PRACTICAL 8

Aim: Implement Single-Area OSPFv2

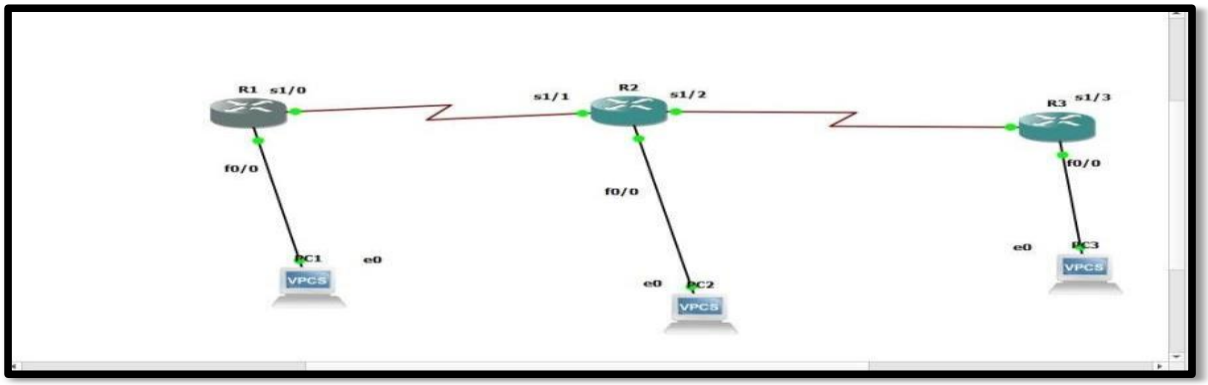
What is Open Shortest Path First (OSPF)?

- The OSPF stands for **Open Shortest Path First**. It is a widely used and supported routing protocol. It is an intra-domain protocol, which means that it is used within an area or a network.
- It is an interior gateway protocol that has been designed within a single autonomous system. It is based on a link-state routing algorithm in which each router contains the information of every domain, and based on this information, it determines the shortest path.
- The goal of routing is to learn routes.
- The OSPF achieves by learning about every router and subnet within the entire network. Every router contains the same information about the network.

1. Implement Single-Area OSPFv2:

Step 1: Assess the requirements for the network.

- For the network, I will be using 3 Routers and 3 PCs. **Step 2: Deign the topology of the network.**



Step 3: Build and Configure the network.

- Configuring Router 1:

```
R1#confi t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface fastethernet 0/0
R1(config-if)#ip address 192.168.1.50 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#
*Mar  1 00:05:59.915: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:06:00.915: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#exit
```

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface serial  0/0
R1(config-if)#ip address 10.1.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#
*Mar  1 00:08:34.851: %LINK-3-UPDOWN: Interface Serial0/0, changed state to up
*Mar  1 00:08:35.851: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
R1(config-if)#exit
```

- Configuring Router 2:

```
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface serial 0/0
R2(config-if)#ip address 10.1.1.2 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
```

```
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface serial 0/1
R2(config-if)#ip address 11.1.1.1 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#no shutdown
*Mar  1 00:19:45.619: %LINK-3-UPDOWN: Interface Serial0/1, changed state to up
*Mar  1 00:19:46.619: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to up
R2(config-if)#exit
R2(config)#end
R2#
```

- Configuring Router 3:

```
R3(config)#interface fastethernet 0/0
R3(config-if)#ip address 192.168.3.50 255.255.255.0
R3(config-if)#no shutdown
R3(config-if)#
*Mar  1 00:09:02.035: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:09:03.035: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#exit
R3(config)#end
```

```
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface serial  0/0
R3(config-if)#exit
R3(config)#interface serial  0/1
R3(config-if)#no shutdown
R3(config-if)#
*Mar  1 00:26:38.571: %LINK-3-UPDOWN: Interface Serial0/1, changed state to up
*Mar  1 00:26:39.571: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to up
R3(config-if)#exit
R3(config)#end
```

