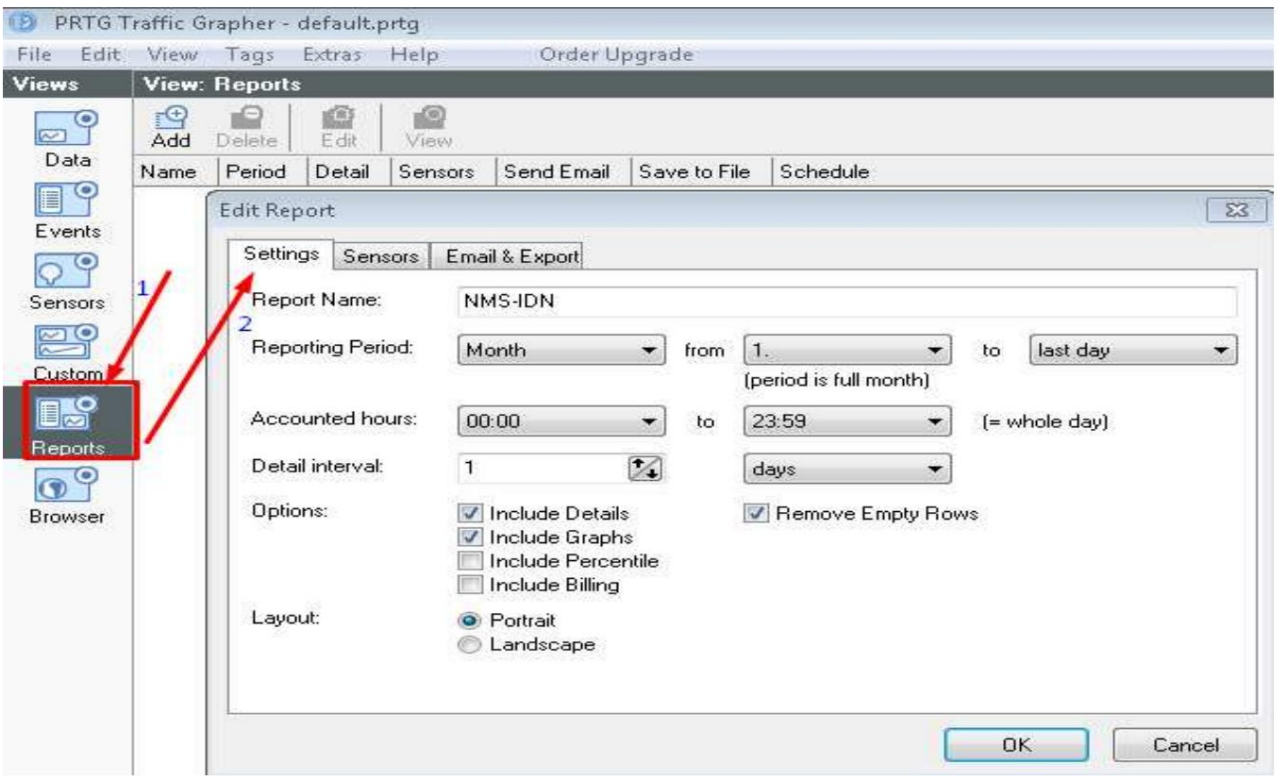


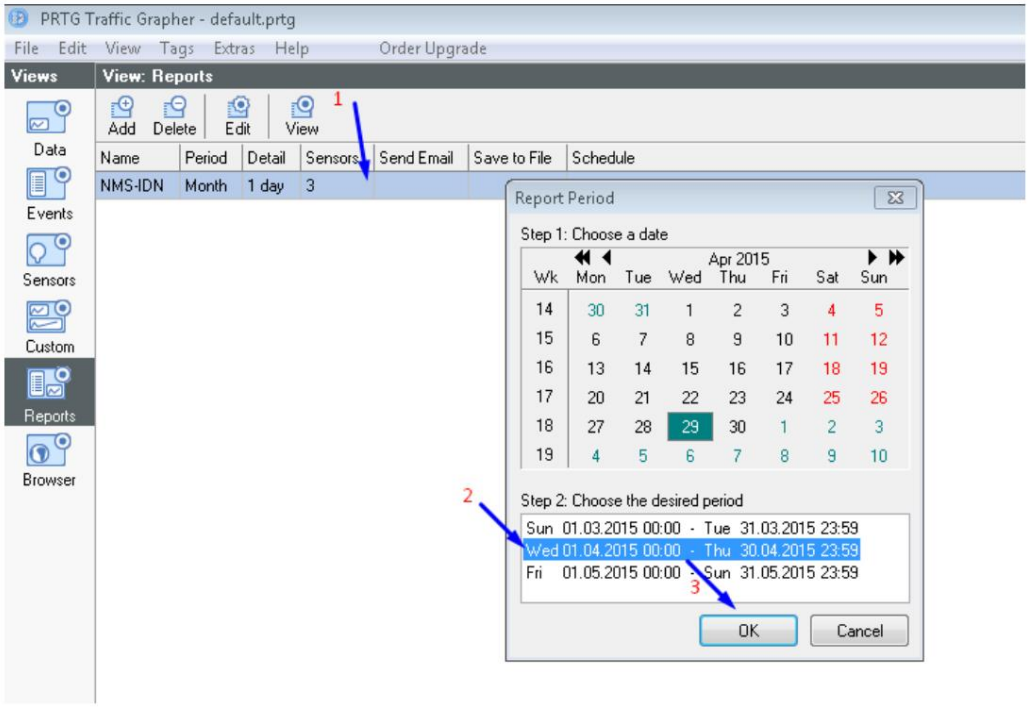


Usually we wait for traffic to increase:

