CISCO PROGRAMARE RUTERE

**Basic configuration of all routers**  
   
R1:  
interface FastEthernet0/0  
 ip address 14.14.14.1 255.255.255.248  
 no shutdown  
!  
interface Serial1/0  
 ip address 10.0.13.1 255.255.255.252  
 no shutdown  
!  
interface Serial1/1  
 ip address 10.0.12.1 255.255.255.252  
 no shutdown  
   
R2:  
interface FastEthernet0/0  
 ip address 10.2.2.2 255.255.255.0  
 no shutdown  
!  
interface Serial1/1  
 ip address 10.0.12.2 255.255.255.252  
 no shutdown  
   
R3:  
interface FastEthernet0/0  
 ip address 10.3.3.3 255.255.255.0  
 no shutdown  
!  
interface Serial1/0  
 ip address 10.0.13.2 255.255.255.252  
 no shutdown  
   
R4:  
interface loopback 0  
 ip address 40.4.4.4 255.255.255.0  
!  
interface FastEthernet0/0  
 ip address 14.14.14.4 255.255.255.248  
 no shutdown  
**R1,R2 and R3 are running OSPF, R1 and R4 are running BGP using different AS number as result they will establish an EBGP session.  
R4 which play a role of an ISP advertises a BGP default route to R1 using the neighbor 14.14.14.1 default-originate command, R1 advertises a default route into OSPF domain using the default-information originate command:**  
   
R1:  
router ospf 1  
router-id 1.1.1.1  
network 10.0.12.1 0.0.0.0 area 0  
network 10.0.13.1 0.0.0.0 area 0  
default-information originate  
!  
router bgp 65500  
bgp router-id 1.1.1.1  
neighbor 14.14.14.4 remote-as 500  
   
R2:  
router ospf 1  
router-id 2.2.2.2  
network 10.0.12.2 0.0.0.0 area 0  
network 10.2.2.2 0.0.0.0 area 0  
   
R3:  
router ospf 1  
router-id 3.3.3.3  
network 10.0.13.2 0.0.0.0 area 0  
network 10.3.3.3 0.0.0.0 area 0  
   
R4  
router bgp 500  
bgp router-id 4.4.4.4  
neighbor 14.14.14.1 remote-as 65500  
neighbor 14.14.14.1 default-originate  
  **Let's verify the routing tables of all routers:  
   
Below R1 is receiving a BGP default route from R4:**  
   
R1#show ip route | beg Gate  
Gateway of last resort is 14.14.14.4 to network 0.0.0.0  
**B\*    0.0.0.0/0 [20/0] via 14.14.14.4, 00:00:01**  
      10.0.0.0/8 is variably subnetted, 6 subnets, 3 masks  
C        10.0.12.0/30 is directly connected, Serial1/1  
L        10.0.12.1/32 is directly connected, Serial1/1  
C        10.0.13.0/30 is directly connected, Serial1/0  
L        10.0.13.1/32 is directly connected, Serial1/0  
O        10.2.2.0/24 [110/65] via 10.0.12.2, 00:01:14, Serial1/1  
O        10.3.3.0/24 [110/65] via 10.0.13.2, 00:01:04, Serial1/0  
      14.0.0.0/8 is variably subnetted, 2 subnets, 2 masks  
C        14.14.14.0/29 is directly connected, FastEthernet0/0  
L        14.14.14.1/32 is directly connected, FastEthernet0/0  
R1#  
   
**Because R1 has already a default route in its routing table and it is configured above with the default-information originate command , it advertises a default route OSPF to R2 and R3 as shown by the routing tables of R2 and R3 below respectivelly:**  
   
R2#show ip route | beg Gate  
Gateway of last resort is 10.0.12.1 to network 0.0.0.0  
  **O\*E2  0.0.0.0/0 [110/1] via 10.0.12.1, 00:02:07, Serial1/1**  
      10.0.0.0/8 is variably subnetted, 6 subnets, 3 masks  
C        10.0.12.0/30 is directly connected, Serial1/1  
L        10.0.12.2/32 is directly connected, Serial1/1  
O        10.0.13.0/30 [110/128] via 10.0.12.1, 00:03:30, Serial1/1  
C        10.2.2.0/24 is directly connected, FastEthernet0/0  
L        10.2.2.2/32 is directly connected, FastEthernet0/0  
O        10.3.3.0/24 [110/129] via 10.0.12.1, 00:03:15, Serial1/1  
R2#  
   
R3#show ip route | beg Gate  
Gateway of last resort is 10.0.13.1 to network 0.0.0.0  
   
**O\*E2  0.0.0.0/0 [110/1] via 10.0.13.1, 00:03:36, Serial1/0**  
      10.0.0.0/8 is variably subnetted, 6 subnets, 3 masks  
O        10.0.12.0/30 [110/128] via 10.0.13.1, 00:04:47, Serial1/0  
C        10.0.13.0/30 is directly connected, Serial1/0  
L        10.0.13.2/32 is directly connected, Serial1/0  
O        10.2.2.0/24 [110/129] via 10.0.13.1, 00:04:47, Serial1/0  
C        10.3.3.0/24 is directly connected, FastEthernet0/0  
L        10.3.3.3/32 is directly connected, FastEthernet0/0  
R3#  
**The show ip bgp summary shown that R1 and R4 established a BGP neighbor relationship:**  
   
