综合实验 --OSPF的应用

原创

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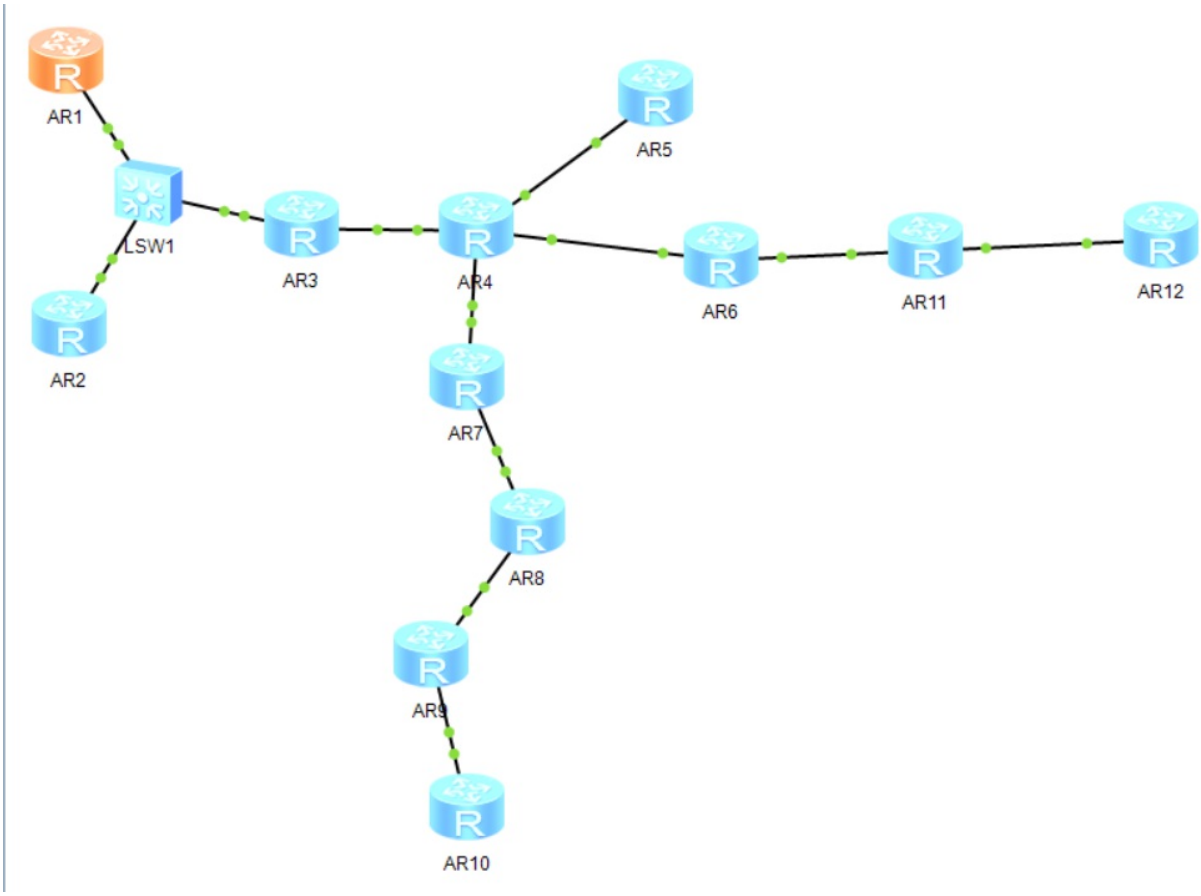
实验拓扑如图：



实验要求：

1.r4为ISP，其上只能配置IP地址；r4与其他所有直连设备间使用共有IP

2.r3—r5/6/7为MGRE环境，r3为中心点

3.整个OSPF环境IP地址为172.16.0.0/16

4.所有设备均可以访问r4的环回

5.减少LSA的更新量，加快收敛，保障更新安全

6.全网可达

首先，我们将公网的地址配置上

r3的地址配置情况：

AR3

```
The device is running!

<Huawei>
<Huawei>
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r3
[r3]int g0/0/1
[r3-GigabitEthernet0/0/1]ip add
[r3-GigabitEthernet0/0/1]ip address 34.1.1.1 24
Jan 16 2022 15:32:10-08:00 r3 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
on the interface GigabitEthernet0/0/1 has entered the UP state.
[r3-GigabitEthernet0/0/1]
[r3-GigabitEthernet0/0/1]
```


