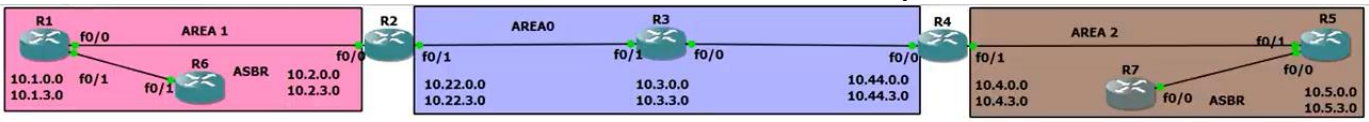
OSPF Advance concepts



** don't configure R6 has ASBR

##Config R6 has Stub

```
R2(config)#router ospf 10
R2(config-router)#area 1 ?
  authentication  Enable authentication
  default-cost    Set the summary default-cost of a NSSA/stub area
  filter-list     Filter networks between OSPF areas
  nssa            Specify a NSSA area
  range           Summarize routes matching address/mask (border routers only)
  sham-link       Define a sham link and its parameters
  stub            Specify a stub area
  virtual-link    Define a virtual link and its parameters

R2(config-router)#area 1 stub ?
  no-summary  Do not send summary LSA into stub area
  <cr>

R2(config-router)#area 1 stub
R2(config-router)#
*Mar  1 00:48:10.723: %OSPF-5-ADJCHG: Process 10, Nbr 10.1.3.1 on FastEthernet0/0 from FULL to DOWN, Neighbor Down
: Adjacency forced to reset
R2(config-router)#
R2(config-router)#do
```

** config stub on R1 & R6

** R1 & R6 will not receive OE2 route

```
O IA    10.44.0.0/22 [110/41] via 172.16.16.1, 00:00:21, FastEthernet0/1
O*IA 0.0.0.0/0 [110/21] via 172.16.16.1, 00:00:21, FastEthernet0/1
R6(config-router)#
```

*default route will generate for R6 (default is R1) and (R1 default is R2)

on configuring Stub we wont receive LSA 4 & 5 that is converted in LSA 3

Totally Stub

```
R2(config-router)#area 1 stub no-summary
R2(config-router)#
```

```
R1(config)#do sh ip rou os
     10.0.0.0/8 is variably subnetted, 11 subnets, 2 masks
O       10.2.1.1/32 [110/11] via 172.16.12.2, 00:04:57, FastEthernet0/0
O       10.2.0.1/32 [110/11] via 172.16.12.2, 00:04:57, FastEthernet0/0
O       10.2.3.1/32 [110/11] via 172.16.12.2, 00:04:57, FastEthernet0/0
O       10.2.2.1/32 [110/11] via 172.16.12.2, 00:04:57, FastEthernet0/0
O       10.6.1.1/32 [110/11] via 172.16.16.6, 00:04:57, FastEthernet0/1
O       10.6.0.1/32 [110/11] via 172.16.16.6, 00:04:57, FastEthernet0/1
O       10.6.3.1/32 [110/11] via 172.16.16.6, 00:04:57, FastEthernet0/1
O*IA 0.0.0.0/0 [110/11] via 172.16.12.2, 00:00:55, FastEthernet0/0
R1(config)#
```

** we have all routes has in form of Default-route

```
R6(config-router)#do sh ip  pro
Routing Protocol is "ospf 10"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 10.66.66.66
  Number of areas in this router is 1. 0 normal 1 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.6.0.0 0.0.3.255 area 1
    172.16.16.0 0.0.0.255 area 1
```

**On R1 (same) and On R2 (1 normal & 1 Stub)

we have end-to-end reachability but we only have LSA 1 & 2 on Routing-table

Remove all stub from all routers (R1,2 & 6)

