HANOI UNIVERSITY

Faculty of Information Technology

CNE – Tutorial Guide

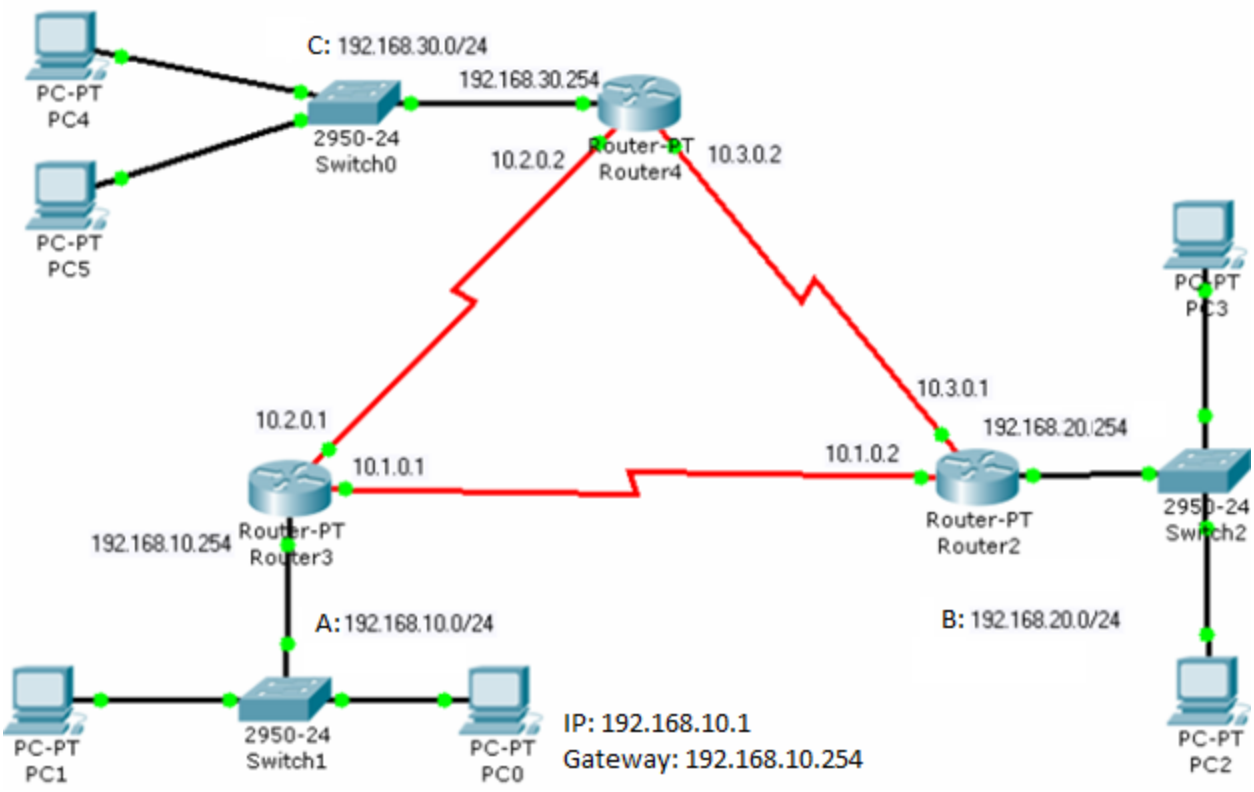
Week 7

Dynamic Routing Configuration with RIP

In previous tutorial, we've learnt how to configure static routing between two or more networks and this works pretty well if there are few networks. The problem is, however, the more networks there are, the more static routes we have to configure one router to remember, thus the more inconvenient it will be. So we have another way to route the data on the network, which is Dynamic Routing Configuration. In this tutorial we will learn about RIP.

This method means one router will dynamically find the route to others network by automatically "learning" other routers' configurations.

Assume we have a network like this:



In this example, we used Router-PT which has 2 serial ports and 4 Ethernet ports. Connections between routers are *Serial DCE* connected to the *serial ports* of the routers.

We also use 6 following IP blocks:

Network A (Switch1): **192.168.10.0/24**
Network B (Switch2): **192.168.20.0/24**
Network C (Switch3): **192.168.30.0/24**
Network connects router2 and router3: **10.1.0.0/24**
Network connects router3 and router4: **10.2.0.0/24**
Network connects router4 and router2: **10.3.0.0/24**

We can access Global Configuration mode, on Serial Interface with DCE cable, we activate/open interface and enable line CLOCK by entering the command (Router 3 for example):

```
Router>en
Router#config terminal
Router(config)#interface se2/0
Router(config-if)#no shut
Router(config-if)#clock rate 1000000
Router(config-if)#ip address 10.1.0.1 255.255.255.0
```

After you have successfully configured IP address to all PCs and routers, all PCs should ping within their network. But we can not ping from network A to B or A to C. The reason is that there is no route from network A to B or A to C.