r4的地址配置情况：

AR4

```
[r4-LoopBack0]ip add
[r4-LoopBack0]ip address 4.4.4.4 24
[r4-LoopBack0]int g0/0/0
[r4-GigabitEthernet0/0/0]ip add
[r4-GigabitEthernet0/0/0]ip address 34.1.1.2 24
Jan 16 2022 15:25:18-08:00 r4 %%01IFNET/4/LINK_STATE(l)[0]:The line prot
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r4-GigabitEthernet0/0/0]int g0/0/1
[r4-GigabitEthernet0/0/1]ip add 45.1.1.1 24
Jan 16 2022 15:25:38-08:00 r4 %%01IFNET/4/LINK_STATE(l)[1]:The line prot
on the interface GigabitEthernet0/0/1 has entered the UP state.
[r4-GigabitEthernet0/0/1]int g0/0/2
[r4-GigabitEthernet0/0/2]ip add
[r4-GigabitEthernet0/0/2]ip address 46.1.1.1 24
[r4-GigabitEthernet0/0/2]
Jan 16 2022 15:25:56-08:00 r4 %%01IFNET/4/LINK_STATE(l)[2]:The line prot
on the interface GigabitEthernet0/0/2 has entered the UP state.
[r4-GigabitEthernet0/0/2]int g4/0/0
[r4-GigabitEthernet4/0/0]ip add
[r4-GigabitEthernet4/0/0]ip address 47.1.1.1 24
[r4-GigabitEthernet4/0/0]
Jan 16 2022 15:26:14-08:00 r4 %%01IFNET/4/LINK_STATE(l)[3]:The line prot
on the interface GigabitEthernet4/0/0 has entered the UP state.
[r4-GigabitEthernet4/0/0]
```


r5的配置：

AR5

```
The device is running!
```

```
<Huawei>
<Huawei>
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r5
[r5]ip add
[r5]int g0/0/0
[r5-GigabitEthernet0/0/0]ip add
[r5-GigabitEthernet0/0/0]ip address 45.1.1.2 24
Jan 16 2022 15:33:02-08:00 r5 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r5-GigabitEthernet0/0/0]
[r5-GigabitEthernet0/0/0]
```


r6的配置：

AR6

```
The device is running!

<Huawei>
<Huawei>
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys
[Huawei]sysname r6
[r6]int g0/0/0
[r6-GigabitEthernet0/0/0]ip ad
[r6-GigabitEthernet0/0/0]ip address 46.1.1.2 24
Jan 16 2022 15:33:34-08:00 r6 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r6-GigabitEthernet0/0/0]
[r6-GigabitEthernet0/0/0]
```


r7的配置：

AR7

```
The device is running!

<Huawei>
<Huawei>
<Huawei>sys
```

```
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r7
[r7]int g0/0/1
[r7-GigabitEthernet0/0/1]ip add
[r7-GigabitEthernet0/0/1]ip address 47.1.1.2 24
Jan 16 2022 15:33:51-08:00 r7 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
on the interface GigabitEthernet0/0/1 has entered the UP state.
[r7-GigabitEthernet0/0/1]
[r7-GigabitEthernet0/0/1]
```

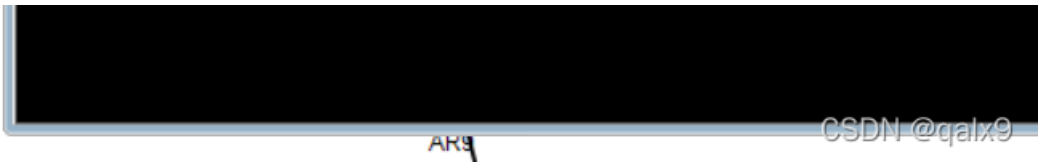

公网的配置基本就完成了
然后就测试一下公网直连路由是否都通，就在r4上测试吧
如下图

AR4

```
    Reply from 47.1.1.2: bytes=56 Sequence=4 ttl=255 time=20 ms
    Reply from 47.1.1.2: bytes=56 Sequence=5 ttl=255 time=20 ms

  --- 47.1.1.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 10/26/60 ms

<r4>ping 34.1.1.1
  PING 34.1.1.1: 56  data bytes, press CTRL_C to break
    Reply from 34.1.1.1: bytes=56 Sequence=1 ttl=255 time=60 ms
    Reply from 34.1.1.1: bytes=56 Sequence=2 ttl=255 time=20 ms
    Reply from 34.1.1.1: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 34.1.1.1: bytes=56 Sequence=4 ttl=255 time=40 ms
    Reply from 34.1.1.1: bytes=56 Sequence=5 ttl=255 time=30 ms

  --- 34.1.1.1 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/34/60 ms

<r4>
```


为了使得公网都能够通，就需要在公网的路由器上写缺省
r3指向r4的缺省：

```
Enter system view, return user view with Ctrl+Z.
[r3]ip route-s
[r3]ip route-static 0.0.0.0 0 34.1.1.2
[r3]
[r3]
```



r5指向r4的缺省：

```
[r5]ip route-s
[r5]ip route-static 0.0.0.0 0 45.1.1.1
[r5]
[r5]
```

剩余的公网的路由器配置大致相同
接着测试公网是否都是通了？

```
[r6]ping 4.4.4.4
  PING 4.4.4.4: 56  data bytes, press CTRL_C to break
    Reply from 4.4.4.4: bytes=56 Sequence=1 ttl=255 time=70 ms
    Reply from 4.4.4.4: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 4.4.4.4: bytes=56 Sequence=3 ttl=255 time=20 ms
```

```
[r3]ping 4.4.4.4
  PING 4.4.4.4: 56  data bytes, press CTRL_C to break
    Reply from 4.4.4.4: bytes=56 Sequence=1 ttl=255 time=40 ms
    Reply from 4.4.4.4: bytes=56 Sequence=2 ttl=255 time=20 ms
    Reply from 4.4.4.4: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 4.4.4.4: bytes=56 Sequence=4 ttl=255 time=20 ms
    Reply from 4.4.4.4: bytes=56 Sequence=5 ttl=255 time=1 ms

  --- 4.4.4.4 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 1/20/40 ms

[r3]
```