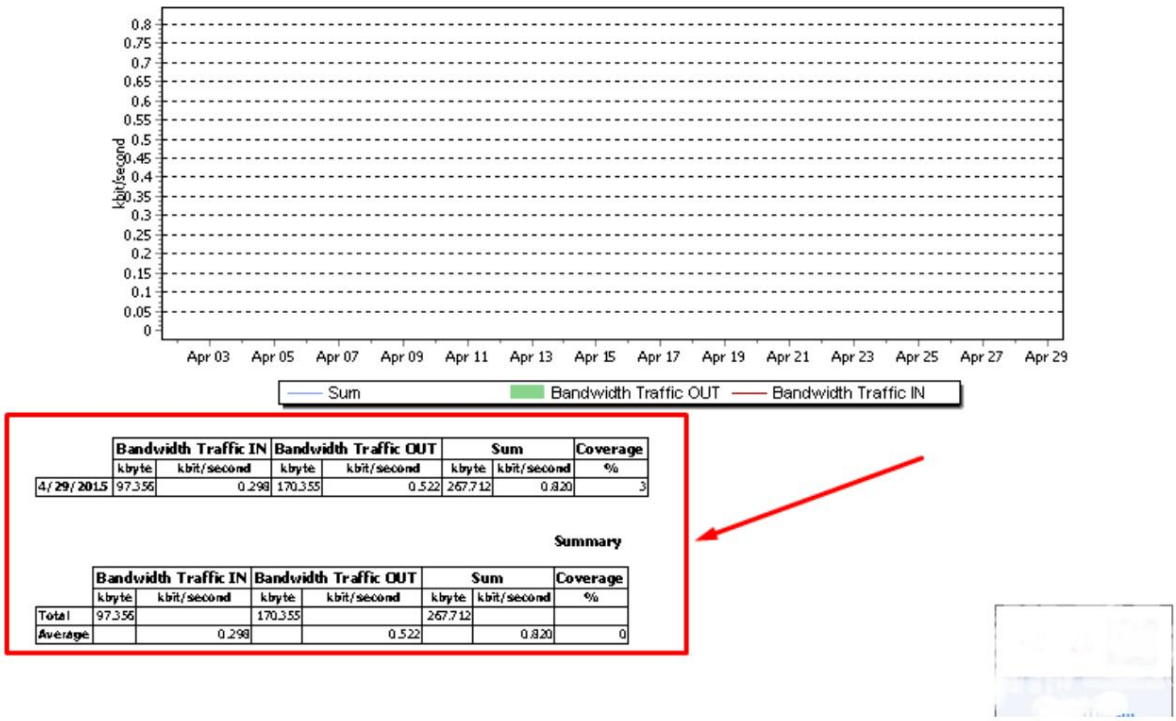


To create a traffic report:





Because here we don't connect to the internet,so the results are empty, but this can be practiced in real situations



	Bandwidth Traffic IN		Bandwidth Traffic OUT		Sum		Coverage
	kbyte	kbit/second	kbyte	kbit/second	kbyte	kbit/second	%
4/29/2015	97.356	0.298	170.355	0.522	267.712	0.820	3