NSSA Area

(Required 2 ospf and ASBR & default route has to create manually & send external route to backbone and can't receive exte from backbone)

```
R6(config)# int loop 2
R6(config-if)#int loop 2
R6(config-if)#ip add 10.6.2.1 255.255.255.0
R6(config-if)#int loop 4
R6(config-if)#ip add 10.66.66.66 255.255.255.255
R6(config-if)#do sh ip int bri
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            unassigned      YES NVRAM  administratively down down
FastEthernet0/1            172.16.16.6     YES NVRAM  up                    up
FastEthernet1/0            unassigned      YES NVRAM  administratively down down
FastEthernet2/0            unassigned      YES NVRAM  administratively down down
Loopback0                  10.6.0.1        YES NVRAM  up                    up
Loopback1                  10.6.1.1        YES NVRAM  up                    up
Loopback2                  10.6.2.1        YES manual up                    up
Loopback3                  10.6.3.1        YES NVRAM  up                    up
Loopback4                  10.66.66.66     YES NVRAM  up                    up
R6(config-if)#
```

** L4 will show has external route and R6 will ASBR (redistribute connected subnets)

#R4

```
R4(config)#router ospf 10
R4(config-router)#area 2 nssa ?
  default-information-originate  Originate Type 7 default into NSSA area
  no-redistribution              No redistribution into this NSSA area
  no-summary                     Do not send summary LSA into NSSA
  translate                      Translate LSA
  <cr>

R4(config-router)#area 2 nssa default-information-originate
R4(config-router)#
*Mar  1 01:06:46.043: %OSPF-5-ADJCHG: Process 10, Nbr 10.5.3.1 on FastEthernet0/1 from FULL to DOWN, Neighbor Down:
Adjacency forced to reset
```

** OE1 convert in ON1 (manually creating default-route)

```
R7(config)#
R7(config)#router ospf 10
R7(config-router)#area 2 nssa
R7(config-router)#
*Mar  1 01:07:03.139: %OSPF-5-ADJCHG: Process 10, Nbr 10.5.3.1 on FastEthernet0/0 from FULL to DOWN, Neighbor Down:
 Adjacency forced to reset
*Mar  1 01:07:03.919: %OSPF-5-ADJCHG: Process 10, Nbr 10.5.3.1 on FastEthernet0/0 from LOADING to FULL, Loading Don
e
R7(config-router)#
```

** config NSSA on R7 and R5

** now it will receive ON*2

```
O        10.5.1.1/32 [110/11] via 172.16.57.5, 00:00:02, FastEthernet0/0
O        10.4.0.1/32 [110/21] via 172.16.57.5, 00:00:02, FastEthernet0/0
O IA     10.22.0.0/22 [110/41] via 172.16.57.5, 00:00:02, FastEthernet0/0
O IA     10.44.0.0/22 [110/21] via 172.16.57.5, 00:00:02, FastEthernet0/0
O        10.77.0.0/22 is a summary, 00:00:16, Null0
O*N2 0.0.0.0/0 [110/1] via 172.16.57.5, 00:00:02, FastEthernet0/0
R7(config-router)#
```

** they won't receive ext. route from backbone

```
R2(config-router)#exit
R2(config)#
R2(config)#
R2(config)#DO sh ip rou | in O E
O E1     10.77.0.0/22 [110/60] via 172.16.23.3, 00:05:17, FastEthernet0/1
O E2     10.66.66.66/32 [110/20] via 172.16.12.1, 00:01:15, FastEthernet0/0
R2(config)#DO sh ip rou | in O E
O E1     10.77.0.0/22 [110/61] via 172.16.23.3, 00:02:30, FastEthernet0/1
O E2     10.66.66.66/32 [110/20] via 172.16.12.1, 00:06:27, FastEthernet0/0
R2(config)#
```

** same on R2 (can't receive ext route from backbone NSSA is config on R4,7,5)

#R4

```
R4(config-router)#
R4(config-router)#
R4(config-router)#
R4(config-router)#area 2 nssa no-summary
R4(config-router)#do sh run | sec ospf
 ip ospf network broadcast
 ip ospf network broadcast
router ospf 10
 log-adjacency-changes
 area 0 range 10.3.0.0 255.255.252.0
 area 0 range 10.22.0.0 255.255.252.0
 area 0 range 10.44.0.0 255.255.252.0
 area 2 nssa default-information-originate no-summary
```