```
R3#sh ip int br
*Mar  1 00:26:48.799: %SYS-5-CONFIG_I: Configured from console by console
R3#sh ip int bri
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.3.50    YES manual up                    up
Serial0/0                  unassigned      YES unset  administratively down down
FastEthernet0/1            unassigned      YES unset  administratively down down
Serial0/1                  unassigned      YES unset  up                    down
Serial0/2                  unassigned      YES unset  administratively down down
Serial0/3                  unassigned      YES unset  administratively down down
Serial0/4                  unassigned      YES unset  administratively down down
Serial0/5                  unassigned      YES unset  administratively down down
```

- Configure PC 1:

R2 R1 R3 PC1

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file


PC1> ip 192.168.1.1/24 192.168.1.50
Checking for duplicate address...
PC1 : 192.168.1.1 255.255.255.0 gateway 192.168.1.50

PC1> show ip

NAME        : PC1[1]
IP/MASK     : 192.168.1.1/24
GATEWAY     : 192.168.1.50
DNS         :
MAC         : 00:50:79:66:68:00
LPORT       : 10026
RHOST:PORT  : 127.0.0.1:10027
MTU:        : 1500
```

- Configure PC 2:

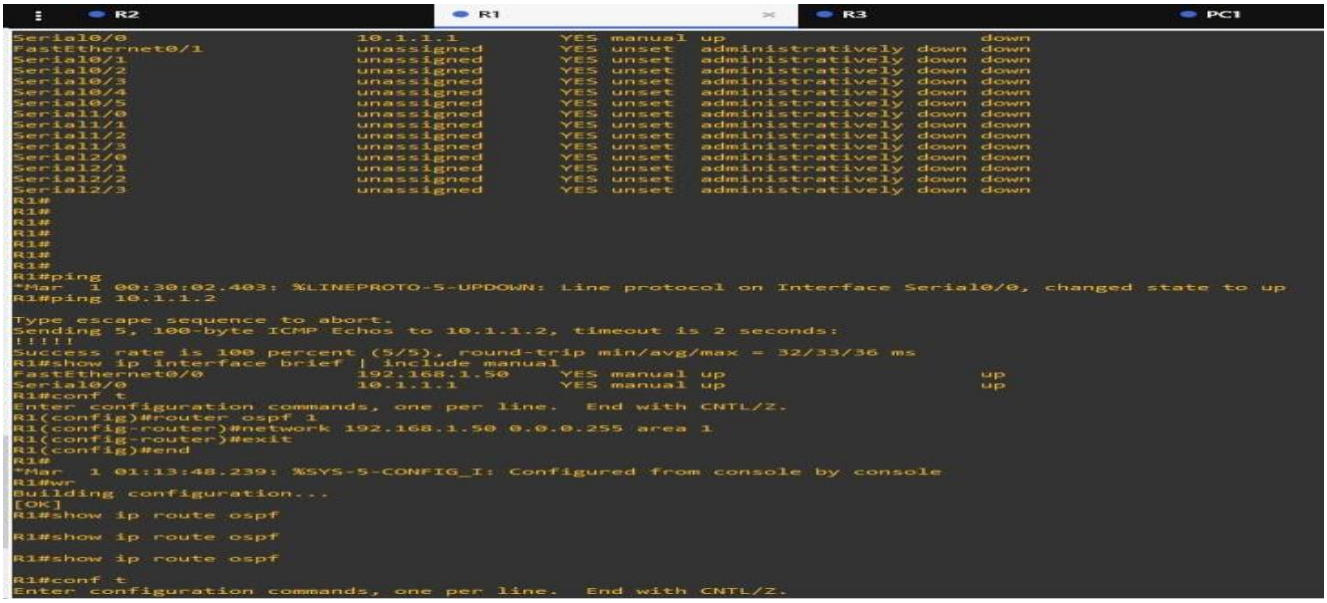
- Configure PC 3:

- Check whether all the interfaces are up.

Step 4: Configure and test the Single – Area OSPFv2 for IPv4 on R1, R2 and R3.