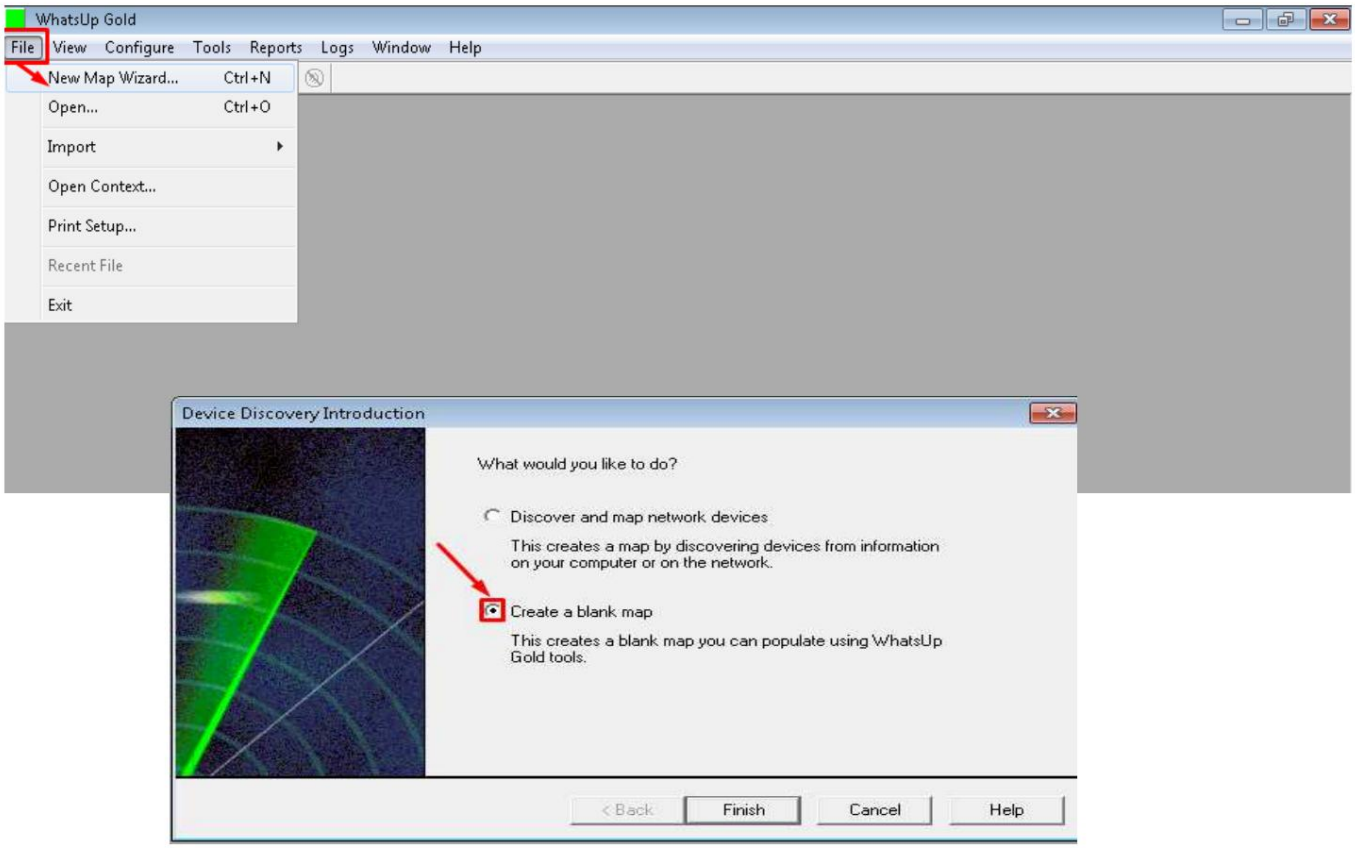
Summary

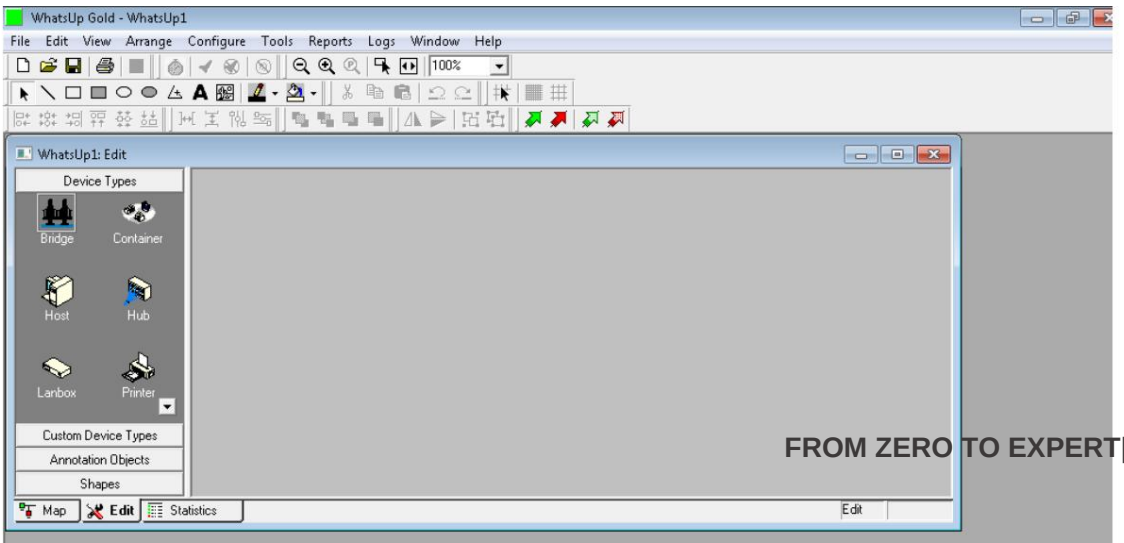
	Bandwidth Traffic IN		Bandwidth Traffic OUT		Sum		Coverage
	kbyte	kbit/second	kbyte	kbit/second	kbyte	kbit/second	%
Total	97.356		170.355		267.712		
Average		0.298		0.522		0.820	0