There are two ways to build the routing tables in routers: static routing and dynamic routing. In the last tutorial, we learnt how to add static routes to routers. In this tutorial, we will configure RIP so that the routers can build the routing table dynamically.

First we have to access Global Configuration mode then using command with syntax:

```
router RIP
network <ip_of_current_network>
```

Configure Router3 as follows:

```
Router(config)#router rip
Router(config-router)#network 192.168.10.0
Router(config-router)#network 10.1.0.0
Router(config-router)#network 10.2.0.0
Router(config-router)#
```

Router2 and router4 are configured similarly:

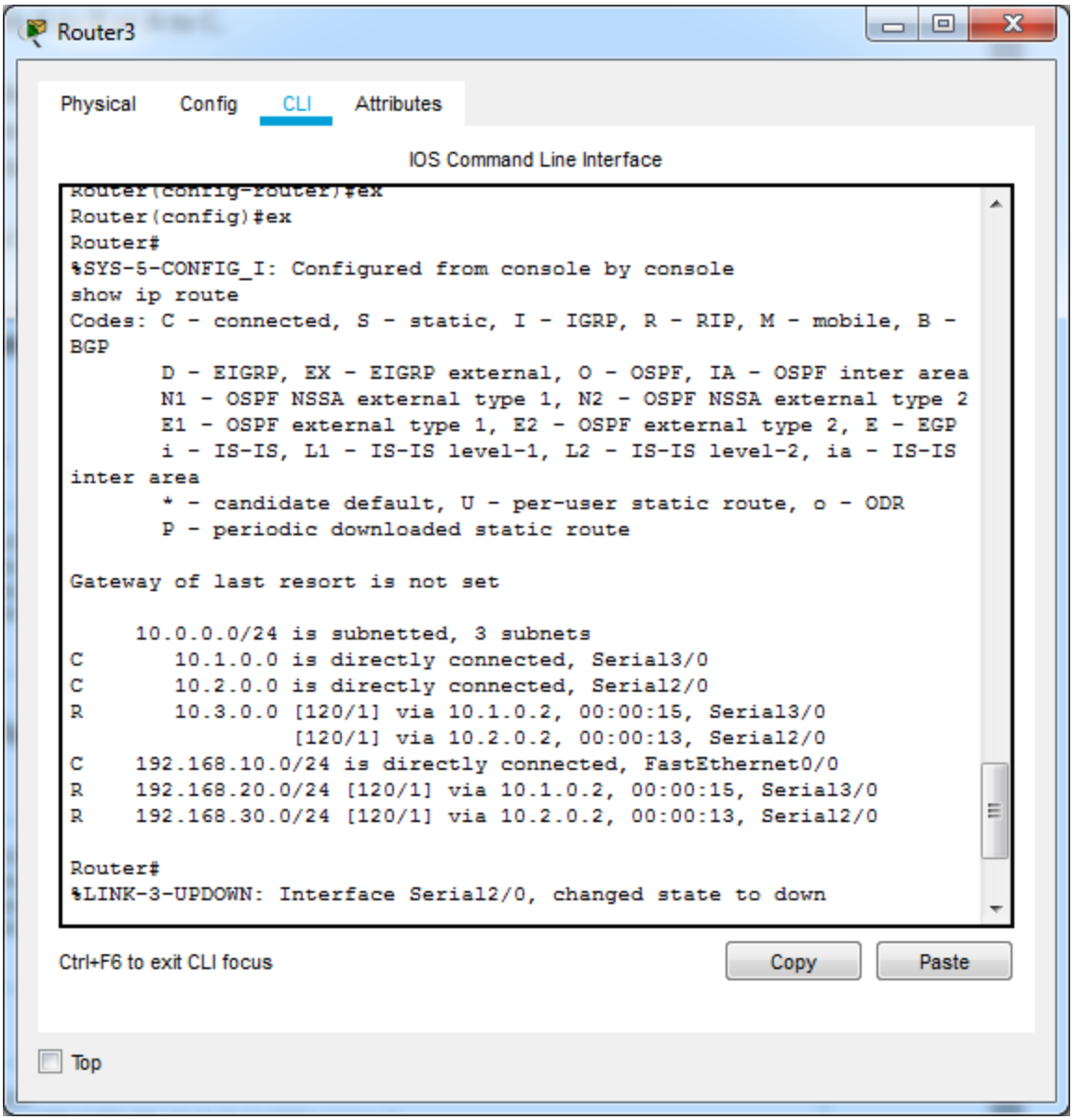
Router2

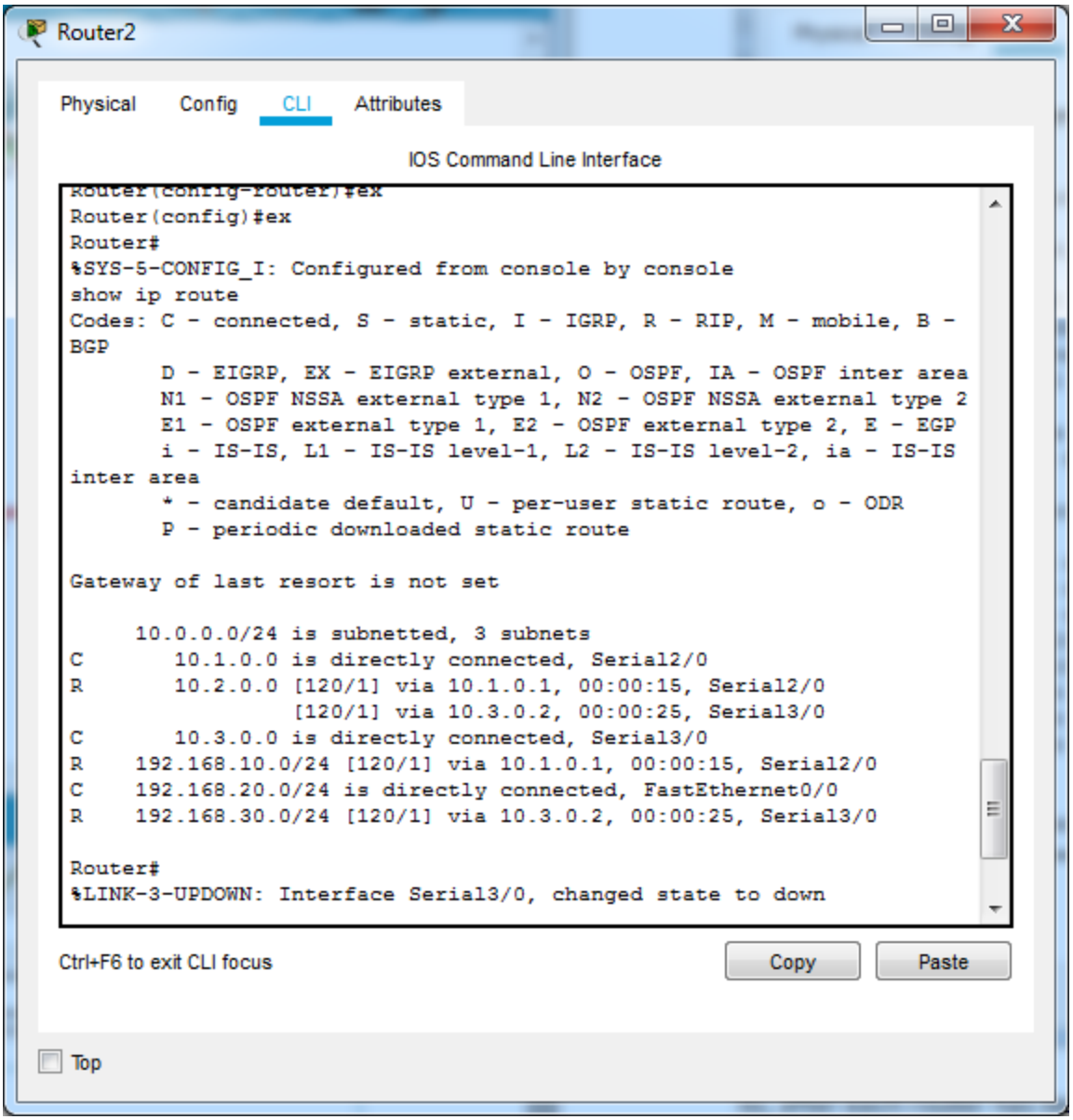
```
Router(config)#router rip
Router(config-router)#network 192.168.20.0
Router(config-router)#network 10.3.0.0
Router(config-router)#network 10.1.0.0
Router(config-router)#
```

Router4

```
Router(config)#router rip
Router(config-router)#network 192.168.30.0
Router(config-router)#network 10.2.0.0
Router(config-router)#network 10.3.0.0
Router(config-router)#
```

And now we check ip route on all routers. From privilege mode, type *show ip route* we'll see:


Router3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router(config-router)#ex
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console
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 not set
10.0.0.0/24 is subnetted, 3 subnets
C 10.1.0.0 is directly connected, Serial3/0
C 10.2.0.0 is directly connected, Serial2/0
R 10.3.0.0 [120/1] via 10.1.0.2, 00:00:15, Serial3/0
[120/1] via 10.2.0.2, 00:00:13, Serial2/0
C 192.168.10.0/24 is directly connected, FastEthernet0/0
R 192.168.20.0/24 [120/1] via 10.1.0.2, 00:00:15, Serial3/0
R 192.168.30.0/24 [120/1] via 10.2.0.2, 00:00:13, Serial2/0
Router#
%LINK-3-UPDOWN: Interface Serial2/0, changed state to down
Ctrl+F6 to exit CLI focus
Copy
Paste
Top