- Configure Single – Area OSPFv2 on R1:
- Test the Single – Area OSPFv2 on R1:
- This shows the neighbour of Router 1 (which is only possible via OSPF)

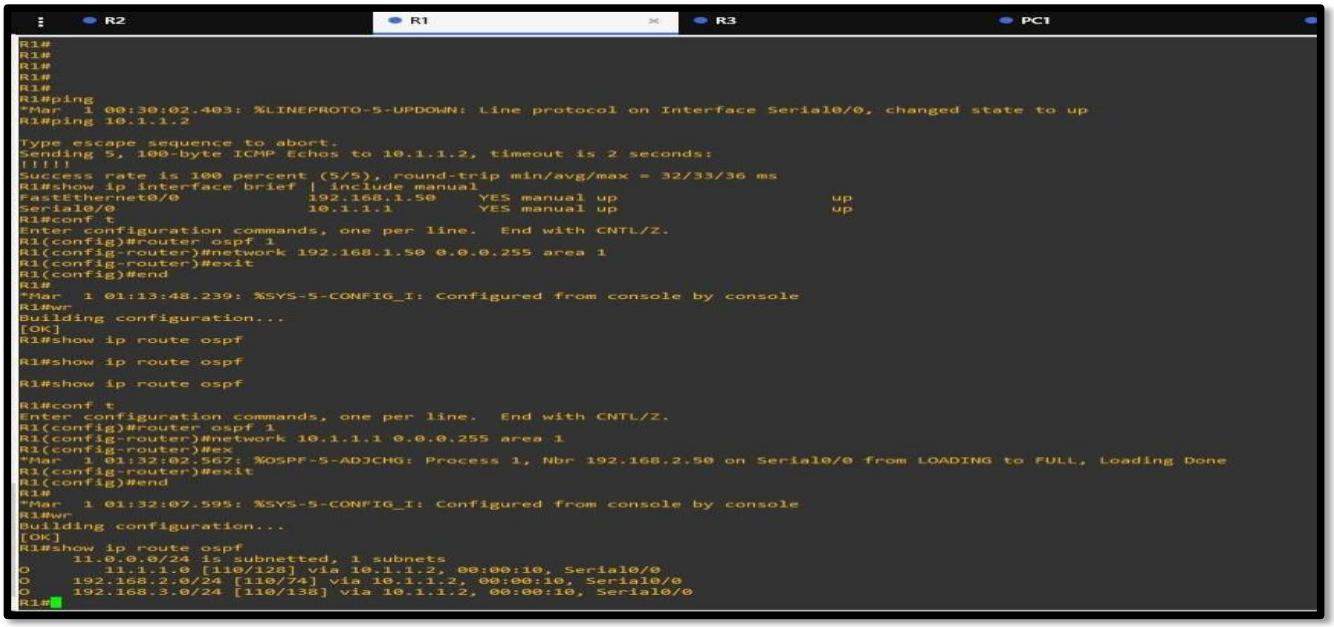
- This will show the various routes used by OSPF. The 'O' at the start indicates a single area network.

