NETWORKS AND PROTOCOLS

Lab 5

Introduction

The objectives of this lab are to :

- Static routing configuration,
- Test and verify configurations.

Instructions

- Both topologies will be implemented via packet tracer following the same principles and approach, namely :
  - mounting,
  - interface configuration,
  - application of static routing rules,
  - and perform tests after each operation to ensure that it has been corrected before the next step.
  - On Packet Tracer, use the first generic router (router-PT).
- Use IP addresses 192.168.1.x, 192.168.2.x, 192.168.3.x and 192.168.4.x for networks LAN1, LAN2, LAN3 and LAN4 respectively, and addresses 192.168.5.x, 192.168.6.x and 192.168.7.x for each of the extended networks E1, E2 and E3 respectively.

Lab topology

See figure 1

Task 1. Installation of topology 1:

- Choose the right material and cabling to set up this topology.

Task 2. Interface configuration

Step 1: Configure computer interfaces.
Step 2:

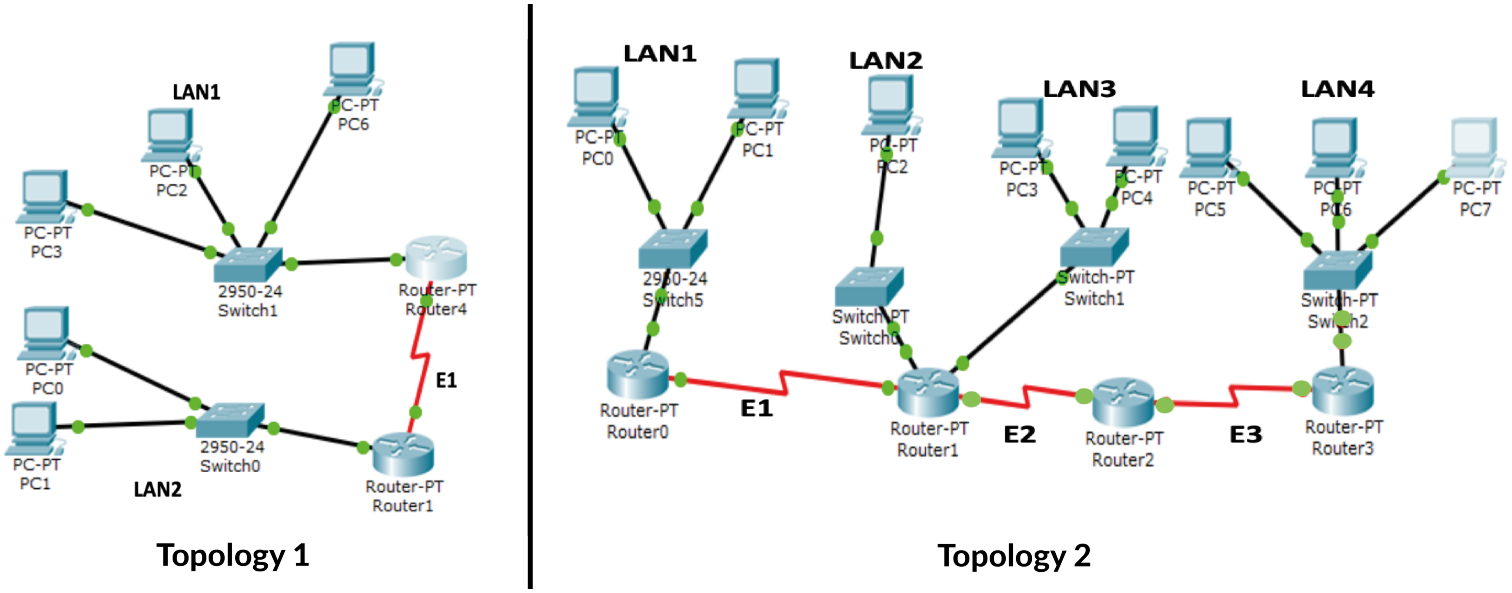

Figure 1: Lab topologies

- Configuring router interfaces: a special configuration is required for the serial interfaces of the two routers, as one of the two interfaces must act as DCE for clock synchronization and the other as DTE.
- In the CLI of the router whose serial interface is DCE (recognized as follows: if you hover the mouse over the serial interface, you'll see a small clock displayed), run the following command in interface configuration mode:

```
Router(config)#interface Serial2/0
Router(config-if)#clock rate 72000
no shutdown
```

Step 3:

  - On each interface, including routers, execute ***ping*** commands to all interfaces on the same local network.
  - If the ***ping*** test has revealed no connectivity errors, proceed to the next task; otherwise, correct the error.

