

知 S5820 MPLS VPN OPTION-B典型组网配置案例

MPLS L3VPN

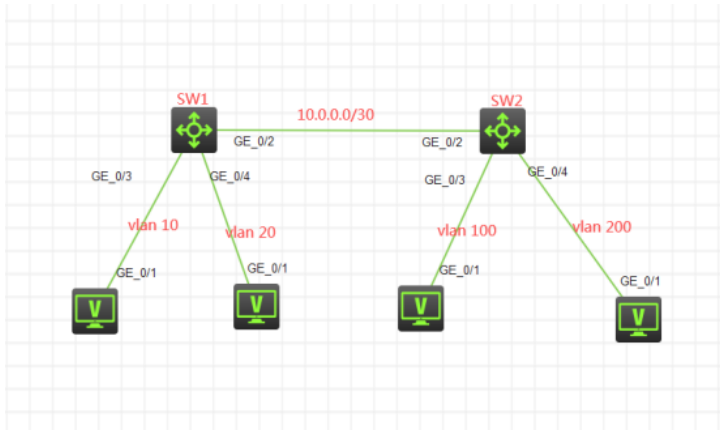
BGP

H3C模拟器

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组网及说明



组网说明：

本案例采用H3C HCL模拟器的S5820交换机来模拟MPLS VPN OPTION-B 典型组网配置。为了实现业务的相互隔离，需要将不同的VLAN绑定到不同的VPN实例中进行业务的互通，因此在本案例引入多实例VPN，将相关的业务进行捆绑。其中SW1属于AS100，SW2属于AS200，SW1与SW2的互联使用trunk，允许VLAN 400 VLAN 500通过，最终建立EBGP邻居关系，宣告业务网段，使得相同VPN实例的业务能互通，不同VPN实例的业务不能互通。

VPN实例规划如下：

VPN实例名称	RD值	RT值	业务类型	备注
vpn-rt	100:1	100:1	实时业务	
vpn-nrt	200:1	200:1	非实时业务	

IP地址规划如下：

设备名称	接口/VLAN	IP地址	子网掩码位数	所属VPN实例	备注
SW1	Gi 1/0/2	10.0.0.1	30	-	
	VLAN 10	192.168.10.1	24	vpn-rt	
	VLAN 20	192.168.20.1	24	vpn-nrt	
	Loopback 0	1.1.1.1	32	vpn-rt	Router-id
SW2	Gi 1/0/2	10.0.0.2	30	-	
	VLAN 100	172.16.10.1	24	vpn-rt	
	VLAN 200	172.16.20.1	24	vpn-nrt	
	Loopback 0	3.3.3.3	32		Router-id

配置步骤

SW1:

sys

System View: return to User View with Ctrl+Z.