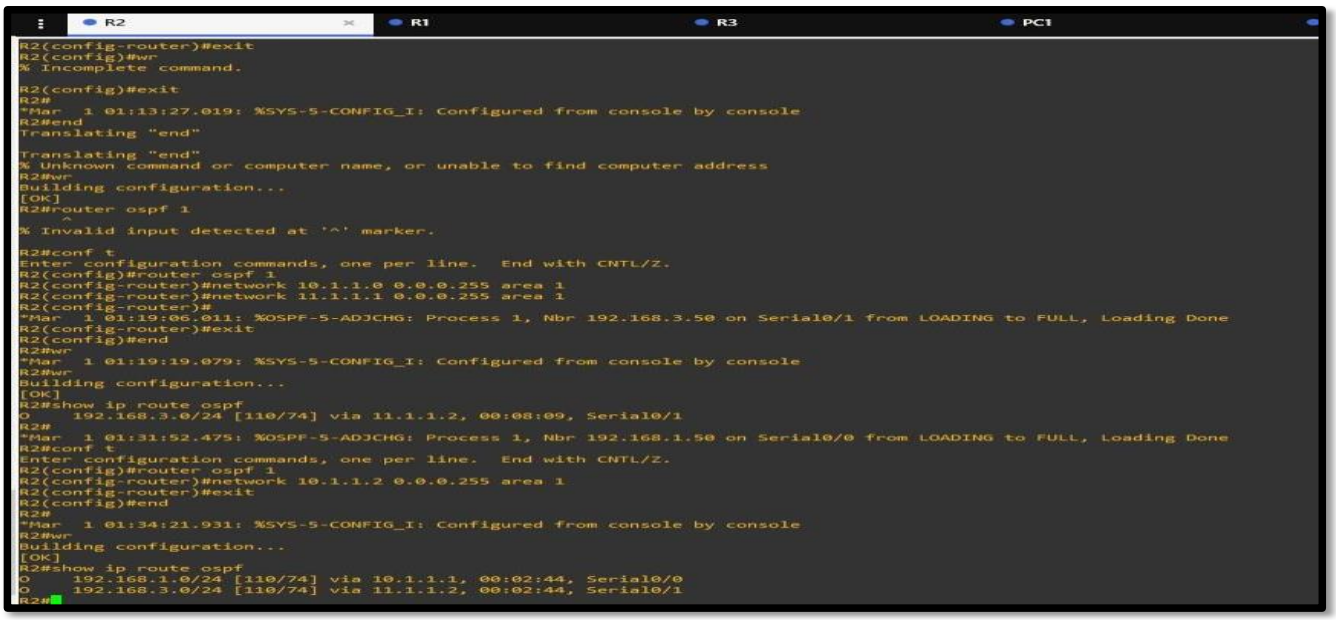


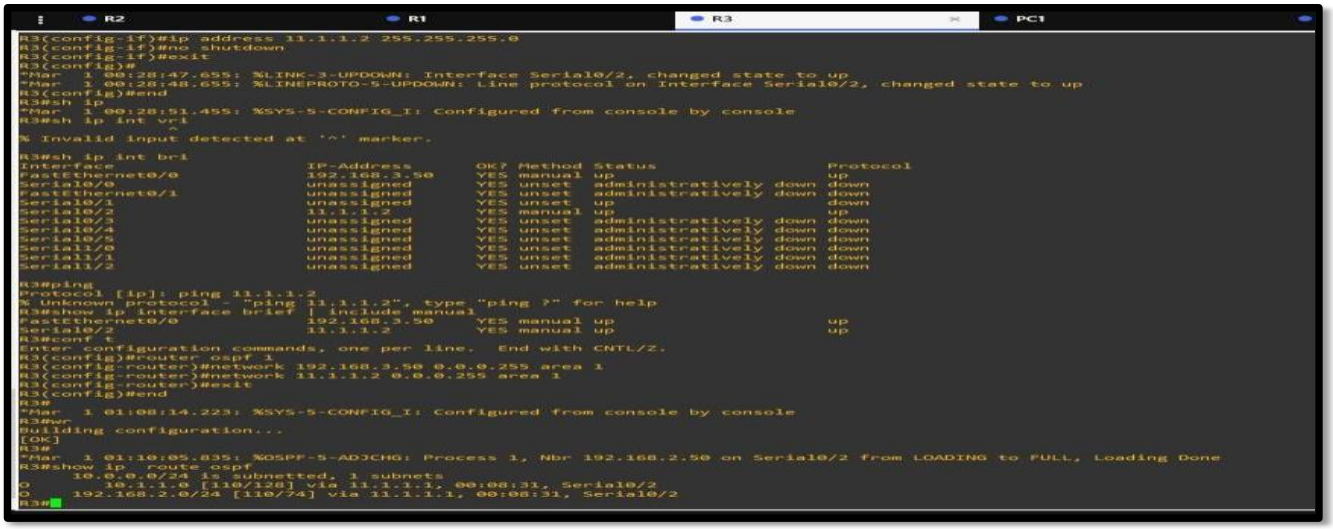
- Configure Single – Area OSPFv2 on R2:
- Test the Single – Area OSPFv2 on R1:
- This will show the various routes used by OSPF. The ‘O’ at the start indicates a single area network.
- This shows the neighbour of Router 2 (which is only possible via OSPF)