Router2
Physical
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Router(config-router)#ex
Router(config)#ex
Router#
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show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
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C 10.1.0.0 is directly connected, Serial2/0
R 10.2.0.0 [120/1] via 10.1.0.1, 00:00:15, Serial2/0
[120/1] via 10.3.0.2, 00:00:25, Serial3/0
C 10.3.0.0 is directly connected, Serial3/0
R 192.168.10.0/24 [120/1] via 10.1.0.1, 00:00:15, Serial2/0
C 192.168.20.0/24 is directly connected, FastEthernet0/0
R 192.168.30.0/24 [120/1] via 10.3.0.2, 00:00:25, Serial3/0
Router#
%LINK-3-UPDOWN: Interface Serial3/0, changed state to down
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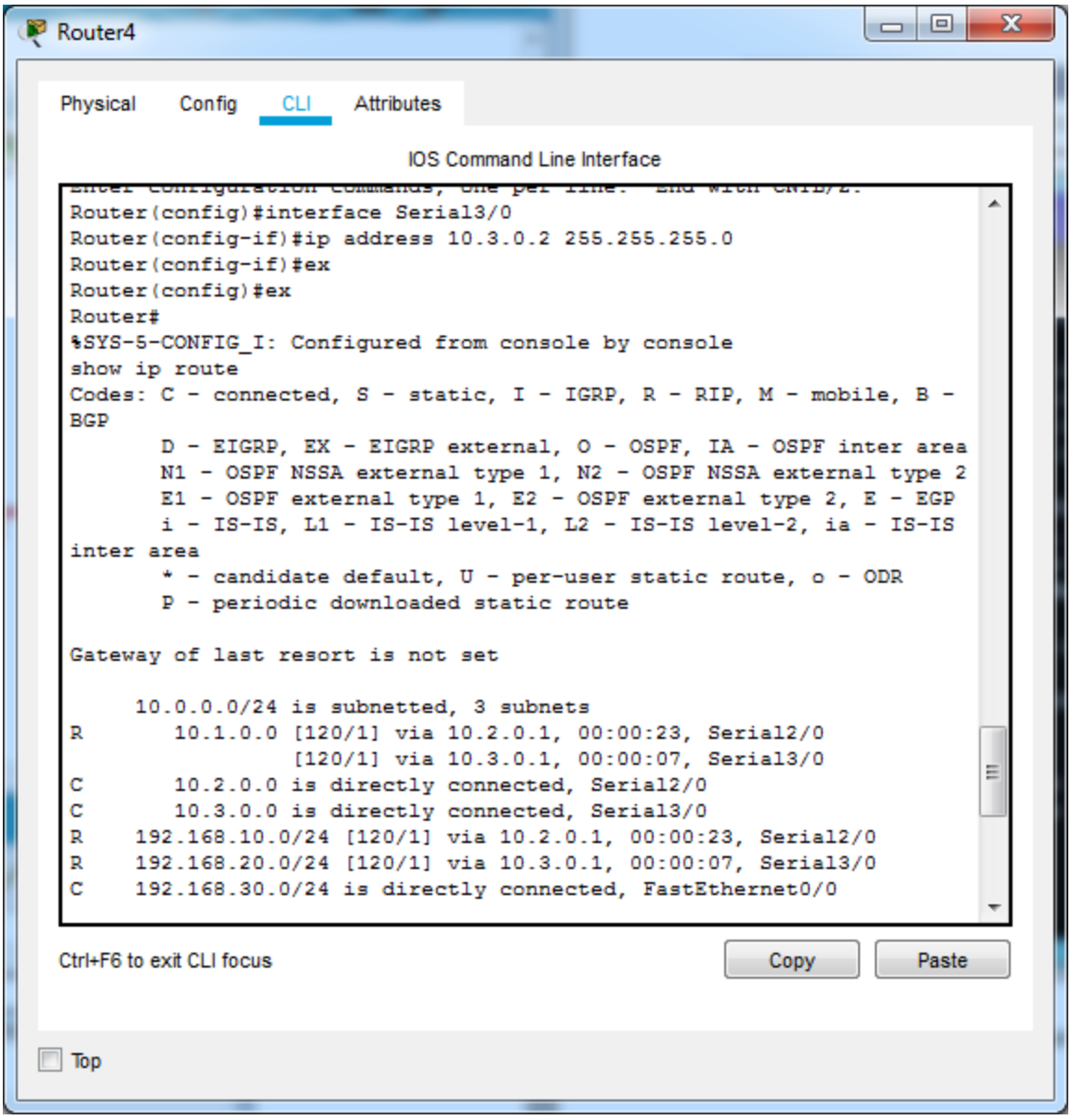
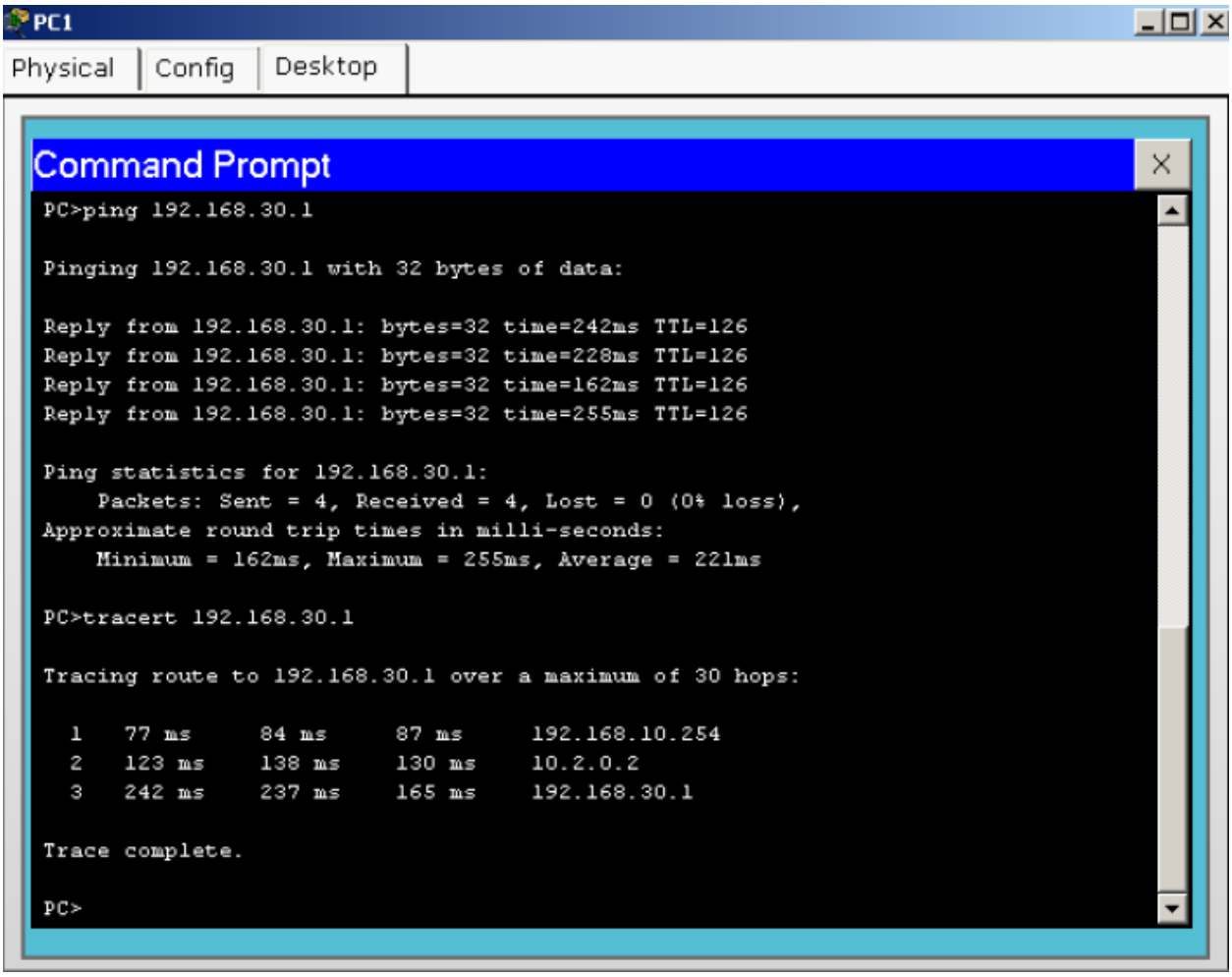