可以看到公网能够进行跑通的

接着来做r3-5/6/7的MGRE环境。。
首先
在中心站点r3上进行配置

AR3

```
[r3]interface Tunnel 0/0/0
[r3-Tunnel0/0/0]ip add
[r3-Tunnel0/0/0]ip address 172.16.0.129 29
[r3-Tunnel0/0/0]tu
[r3-Tunnel0/0/0]tunnel-protocol gre
[r3-Tunnel0/0/0]tunnel-protocol gre p
[r3-Tunnel0/0/0]tunnel-protocol gre p2mp
[r3-Tunnel0/0/0]souc
[r3-Tunnel0/0/0]sou
[r3-Tunnel0/0/0]source 34.1.1.1
Jan 16 2022 15:51:04-08:00 r3 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol I
```

```
on the interface Tunnel0/0/0 has entered the UP state.
[r3-Tunnel0/0/0]
[r3-Tunnel0/0/0]nh
[r3-Tunnel0/0/0]nhrp e
[r3-Tunnel0/0/0]nhrp entry mu
[r3-Tunnel0/0/0]nhrp entry multicast dy
[r3-Tunnel0/0/0]nhrp entry multicast dynamic
[r3-Tunnel0/0/0]n
[r3-Tunnel0/0/0]nhr
[r3-Tunnel0/0/0]nhrp en
[r3-Tunnel0/0/0]nhrp entry net
[r3-Tunnel0/0/0]nhrp entry netw
[r3-Tunnel0/0/0]nhrp entry network
[r3-Tunnel0/0/0]nhrp eet
```



```
-Tunnel0/0/0]nhrp en
-Tunnel0/0/0]nhrp entry net
-Tunnel0/0/0]nhrp entry netw
-Tunnel0/0/0]nhrp entry network
-Tunnel0/0/0]nhrp eet
-Tunnel0/0/0]nhrp net
-Tunnel0/0/0]nhrp network-id 100
-Tunnel0/0/0]
```

r5

AR5

```
[r5]interface tu
[r5]interface Tunnel 0/0/0
[r5-Tunnel0/0/0]ipadd
[r5-Tunnel0/0/0]ip add
[r5-Tunnel0/0/0]ip address 172.16.0.130 29
[r5-Tunnel0/0/0]tu
[r5-Tunnel0/0/0]tunnel-protocol g
[r5-Tunnel0/0/0]tunnel-protocol gre g
[r5-Tunnel0/0/0]tunnel-protocol gre p
[r5-Tunnel0/0/0]tunnel-protocol gre p2mp
[r5-Tunnel0/0/0]souc
[r5-Tunnel0/0/0]sour
[r5-Tunnel0/0/0]source 45.1.1.2
Jan 16 2022 15:55:37-08:00 r5 %%01IFNET/4/LINK_STATE(1)[0]:The line protocol I
on the interface Tunnel0/0/0 has entered the UP state.
[r5-Tunnel0/0/0]
[r5-Tunnel0/0/0]nhr
[r5-Tunnel0/0/0]nhrp wn
[r5-Tunnel0/0/0]nhrp en
[r5-Tunnel0/0/0]nhrp entry 172.16.0.129 34.1.1.1 r
[r5-Tunnel0/0/0]nhrp entry 172.16.0.129 34.1.1.1 register
[r5-Tunnel0/0/0]nhr
[r5-Tunnel0/0/0]nhrp ne
[r5-Tunnel0/0/0]nhrp network-id 100
[r5-Tunnel0/0/0]
```


r6

```
[r6-Tunnel0/0/0]source 46.1.1.2
```

AR6

```
<r6>sys
```

```
Enter system view, return user view with Ctrl+Z.
[r6]int
[r6]interface t
[r6]interface Tunnel 0/0/0
[r6-Tunnel0/0/0]ip add
[r6-Tunnel0/0/0]ip address 172.16.0.131 29
[r6-Tunnel0/0/0]souce
[r6-Tunnel0/0/0]so
[r6-Tunnel0/0/0]sour
[r6-Tunnel0/0/0]tu
[r6-Tunnel0/0/0]tunnel-protocol g
[r6-Tunnel0/0/0]tunnel-protocol gre p
[r6-Tunnel0/0/0]tunnel-protocol gre p2mp
[r6-Tunnel0/0/0]sou
[r6-Tunnel0/0/0]source 46.1.1.1
[r6-Tunnel0/0/0]nhr
[r6-Tunnel0/0/0]nhrp en
[r6-Tunnel0/0/0]nhrp entry 172.16.0.129 34.1.1.1 re
[r6-Tunnel0/0/0]nhrp entry 172.16.0.129 34.1.1.1 register
[r6-Tunnel0/0/0]nhr
[r6-Tunnel0/0/0]nhrp ne
[r6-Tunnel0/0/0]nhrp network-id 100
[r6-Tunnel0/0/0]
```