Task 3. Static routing
Step 1:

- In each router's CLI, run the `show ip route` command in privileged mode;
- If the configuration is correct, the routing table of router 'router1' should look like this the following figure 2:

In the figure 2, the possible routing codes on this router are displayed, for example :

- **C** represents networks connected directly to the router,

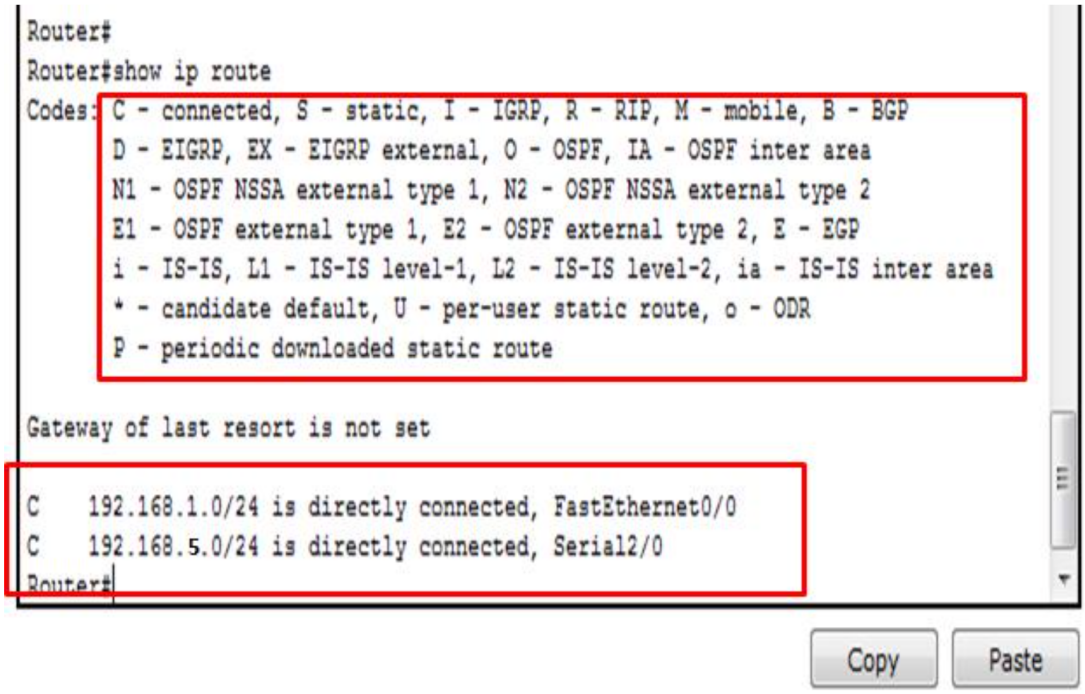

Figure 2: Simple routing table

- **S** represents networks configured statically using the ip route command,
- **I**, **R**, **B**, ... represent the routes learned respectively by the dynamic routing protocols protocols **IGRP**, **RIP**, **BGP**, ...
- You can see that connected networks are automatically recognized by the router router, as they are directly attached to its interfaces.

Step 2: Static routing configuration.

- This step consists in telling the router what the next hop is that will enable it to route a data packet to a particular network.
- For example, in topology 1, **router1** uses **router4's** serial interface as the next hop to the **192.168.2.0** networks, and in topology 2 **router0** uses **router1's** serial interface as the next hop to the **192.168.2.0**, **192.168.3.0** and **192.168.4.0** networks (LAN2, LAN3 and LAN4 respectively).
- The static routing configuration command in global configuration mode is:

  `ip route <destination network> <destinatiom network mask> <next hop IP address>`

This command configures static routing to a given destination network.
It must be executed for all remote networks present in the architecture.

- In the case of topology 2, on **router0**, this configuration must be carried out as follows, figure 3:
- You are asked to configure static routing on routers in topology 1 and topology 2.