[H3C]sysname SW1

[SW1]int loopback 0

[SW1-LoopBack0]ip address 1.1.1.1 32

[SW1-LoopBack0]quit

[SW1]ip vpn-instance vpn-rt

[SW1-vpn-instance-vpn-rt]route-distinguisher 100:1

[SW1-vpn-instance-vpn-rt]vpn-target 100:1

[SW1-vpn-instance-vpn-rt]quit

[SW1]ip vpn-instance vpn-nrt

[SW1-vpn-instance-vpn-nrt]route-distinguisher 200:1

[SW1-vpn-instance-vpn-nrt]vpn-target 200:1

[SW1-vpn-instance-vpn-nrt]quit

[SW1]mpls lsr-id 1.1.1.1

[SW1]mpls ldp

[SW1-ldp]quit

[SW1]vlan 10

[SW1-vlan10]quit

```

[SW1]vlan 20
[SW1-vlan20]quit
[SW1]int vlan 10
[SW1-Vlan-interface10]ip binding vpn-instance vpn-rt
Some configurations on the interface are removed.
[SW1-Vlan-interface10]ip address 192.168.10.1 24
[SW1-Vlan-interface10]quit
[SW1]int vlan 20
[SW1-Vlan-interface20]ip binding vpn-instance vpn-nrt
Some configurations on the interface are removed.
[SW1-Vlan-interface20]ip address 192.168.20.1 24
[SW1-Vlan-interface20]quit
[SW1]int gi 1/0/3
[SW1-GigabitEthernet1/0/3]port link-mode bridge
[SW1-GigabitEthernet1/0/3]port link-type access
[SW1-GigabitEthernet1/0/3]port access vlan 10
[SW1-GigabitEthernet1/0/3]quit
[SW1]int gi 1/0/4
[SW1-GigabitEthernet1/0/4]port link-mode bridge
[SW1-GigabitEthernet1/0/4]port link-type access
[SW1-GigabitEthernet1/0/4]port access vlan 20
[SW1-GigabitEthernet1/0/4]quit
[SW1]int gi 1/0/2
[SW1-GigabitEthernet1/0/2]port link-mode route
[SW1-GigabitEthernet1/0/2]des
[SW1-GigabitEthernet1/0/2]ip address 10.0.0.1 30
[SW1-GigabitEthernet1/0/2]mpls enable
[SW1-GigabitEthernet1/0/2]mpls ldp enable
[SW1-GigabitEthernet1/0/2]quit
[SW1]bgp 100
[SW1-bgp-default]router-id 1.1.1.1
[SW1-bgp-default]peer 10.0.0.2 as-number 200
[SW1-bgp-default]address-family ipv4 unicast
[SW1-bgp-default-ipv4]peer 10.0.0.2 enable
[SW1-bgp-default-ipv4]import-route direct
[SW1-bgp-default-ipv4]quit
[SW1-bgp-default]address-family vpnv4
[SW1-bgp-default-vpnv4]peer 10.0.0.2 enable
[SW1-bgp-default-vpnv4]quit
[SW1-bgp-default]ip vpn-instance vpn-rt
[SW1-bgp-default-vpn-rt]address-family ipv4 unicast
[SW1-bgp-default-ipv4-vpn-rt]network 192.168.10.0 255.255.255.0
[SW1-bgp-default-ipv4-vpn-rt]quit
[SW1-bgp-default-vpn-rt]quit
[SW1-bgp-default]ip vpn-instance vpn-nrt
[SW1-bgp-default-vpn-nrt]address-family ipv4 unicast
[SW1-bgp-default-ipv4-vpn-nrt]network 192.168.20.0 255.255.255.0
[SW1-bgp-default-ipv4-vpn-nrt]quit
[SW1-bgp-default-vpn-nrt]quit
[SW1-bgp-default]quit

```

SW2:

sys

System View: return to User View with Ctrl+Z.

```
[H3C]sysname SW2
```

```
[SW2]int loopback 0
```

```
[SW2-LoopBack0]ip address 3.3.3.3 32
```

```
[SW2-LoopBack0]quit
```

```
[SW2]ip vpn-instance vpn-rt
```

```
[SW2-vpn-instance-vpn-rt]route-distinguisher 100:1
```

```
[SW2-vpn-instance-vpn-rt]vpn-target 100:1
```

```
[SW2-vpn-instance-vpn-rt]quit
```

```

[SW2]ip vpn-instance vpn-nrt
[SW2-vpn-instance-vpn-nrt]route-distinguisher 200:1
[SW2-vpn-instance-vpn-nrt]vpn-target 200:1
[SW2-vpn-instance-vpn-nrt]quit
[SW2]router id 3.3.3.3
[SW2]mpls lsr-id 3.3.3.3
[SW2]mpls ldp
[SW2-ldp]quit
[SW2]vlan 100
[SW2-vlan100]quit
[SW2]vlan 200
[SW2-vlan200]quit
[SW2]int vlan 100
[SW2-Vlan-interface100]ip binding vpn-instance vpn-rt
Some configurations on the interface are removed.
[SW2-Vlan-interface100]ip address 172.16.10.1 24
[SW2-Vlan-interface100]quit
[SW2]int vlan 200
[SW2-Vlan-interface200]ip binding vpn-instance vpn-nrt
Some configurations on the interface are removed.
[SW2-Vlan-interface200]ip address 172.16.20.1 24
[SW2-Vlan-interface200]quit
[SW2]int gi 1/0/3
[SW2-GigabitEthernet1/0/3]port link-mode bridge
[SW2-GigabitEthernet1/0/3]port link-type access
[SW2-GigabitEthernet1/0/3]port access vlan 100
[SW2-GigabitEthernet1/0/3]quit
[SW2]int gi 1/0/4
[SW2-GigabitEthernet1/0/4]port link-mode bridge
[SW2-GigabitEthernet1/0/4]port link-type access
[SW2-GigabitEthernet1/0/4]port access vlan 200
[SW2-GigabitEthernet1/0/4]quit
[SW2]int gi 1/0/2
[SW2-GigabitEthernet1/0/2]port link-mode route
[SW2-GigabitEthernet1/0/2]des
[SW2-GigabitEthernet1/0/2]ip address 10.0.0.2 30
[SW2-GigabitEthernet1/0/2]mpls enable
[SW2-GigabitEthernet1/0/2]mpls ldp enable
[SW2-GigabitEthernet1/0/2]quit
[SW2]bgp 200
[SW2-bgp-default]router-id 2.2.2.2
[SW2-bgp-default]peer 10.0.0.1 as-number 100
[SW2-bgp-default]address-family ipv4 unicast
[SW2-bgp-default-ipv4]peer 10.0.0.1 enable
[SW2-bgp-default-ipv4]import-route direct
[SW2-bgp-default-ipv4]quit
[SW2-bgp-default]address-family vpnv4
[SW2-bgp-default-vpnv4]peer 10.0.0.1 enable
[SW2-bgp-default-vpnv4]quit
[SW2-bgp-default]ip vpn-instance vpn-rt
[SW2-bgp-default-vpn-rt]address-family ipv4 unicast
[SW2-bgp-default-ipv4-vpn-rt]network 172.16.10.0 255.255.255.0
[SW2-bgp-default-ipv4-vpn-rt]quit
[SW2-bgp-default-vpn-rt]quit
[SW2-bgp-default]ip vpn-instance vpn-nrt
[SW2-bgp-default-vpn-nrt]address-family ipv4 unicast
[SW2-bgp-default-ipv4-vpn-nrt]network 172.16.20.0 255.255.255.0
[SW2-bgp-default-ipv4-vpn-nrt]quit
[SW2-bgp-default-vpn-nrt]quit
[SW2-bgp-default]quit

```

PC都填写IP地址:

配置PC_3

接口	状态	IPv4地址	IPv6地址
G0/0/1	UP	192.168.10.2/24	

刷新

接口管理

☐ 禁用

☒ 启用

IPv4配置:

☐ DHCP

☒ 静态

IPv4地址:

192.168.10.2

掩码地址:

255.255.255.0

IPv4网关:

192.168.10.1

启用

配置PC_4

接口	状态	IPv4地址	IPv6地址
G0/0/1	UP	192.168.20.2/24	

刷新

接口管理

☐ 禁用

☒ 启用

IPv4配置:

☐ DHCP

☒ 静态

IPv4地址:

192.168.20.2

掩码地址:

255.255.255.0

IPv4网关:

192.168.20.1

启用

配置PC_5

接口	状态	IPv4地址	IPv6地址
G0/0/1	UP	172.16.10.2/24	

刷新

接口管理

☐ 禁用

☒ 启用

IPv4配置:

☐ DHCP

☒ 静态

IPv4地址:

172.16.10.2

掩码地址:

255.255.255.0

IPv4网关:

172.16.10.1

启用

配置PC_6

接口	状态	IPv4地址	IPv6地址
G0/0/1	UP	172.16.20.2/24	

刷新

接口管理

☐ 禁用
 ☒ 启用

IPv4配置:

☐ DHCP
 ☒ 静态

IPv4地址:

掩码地址:

IPv4网关:

启用

相同VPN实例的业务可以互通，不同VPN实例的业务不可以互通：

hcl_wcec5l

S5820V2-54QS-GE_1 x S5820V2-54QS-GE_2 x PC_3 x PC_4 x PC_5 x PC_6 x

```

<H3C>
<H3C>ping 172.16.10.2
Ping 172.16.10.2 (172.16.10.2): 56 data bytes, press CTRL_C to break
56 bytes from 172.16.10.2: icmp_seq=0 ttl=253 time=3.000 ms
56 bytes from 172.16.10.2: icmp_seq=1 ttl=253 time=2.000 ms
56 bytes from 172.16.10.2: icmp_seq=2 ttl=253 time=3.000 ms
56 bytes from 172.16.10.2: icmp_seq=3 ttl=253 time=4.000 ms
56 bytes from 172.16.10.2: icmp_seq=4 ttl=253 time=3.000 ms

--- Ping statistics for 172.16.10.2 ---
5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss
round-trip min/avg/max/std-dev = 2.000/3.000/4.000/0.632 ms
<H3C>^Apr  5 18:09:10:021 2020 H3C PING/6/PING STATISTICS: Ping statistics for 172.16.10.2
: 5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss, round-trip min/avg/max/
std-dev = 2.000/3.000/4.000/0.632 ms.

<H3C>ping 172.16.20.2
Ping 172.16.20.2 (172.16.20.2): 56 data bytes, press CTRL_C to break
Request time out
Request time out
Request time out
Request time out
Request time out

--- Ping statistics for 172.16.20.2 ---
5 packet(s) transmitted, 0 packet(s) received, 100.0% packet loss
  
```

hcl_wcec5l

S5820V2-54QS-GE_1 x S5820V2-54QS-GE_2 x PC_3 x PC_4 x PC_5 x PC_6 x

```

<H3C>ping 172.16.20.2
Ping 172.16.20.2 (172.16.20.2): 56 data bytes, press CTRL_C to break
56 bytes from 172.16.20.2: icmp_seq=0 ttl=255 time=0.000 ms
56 bytes from 172.16.20.2: icmp_seq=1 ttl=255 time=0.000 ms
56 bytes from 172.16.20.2: icmp_seq=2 ttl=255 time=0.000 ms
56 bytes from 172.16.20.2: icmp_seq=3 ttl=255 time=0.000 ms
56 bytes from 172.16.20.2: icmp_seq=4 ttl=255 time=0.000 ms

--- Ping statistics for 172.16.20.2 ---
5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss
round-trip min/avg/max/std-dev = 0.000/0.000/0.000/0.000 ms
<H3C>^Apr  5 18:09:54:441 2020 H3C PING/6/PING STATISTICS: Ping statistics for 172.16.20.2
: 5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss, round-trip min/avg/max/
std-dev = 0.000/0.000/0.000/0.000 ms.

<H3C>ping 172.16.10.2
Ping 172.16.10.2 (172.16.10.2): 56 data bytes, press CTRL_C to break
Request time out
Request time out
Request time out
Request time out
Request time out

--- Ping statistics for 172.16.10.2 ---
  