r7

AR7

```
<r7>sys
Enter system view, return user view with Ctrl+Z.
[r7]int t0/0/0
[r7-Tunnel0/0/0]ip add
[r7-Tunnel0/0/0]ip address 172.16.0.132 29
[r7-Tunnel0/0/0]tu
[r7-Tunnel0/0/0]tunnel-protocol gre p
[r7-Tunnel0/0/0]tun
[r7-Tunnel0/0/0]tunnel-protocol grep
[r7-Tunnel0/0/0]tunnel-protocol gre p
[r7-Tunnel0/0/0]tunnel-protocol gre p2mp
[r7-Tunnel0/0/0]sou
[r7-Tunnel0/0/0]source 47.1.1.2
Jan 16 2022 16:00:55-08:00 r7 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol I
on the interface Tunnel0/0/0 has entered the UP state.
[r7-Tunnel0/0/0]
[r7-Tunnel0/0/0]nh
[r7-Tunnel0/0/0]nhrp en
[r7-Tunnel0/0/0]nhrp entry 172.16.0.129 34.1.1.1 re
[r7-Tunnel0/0/0]nhrp entry 172.16.0.129 34.1.1.1 register
[r7-Tunnel0/0/0]nhr
[r7-Tunnel0/0/0]nhrp net
[r7-Tunnel0/0/0]nhrp network-id 100
[r7-Tunnel0/0/0]
```


测试一下

AR6

```
on the interface Tunnel0/0/0 has entered the UP state.
[r6-Tunnel0/0/0]
[r6-Tunnel0/0/0]nhrp
[r6-Tunnel0/0/0]nhrp en
[r6-Tunnel0/0/0]nhrp entry 172.16.0.129 34.1.1.1 re
```

```
[r6-Tunnel0/0/0]nhrp entry 172.16.0.129 34.1.1.1 register
Info: Peer entry exists already.
[r6-Tunnel0/0/0]
[r6-Tunnel0/0/0]q
[r6]ping 172.16.0.129
  PING 172.16.0.129: 56  data bytes, press CTRL_C to break
    Reply from 172.16.0.129: bytes=56 Sequence=1 ttl=255 time=30 ms
    Reply from 172.16.0.129: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 172.16.0.129: bytes=56 Sequence=3 ttl=255 time=30 ms
    Reply from 172.16.0.129: bytes=56 Sequence=4 ttl=255 time=20 ms
    Reply from 172.16.0.129: bytes=56 Sequence=5 ttl=255 time=20 ms

  --- 172.16.0.129 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/26/30 ms

[r6]
```


可以发现基本都是通的 MGRE的环境已经搭好了。

接着配置其他的区域

区域1：

```
r3-GigabitEthernet0/0/0]ip add
r3-GigabitEthernet0/0/0]ip address 172.16.32.131 29
an 16 2022 16:18:07-08:00 r3 %%01IFNET/4/LINK_STATE(l)[0]:The line prot
 the interface GigabitEthernet0/0/0 has entered the UP state.
r3-GigabitEthernet0/0/0]
r3-GigabitEthernet0/0/0]
```

AR2

```
The device is running!

<Huawei>
<Huawei>
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r2
[r2]int lo0
[r2-LoopBack0]ip add
[r2-LoopBack0]ip address 172.16.33.129 25
[r2-LoopBack0]
[r2-LoopBack0]int g0/0/0
[r2-GigabitEthernet0/0/0]ip add
[r2-GigabitEthernet0/0/0]ip address 172.16.32.130 29
Jan 16 2022 16:17:33-08:00 r2 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r2-GigabitEthernet0/0/0]
[r2-GigabitEthernet0/0/0]
[r2-GigabitEthernet0/0/0]
```

AR1

```
The device is running!

<Huawei>
<Huawei>
<Huawei>
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r1
[r1]int lo0
[r1-LoopBack0]ip add
[r1-LoopBack0]ip address 172.16.33.1 25
[r1-LoopBack0]
[r1-LoopBack0]int g0/0/0
[r1-GigabitEthernet0/0/0]ip add
[r1-GigabitEthernet0/0/0]ip address 172.16.32.129 29
Jan 16 2022 16:16:53-08:00 r1 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r1-GigabitEthernet0/0/0]
[r1-GigabitEthernet0/0/0]
```


区域2：

AR11

```
Please press enter to start cmd line!

<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r11
[r11]int lo0
[r11-LoopBack0]ip add 172.16.65.1 25
[r11-LoopBack0]int g0/0/0
[r11-GigabitEthernet0/0/0]
[r11-GigabitEthernet0/0/0]ip add 172.16.64.2 30
Jan 16 2022 16:23:09-08:00 r11 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol
 on the interface GigabitEthernet0/0/0 has entered the UP state.
[r11-GigabitEthernet0/0/0]int g0/0/1
[r11-GigabitEthernet0/0/1]ip add
[r11-GigabitEthernet0/0/1]ip address 172.16.64.5 30
Jan 16 2022 16:24:04-08:00 r11 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol
 on the interface GigabitEthernet0/0/1 has entered the UP state.
[r11-GigabitEthernet0/0/1]
[r11-GigabitEthernet0/0/1]q
[r11]ping 172.16.64.1
  PING 172.16.64.1: 56  data bytes, press CTRL_C to break
    Reply from 172.16.64.1: bytes=56 Sequence=1 ttl=255 time=60 ms
    Reply from 172.16.64.1: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 172.16.64.1: bytes=56 Sequence=3 ttl=255 time=30 ms
    Reply from 172.16.64.1: bytes=56 Sequence=4 ttl=255 time=20 ms
```



```
[r6]
[r6]int lo0
[r6-LoopBack0]ip ad
[r6-LoopBack0]ip address 172.16.1.129 25
[r6-LoopBack0]
```

```
[r6>sys
Enter system view, return user view with Ctrl+Z.
[r6]int g0/0/1
[r6-GigabitEthernet0/0/1]ip add
[r6-GigabitEthernet0/0/1]ip address 172.16.64.1 30
[r6-GigabitEthernet0/0/1]
Jan 16 2022 16:22:28-08:00 r6 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol I
on the interface GigabitEthernet0/0/1 has entered the UP state.
[r6-GigabitEthernet0/0/1]
```