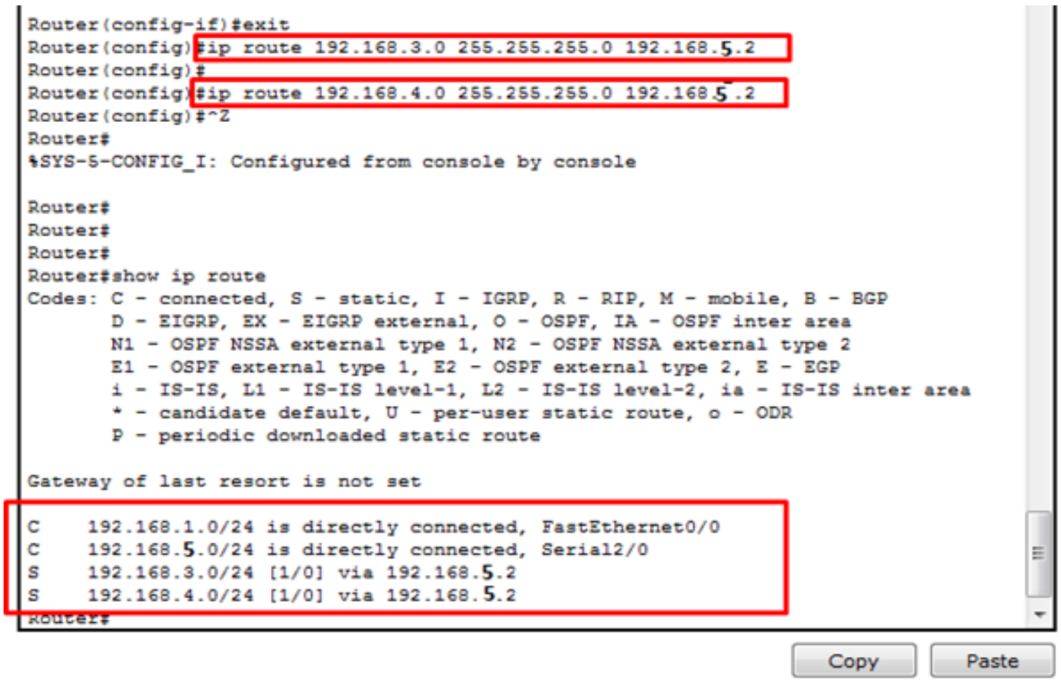

Figure 3: Routing table config

Step 3:

- Check that static routing has been established.
- As described above, the `show ip route` command in privileged mode can be used to to display the routing table and check that it is correct.

Step 4:

- Check connectivity.
- Connectivity on each local network has already been checked (step 3 of the previous task).
- This step involves checking connectivity outside each local network. So, from each computer, ping all other computers. Also ping between computers and router interfaces and vice versa.

Hint: How to proceed with the ping test?

In fact, the ping test, as seen above and in the previous labs, reveals connectivity problems. If a ping between 2 machines reveals an error, this means that these two machines can't exchange information.

The problem may be due to several factors, and must be detected methodically:

- Firstly, the problem may be due to incorrect configuration of the IP addresses of one or both machines; the addressing plan must be well established before switching to machines. However, typing errors cannot be ruled out;

- Secondly, the default gateways on one or both machines may not correspond to the router interfaces;

- The next error to suspect may be due to misconfiguration of the IP addresses of the router interfaces on the path between the two source and destination machines. In this case, perform the necessary checks on all interfaces. Cisco IOS offers interface diagnostic commands in privileged mode:

  `#show interfaces` for details of interface ip configuration,

  `#show ip interface brief` for information on interface operation

  `#show ip interface <interface name>` for information on a specific interface.

- It is also possible to ping one of the two machines to the output interfaces of the routers on the path. In this way, IP address misconfigurations are corrected step by step;

- The problem may also be linked to a routing error. In this case, a rigorous analysis of the established paths is required, using the command: `show ip route`.

