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1)** INTERFACE CONFIGURATION **
** R1**
```
int s0/1/1
ip address 1.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int s0/0/0
ip address 2.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/0/1
ip address 6.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/1/0
ip address 11.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/2/0
ip address 15.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/2/1
ip address 18.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/3/0
ip address 22.0.0.1 255.0.0.0
```

```
encapsulation hdlc
clock rate 64000
no shutdown

int s0/3/1
ip address 25.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

*R2*
int s0/0/0
ip address 2.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int s0/0/1
ip address 3.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/1/0
ip address 4.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

*R3*
int s0/0/0
ip address 6.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int s0/0/1
ip address 7.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/1/0
ip address 8.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

*R4*
int s0/0/0
ip address 11.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int s0/0/1
ip address 13.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/1/0
```

```
ip address 14.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/1/1
ip address 9.0.0.1 255.0.0.0
encapsulation hdlc
no shutdown

*R5*
int s0/0/0
ip address 15.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int s0/0/1
ip address 16.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/1/0
ip address 17.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

*R6*
int s0/0/0
ip address 18.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int s0/0/1
ip address 19.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/1/0
ip address 21.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

*R7*
int s0/0/0
ip address 22.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int s0/0/1
ip address 23.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

int s0/1/0
```

```
ip address 24.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

*R8*
int s0/0/0
ip address 25.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int s0/0/1
ip address 26.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

*R9*
int s0/0/0
ip address 3.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int f0/0
ip address 5.0.0.1 255.0.0.0
no shutdown

*R10*
int s0/0/0
ip address 4.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

int f0/0
ip address 5.0.0.2 255.0.0.0
no shutdown

*R12*
int f0/0
ip address 5.0.0.3 255.0.0.0
no shutdown

*R13*
int f0/0
ip address 5.0.0.4 255.0.0.0
no shutdown

*R14*
int s0/0/0
ip address 7.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R15*
int s0/0/0
ip address 8.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown
```

```
int s0/0/1
ip address 9.0.0.2 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

*R16*
int s0/0/0
ip address 13.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R17*
int s0/0/0
ip address 14.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R18*
int s0/0/0
ip address 16.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R19*
int s0/0/0
ip address 17.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R20*
int s0/0/0
ip address 19.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R21*
int s0/0/0
ip address 21.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R22*
int s0/0/0
ip address 23.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R23*
int s0/0/0
ip address 24.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown

*R24*
int s0/0/0
ip address 26.0.0.2 255.0.0.0
encapsulation hdlc
no shutdown
```

```
*ISP*
int s0/0/0
ip address 1.0.0.1 255.0.0.0
encapsulation hdlc
clock rate 64000
no shutdown

2)** loopback configuration **
*ISP*
interface loopback 0
ip address 20.1.0.1 255.255.255.0
interface loopback 1
ip address 20.1.1.1 255.255.255.0
interface loopback 2
ip address 20.1.2.1 255.255.255.0
interface loopback 3
ip address 20.1.3.1 255.255.255.0

*R14*
interface loopback 0
ip address 10.1.0.1 255.255.255.0
interface loopback 1
ip address 10.1.1.1 255.255.255.0
interface loopback 2
ip address 10.1.2.1 255.255.255.0
interface loopback 3
ip address 10.1.3.1 255.255.255.0

*R16*
int loopback 0
ip address 50.1.0.1 255.255.255.0
int loopback 1
ip address 50.1.1.1 255.255.255.0
int loopback 2
ip address 50.1.2.1 255.255.255.0

*R23*
int loopback 0
ip address 55.0.0.1 255.0.0.0
int loopback 1
ip address 56.0.0.1 255.0.0.0
int loopback 2
ip address 57.0.0.1 255.0.0.0

*R24*
int loopback 0
ip address 60.0.0.1 255.0.0.0

3)** ospf routing **
*isp*
ip route 0.0.0.0 0.0.0.0 s0/0/0

* R1 *
router ospf 1
network 2.0.0.0 0.0.0.255 area 0
network 6.0.0.0 0.0.0.255 area 0
network 11.0.0.0 0.0.0.255 area 0
network 15.0.0.0 0.0.0.255 area 0
```

```
network 18.0.0.0 0.0.0.255 area 0
network 22.0.0.0 0.0.0.255 area 0
network 25.0.0.0 0.0.0.255 area 0
exit

ip route 0.0.0.0 0.0.0.0 s0/1/1

* R2 *
router ospf 1
network 2.0.0.0 0.0.0.255 area 0
network 3.0.0.0 0.0.0.255 area 1
network 4.0.0.0 0.0.0.255 area 1
exit

* R3 *
router ospf 1
network 6.0.0.0 0.0.0.255 area 0
network 7.0.0.0 0.0.0.255 area 2
network 8.0.0.0 0.0.0.255 area 2
exit

* R4 *
router ospf 1
network 11.0.0.0 0.0.0.255 area 0
network 13.0.0.0 0.0.0.255 area 3
network 14.0.0.0 0.0.0.255 area 3
exit

* R5 *
router ospf 1
network 15.0.0.0 0.0.0.255 area 0
network 16.0.0.0 0.0.0.255 area 4
network 17.0.0.0 0.0.0.255 area 4
exit

* R6 *
router ospf 1
network 18.0.0.0 0.0.0.255 area 0
network 19.0.0.0 0.0.0.255 area 5
network 21.0.0.0 0.0.0.255 area 5
exit

* R7 *
router ospf 1
network 22.0.0.0 0.0.0.255 area 0
network 23.0.0.0 0.0.0.255 area 6
network 24.0.0.0 0.0.0.255 area 6
exit

* R8 *
router ospf 1
network 25.0.0.0 0.0.0.255 area 0
network 26.0.0.0 0.0.0.255 area 7
exit

* R9 *
router ospf 1
network 3.0.0.0 0.0.0.255 area 1
network 5.0.0.0 0.0.0.255 area 1
```

```
exit

* R10 *
router ospf 1
network 4.0.0.0 0.0.0.255 area 1
network 5.0.0.0 0.0.0.255 area 1
exit

* R12 *
router ospf 1
network 5.0.0.0 0.0.0.255 area 1
exit

* R13 *
router ospf 1
network 5.0.0.0 0.0.0.255 area 1
exit

* R14 *
router ospf 1
network 7.0.0.0 0.0.0.255 area 2
network 10.1.0.0 0.255.255.255 area 2
network 10.1.1.0 0.255.255.255 area 2
network 10.1.2.0 0.255.255.255 area 2
network 10.1.3.0 0.255.255.255 area 2
exit

* R15 *
router ospf 1
network 8.0.0.0 0.0.0.255 area 2
exit

* R16 *
router ospf 1
network 13.0.0.0 0.0.0.255 area 3
exit

* R17 *
router ospf 1
network 14.0.0.0 0.0.0.255 area 3
exit

* R18 *
router ospf 1
network 16.0.0.0 0.0.0.255 area 4
exit

* R19 *
router ospf 1
network 17.0.0.0 0.0.0.255 area 4
exit

* R20 *
router ospf 1
network 19.0.0.0 0.0.0.255 area 5
exit

* R21 *
router ospf 1
```

```
network 21.0.0.0 0.0.0.255 area 5
exit

* R22 *
router ospf 1
network 23.0.0.0 0.0.0.255 area 6
exit

* R23 *
router ospf 1
network 24.0.0.0 0.0.0.255 area 6
exit

* R24 *
router ospf 1
network 26.0.0.0 0.0.0.255 area 7
exit

** configure ospf backup link between R15 and R4 **
* R4 *
router ospf 1
network 9.0.0.0 0.0.0.255 area 3
exit

* R15 *
router ospf 1
network 9.0.0.0 0.0.0.255 area 3
exit

4)** to change ospf reference bandwidth **
conf t
router ospf 1
auto-cost reference-bandwidth 100
end

5)** configure ospf cost on an interface **
*R14*
conf t
int s0/0/0
ip ospf  cost 100
end

6)** change ospf timers **
#conf t
#interface s0/0/0
#ip ospf hello-interval 2
#ip ospf dead-interval 8
#end

7)** configure lan interfaces and ospf priority (the highest priority will become
DR )**
*R9*
int f0/0
ip ospf priority 200
end

8)** to config router ID **
*R13*
conf t
```

```
router ospf 1
router-id 6.6.6.6
end

9)** redistribution **
** redistribute default in ospf**
*R1*
conf t
router ospf 1
default-information originate
exit

** redistribute loop back int**
*R23*
router ospf 1
redistribute connected
end

** redistribute loop back int**
*R24*
router ospf 1
redistribute connected
end

10)** configure virtual link **
*R4*
router ospf 1
area 3 virtual-link 9.0.0.2
end

*R15*
router ospf 1
no area 3 virtual-link 11.0.0.2
end

11)** internal summarization **
router ospf 1
area 2 range 10.1.0.0 255.255.252.0
end

12** external summarization **
router ospf 5
redistribute connected
end

13)** configure ospf simple authentication **
*R4*
int s0/0/1
ip ospf authentication
ip ospf authentication-key noor
end

*R16*
int s0/0/0
ip ospf authentication
ip ospf authentication-key noor
end

14)** configure ospf MD5 authentication **
```