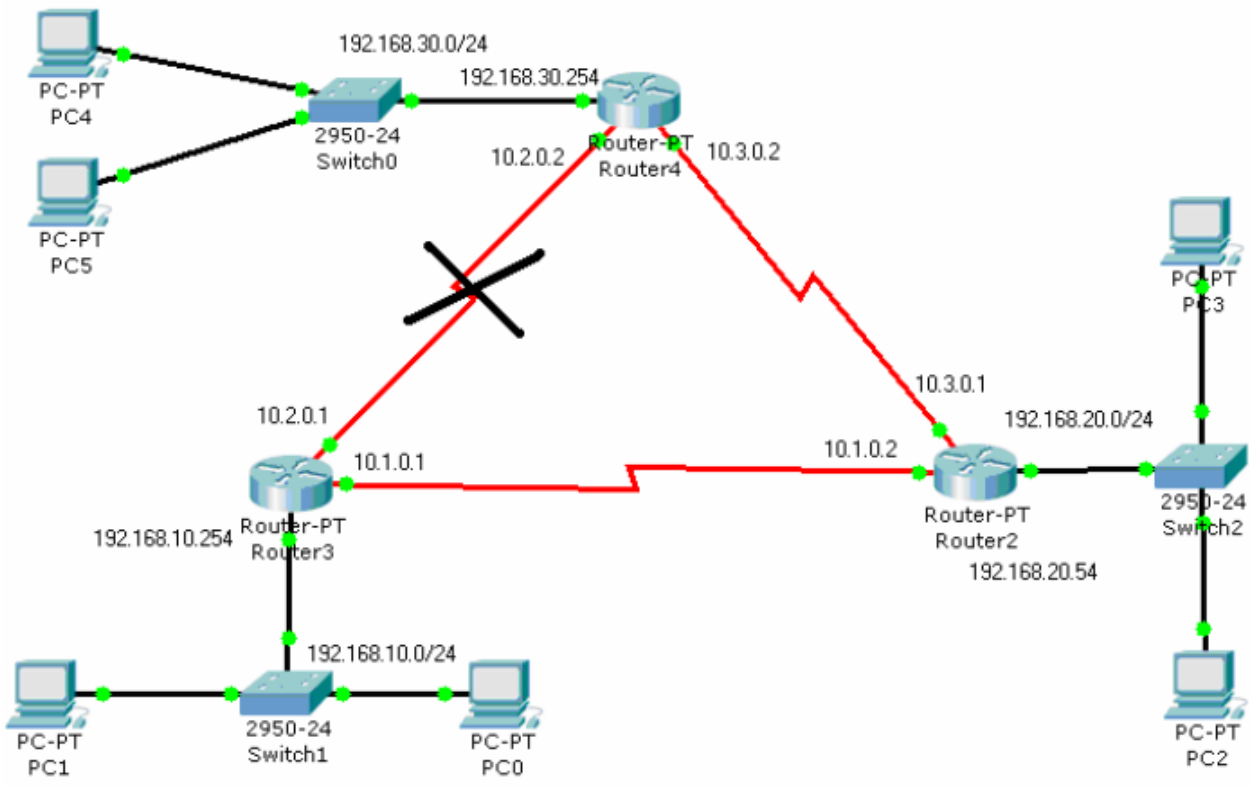
So, after each router has been configured, **routes of the networks it belongs to will automatically added to ip route table of other already-configured routers of connected networks, and vice versa**.