- Configure Single – Area OSPFv2 on R3:
- This shows the neighbour of Router 3 (which is only possible via OSPF).
- This will show the various routes used by OSPF. The ‘O’ at the start indicates a single area network.


R2
R1
R3
PC1
Serial1/0 unassigned YES unset administratively down down
Serial1/1 unassigned YES unset administratively down down
Serial1/2 unassigned YES unset administratively down down
--More--
*Mar 1 00:27:02.231: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1, changed state to do
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#interface serial 0/2
R3(config-if)#ip address 11.1.1.2 255.255.255.0
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#
*Mar 1 00:28:47.655: %LINK-3-UPDOWN: Interface Serial0/2, changed state to up
*Mar 1 00:28:48.655: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/2, changed state to up
R3(config)#end
R3#sh ip
*Mar 1 00:28:51.455: %SYS-5-CONFIG_I: Configured from console by console
R3#sh ip int vri
^
% Invalid input detected at '^' marker.
R3#sh ip int bri
Interface IP-Address OK? Method Status Protocol
FastEthernet0/0 192.168.3.50 YES manual up up
Serial0/0 unassigned YES unset administratively down down
FastEthernet0/1 unassigned YES unset administratively down down
Serial0/1 unassigned YES unset up down
Serial0/2 11.1.1.2 YES manual up up
Serial0/3 unassigned YES unset administratively down down
Serial1/4 unassigned YES unset administratively down down
Serial1/5 unassigned YES unset administratively down down
Serial1/0 unassigned YES unset administratively down down
Serial1/1 unassigned YES unset administratively down down
Serial1/2 unassigned YES unset administratively down down
R3#ping
Protocol [ip]: ping 11.1.1.2
% Unknown protocol. "ping 11.1.1.2", type "ping ?" for help
R3#show ip interface brief | include manual
FastEthernet0/0 192.168.3.50 YES manual up up
Serial0/2 11.1.1.2 YES manual up up
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 192.168.3.50 0.0.0.255 area 1
R3(config-router)#network 11.1.1.2 0.0.0.255 area 1
R3(config-router)#exit
R3(config)#end
R3#
*Mar 1 01:08:14.223: %SYS-5-CONFIG_I: Configured from console by console
R3#wr


R2
R1
R3
PC1
R1#
R1#
R1#
R1#
R1#
R1#ping
*Mar 1 00:30:02.403: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0, changed state to up
R1#ping 10.1.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/33/36 ms
R1#show ip interface brief | include manual
FastEthernet0/0 192.168.1.50 YES manual up up
Serial0/0 10.1.1.1 YES manual up up
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 192.168.1.50 0.0.0.255 area 1
R1(config-router)#exit
R1(config)#end
R1#
*Mar 1 01:13:48.239: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#show ip route ospf
R1#show ip route ospf
R1#show ip route ospf
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 10.1.1.1 0.0.0.255 area 1
R1(config-router)#ex
*Mar 1 01:32:02.567: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.2.50 on Serial0/0 from LOADING to FULL, Loading Done
R1(config-router)#exit
R1(config)#end
R1#
*Mar 1 01:32:07.595: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#show ip route ospf
11.0.0.0/24 is subnetted, 1 subnets
O 11.1.1.0 [110/128] via 10.1.1.2, 00:00:10, Serial0/0
O 192.168.2.0/24 [110/74] via 10.1.1.2, 00:00:10, Serial0/0
O 192.168.3.0/24 [110/138] via 10.1.1.2, 00:00:10, Serial0/0
R1#