AR12

```
The device is running!

<Huawei>
<Huawei>
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r12
[r12]int h0/0/0
         ^
Error: Wrong parameter found at '^' position.
[r12]int g0/0/0
[r12-GigabitEthernet0/0/0]ip add
[r12-GigabitEthernet0/0/0]ip address 172.16.64.6 30
Jan 16 2022 16:25:08-08:00 r12 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
 on the interface GigabitEthernet0/0/0 has entered the UP state.
[r12-GigabitEthernet0/0/0]
```


r12上还有两条环回：[r12-LoopBack1]ip address 172.16.176.1 20

[r12-LoopBack0]ip address 172.16.160.1 20

区域3：

AR9

```
The device is running!

<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r9
[r9]int g0/0/0
[r9-GigabitEthernet0/0/0]ip add
[r9-GigabitEthernet0/0/0]ip address 172.16.96.6 30
Jan 16 2022 16:36:25-08:00 r9 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r9-GigabitEthernet0/0/0]
[r9-GigabitEthernet0/0/0]
```

AR8

```
The device is running!

<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r8
[r8]int lo0
[r8-LoopBack0]ip add
[r8-LoopBack0]ip address 172.16.97.1 29
[r8-LoopBack0]int g0/0/0
[r8-GigabitEthernet0/0/0]
[r8-GigabitEthernet0/0/0]ip ad
[r8-GigabitEthernet0/0/0]ip address 172.16.96.2 30
Jan 16 2022 16:35:41-08:00 r8 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r8-GigabitEthernet0/0/0]
[r8-GigabitEthernet0/0/0]int g0/0/1
[r8-GigabitEthernet0/0/1]ip ad
[r8-GigabitEthernet0/0/1]ip address 172.16.96.5 30
Jan 16 2022 16:35:55-08:00 r8 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP
on the interface GigabitEthernet0/0/1 has entered the UP state.
[r8-GigabitEthernet0/0/1]
[r8-GigabitEthernet0/0/1]
```

CSDN @qalx9

```
7]int g0/0/1
7-GigabitEthernet0/0/1]int g0/0/0
7-GigabitEthernet0/0/0]ip add
7-GigabitEthernet0/0/0]ip address 172.16.96.1 30
an 16 2022 16:34:45-08:00 r7 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol
 the interface GigabitEthernet0/0/0 has entered the UP state.
7-GigabitEthernet0/0/0]
```

区域4：

AR10

```
The device is running!

<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]sys r10
[r10]intlo0
     ^
Error: Unrecognized command found at '^' position.
[r10]int lo0
[r10-LoopBack0]ip add
[r10-LoopBack0]int g0/0/0
[r10-GigabitEthernet0/0/0]ip add
[r10-GigabitEthernet0/0/0]ip address 172.16.129.129 25
Jan 16 2022 16:40:35-08:00 r10 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
 on the interface GigabitEthernet0/0/0 has entered the UP state.
[r10-GigabitEthernet0/0/0]
[r10-GigabitEthernet0/0/0]ip add
[r10-GigabitEthernet0/0/0]ip address 172.16.128.2 30
[r10-GigabitEthernet0/0/0]int lo0
[r10-LoopBack0]ip add
[r10-LoopBack0]ip address 172.16.128.128 25
Error: The specified IP address is invalid.
[r10-LoopBack0]ip add
[r10-LoopBack0]ip address 172.16.129.129 25
[r10-LoopBack0]
```



```
r9-LoopBack0]int g0/0/1
r9-GigabitEthernet0/0/1]ip ad
r9-GigabitEthernet0/0/1]ip address 172.16.128.1 30
an 16 2022 16:41:24-08:00 r9 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol I
n the interface GigabitEthernet0/0/1 has entered the UP state.
r9-GigabitEthernet0/0/1]
r9-GigabitEthernet0/0/1]
```