```

```
hcl_wce5i
S5820V2-54Q5-GE_1 S5820V2-54Q5-GE_2 PC_3 PC_4 PC_5 PC_6
<H3C>%Apr  5 18:09:04:934 2020 H3C SHELL/5/SHELL_LOGIN: Console logged in from con0.

<H3C>ping 192.168.10.2
Ping 192.168.10.2 (192.168.10.2): 56 data bytes, press CTRL_C to break
56 bytes from 192.168.10.2: icmp_seq=0 ttl=253 time=4.000 ms
56 bytes from 192.168.10.2: icmp_seq=1 ttl=253 time=3.000 ms
56 bytes from 192.168.10.2: icmp_seq=2 ttl=253 time=2.000 ms
56 bytes from 192.168.10.2: icmp_seq=3 ttl=253 time=1.000 ms
56 bytes from 192.168.10.2: icmp_seq=4 ttl=253 time=2.000 ms

--- Ping statistics for 192.168.10.2 ---
5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss
round-trip min/avg/max/std-dev = 1.000/2.400/4.000/1.020 ms
<H3C>%Apr  5 18:10:32:935 2020 H3C SHELL/5/SHELL_LOGIN: Console logged in from con0.
<H3C>ping 192.168.20.2
Ping 192.168.20.2 (192.168.20.2): 56 data bytes, press CTRL_C to break
Request time out
Request time out
Request time out
Request time out
Request time out
```

```
hcl_wce5i
S5820V2-54Q5-GE_1 S5820V2-54Q5-GE_2 PC_3 PC_4 PC_5 PC_6
<H3C>%Apr  5 18:14:14:157 2020 H3C SHELL/5/SHELL_LOGIN: Console logged in from con0.

<H3C>ping 192.168.20.2
Ping 192.168.20.2 (192.168.20.2): 56 data bytes, press CTRL_C to break
56 bytes from 192.168.20.2: icmp_seq=0 ttl=253 time=3.000 ms
56 bytes from 192.168.20.2: icmp_seq=1 ttl=253 time=2.000 ms
56 bytes from 192.168.20.2: icmp_seq=2 ttl=253 time=2.000 ms
56 bytes from 192.168.20.2: icmp_seq=3 ttl=253 time=2.000 ms
56 bytes from 192.168.20.2: icmp_seq=4 ttl=253 time=2.000 ms

--- Ping statistics for 192.168.20.2 ---
5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss
round-trip min/avg/max/std-dev = 2.000/2.200/3.000/0.400 ms
<H3C>%Apr  5 18:14:21:870 2020 H3C SHELL/5/SHELL_LOGIN: Console logged in from con0.
<H3C>ping 192.168.10.2
Ping 192.168.10.2 (192.168.10.2): 56 data bytes, press CTRL_C to break
Request time out
Request time out
Request time out
Request time out
Request time out
```

查看SW1的BGP邻居信息:

```
[SW1]dis bgp peer ipv4

BGP local router ID: 1.1.1.1
Local AS number: 100
Total number of peers: 1                Peers in established state: 1

* - Dynamically created peer
Peer          AS  MsgRcvd  MsgSent  OutQ  PrefRcv  Up/Down  State
10.0.0.2      200    16      13      0     2 00:05:09 Established
[SW1]dis bgp peer vpnv4

BGP local router ID: 1.1.1.1
Local AS number: 100
Total number of peers: 1                Peers in established state: 1

* - Dynamically created peer
Peer          AS  MsgRcvd  MsgSent  OutQ  PrefRcv  Up/Down  State
10.0.0.2      200    16      13      0     2 00:05:13 Established
[SW1]
```

查看SW2的BGP邻居信息:

```
[SW2]dis bgp peer ipv4

BGP local router ID: 2.2.2.2
Local AS number: 200
Total number of peers: 1                Peers in established state: 1

* - Dynamically created peer
Peer          AS  MsgRcvd  MsgSent  OutQ  PrefRcv  Up/Down  State
10.0.0.1      100    14      14      0     2 00:05:27 Established
[SW2]dis bgp peer vpnv4

BGP local router ID: 2.2.2.2
Local AS number: 200
Total number of peers: 1                Peers in established state: 1

* - Dynamically created peer
Peer          AS  MsgRcvd  MsgSent  OutQ  PrefRcv  Up/Down  State
10.0.0.1      100    14      14      0     2 00:05:31 Established
[SW2]
```

