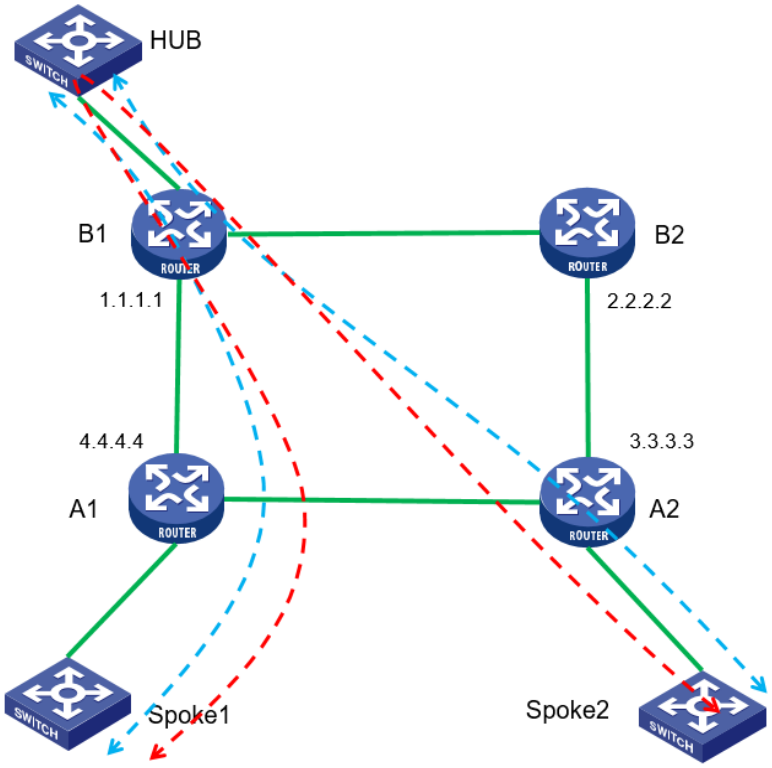
IPRAN组网政企专线业务典型配置—点到多点（2）—分支互访流量过总部

IP-RAN　何理　2015-11-12 发表

一、 组网需求：

某地市已经部署了我司IPRAN环网，现在客户希望在环网上增加某政企客户的二层专线业务，从而实现该客户同城总部与两个办公楼之间的业务二层互通。

分支站点之间不能直接通信，必须通过中心站点通信，以实现中心站点对数据流量进行统一管理。



如图所示，总部CE设备挂在B1设备上，两个分支节点分别位于A1/A2下；要求分支站点之间不能直接通信，必须通过中心站点通信，以实现中心站点对数据流量进行统一管理。

实现该需求有两种配置方法：

1. 本地ARP代理方式：B1使用VPLS方式，分支采用VLL，B1分别与A1/A2建立两个PW，详见《IPRAN组网政企专线典型配置—点到多点（1）》；使用该配置可实现总部分支之间的通信，但是无法实现分支之间的通信，此时我们可以在总部HUB网关上**开启本地代理ARP功能**后，这样就可以实现分支之间的通信；

2. VPLS Hub-Spoke组网：在Hub-Spoke组网方式中，分支站点之间不能直接通信，必须通过中心站点通信，以实现中心站点对数据流量进行统一管理。

   朝向中心站点方向的链路（AC或PW）称为Hub链路。用户需要手工指定VSI内的Hub链路。在一个VSI内只能存在一条Hub链路。

   朝向中心站点方向的链路（AC或PW）称为Spoke链路。

   该方式下也需要配置本地ARP代理功能；

配置点到多点L2VPN业务之前，请先确保IPRAN环网上路由可达，MPLS及MPLS LDP已经使能；

B1配置

```
l2vpn enable
#
pw-class vpls
 pw-type ethernet
 vccv cc router-alert
 vccv bfd
#
vsi vpls-hub hub-spoke
 pwsignaling ldp
  peer 3.3.3.3 pw-id 13 pw-class vpls
  peer 4.4.4.4 pw-id 14 pw-class vpls
#
interface GigabitEthernet0/0
 port link-mode route
 combo enable copper
 xconnect vsi vpls-hub hub
```

A1配置

```
 l2vpn enable
#
pw-class vpls
 pw-type ethernet
 vccv cc router-alert
 vccv bfd

vsi vpls-spoke hub-spoke
 pwsignaling ldp
  peer 1.1.1.1 pw-id 14 hub pw-class vpls

interface GigabitEthernet0/2
 port link-mode route
 combo enable copper
 xconnect vsi vpls-spoke
```

A2配置

```
l2vpn enable
#
pw-class vpls
 pw-type ethernet
 vccv cc router-alert
 vccv bfd
#

vsi vpls-spoke hub-spoke
 pwsignaling ldp
  peer 1.1.1.1 pw-id 13 hub pw-class vpls

interface GigabitEthernet0/2
 port link-mode route
 combo enable copper
 xconnect vsi vpls-spoke
```