经过测试 以上所有的直连均可以通

以上 所有的地址就配置完成了

然后 就开始在不同的区域起OSPF协议了

AR5

```
[r5]int lo0
[r5-LoopBack0]ip ad
[r5-LoopBack0]ip address 172.16.1.1 25
[r5-LoopBack0]
[r5-LoopBack0]
<r5>sys
Enter system view, return user view with Ctrl+Z.
[r5]os
[r5]ospf 1
[r5-ospf-1]rou
[r5-ospf-1]route-i
[r5-ospf-1]ospf 1 rou
[r5-ospf-1]q
[r5]osp
[r5]ospf 1 rou
[r5]ospf 1 router-id 5.5.5.5
Info: The configuration succeeded. You need to restart the OSPF process to vali
```

```
ate the new router ID.
[r5-ospf-1]ar
[r5-ospf-1]area 0
[r5-ospf-1-area-0.0.0.0]ne
[r5-ospf-1-area-0.0.0.0]network 172.16.0.0 0.0.255.255
[r5-ospf-1-area-0.0.0.0]
<r5>
```


AR3

```
Jan 16 2022 16:18:07-08:00 r3 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol I
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r3-GigabitEthernet0/0/0]
[r3-GigabitEthernet0/0/0]
<r3>sys
Enter system view, return user view with Ctrl+Z.
[r3]osp
[r3]ospf 1 rou
[r3]ospf 1 router-id 3.3.3.3
[r3-ospf-1]are
[r3-ospf-1]area 1
[r3-ospf-1-area-0.0.0.1]net
[r3-ospf-1-area-0.0.0.1]network 172.16.32.0 0.0.3.255
[r3-ospf-1-area-0.0.0.1]q
[r3-ospf-1]ar
[r3-ospf-1]area 0
[r3-ospf-1-area-0.0.0.0]ne
[r3-ospf-1-area-0.0.0.0]network 17
Jan 16 2022 16:50:00-08:00 r3 %%01OSPF/4/NBR_CHANGE_E(l)[0]:Neighbor changes ev
nt: neighbor status changed. (ProcessId=256, NeighborAddress=129.32.16.172, Ne
hborEvent=HelloReceived, NeighborPreviousState=Down, NeighborCurrentState=Init

[r3-ospf-1-area-0.0.0.0]network 17
Jan 16 2022 16:50:00-08:00 r3 %%01OSPF/4/NBR_CHANGE_E(l)[1]:Neighbor changes ev
nt: neighbor status changed. (ProcessId=256, NeighborAddress=129.32.16.172, Ne
```


AR2

```
[r2-LoopBack0]int g0/0/0
[r2-GigabitEthernet0/0/0]ip add
[r2-GigabitEthernet0/0/0]ip address 172.16.32.130 29
Jan 16 2022 16:17:33-08:00 r2 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol I
on the interface GigabitEthernet0/0/0 has entered the UP state.
[r2-GigabitEthernet0/0/0]
[r2-GigabitEthernet0/0/0]
[r2-GigabitEthernet0/0/0]
<r2>sys
Enter system view, return user view with Ctrl+Z.
[r2]os
[r2]ospf 1 rou
[r2]ospf 1 router-id 2.2.2.2
[r2-ospf-1]ar
[r2-ospf-1]area 1
[r2-ospf-1-area-0.0.0.1]net
[r2-ospf-1-area-0.0.0.1]network 172.16.0.0 0.0.255.255
[r2-ospf-1-area-0.0.0.1]
Jan 16 2022 16:48:46-08:00 r2 %%01OSPF/4/NBR_CHANGE_E(l)[0]:Neighbor changes ev
nt: neighbor status changed. (ProcessId=256, NeighborAddress=129.32.16.172, Ne
hborEvent=HelloReceived, NeighborPreviousState=Down, NeighborCurrentState=Init

[r2-ospf-1-area-0.0.0.1]
Jan 16 2022 16:48:46-08:00 r2 %%01OSPF/4/NBR_CHANGE_E(l)[1]:Neighbor changes ev
```

```
nt: neighbor status changed. (ProcessId=256, NeighborAddress=129.32.16.172, Ne
```



```
[r1]os
[r1]ospf 1 rou
[r1]ospf 1 router-id 1.1.1.1
[r1-ospf-1]ar
[r1-ospf-1]area 1
[r1-ospf-1-area-0.0.0.1]net
[r1-ospf-1-area-0.0.0.1]network 172.16.0.0 0.0.255.255
[r1-ospf-1-area-0.0.0.1]
<r1>
```


然后其余区域的路由器配置大致相同。。

全部配置完成后 我们会发现 图中的邻居不会完全都建立了
所以我们要更改r3 r5/6/7的工作方式
通过指令：
[r7-Tunnel0/0/0]ospf network-type broadcast
来改变他的工作方式为broadcast
并且需要修改r5/6/7的优先级 使其不参加选举
通过指令：
[r7-Tunnel0/0/0]ospf dr-priority 0
使得r5，r6，r7进行放弃选举。

这样全图就能够正常建立邻居了。。
接着将rip协议宣告的路由引入：

```
r12]ospf 1
r12-ospf-1]imp
r12-ospf-1]import-route rip 1
r12-ospf-1]
```