For example, we can ping and tracert from PC1 (192.168.10.1) to PC 4 (192.168.30.1):

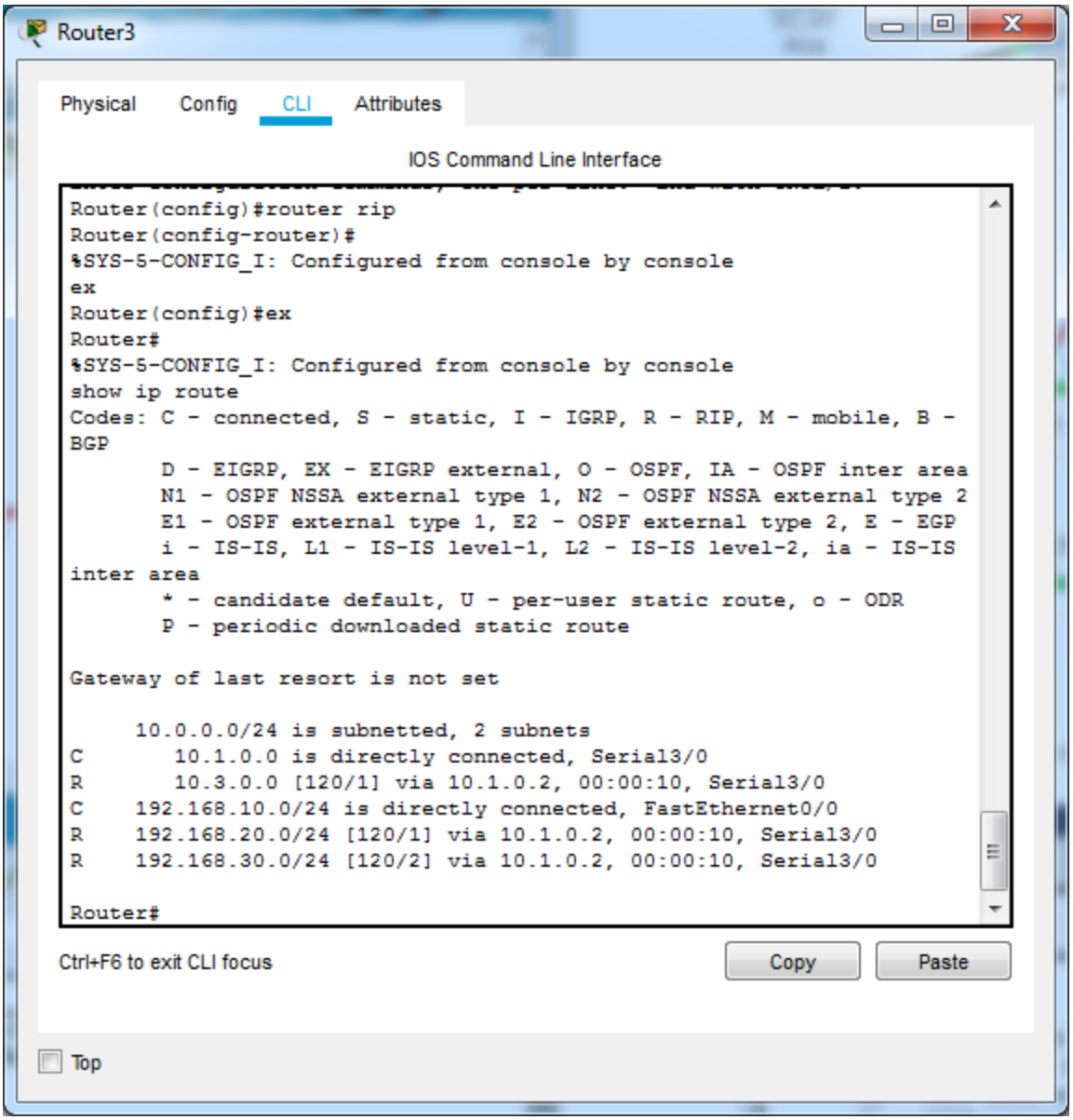


We can see that packets sent from PC1 to Router3 (192.168.10.254), then to router4 (10.2.0.2), then to 192.168.30.1.

If for some reason, the connection between Router3 and Router4 died:



Because we used dynamic routing (RIP), the routing table is automatically updated: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%SYS-5-CONFIG_I: Configured from console by console
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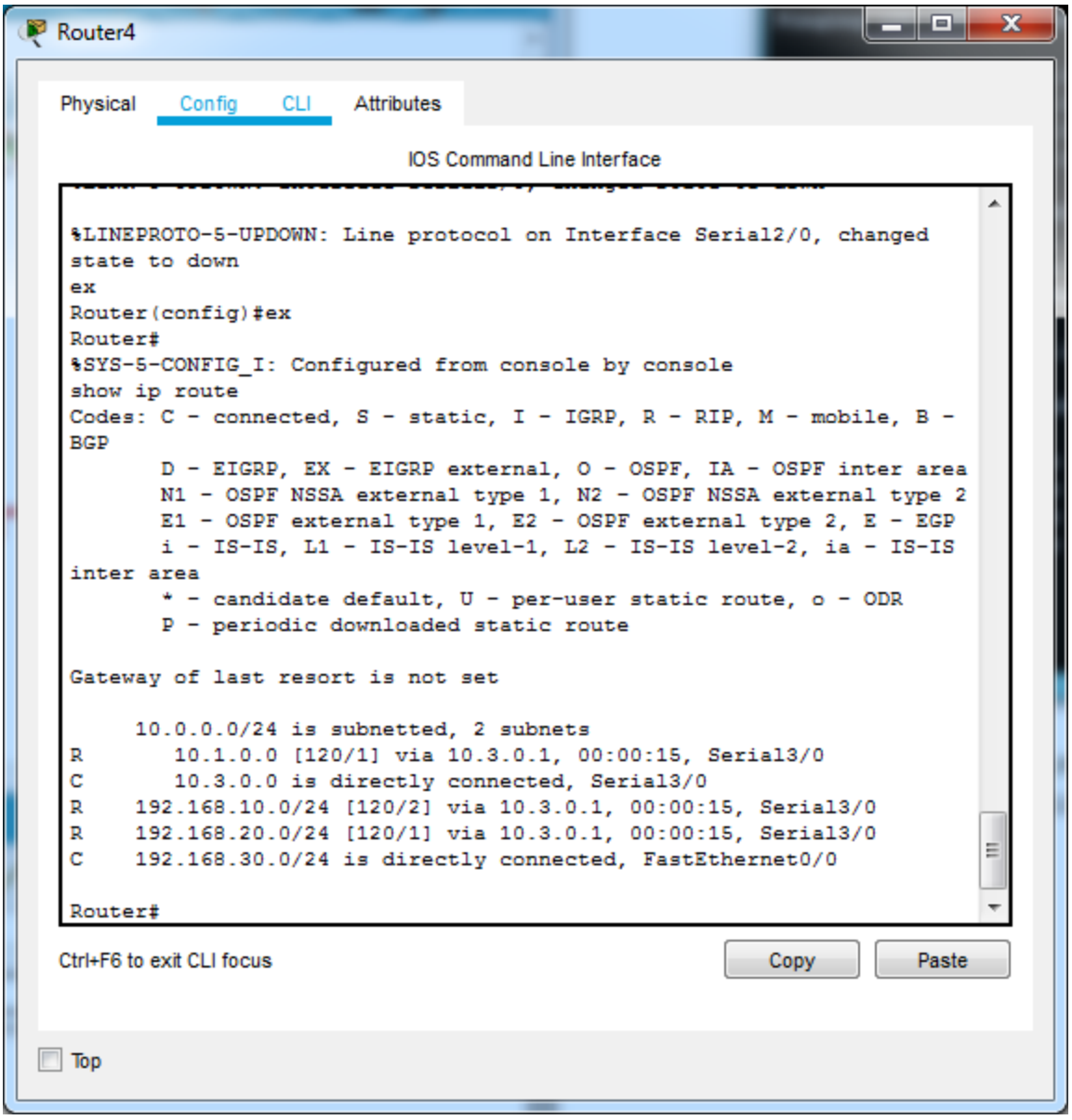
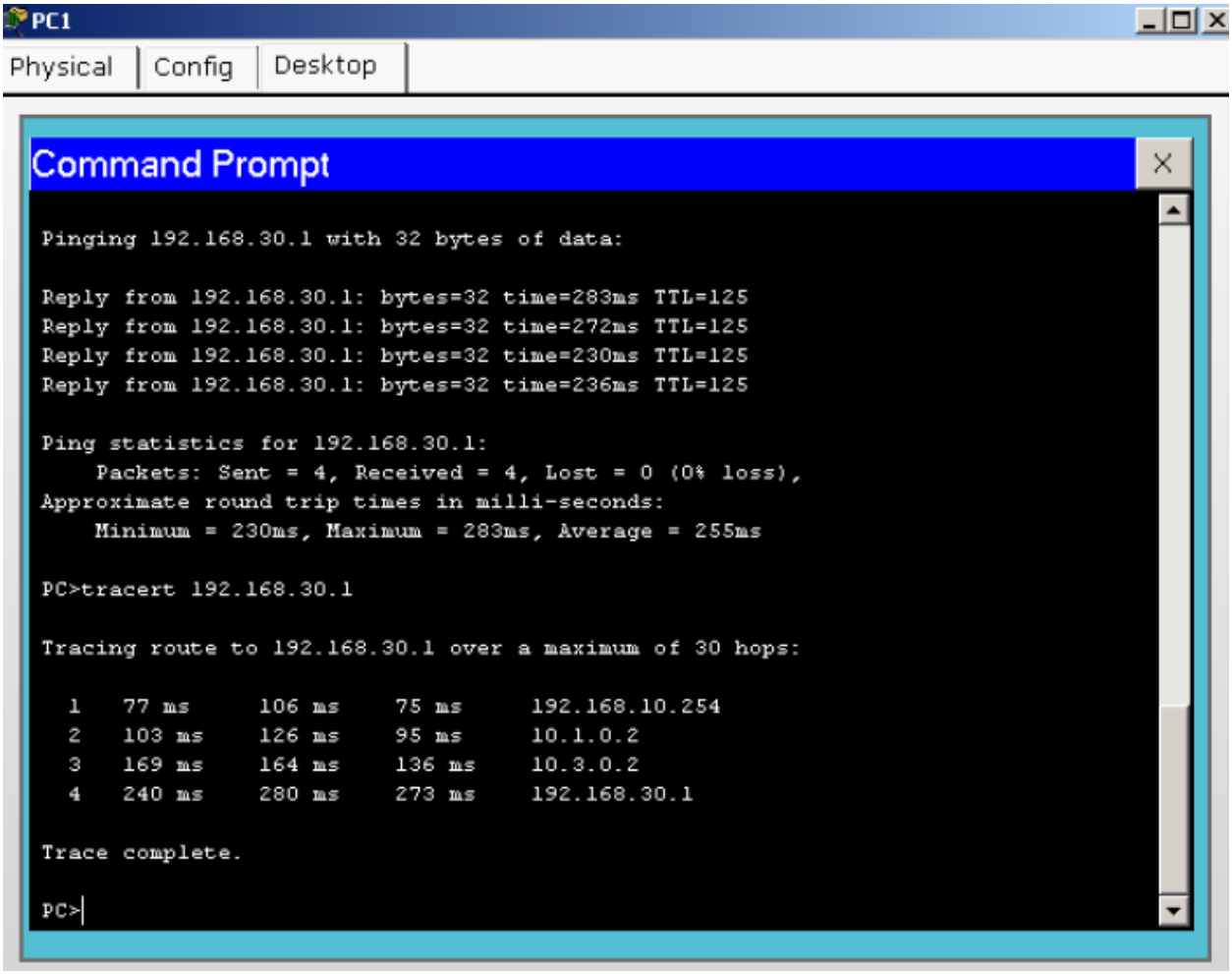
Gateway of last resort is not set
10.0.0.0/24 is subnetted, 2 subnets
C 10.1.0.0 is directly connected, Serial3/0
R 10.3.0.0 [120/1] via 10.1.0.2, 00:00:10, Serial3/0
C 192.168.10.0/24 is directly connected, FastEthernet0/0
R 192.168.20.0/24 [120/1] via 10.1.0.2, 00:00:10, Serial3/0
R 192.168.30.0/24 [120/2] via 10.1.0.2, 00:00:10, Serial3/0
Router#
Ctrl+F6 to exit CLI focus
Copy
Paste
Top



We still can ping from PC1 to PC4:



But the route from PC1 to PC4 now is changed: PC1 to Router3 (192.168.10.254) to Router2 (10.1.0.2) to Router4 (10.3.0.2) to PC4.