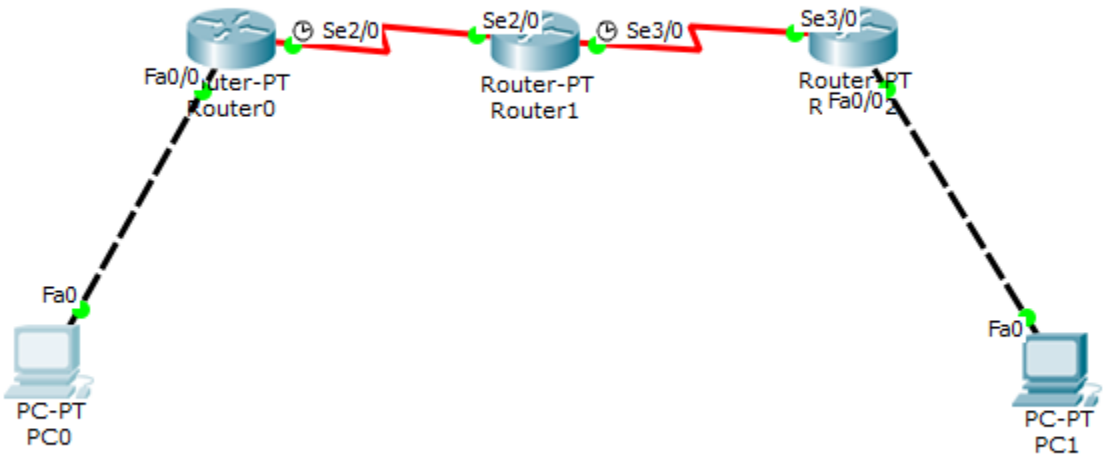
OSPF

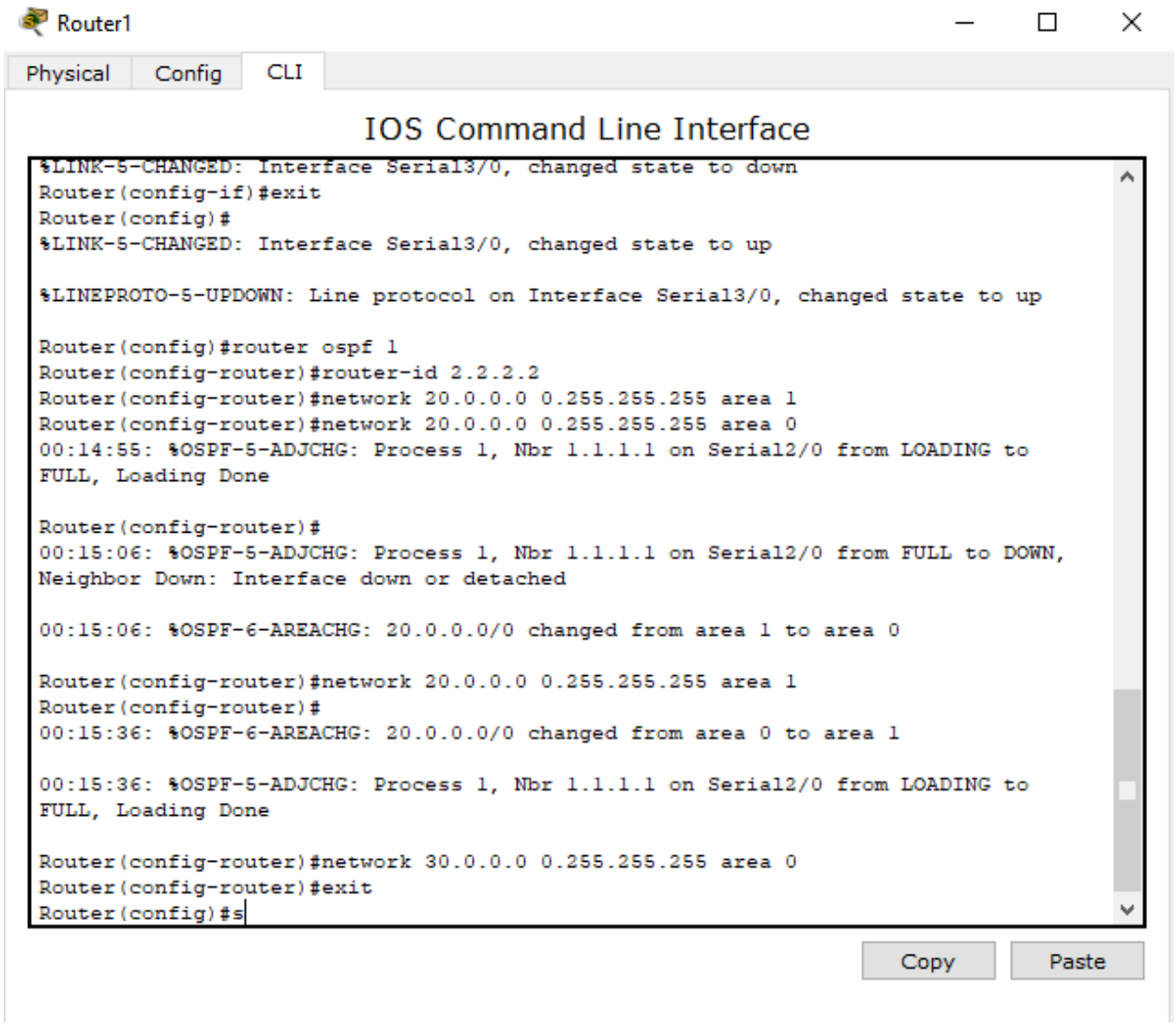
Set up the topology as shown below and configure the pcs, routers with encapsulation ppp, clock rate, as we do in rip.