R2
R1
R3
PC1
R2(config-router)#exit
R2(config)#wr
% Incomplete command.
R2(config)#exit
R2#
*Mar 1 01:13:27.019: %SYS-5-CONFIG_I: Configured from console by console
R2#end
Translating "end"
Translating "end"
% Unknown command or computer name, or unable to find computer address
R2#wr
Building configuration...
[OK]
R2#router ospf 1
^
% Invalid input detected at '^' marker.
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 10.1.1.0 0.0.0.255 area 1
R2(config-router)#network 11.1.1.1 0.0.0.255 area 1
R2(config-router)#
*Mar 1 01:19:06.011: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.3.50 on Serial0/1 from LOADING to FULL, Loading Done
R2(config-router)#exit
R2(config)#end
R2#wr
*Mar 1 01:19:19.079: %SYS-5-CONFIG_I: Configured from console by console
R2#wr
Building configuration...
[OK]
R2#show ip route ospf
O 192.168.3.0/24 [110/74] via 11.1.1.2, 00:08:09, Serial0/1
R2#
*Mar 1 01:31:52.475: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.1.50 on Serial0/0 from LOADING to FULL, Loading Done
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 10.1.1.2 0.0.0.255 area 1
R2(config-router)#exit
R2(config)#end
R2#
*Mar 1 01:34:21.931: %SYS-5-CONFIG_I: Configured from console by console
R2#wr
Building configuration...
[OK]
R2#show ip route ospf
O 192.168.1.0/24 [110/74] via 10.1.1.1, 00:02:44, Serial0/0
O 192.168.3.0/24 [110/74] via 11.1.1.2, 00:02:44, Serial0/1
R2#


R2
R1
R3
PC1
R3(config-if)#ip address 11.1.1.2 255.255.255.0
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#
*Mar 1 00:28:47.655: %LINK-3-UPDOWN: Interface Serial0/2, changed state to up
*Mar 1 00:28:48.655: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/2, changed state to up
R3(config)#end
R3#sh ip
*Mar 1 00:28:51.455: %SYS-5-CONFIG_I: Configured from console by console
R3#sh ip int vr1
                ^
% Invalid input detected at '^' marker.
R3#sh ip int br1
Interface   IP-Address   OK? Method Status   Protocol
FastEthernet0/0   192.168.3.50   YES manual up   up
Serial0/0   unassigned   YES unset administratively down down
FastEthernet0/1   unassigned   YES unset administratively down down
Serial0/1   unassigned   YES unset up   down
Serial0/2   11.1.1.2   YES manual up   up
Serial0/3   unassigned   YES unset administratively down down
Serial0/4   unassigned   YES unset administratively down down
Serial0/5   unassigned   YES unset administratively down down
Serial1/0   unassigned   YES unset administratively down down
Serial1/1   unassigned   YES unset administratively down down
Serial1/2   unassigned   YES unset administratively down down
R3#ping
Protocol [ip]: ping 11.1.1.2
% Unknown protocol - "ping 11.1.1.2", type "ping ?" for help
R3#show ip interface brief | include manual
FastEthernet0/0   192.168.3.50   YES manual up   up
Serial0/2   11.1.1.2   YES manual up   up
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 192.168.3.50 0.0.0.255 area 1
R3(config-router)#network 11.1.1.2 0.0.0.255 area 1
R3(config-router)#exit
R3(config)#end
R3#
*Mar 1 01:08:14.223: %SYS-5-CONFIG_I: Configured from console by console
R3#wr
Building configuration...
[OK]
R3#
*Mar 1 01:10:05.835: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.2.50 on Serial0/2 from LOADING to FULL, Loading Done
R3#show ip route ospf
     10.0.0.0/24 is subnetted, 1 subnets
O   10.1.1.0 [110/128] via 11.1.1.1, 00:08:31, Serial0/2
O   192.168.2.0/24 [110/74] via 11.1.1.1, 00:08:31, Serial0/2
R3#