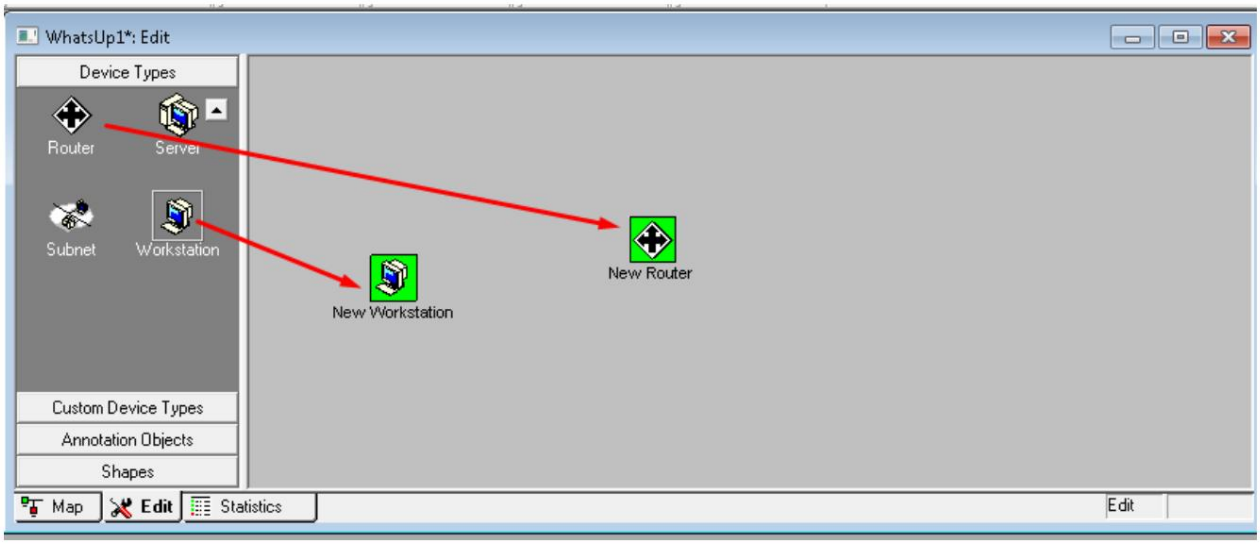
Whatsup Gold

This application is an application that is used to monitor devices. If a device is down, it will immediately notify you of the situation because this software is equipped with error detection.