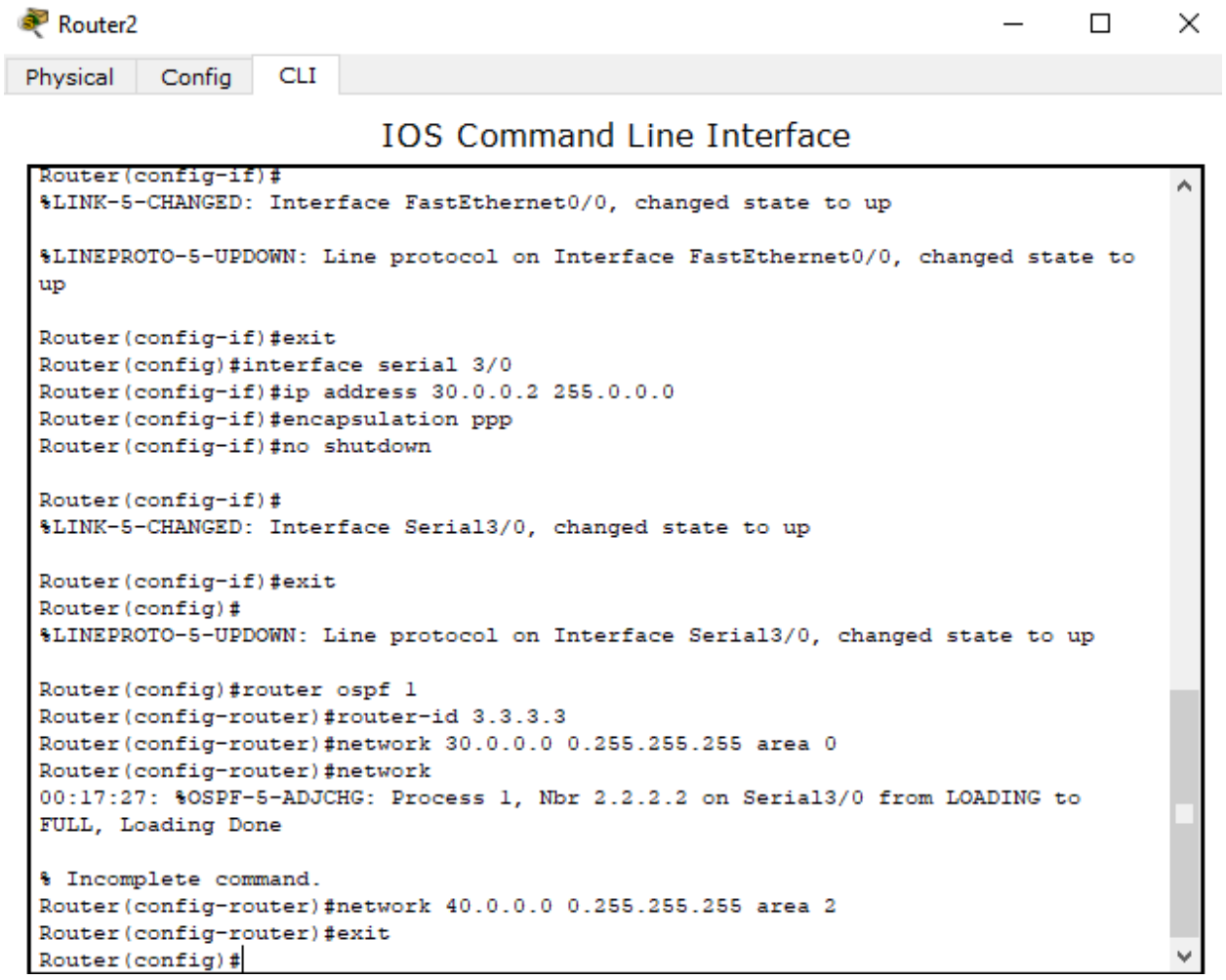


Configuring ospf

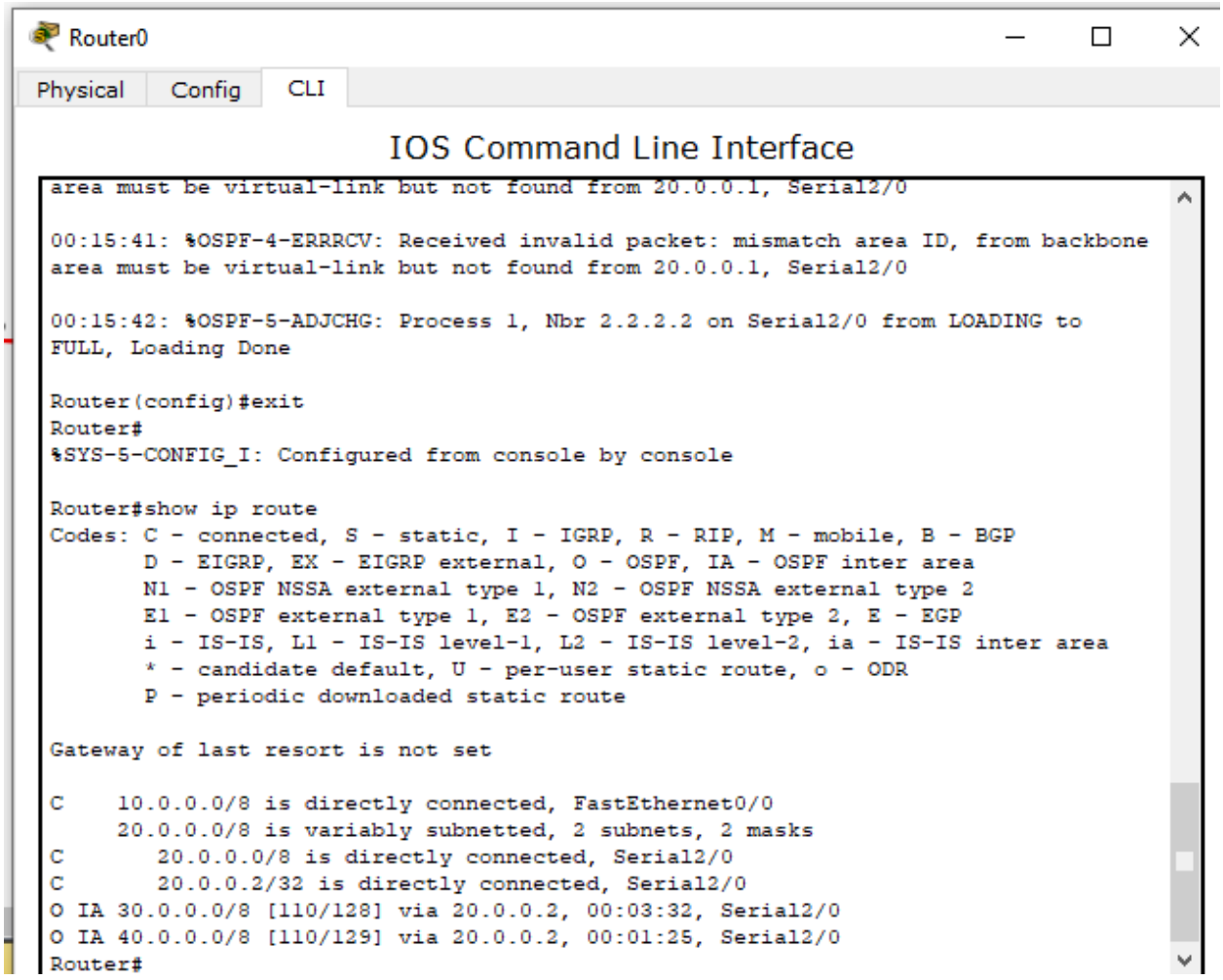
IN R0

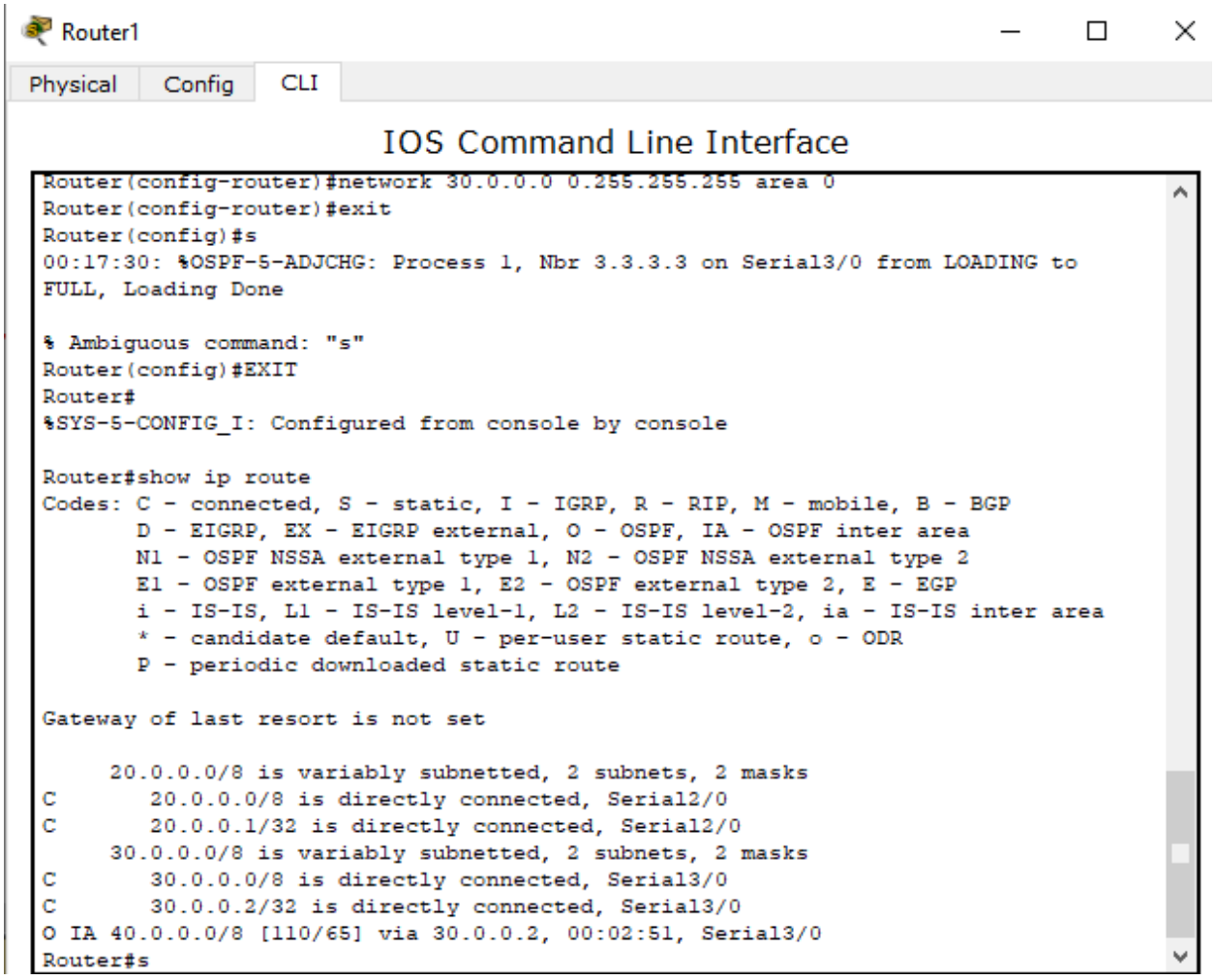
```
Router(config)#router ospf 1
Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 10.0.0.0 0.255.255.255 area3
                                                      ^
% Invalid input detected at '^' marker.

Router(config-router)#network 10.0.0.0 0.255.255.255 area 3
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#exit
Router(config)#
```