** all routes will convert in default-route (totally nssa will automatically create default-route)

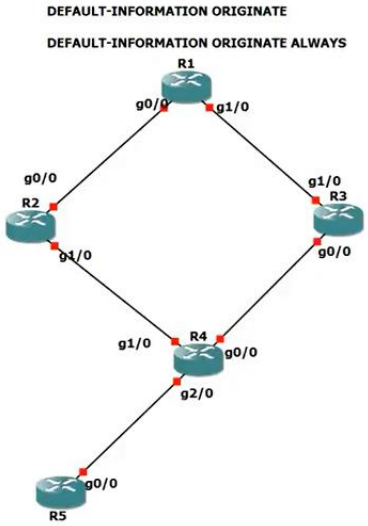
#R2

```
R2(config)#
R2(config)#router ospf 10
R2(config-router)#area 1 nssa no-summary
R2(config-router)#^Z
R2#
*Mar  1 01:15:05.579: %OSPF-5-ADJCHG: Process 10, Nbr 10.1.3.1
```

**config NSSA on R1 & 6

##conclusion (No changes on Backbone area Router (R3))

OSPF Default-Information-Originate and (Always)



**config one loopback on each router and don't config ospf on R5

```
R5(config)#
R5(config)#ip route 0.0.0.0 0.0.0.0 172.16.45.4
R5(config)#^Z
R5#ship
*Aug 30 21:01:13.235: %SYS-5-CONFIG_I: Configured from console by console
R5#sh ip rou
Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is 172.16.45.4 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 172.16.45.4
      10.0.0.0/32 is subnetted, 1 subnets
C        10.5.5.5 is directly connected, Loopback1
      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.16.45.0/24 is directly connected, GigabitEthernet0/0
L        172.16.45.5/32 is directly connected, GigabitEthernet0/0
R5#ping 1
```

** config default-route on R5

** config same default-route on R4 also

#R4

```
R4(config)#router ospf 10
R4(config-router)#default-inforamtion originate
                             ^
% Invalid input detected at '^' marker.

R4(config-router)#default-inforamation originate
                             ^
% Invalid input detected at '^' marker.

R4(config-router)#default in
R4(config-router)#default-in
R4(config-router)#default-information o
R4(config-router)#default-information originate
R4(config-router)#
R4(config-router)#
R4(config-router)#do sh run | sec ospf
router ospf 10
 network 0.0.0.0 255.255.255.255 area 0
 default-information originate
```

```
O*E2  0.0.0.0/0 [110/1] via 172.16.24.4, 00:00:40, GigabitEthernet1/0
      10.0.0.0/32 is subnetted, 4 subnets
O        10.1.1.1 [110/2] via 172.16.12.1, 00:12:54, GigabitEthernet0/0
O        10.3.3.3 [110/3] via 172.16.24.4, 00:11:00, GigabitEthernet1/0
                  [110/3] via 172.16.12.1, 00:12:18, GigabitEthernet0/0
O        10.4.4.4 [110/2] via 172.16.24.4, 00:11:10, GigabitEthernet1/0
      172.16.0.0/16 is variably subnetted, 7 subnets, 2 masks
O        172.16.13.0/24 [110/2] via 172.16.12.1, 00:12:54, GigabitEthernet0/0
O        172.16.34.0/24 [110/2] via 172.16.24.4, 00:11:00, GigabitEthernet1/0
O        172.16.45.0/24 [110/2] via 172.16.24.4, 00:11:10, GigabitEthernet1/0
R2#
```

**when we create default-route in Dynamic routing protocol it will flood to all routers

**remove default-route from R4 and check

```
R4(config-router)#do sh run | sec ospf
router ospf 10
 network 0.0.0.0 255.255.255.255 area 0
 default-information originate
R4(config-router)#exit
R4(config)#no ip route 0.0.0.0 0.0.0.0 172.16.45.5
R4(config)#
R4(config)#do sh ip rou
```