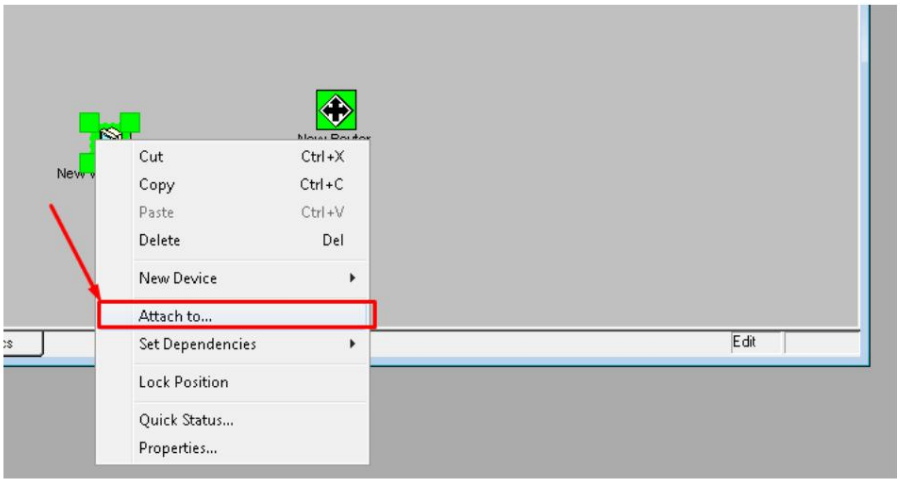
Open the application

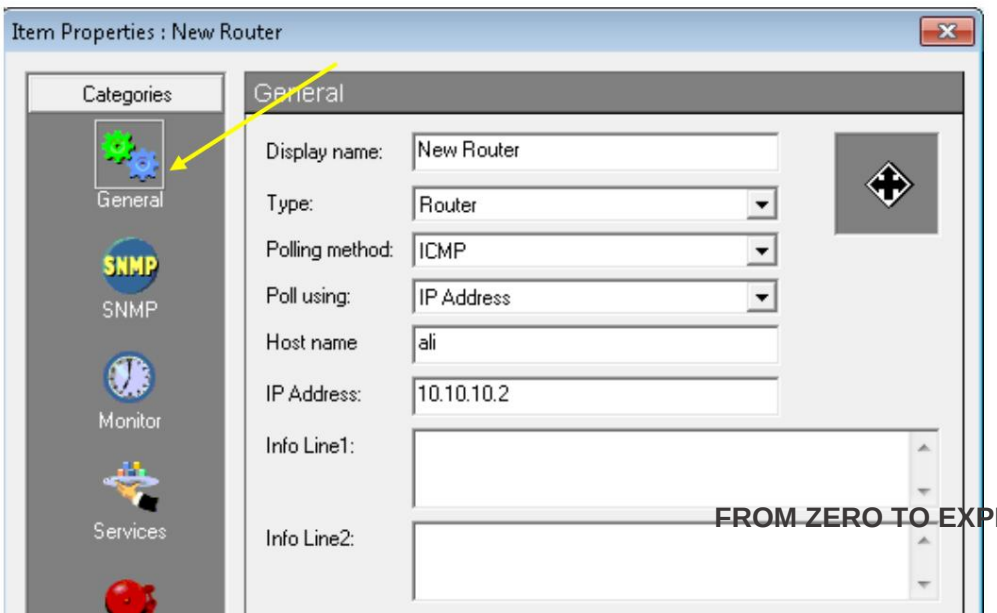


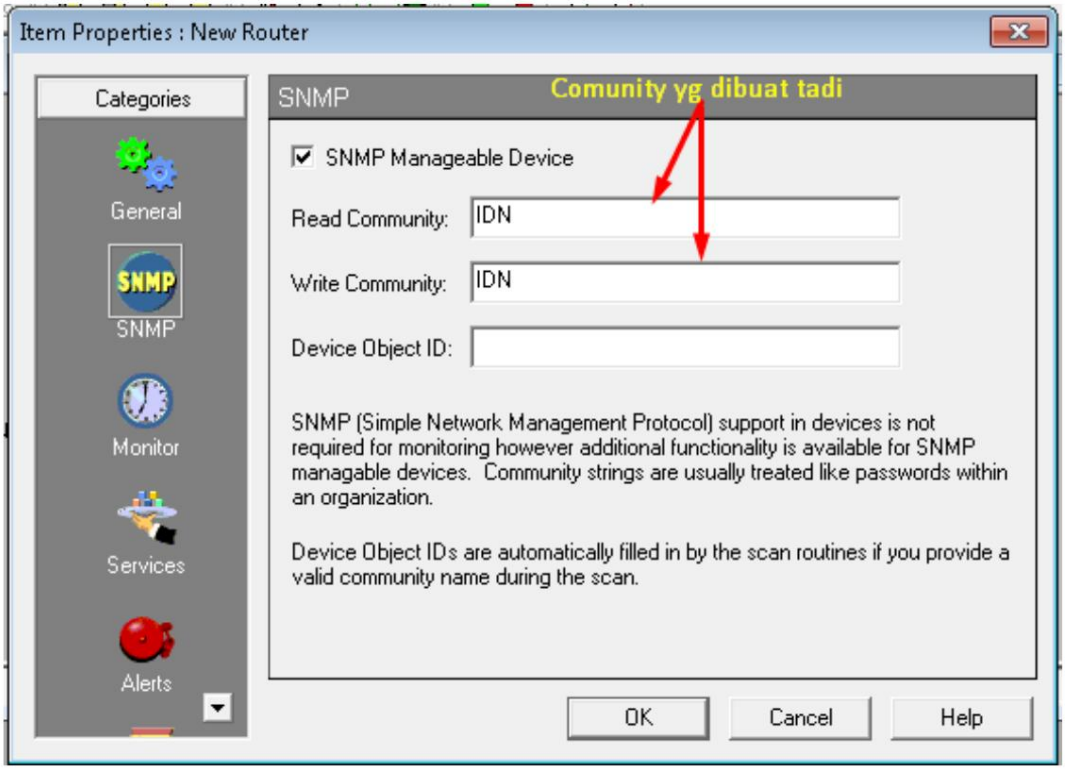