Router1
Physical
Config
CLI
IOS Command Line Interface
%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
Router(config)#router ospf 1
Router(config-router)#router-id 2.2.2.2
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#network 20.0.0.0 0.255.255.255 area 0
00:14:55: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from LOADING to FULL, Loading Done
Router(config-router)#
00:15:06: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from FULL to DOWN, Neighbor Down: Interface down or detached
00:15:06: %OSPF-6-AREACHG: 20.0.0.0/0 changed from area 1 to area 0
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#
00:15:36: %OSPF-6-AREACHG: 20.0.0.0/0 changed from area 0 to area 1
00:15:36: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from LOADING to FULL, Loading Done
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#exit
Router(config)#s
Copy
Paste



SHOW IP ROUTE


Router0
Physical
Config
CLI
IOS Command Line Interface
area must be virtual-link but not found from 20.0.0.1, Serial2/0
00:15:41: %OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone
area must be virtual-link but not found from 20.0.0.1, Serial2/0
00:15:42: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to
FULL, Loading Done
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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 not set
C 10.0.0.0/8 is directly connected, FastEthernet0/0
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial2/0
C 20.0.0.2/32 is directly connected, Serial2/0
O IA 30.0.0.0/8 [110/128] via 20.0.0.2, 00:03:32, Serial2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:01:25, Serial2/0
Router#


Router1
Physical
Config
CLI
IOS Command Line Interface
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#exit
Router(config)#s
00:17:30: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial3/0 from LOADING to
FULL, Loading Done
% Ambiguous command: "s"
Router(config)#EXIT
Router#
%SYS-5-CONFIG_I: Configured from console by console
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 not set
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial2/0
C 20.0.0.1/32 is directly connected, Serial2/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, Serial3/0
C 30.0.0.2/32 is directly connected, Serial3/0
O IA 40.0.0.0/8 [110/65] via 30.0.0.2, 00:02:51, Serial3/0
Router#s

Router2

Physical | Config | CLI

IOS Command Line Interface

```
Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#network
00:17:27: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial3/0 from LOADING to
FULL, Loading Done

% Incomplete command.
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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 not set

O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:04:05, Serial3/0
     30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial3/0
C       30.0.0.1/32 is directly connected, Serial3/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

LOOPBACK

RO

```
Router(config)#interface loopback 0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

Router(config-if)#ip add 172.16.1.252 255.255.0.0
Router(config-if)#mo shutdown
                   ^
% Invalid input detected at '^' marker.