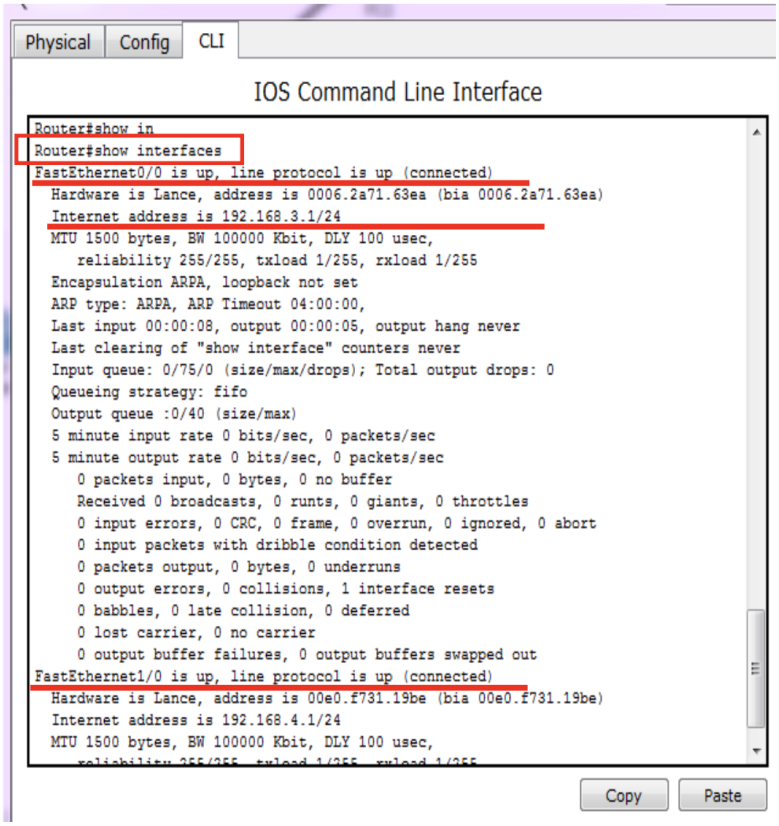

Figure 4: show interfaces

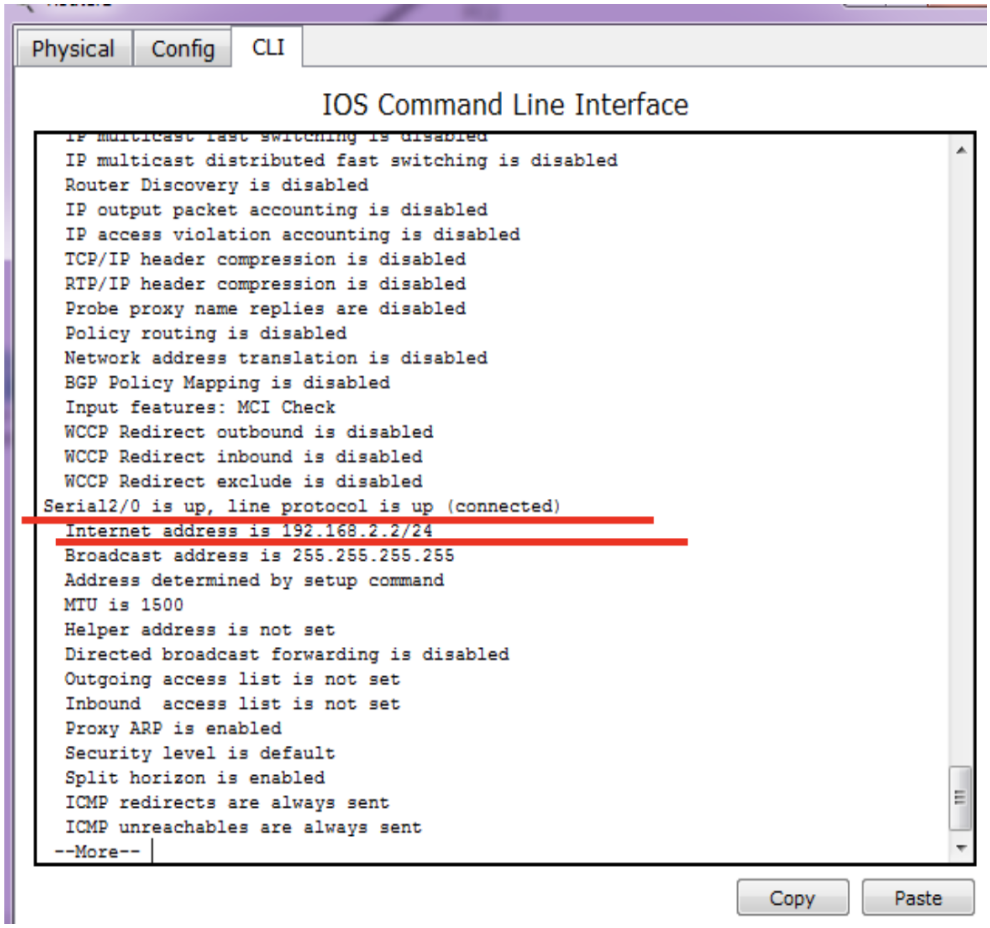

Figure 5: show interfaces / next

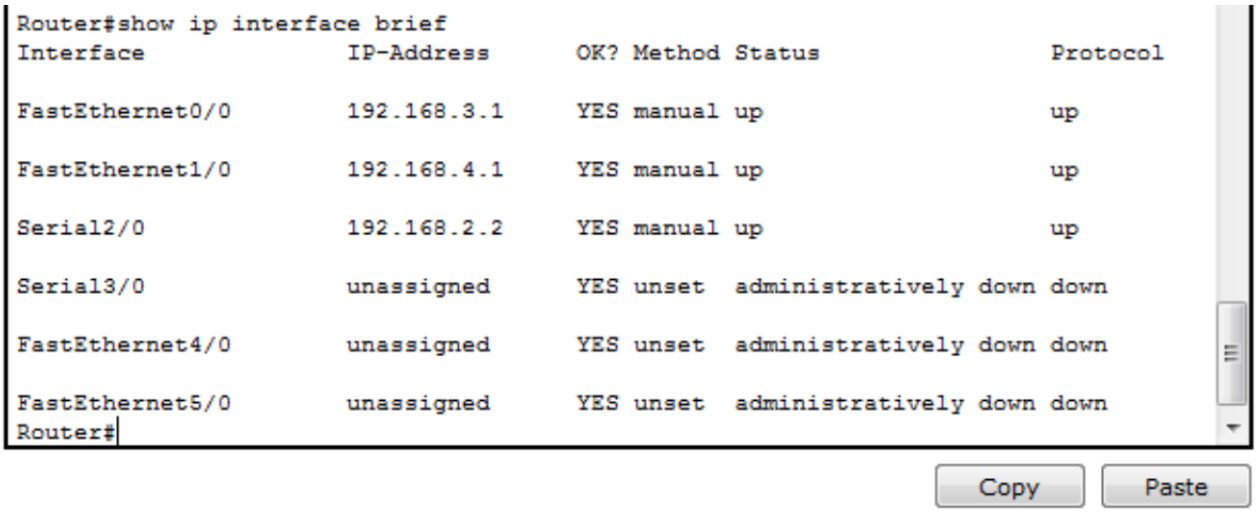

Figure 6: show interfaces brief