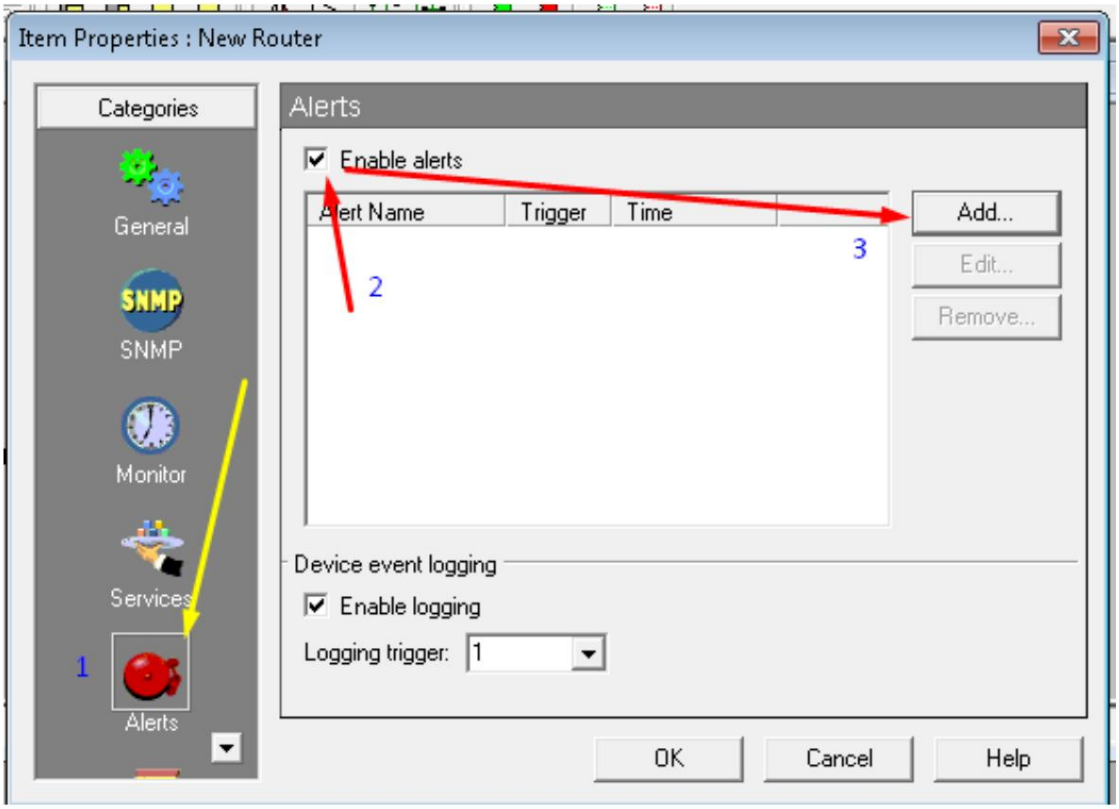


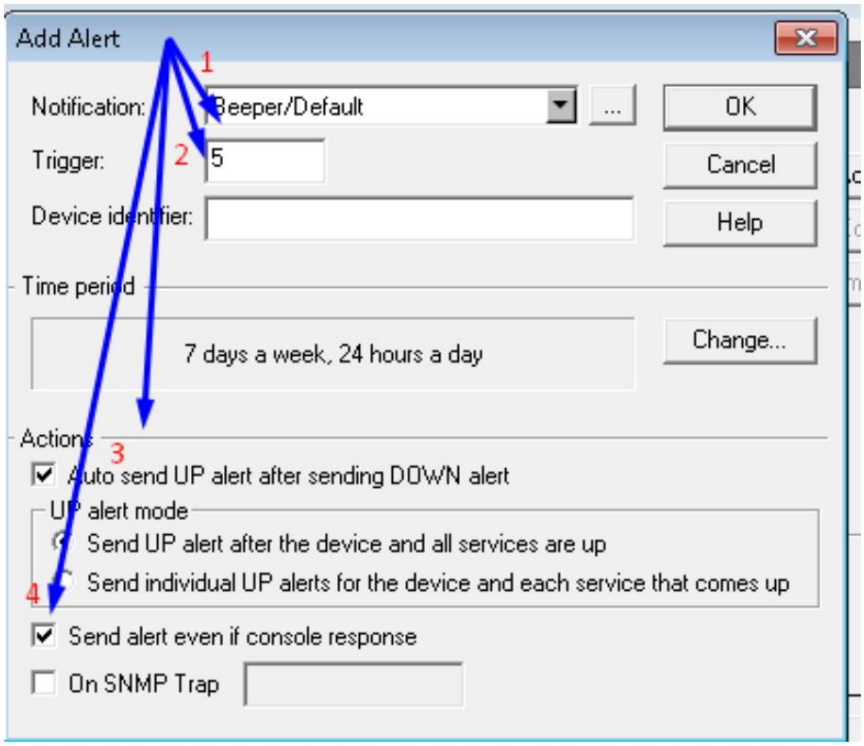
To connect the cable, we click on the PC or router then select Atech to



