# MSR路由器MPLS L3VPN HubSpoke功能的配置
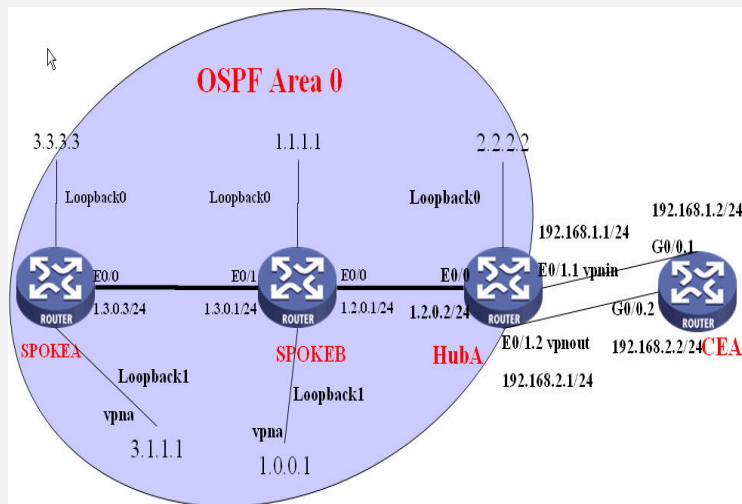
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**MSR路由器**
**MPLS L3VPN HubSpoke功能的配置**

关键词：MSR;MPLS;L3VPN;HubSpoke

**一、组网需求**：

SPOKEA和SPOKEB是vpna的2个分布站点接入PE，总部站点用CEA表示，CEA的接入PE是HubA，要求SPOKEA和SPOKEB之间的VPN流量都需要从总部站点转发。

设备清单：MSR路由器4台

**二、组网图：**



**三、配置步骤：**

适用设备和版本：MSR、Version 5.20, Beta 1105后所有版本。

**SPOKEA配置，注意vpn的团体属性配置：**

```
#
 router id 3.3.3.3         //BGP的router id
#
ip vpn-instance vpna          //配置vpn实例vpna
 route-distinguisher 3:1    //配置vpna的RD
 vpn-target 3:1 export-extcommunity    //配置vpna的出团体属性
 vpn-target 2:1 import-extcommunity    //配置vpna的入团体属性
#
mpls lsr-id 3.3.3.3         //MPLS的LSR-ID
#
mpls               //全局使能MPLS
ttl propagate vpn         //使能vpn的ttl复制，用于tracert
#
mpls ldp             //全局使能MPLS LDP
#
interface Ethernet0/0
 port link-mode route
 ip address 1.3.0.3 255.255.255.0
 mpls             //接口使能MPLS
 mpls ldp             //接口使能MPLS LDP
#
interface LoopBack0       //router id 和 MPLS LSR-ID
 ip address 3.3.3.3 255.255.255.255
#
interface LoopBack1         //用于模拟vpna站点的loopback口
 ip binding vpn-instance vpna
//绑定vpn实例vpna
 ip address 3.1.1.1 255.255.255.255
#
```

```
bgp 1                    //启动BGP进程，AS为1
 undo synchronization
 peer 2.2.2.2 as-number 1   //2.2.2.2是HubA的router id
 peer 2.2.2.2 connect-interface LoopBack0 //指定连接接口
 #
 ipv4-family vpnv4        //使能BGP的vpnv4路由能力
  peer 2.2.2.2 enable       //指定与HubA互传vpnv4路由
 #
 ipv4-family vpn-instance vpna //引入vpna的路由
  import-route direct          //引入vpna的直联路由
 #
ospf 1                   //OSPF保证全网互通
 area 0.0.0.0
  network 3.3.3.3 0.0.0.0
  network 1.3.0.0 0.0.0.255
 #
```