在r9上做一个多进程双向重发布，
为了减少LSA量，就做一个单项的
在area4区域内做一个向ISP的缺省，就能达到减少LSA量的目的。

AR9

```
nt: neighbor status changed. (ProcessId=512, NeighborAddress=2.128.16.172, Nei
borEvent=AdjOk?, NeighborPreviousState=2Way, NeighborCurrentState=ExStart)
[r9-ospf-2-area-0.0.0.4]
Jan 16 2022 17:38:14-08:00 r9 %%01OSPF/4/NBR_CHANGE_E(1)[5]:Neighbor changes e
nt: neighbor status changed. (ProcessId=512, NeighborAddress=2.128.16.172, Nei
borEvent=NegotiationDone, NeighborPreviousState=ExStart, NeighborCurrentState=
change)
[r9-ospf-2-area-0.0.0.4]
Jan 16 2022 17:38:14-08:00 r9 %%01OSPF/4/NBR_CHANGE_E(1)[6]:Neighbor changes e
nt: neighbor status changed. (ProcessId=512, NeighborAddress=2.128.16.172, Nei
borEvent=ExchangeDone, NeighborPreviousState=Exchange, NeighborCurrentState=Lo
ing)
[r9-ospf-2-area-0.0.0.4]
Jan 16 2022 17:38:14-08:00 r9 %%01OSPF/4/NBR_CHANGE_E(1)[7]:Neighbor changes e
nt: neighbor status changed. (ProcessId=512, NeighborAddress=2.128.16.172, Nei
borEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full
```

```
[r9-ospf-2-area-0.0.0.4]q
[r9-ospf-2]q
[r9]dis
[r9]display osp
[r9]display ospf pe
[r9]display ospf peer bri
[r9]display ospf peer brief
```


AR9

```
borEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full]

[r9-ospf-2-area-0.0.0.4]q
[r9-ospf-2]q
[r9]dis
[r9]display osp
[r9]display ospf pe
[r9]display ospf peer bri
[r9]display ospf peer brief

       OSPF Process 1 with Router ID 9.9.9.9
              Peer Statistic Information
 ----------------------------------------------------------------------------
 Area Id          Interface                       Neighbor id      State
 0.0.0.3          GigabitEthernet0/0/0            8.8.8.8          Full
 ----------------------------------------------------------------------------

       OSPF Process 2 with Router ID 172.16.96.6
              Peer Statistic Information
 ----------------------------------------------------------------------------
 Area Id          Interface                       Neighbor id      State
 0.0.0.4          GigabitEthernet0/0/1            10.10.10.10      Full
 ----------------------------------------------------------------------------
[r9]
```


将进程2导入进程1

```
 0.0.0.4          GigabitEthernet0/0/1            10.10.10.10      Full
 ----------------------------------------------------------------------------
[r9]
[r9]ospf 1
[r9-ospf-1]imo
[r9-ospf-1]imp
[r9-ospf-1]import-route osp
[r9-ospf-1]import-route ospf 2
[r9-ospf-1]
```


为了减少LSA的更新量

主要是非骨干区域来调成特殊区域来减少更新量

骨干区域来进程汇总来减少

在r3上进行汇总1

```
nter system view, return user view with Ctrl+Z.
r3]ospf 1
r3-ospf-1]ar
r3-ospf-1]area 1
r3-ospf-1-area-0.0.0.1]abr
r3-ospf-1-area-0.0.0.1]abr-summary 172.16.32.0 255.255.224.0
r3-ospf-1-area-0.0.0.1]
r3-ospf-1-area-0.0.0.1]
```


在r6上汇总2：

```
[r6-ospf-1-area-0.0.0.2]
<r6>sys
Enter system view, return user view with Ctrl+Z.
[r6]ospf 1
[r6-ospf-1]ar
[r6-ospf-1]area 2
[r6-ospf-1-area-0.0.0.2]abr
                        ^
Error:Incomplete command found at '^' position.
[r6-ospf-1-area-0.0.0.2]abr
[r6-ospf-1-area-0.0.0.2]abr-summary 172.16.64.0 255.255.224.0
[r6-ospf-1-area-0.0.0.2]
[r6-ospf-1-area-0.0.0.2]
```


在r7上汇总3：

```
[r7]ospf 1
[r7-ospf-1]ar
[r7-ospf-1]area 3
[r7-ospf-1-area-0.0.0.3]abr
[r7-ospf-1-area-0.0.0.3]abr-summary 172.16.96.0 255.255.224.0
[r7-ospf-1-area-0.0.0.3]
```

在r12上汇总rip的：

```
[r12]ospf 1
[r12-ospf-1]abr
[r12-ospf-1]abr
[r12-ospf-1]as
[r12-ospf-1]asbr-summary 172.16.160.0 255.255.224.0
[r12-ospf-1]
```

在r9上进程1中汇总4：

```
[r9]ospf 1
[r9-ospf-1]abr
[r9-ospf-1]as
[r9-ospf-1]asbr-summary 172.16.128.0 255.255.224.0
[r9-ospf-1]
```

将区域1做成完全末梢区域：

将r1 和r2 和r3调成末梢区域

```
[r3-ospf-1-area-0.0.0.1]st
[r3-ospf-1-area-0.0.0.1]stub no
[r3-ospf-1-area-0.0.0.1]stub no-summary
Jan 16 2022 17:58:14-08:00 r3 %%01OSPF/3/NBR_CHG_DOWN(
```

```
[r2-ospf-1]ar
[r2-ospf-1]area 1
[r2-ospf-1-area-0.0.0.1]s
[r2-ospf-1-area-0.0.0.1]stub
```

```
[r1-ospf-1]ar
[r1-ospf-1]area 1
[r1-ospf-1-area-0.0.0.1]s
[r1-ospf-1-area-0.0.0.1]stub
Jan 16 2022 17:57:23-08:00 r1 %%01OSPF/3/NBR_CH
```