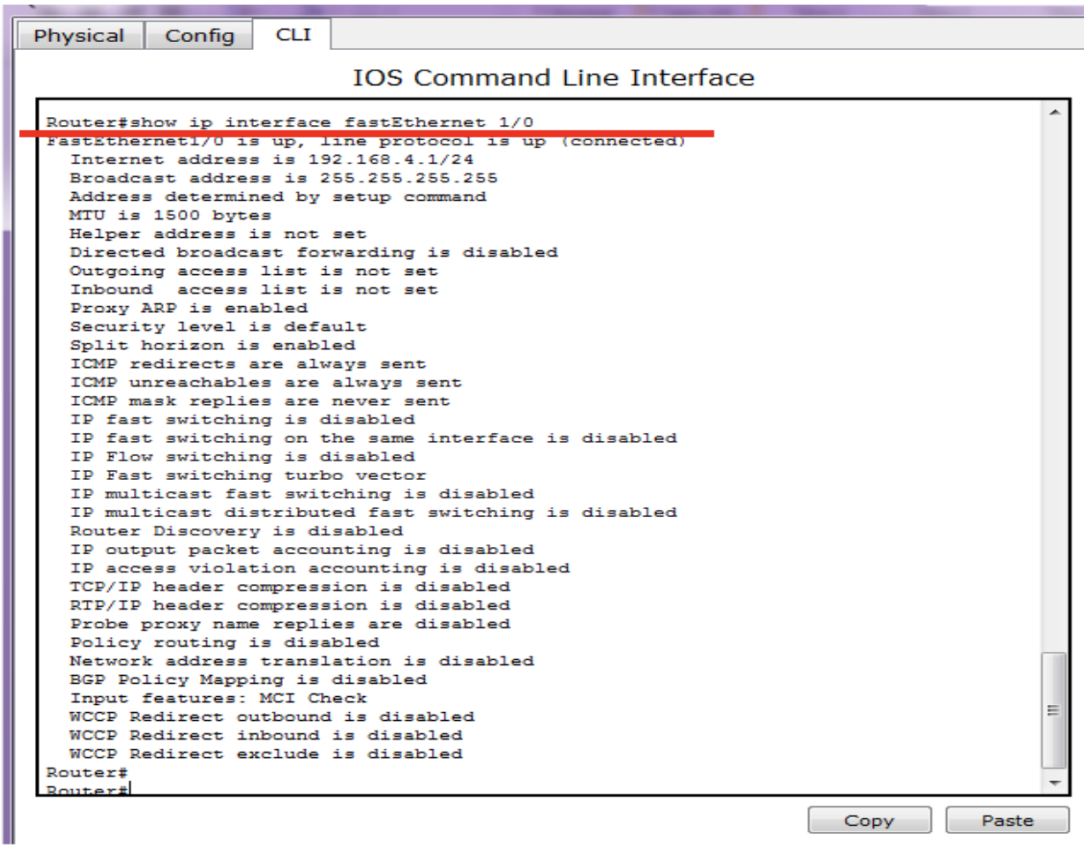

Figure 7: show ip interface with one interface

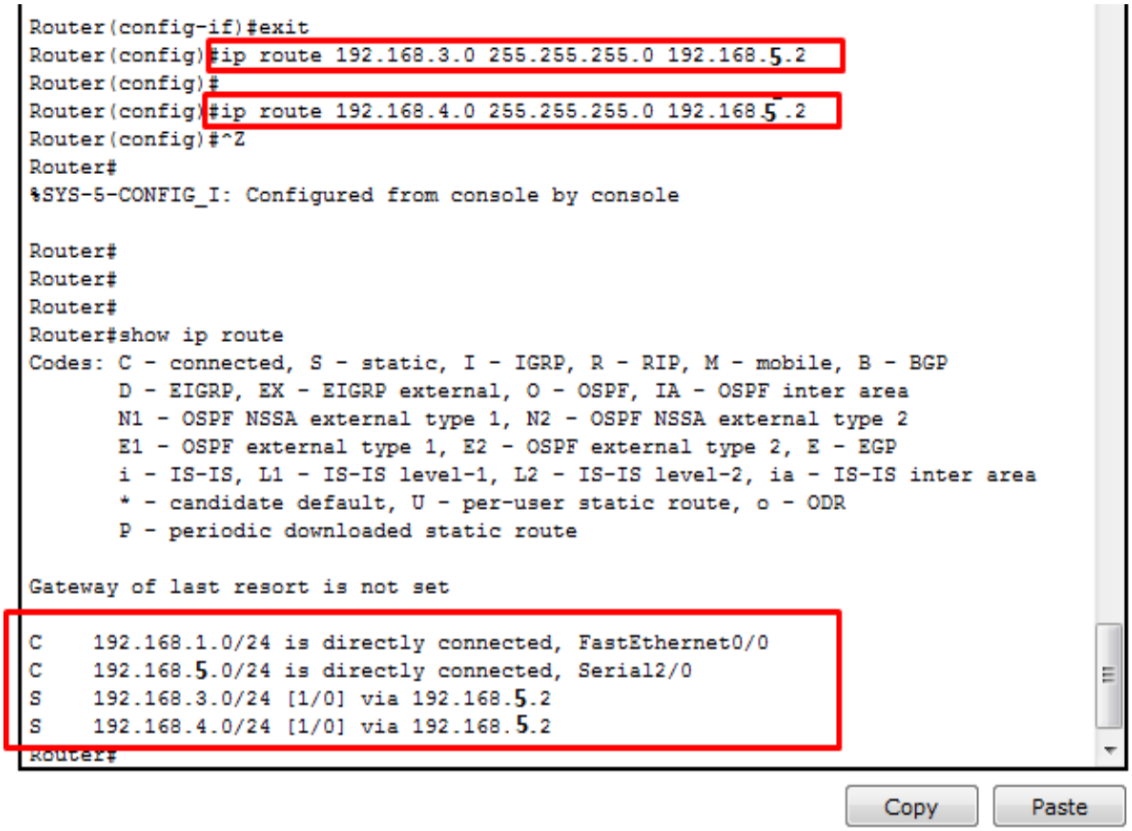

Figure 8: show ip route

Task 4: Creating topology 2 with Packet Tracer

Step 1: Propose an addressing plan for topology 2 using the following network address address: 192.168.1.0/24

Step 2:

- Set up and configure network topology 2,
- Establish static routing of computers,
- Perform the necessary connectivity tests.