** default-route will remove from all Routers

if we don't have any default-route from Undynamic router (we use default-dynamic-originate cmd)

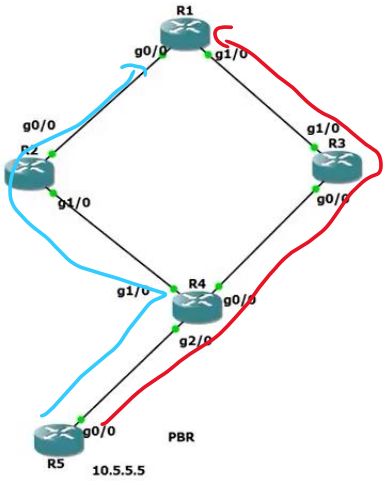
```
R4(config)#
R4(config)#do sh run | sec ospf
router ospf 10
 network 0.0.0.0 255.255.255.255 area 0
 default-information originate
R4(config)#
R4(config)#router ospf 10
R4(config-router)#default-information originate always
R4(config-router)#exit
R4(config)#
```

**default route will generate automatically for all routers

#R4 = ip route 0.0.0.0 0.0.0.0 172.16.45.5

POLICY-Based-Routing

```
R5#traceroute 10.1.1.1
Type escape sequence to abort.
Tracing the route to 10.1.1.1
VRF info: (vrf in name/id, vrf out name/id)
  1 172.16.45.4 20 msec 24 msec 28 msec
  2 172.16.34.3 60 msec 56 msec 52 msec
  3 172.16.13.1 96 msec 88 msec 76 msec
R5#
R5#traceroute 10.1.1.1 source 10.5.5.5
Type escape sequence to abort.
Tracing the route to 10.1.1.1
VRF info: (vrf in name/id, vrf out name/id)
  1 172.16.45.4 20 msec 24 msec 28 msec
  2 172.16.24.2 28 msec 68 msec 76 msec
  3 172.16.12.1 88 msec 76 msec 100 msec
R5#
```



DEFAULT-INFORMATION ORIGINATE

DEFAULT-INFORMATION ORIGINATE ALWAYS

**we want one path to access 10.1.1.1

#R4

```
R4(config)#ip route 10.5.5.5 255.255.255.255 172.16.45.5
R4(config)#
R4(config)#
R4(config)#
R4(config)#access-list 145 permit ip host 10.5.5.5 host 10.1.1.1
R4(config)#route-map NH permit
R4(config-route-map)#match ip add 145
R4(config-route-map)#set ip next-hop 172.16.34.3
R4(config-route-map)#exit
R4(config)#int gig2/0
R4(config-if)#ip policy route-map NH
R4(config-if)#
```

** only ip will work on policy based routing

**having same now

```
R5#traceroute 10.1.1.1
Type escape sequence to abort.
Tracing the route to 10.1.1.1
VRF info: (vrf in name/id, vrf out name/id)
  1 172.16.45.4 20 msec 28 msec 24 msec
  2 172.16.34.3 32 msec 80 msec 36 msec
  3 172.16.13.1 100 msec 84 msec 80 msec
R5#
R5#traceroute 10.1.1.1 source 10.5.5.5
Type escape sequence to abort.
Tracing the route to 10.1.1.1
VRF info: (vrf in name/id, vrf out name/id)
  1 172.16.45.4 20 msec 28 msec 24 msec
  2 172.16.34.3 28 msec 56 msec 60 msec
  3 172.16.13.1 100 msec 92 msec 72 msec
```

** for the security purpose when someone is act as a threat for nw by replacing router and config same ip on original routes (that leads to access of complete network to avoid this we use TTL-security)

```
R1(config)#router ospf 10
R1(config-router)#ttl-se
R1(config-router)#ttl-security al
R1(config-router)#ttl-security all-interfaces
```

**it will lose neighborship with router that no enabled ttl-security (we have enable ttl-security on both routers)