**SPOKEB配置，注意vpn的团体属性配置：**

```
 #
 router id 1.1.1.1          //BGP的router id
 #
ip vpn-instance vpna          //配置vpn实例vpna
 route-distinguisher 1:1    //配置vpna的RD
 vpn-target 1:1 export-extcommunity    //配置vpna的出团体属性
 vpn-target 2:1 import-extcommunity    //配置vpna的入团体属性
 #                                        mpls lsr-id 1.1.1.1         //MPLS的
LSR-ID
 #
mpls                //全局使能MPLS
ttl propagate vpn           //使能vpn的ttl复制，用于tracert
 #
mpls ldp               //全局使能MPLS LDP
 #
interface Ethernet0/0
 port link-mode route
 ip address 1.2.0.1 255.255.255.0
 mpls               //接口使能MPLS
 mpls ldp             //接口使能MPLS LDP
 #
interface Ethernet0/1
 port link-mode route
 ip address 1.3.0.1 255.255.255.0
 mpls               //接口使能MPLS
 mpls ldp             //接口使能MPLS LDP
 #
interface LoopBack0        //router id 和 MPLS LSR-ID
 ip address 1.1.1.1 255.255.255.255
 #
interface LoopBack1          //用于模拟vpna站点的loopback口
 ip binding vpn-instance vpna     //绑定vpn实例vpna
 ip address 1.0.0.1 255.255.255.255
 #
bgp 1                  //启动BGP进程，AS为1
 undo synchronization
 peer 2.2.2.2 as-number 1   //2.2.2.2是HubA的router id
 peer 2.2.2.2 connect-interface LoopBack0 //指定连接接口
 #
 ipv4-family vpnv4          //使能BGP的vpnv4路由能力
  peer 2.2.2.2 enable       //指定与HubA互传vpnv4路由
 #
 ipv4-family vpn-instance vpna //引入vpna的路由
  network 1.0.0.1 255.255.255.255 //手工引入vpna路由
 #
ospf 1                 //OSPF保证全网互通
 area 0.0.0.0
```

```
  network 3.3.3.3 0.0.0.0
  network 1.3.0.0 0.0.0.255
  network 1.2.0.0 0.0.0.255
#
```

**HubA配置，注意vpn实例配置和BGP配置：**

```
#
 router id 2.2.2.2        //BGP的router id
#
ip vpn-instance vpnin      //配置vpn实例vpnin
 route-distinguisher 2:2   //配置vpnin的RD
vpn-target 1:1 3:1 import-extcommunity //只有入团体属性
#
ip vpn-instance vpnout     //配置vpn实例vpnout
 route-distinguisher 2:1   //配置vpnout的RD
vpn-target 2:1 export-extcommunity      //只有出团体属性
#
mpls lsr-id 2.2.2.2        //MPLS的LSR-ID
#
mpls               //全局使能MPLS
 ttl propagate vpn        //使能vpn的ttl复制，用于tracert
#
mpls ldp             //全局使能MPLS LDP
#
interface Ethernet0/0
 port link-mode route
 ip address 1.2.0.2 255.255.255.0
 mpls               //接口使能MPLS
 mpls ldp             //接口使能MPLS LDP
#
interface Ethernet0/1.1      //建立子接口
 vlan-type dot1q vid 1       //设定vlan
 ip binding vpn-instance vpnin //绑定vpn实例vpnin
 ip address 192.168.1.1 255.255.255.0
#
interface Ethernet0/1.2      //建立子接口
 vlan-type dot1q vid 2       //设定vlan
 ip binding vpn-instance vpnout   //绑定vpn实例vpnout
 ip address 192.168.2.1 255.255.255.0
#
interface LoopBack0        //router id 和 MPLS LSR-ID
 ip address 2.2.2.2 255.255.255.255
#
interface LoopBack1          //用于模拟vpna站点的loopback口
 ip binding vpn-instance vpna     //绑定vpn实例vpna
 ip address 2.1.1.1 255.255.255.255
#
bgp 1               //启动BGP进程，AS为1
 undo synchronization
 group 1 internal           //建立peer组
 peer 1 connect-interface LoopBack0   //组1使用指定接口连接
 peer 3.3.3.3 group 1   //3.3.3.3是SPOKEA的router id
 peer 1.1.1.1 group 1   //1.1.1.1是SPOKEB的router id
 #
 ipv4-family vpnv4         //使能BGP的vpnv4路由能力
  peer 1 enable          //指定与组1互传vpnv4路由
  peer 1.1.1.1 enable      //由下一行生成，无需配置
  peer 1.1.1.1 group 1     //将SPOKEB加入到组1
  peer 3.3.3.3 enable      //由下一行生成，无需配置
  peer 3.3.3.3 group 1     //将SPOKEA加入到组1
 #
 ipv4-family vpn-instance vpnin   //vpnin的路由和peer配置
  peer 192.168.1.2 as-number 2 //与CEA建立EBGP连接
 #
 ipv4-family vpn-instance vpnout  //vpnout的路由和peer配置
```

```
 peer 192.168.2.2 as-number 2 //与CEA建立EBGP连接
 network 192.168.2.0        //手工引入路由便于tracert
 peer 192.168.2.2 allow-as-loop //必配，使能接受路由环路
#
ospf 1              //OSPF保证全网互通
 area 0.0.0.0
  network 2.2.2.2 0.0.0.0
  network 1.2.0.0 0.0.0.255
#
```