R4
int s0/1/0
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 noor
end

R17
int s0/0/0
ip ospf authentication message-digest
ip ospf message-digest-key 1 md5 noor
end

15)** to configure area-4 as a stub area**
R5
router ospf 1
area 4 stub
exit

R18
router ospf 1
area 4 stub
exit

R19
router ospf 1
area 4 stub
exit

16)** to configure area-5 as a totally stub area**
R6
router ospf 1
area 5 stub no-summary
exit

R20
router ospf 1
area 5 stub
exit

R21
router ospf 1
area 5 stub
exit

17)** to configure area-6 as a not so stubby area(nssa) **
R7
router ospf 1
area 6 nssa
exit

R23
router ospf 1
area 6 nssa
exit

R22
router ospf 1
area 6 nssa
exit

18)** to configure area-7 as a totally not so stubby area(totally nssa) **
R7
router ospf 1
area 7 nssa no-summary
exit

R24
router ospf 1
area 7 nssa
exit

19)**ospf verification commands **
1)* verivy ospf neighbor and database table *
#show ip ospf neighbor
#show ip ospf database

2)* verivy ospf routes in the routing table*
#show ip route ospf

3)* trace the path to destination using the source address *
#traceroute 5.0.0.4

4)* verify ospf protocol default settings *
#show ip protocols

5)* verify ospf default cost metric on interface *
#sh ip ospf interface

6)* verify ospf default reference bandwidth *
#show ip ospf

7)* verify ospf states and packet types *
#terminal monitor
#debug ip ospf adj
#clear ip ospf process (yes)
#undebug all
#terminal no monitor

8)* verify ospf timers *
#show ip ospf interface s0/0/0

9)* verify ospf-hello packet *
#terminal monitor
#debug ip ospf hello
#undebug all
#terminal no monitor

10)* verify ospf-hello packet details *
#terminal monitor
#debug ip ospf packet
#undebug all
#terminal no monitor

11)* verify ospf simple and md5 authentication *
#sh ip ospf neighbor
#sh ip ospf int s0/0/1

12)* verify ospf authentication packets *

```
terminal monitor
debug ip ospf packet
clear ip ospf process (yes)
```