Router(config-if)#no shutdown
Router(config-if)#
```

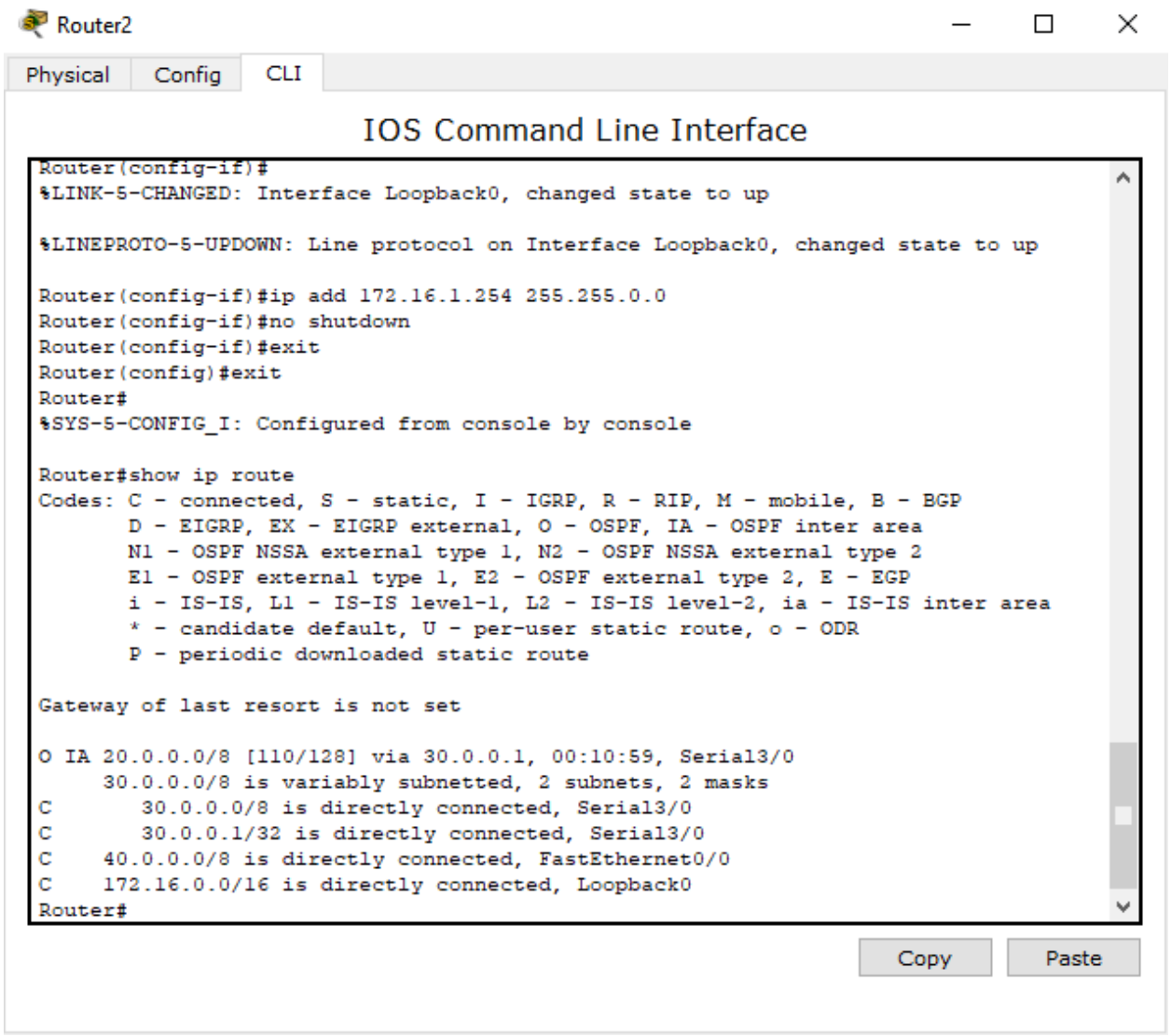
R1

```
Router#CONFIGURE TERMINAL
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface loopback 0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

Router(config-if)#ip add 172.16.1.253 255.255.0.0.0
                                      ^
% Invalid input detected at '^' marker.

Router(config-if)#ip add 172.16.1.253 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#
```

R2

```
C    40.0.0.0/8 is directly connected, FastEthernet0/0
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface loopback 0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

Router(config-if)#ip add 172.16.1.254 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#
```

SHOW IP ROUTE



CREATE VIRTUAL LINK BETWEEN R1 AND R2

IN R0

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

Similarly do for R1

Show ip route for R2

```
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 not set

O IA 10.0.0.0/8 [110/129] via 30.0.0.1, 00:00:16, Serial3/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:05:19, Serial3/0
     30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial3/0
C       30.0.0.1/32 is directly connected, Serial3/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
C    172.16.0.0/16 is directly connected, Loopback0
Router#
```

PINGING

```
Pinging 40.0.0.10 with 32 bytes of data:

Reply from 40.0.0.10: bytes=32 time=16ms TTL=125
Reply from 40.0.0.10: bytes=32 time=7ms TTL=125
Reply from 40.0.0.10: bytes=32 time=7ms TTL=125
Reply from 40.0.0.10: bytes=32 time=18ms TTL=125

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 7ms, Maximum = 18ms, Average = 12ms
```