**CEA配置，注意子接口和BGP配置：**

```
#
interface GigabitEthernet0/0.1 //子接口配置
 vlan-type dot1q vid 1      //要和对端配置相同vid
 ip address 192.168.1.2 255.255.255.0
#
interface GigabitEthernet0/0.2 //子接口配置
 vlan-type dot1q vid 2      //要和对端配置相同vid
 ip address 192.168.2.2 255.255.255.0
#
bgp 2
 network 192.168.1.0          //引入路由便于tracert
 undo synchronization
 peer 192.168.1.1 as-number 1   //与HubA建立EBGP连接
 peer 192.168.2.1 as-number 1   //与HubA建立EBGP连接
 group 1 external
 peer 192.168.1.1 group 1    //与HubA建立EBGP连接
 peer 192.168.2.1 group 1      //与HubA建立EBGP连接
#
```

**四、配置关键点：**

掌握VPN路由的流向，主要关注vpn-target、HubPE的BGP配置。

**五、实验分析**

在SPOKEA和SPOKB上检查vpn路由和tracert结果。

**SPOKEA上查看标签分发情况：**

```
<SPOKEA>dis bgp vpnv4 vpn-instance vpna routing-table
Total Number of Routes: 5
BGP Local router ID is 3.3.3.3
 Status codes: * - valid, > - best, d - damped,
         h - history, i - internal, s - suppressed, S - Stale
         Origin : i - IGP, e - EGP, ? - incomplete
   Network          NextHop      MED      LocPrf    PrefVal Path/Ogn
*>i 1.0.0.1/32      2.2.2.2              100      0     2 1i
 *>  3.1.1.1/32      0.0.0.0      0               0     ?
 * i               2.2.2.2              100      0     2 1?
 *>i 192.168.1.0    2.2.2.2      0      100      0     2i
 *>i 192.168.2.0    2.2.2.2      0      100      0     i
<SPOKEA>tracert -vpn-instance vpna 1.0.0.1
 traceroute to vpna 1.0.0.1(1.0.0.1) 30 hops max,40 bytes packet, press CTRL_C to
break
 1 1.3.0.1 3 ms  3 ms  3 ms
 2 192.168.2.1 199 ms  4 ms  3 ms
 3 192.168.2.2 4 ms  4 ms  3 ms
 4 192.168.1.1 3 ms  4 ms  4 ms
 5 1.0.0.1 5 ms  6 ms  4 ms
```

**SPOKEB上查看标签分发情况：**

```
 [PEB]dis bgp vpnv4 all routing-table
<SPOKEB>dis bgp vpnv4 vpn-instance vpna routing-table
Total Number of Routes: 5
BGP Local router ID is 1.1.1.1
 Status codes: * - valid, > - best, d - damped,
         h - history, i - internal, s - suppressed, S - Stale
         Origin : i - IGP, e - EGP, ? - incomplete
   Network          NextHop      MED      LocPrf    PrefVal Path/Ogn
*>  1.0.0.1/32      0.0.0.0      0               0     i
 * i               2.2.2.2              100      0     2 1i
```

```
 *>i 3.1.1.1/32      2.2.2.2            100    0    2 1?
 *>i 192.168.1.0     2.2.2.2      0     100    0    2i
 *>i 192.168.2.0     2.2.2.2      0     100    0    i


<SPOKEB>tracert -vp vpna 3.1.1.1
 traceroute to vpna 3.1.1.1(3.1.1.1) 30 hops max,40 bytes packet, press CTRL_C to
break
 1 192.168.2.1 2 ms  2 ms  3 ms
 2 192.168.2.2 2 ms  3 ms  3 ms
 3 192.168.1.1 3 ms  2 ms  2 ms
 4 1.2.0.1  6 ms  6 ms  6 ms
 5 3.1.1.1  6 ms  6 ms  5 ms
```

**注意观察路由的下一条2.2.2.2和tracert标明的走向。**

**HubA上查看vpn路由的关键信息：**

```
[HubA]dis bgp vpnv4 all routing-table
Total routes of vpn-instance vpnin: 3
   Network         NextHop      In/Out Label    MED      LocPrf
 *>i 1.0.0.1/32     1.1.1.1      NULL/1029     0        100
 *>i 3.1.1.1/32     3.3.3.3      NULL/1025     0        100
 *   192.168.1.0    192.168.1.2              0
Total routes of vpn-instance vpnout: 4
   Network         NextHop      In/Out Label    MED      LocPrf
 *>  1.0.0.1/32     192.168.2.2    1029/NULL
 *>  3.1.1.1/32     192.168.2.2    1028/NULL
 *>  192.168.1.0    192.168.2.2    1025/NULL      0
 *>  192.168.2.0    0.0.0.0        1026/NULL      0
```

**CEA上查看vpn路由的关键信息：**

```
<CEA>dis bgp routing-table
Total Number of Routes: 4
 *>  1.0.0.1/32     192.168.1.1             0     1i
 *>  3.1.1.1/32     192.168.1.1             0     1?
 *>  192.168.1.0    0.0.0.0      0          0     i
 *   192.168.2.0    192.168.2.1   0          0     1i
```