查看SW1的VPN路由表:

```
[SW1]dis ip routing-table vpn-instance vpn-rt
Destinations : 13          Routes : 13

Destination/Mask    Proto   Pre Cost       NextHop           Interface
0.0.0.0/32          Direct  0  0             127.0.0.1         InLoop0
127.0.0.0/8          Direct  0  0             127.0.0.1         InLoop0
127.0.0.0/32          Direct  0  0             127.0.0.1         InLoop0
127.0.0.1/32          Direct  0  0             127.0.0.1         InLoop0
127.255.255.255/32    Direct  0  0             127.0.0.1         InLoop0
172.16.10.0/24        BGP     255 0             10.0.0.2           GE1/0/2
192.168.10.0/24        Direct  0  0             192.168.10.1       Vlan10
192.168.10.0/32        Direct  0  0             192.168.10.1       Vlan10
192.168.10.1/32        Direct  0  0             127.0.0.1         InLoop0
192.168.10.255/32     Direct  0  0             192.168.10.1       Vlan10
224.0.0.0/4           Direct  0  0             0.0.0.0           NULL0
224.0.0.0/24          Direct  0  0             0.0.0.0           NULL0
255.255.255.255/32    Direct  0  0             127.0.0.1         InLoop0
[SW1]
```

```
[SW1]dis ip routing-table vpn-instance vpn-nrt
Destinations : 13          Routes : 13

Destination/Mask    Proto   Pre Cost       NextHop           Interface
0.0.0.0/32          Direct  0  0             127.0.0.1         InLoop0
127.0.0.0/8          Direct  0  0             127.0.0.1         InLoop0
127.0.0.0/32          Direct  0  0             127.0.0.1         InLoop0
127.0.0.1/32          Direct  0  0             127.0.0.1         InLoop0
127.255.255.255/32    Direct  0  0             127.0.0.1         InLoop0
172.16.20.0/24        BGP     255 0             10.0.0.2           GE1/0/2
192.168.20.0/24        Direct  0  0             192.168.20.1       Vlan20
192.168.20.0/32        Direct  0  0             192.168.20.1       Vlan20
192.168.20.1/32        Direct  0  0             127.0.0.1         InLoop0
192.168.20.255/32     Direct  0  0             192.168.20.1       Vlan20
224.0.0.0/4           Direct  0  0             0.0.0.0           NULL0
224.0.0.0/24          Direct  0  0             0.0.0.0           NULL0
255.255.255.255/32    Direct  0  0             127.0.0.1         InLoop0
[SW1]
```

查看SW2的VPN路由表：

```
[SW2]dis ip routing-table vpn-instance vpn-rt
Destinations : 13          Routes : 13

Destination/Mask    Proto   Pre Cost       NextHop           Interface
0.0.0.0/32          Direct  0  0             127.0.0.1         InLoop0
127.0.0.0/8          Direct  0  0             127.0.0.1         InLoop0
127.0.0.0/32          Direct  0  0             127.0.0.1         InLoop0
127.0.0.1/32          Direct  0  0             127.0.0.1         InLoop0
127.255.255.255/32    Direct  0  0             127.0.0.1         InLoop0
172.16.10.0/24        Direct  0  0             172.16.10.1       Vlan100
172.16.10.0/32        Direct  0  0             172.16.10.1       Vlan100
172.16.10.1/32        Direct  0  0             127.0.0.1         InLoop0
172.16.10.255/32     Direct  0  0             172.16.10.1       Vlan100
192.168.10.0/24        BGP     255 0             10.0.0.1           GE1/0/2
224.0.0.0/4           Direct  0  0             0.0.0.0           NULL0
224.0.0.0/24          Direct  0  0             0.0.0.0           NULL0
255.255.255.255/32    Direct  0  0             127.0.0.1         InLoop0
[SW2]
```

```
[SW2]dis ip routing-table vpn-instance vpn-nrt
Destinations : 13          Routes : 13

Destination/Mask    Proto   Pre Cost       NextHop           Interface
0.0.0.0/32          Direct  0  0             127.0.0.1         InLoop0
127.0.0.0/8          Direct  0  0             127.0.0.1         InLoop0
127.0.0.0/32          Direct  0  0             127.0.0.1         InLoop0
127.0.0.1/32          Direct  0  0             127.0.0.1         InLoop0
127.255.255.255/32    Direct  0  0             127.0.0.1         InLoop0
172.16.20.0/24        Direct  0  0             172.16.20.1       Vlan200
172.16.20.0/32        Direct  0  0             172.16.20.1       Vlan200
172.16.20.1/32        Direct  0  0             127.0.0.1         InLoop0
172.16.20.255/32     Direct  0  0             172.16.20.1       Vlan200
192.168.20.0/24        BGP     255 0             10.0.0.1           GE1/0/2
224.0.0.0/4           Direct  0  0             0.0.0.0           NULL0
224.0.0.0/24          Direct  0  0             0.0.0.0           NULL0
255.255.255.255/32    Direct  0  0             127.0.0.1         InLoop0
[SW2]
```

至此，S5820 MPLS VPN OPTION-B典型组网配置案例已完成！

配置关键点