通过display ospf lsdb 进行查看

AR1

```
[r1-ospf-1-area-0.0.0.1]q
[r1-ospf-1]q
[r1]q
<r1>qsysa
     ^
Error: Unrecognized command found at '^' position.
<r1>sys
Enter system view, return user view with Ctrl+Z.
[r1]dis
[r1]display ospf ls
[r1]display ospf lsdb

       OSPF Process 1 with Router ID 1.1.1.1
             Link State Database

                   Area: 0.0.0.1
 Type      LinkState ID    AdvRouter          Age  Len   Sequence    Metric
 Router    2.2.2.2         2.2.2.2            225  48    80000005        0
 Router    1.1.1.1         1.1.1.1            218  48    80000007        0
 Router    3.3.3.3         3.3.3.3            218  48    80000005        0
 Network   172.16.32.131   3.3.3.3            218  36    80000003        0
 Sum-Net   0.0.0.0         3.3.3.3            263  28    80000001        1

[r1]
```


接着将区域3调成nssa区域

```
[r7-ospf-1]ar
[r7-ospf-1]area 3
[r7-ospf-1-area-0.0.0.3]ns
[r7-ospf-1-area-0.0.0.3]nssa no
[r7-ospf-1-area-0.0.0.3]nssa no-s
[r7-ospf-1-area-0.0.0.3]nssa no-summary
```

```
[r8-ospf-1]ar
[r8-ospf-1]area 3
[r8-ospf-1-area-0.0.0.3]ns
[r8-ospf-1-area-0.0.0.3]nssa
```

```
[r9]ospf 1
[r9-ospf-1]ar
[r9-ospf-1]area 3
[r9-ospf-1-area-0.0.0.3]ns
[r9-ospf-1-area-0.0.0.3]nssa
Jan 16 2022 18:11:35-08:00 r9 %%01OSPF/3/NBR_CHG_DOW
```

然后r9给r10发一条缺省路由

```
Enter system view, return user view with Ctrl+Z.
[r9]ospf 2
[r9-ospf-2]def
[r9-ospf-2]default-r
[r9-ospf-2]default-route-advertise
[r9-ospf-2]
```

在r3 r6 r7上做一个nat
如下图所示

```
6]acl 2000
6-acl-basic-2000]ru
6-acl-basic-2000]rule pe
6-acl-basic-2000]rule permit sou
6-acl-basic-2000]rule permit source 172.16.0.0 0.0.255.255
6-acl-basic-2000]int g0/0/0
6-GigabitEthernet0/0/0]nat ou
6-GigabitEthernet0/0/0]nat outbound 2000
6-GigabitEthernet0/0/0]
6-GigabitEthernet0/0/0]
```


AR9

```
Enter system view, return user view with Ctrl+Z.
[r7]acl 2000
[r7-acl-basic-2000]rule
[r7-acl-basic-2000]rule per
[r7-acl-basic-2000]rule permit sou
[r7-acl-basic-2000]rule permit source 172.16.0.0 0.0.255.255
[r7-acl-basic-2000]q
[r7]int g0/0/1
[r7-GigabitEthernet0/0/1]acl ou
[r7-GigabitEthernet0/0/1]nat ou
[r7-GigabitEthernet0/0/1]nat outbound 2000
[r7-GigabitEthernet0/0/1]
[r7-GigabitEthernet0/0/1]
```

AR9


```
<r3>sys
Enter system view, return user view with Ctrl+Z.
[r3]acl 2000
[r3-acl-basic-2000]ru
[r3-acl-basic-2000]rule oer
[r3-acl-basic-2000]rule per
[r3-acl-basic-2000]rule permit su
[r3-acl-basic-2000]rule permit su=ou
[r3-acl-basic-2000]rule permit sou
[r3-acl-basic-2000]rule permit source 172.16.0.0 0.0.255.255
```

```
[r3-acl-basic-2000]q
[r3]int g0/0/1
[r3-GigabitEthernet0/0/1]nat ou
[r3-GigabitEthernet0/0/1]nat outbound 2000
[r3-GigabitEthernet0/0/1]
[r3-GigabitEthernet0/0/1]
```


然后用r1去pingr4的环回

```
<r1>ping 4.4.4.4
  PING 4.4.4.4: 56  data bytes, press CTRL_C to break
    Reply from 4.4.4.4: bytes=56 Sequence=1 ttl=254 time=50 ms
    Reply from 4.4.4.4: bytes=56 Sequence=2 ttl=254 time=40 ms
    Reply from 4.4.4.4: bytes=56 Sequence=3 ttl=254 time=30 ms
    Reply from 4.4.4.4: bytes=56 Sequence=4 ttl=254 time=50 ms
    Reply from 4.4.4.4: bytes=56 Sequence=5 ttl=254 time=40 ms

  --- 4.4.4.4 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 30/42/50 ms
```


可以ping通， 由此 这个实验基本大致到此结束了。