Step 3:

- Run the `tracert <IP address of PC7>` command from the PC0 terminal.
- Interpret the result. Please explain: .....
  .....
  .....

Step 4:

- Change the IP address of router 3's serial interface to cause an error,
- Repeat step 3.
- Explain the result .....
  .....
  .....

Appendix: Adding a new interface to a generic router on Packet Tracer

Once the router has been added to the desktop, click on it to display an image of the router's rear panel:

Step 1: To switch off the router, click on the switch (1).

Step 2: Choose the appropriate interface (2).

Step 3: Drag and drop the image of the new interface into a free slot on the router (3 and 4).

Step 4: Switch on the router and wait for it to start up. The new interface will be added to the "Config" tab.

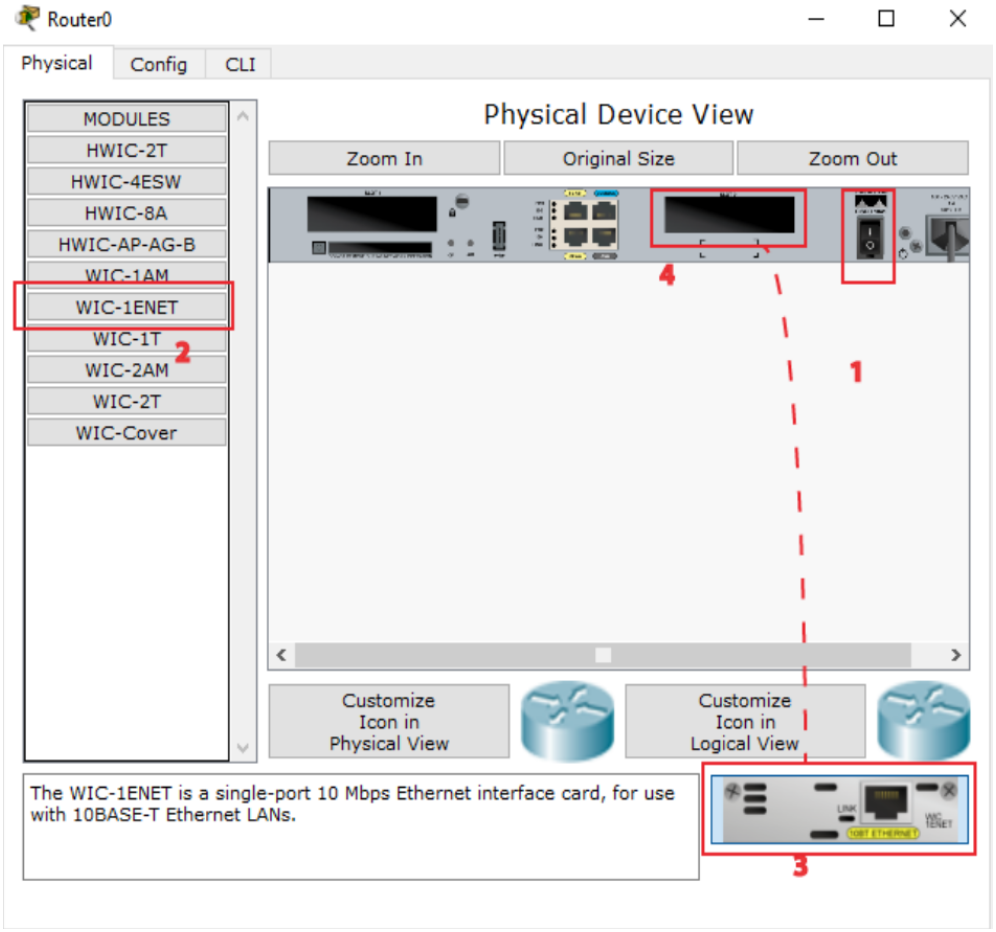

Figure 9: Adding a new interface