R4#show ip bgp summary  
BGP router identifier 4.4.4.4, local AS number 500  
BGP table version is 2, main routing table version 2  
1 network entries using 144 bytes of memory  
1 path entries using 80 bytes of memory  
1/0 BGP path/bestpath attribute entries using 136 bytes of memory  
0 BGP route-map cache entries using 0 bytes of memory  
0 BGP filter-list cache entries using 0 bytes of memory  
BGP using 360 total bytes of memory  
BGP activity 1/0 prefixes, 1/0 paths, scan interval 60 secs  
   
Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd  
**14.14.14.1      4        65500      10      10        2    0    0 00:06:19        0**  
R4#  
   
**Configure Internet access for the LANs subnet of R2 and R3 using Port Address Translation,or PAT on R1:  
1.All traffic sourced from the 10.2.2.0/24 subnet should be translated to 14.14.14.2  
2.All traffic sourced from the 10.3.3.0/24 subnet should be translated to 14.14.14.3**  
   
R1:  
ip nat pool POOL2 14.14.14.2 14.14.14.2 prefix-length 29  
ip nat pool POOL3 14.14.14.3 14.14.14.3 prefix-length 29  
!  
ip access-list extended ACL-POOL2  
permit ip 10.2.2.0 0.0.0.255 any  
!  
ip access-list extended ACL-POOL3  
permit ip 10.3.3.0 0.0.0.255 any  
!  
ip nat inside source list ACL-POOL2 pool POOL2 overload  
ip nat inside source list ACL-POOL3 pool POOL3 overload  
!  
interface serial 1/1  
ip nat inside  
!  
interface serial 1/0  
ip nat inside  
!  
interface fastethernet 0/0  
ip nat outside  
**Let's verify with the ping to the loopback address of R4 40.4.4.4 from the A+LANs subnet of R2 and R3:**  
   
R2#ping 40.4.4.4 source fastEthernet 0/0  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 40.4.4.4, timeout is 2 seconds:  
Packet sent with a source address of 10.2.2.2  
.!!!!  
Success rate is 80 percent (4/5), round-trip min/avg/max = 104/112/120 ms  
R2#  
   
R3#ping 40.4.4.4 source fastEthernet 0/0  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 40.4.4.4, timeout is 2 seconds:  
Packet sent with a source address of 10.3.3.3  
.!!!!  
Success rate is 80 percent (4/5), round-trip min/avg/max = 104/114/124 ms  
R3#  
   
Let's verify the translations using the show ip nat translations:  
   
R1#show ip nat translations  
Pro Inside global      Inside local       Outside local      Outside global  
**icmp 14.14.14.2:1024   10.2.2.2:0         40.4.4.4:0         40.4.4.4:1024  
icmp 14.14.14.3:1024   10.3.3.3:0         40.4.4.4:0         40.4.4.4:1024**  
R1#  
**Now assume we an internal web server that is connected to the R3 and we want that all HTTP traffic destined only to the IP address 14.14.14.5 will be forwarded to a Loopback 0 interface with the IP address 3.3.3.3 on R3 by using static NAT for TCP port 80 on R1.  
   
Let's configure a Loopback interface on R3 and advertise it via OSPF and enable HTTP server on R3:**  
   
R3:  
interface loopback 0  
ip address 3.3.3.3 255.255.255.255  
!  
router ospf 1  
network 3.3.3.3 0.0.0.0 area 0  
!  
ip http server  
   
**Now let's configure a static NAT on R1 to translate the HTTP traffic coming from the internet toward the web server 3.3.3.3 into the IP address 14.14.14.5 and port 80:**  
   
R1:  
ip nat inside source static tcp 3.3.3.3 80 14.14.14.5 80  
   
**Let's verify the static translation using the show ip nat translations verbose:**  
   
R1#show ip nat translations verbose  
Pro Inside global      Inside local       Outside local      Outside global  
tcp 14.14.14.5:80      3.3.3.3:80         ---                ---  
    create 00:00:31, use 00:00:31,  
    flags:  
static, extended, extendable, use\_count: 0, entry-id: 4, lc\_entries: 0  
R1#  
**Let's verify static NAT operation by initiating a telnet session from R4 using TCP port 80:**  
   
R4#telnet 14.14.14.5 www  
Trying 14.14.14.5, 80 ... Open  
   
[Connection to 14.14.14.5 closed by foreign host]  
R4#  
   
**Now let's see if the translation occurs:  
Yes as expected the HTTP traffic initiated from R4 to the public address of the web server passed successfully:**  
   
R1#show ip nat translations verbose  
Pro Inside global      Inside local       Outside local      Outside global  
**tcp 14.14.14.5:80      3.3.3.3:80         14.14.14.4:44255   14.14.14.4:44255**  
    create 00:03:34, use 00:00:34, left 00:00:25,  
    flags:  
extended, timing-out, use\_count: 0, entry-id: 5, lc\_entries: 0  
tcp 14.14.14.5:80      3.3.3.3:80         ---                ---  
    create 00:06:15, use 00:03:34,  
    flags:  
static, extended, extendable, use\_count: 1, entry-id: 4, lc\_entries: 0  
R1#

**Attachments:**

* [topo.png(37k)](https://www.netacad.com/documents/portlet_file_entry/300006/topo.png/cf4cb0ea-7a8f-4a1f-b621-456dfa8c1f47)