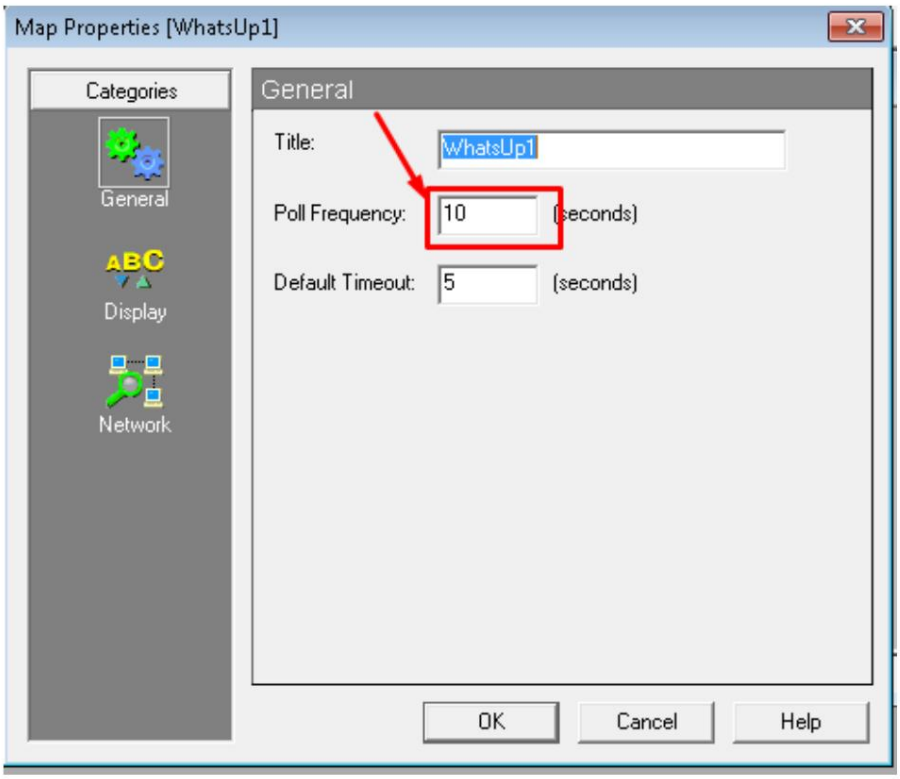


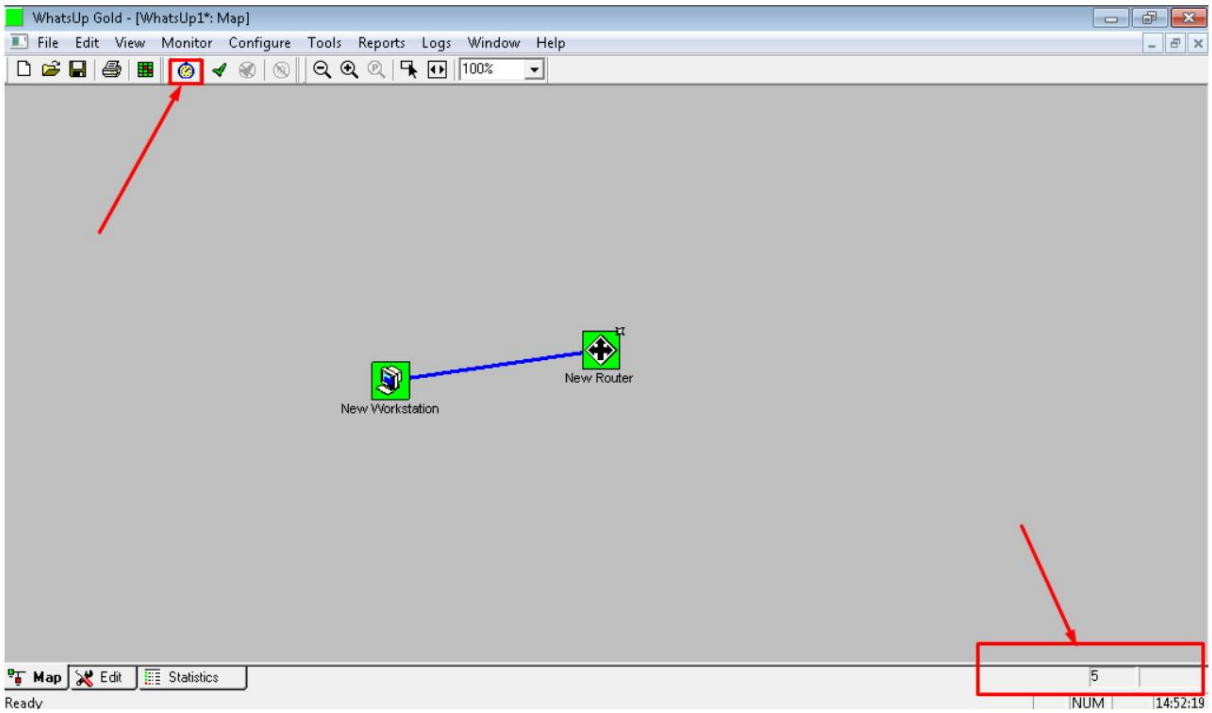




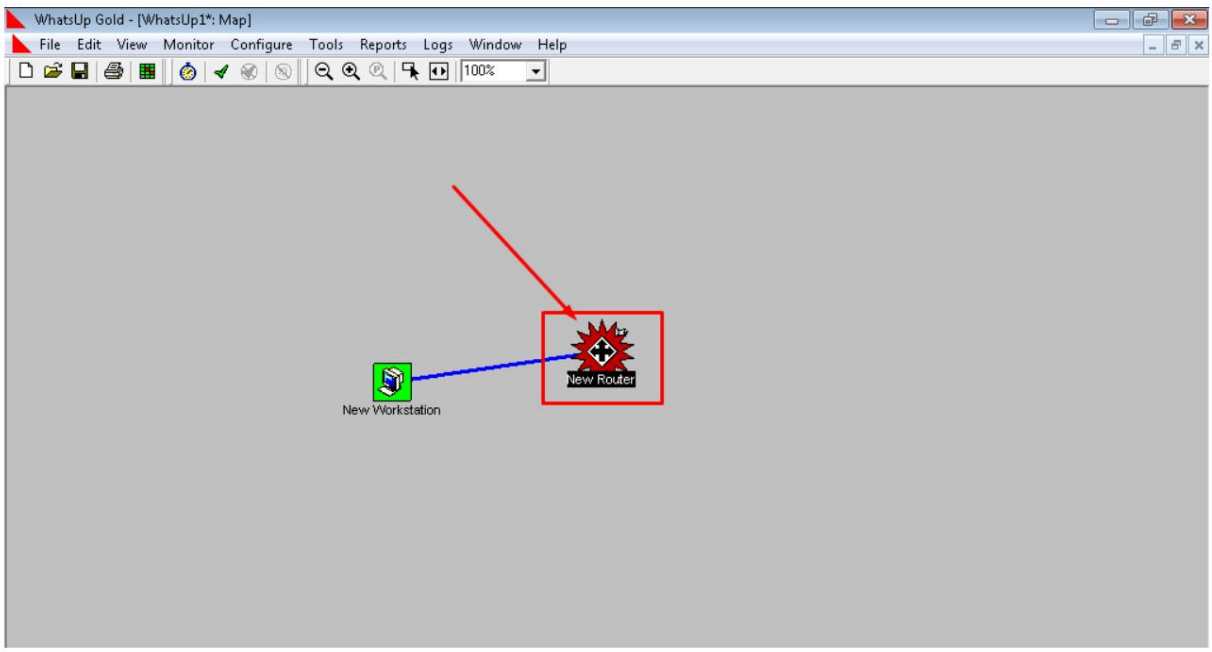


double left on cable:





Try now disconnecting the cable on the router... there will be a sign ranging from yellow to red and that is a sign that there is an error tone or something is down

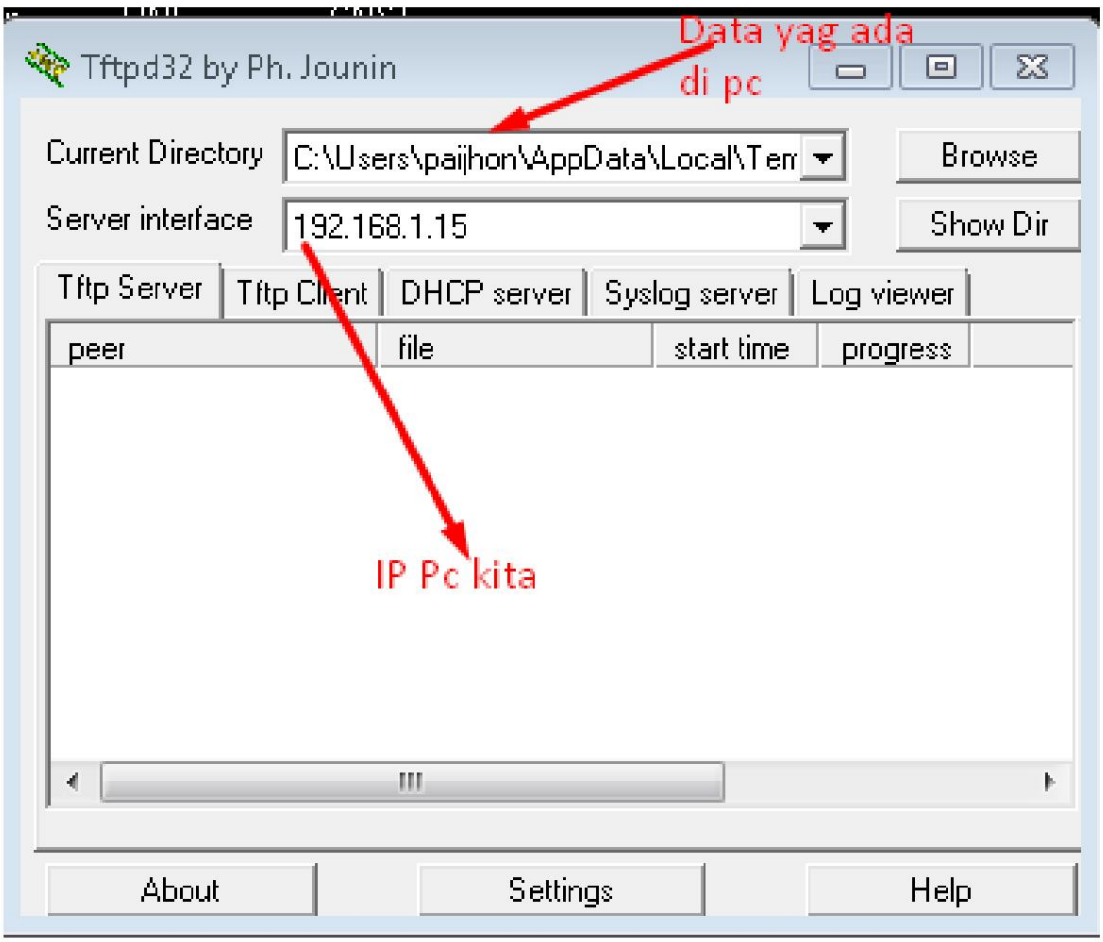


TFTP D3

Used to backup configuration on a router or switch.

Just go straight to the lab, this time we try to back up the IOS files on the router:

ÿOpen the software, don't change anything, we can see that our PC's IP address is automatically registered:



ÿConfiguration of the Cooper tftp router or switch:

```
ali#sh flash:
-#- --length-- -----date/time------ path
1           24128228 Jul 5 2014 07:28:32 +00:00 c1841-adventerprisek9-mz.124-10a.bin
2                 925 Apr 12 2014 07:20:16 +00:00 str
3                 919 Nov 8 2014 06:22:36 +00:00 20.20.20.5 The IOS version that we backed up


7794688 bytes available (24137728 bytes used)
```

ÿCopy the iOS file that you want to backup:

```
ali#copy flash: tftp:
Source filename [c1841-adventerprisek9-mz.124-10a.bin]? c1841-
adventerprisek9-mz.124-10a.bin IOS file that you want to back up
Address or name of remote host []? 10.10.10.1 IP interface pc kita
Destination filename [c1841-adventerprisek9-mz.124-10a.bin]?
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!
24128228 bytes copied in 69.352 secs (347910 bytes/sec)
```

ÿLook at the backup process in the tftp wizard table;