HUB配置

```
interface Vlan-interface10
 ip address 192.168.1.1 255.255.255.0
 local-proxy-arp enable
```

业务验证：

HUB地址：192.168.1.1　Spoke1:192.168.1.2　Spoke2:192.168.1.3

总部ping分支互通正常：

```
<HUB>ping 192.168.1.3
Ping 192.168.1.3 (192.168.1.3): 56 data bytes, press CTRL_C to break
56 bytes from 192.168.1.3: icmp_seq=0 ttl=255 time=2.761 ms
56 bytes from 192.168.1.3: icmp_seq=1 ttl=255 time=2.779 ms
56 bytes from 192.168.1.3: icmp_seq=2 ttl=255 time=1.766 ms
56 bytes from 192.168.1.3: icmp_seq=3 ttl=255 time=2.419 ms
56 bytes from 192.168.1.3: icmp_seq=4 ttl=255 time=3.031 ms

--- Ping statistics for 192.168.1.3 ---
5 packets transmitted, 5 packets received, 0.0% packet loss
round-trip min/avg/max/std-dev = 1.766/2.551/3.031/0.438 ms
<HUB>%Nov  4 07:57:59:275 2015 HUB PING/6/PING_STATISTICS: Ping statist
ted, 5 packets received, 0.0% packet loss, round-trip min/avg/max/std-d
ping 192.168.1.2
Ping 192.168.1.2 (192.168.1.2): 56 data bytes, press CTRL_C to break
56 bytes from 192.168.1.2: icmp_seq=0 ttl=255 time=1.637 ms
56 bytes from 192.168.1.2: icmp_seq=1 ttl=255 time=1.980 ms
56 bytes from 192.168.1.2: icmp_seq=2 ttl=255 time=1.862 ms
56 bytes from 192.168.1.2: icmp_seq=3 ttl=255 time=1.276 ms
56 bytes from 192.168.1.2: icmp_seq=4 ttl=255 time=1.687 ms

--- Ping statistics for 192.168.1.2 ---
5 packets transmitted, 5 packets received, 0.0% packet loss
round-trip min/avg/max/std-dev = 1.276/1.688/1.980/0.240 ms
```

分支Spoke1 ping HUB正常，分支之间互访正常：

```
<SPOKE1>ping 192.168.1.1
Ping 192.168.1.1 (192.168.1.1): 56 data bytes, press CTRL_C to break
56 bytes from 192.168.1.1: icmp_seq=0 ttl=255 time=2.000 ms
56 bytes from 192.168.1.1: icmp_seq=1 ttl=255 time=3.000 ms
56 bytes from 192.168.1.1: icmp_seq=2 ttl=255 time=2.000 ms
56 bytes from 192.168.1.1: icmp_seq=3 ttl=255 time=2.000 ms
56 bytes from 192.168.1.1: icmp_seq=4 ttl=255 time=1.000 ms

--- Ping statistics for 192.168.1.1 ---
5 packets transmitted, 5 packets received, 0.0% packet loss
round-trip min/avg/max/std-dev = 1.000/2.000/3.000/0.632 ms
<SPOKE1>%Nov  5 08:59:25:337 2015 SPOKE1 PING/6/PING_STATISTICS: Ping st
ansmitted, 5 packets received, 0.0% packet loss, round-trip min/avg/max/
ping 192.168.1.3
Ping 192.168.1.3 (192.168.1.3): 56 data bytes, press CTRL_C to break
56 bytes from 192.168.1.3: icmp_seq=0 ttl=254 time=5.000 ms
56 bytes from 192.168.1.3: icmp_seq=1 ttl=254 time=4.000 ms
56 bytes from 192.168.1.3: icmp_seq=2 ttl=254 time=4.000 ms
56 bytes from 192.168.1.3: icmp_seq=3 ttl=254 time=5.000 ms
56 bytes from 192.168.1.3: icmp_seq=4 ttl=254 time=3.000 ms

--- Ping statistics for 192.168.1.3 ---
5 packets transmitted, 5 packets received, 0.0% packet loss
round-trip min/avg/max/std-dev = 3.000/4.200/5.000/0.748 ms
```

分支Spoke2 ping HUB正常，分支之间互访正常：

```
<SPOKE2>ping 192.168.1.1
Ping 192.168.1.1 (192.168.1.1): 56 data bytes, press CTRL_C to break
56 bytes from 192.168.1.1: icmp_seq=0 ttl=255 time=3.071 ms
56 bytes from 192.168.1.1: icmp_seq=1 ttl=255 time=2.225 ms
56 bytes from 192.168.1.1: icmp_seq=2 ttl=255 time=1.849 ms
56 bytes from 192.168.1.1: icmp_seq=3 ttl=255 time=2.937 ms
56 bytes from 192.168.1.1: icmp_seq=4 ttl=255 time=2.485 ms

--- Ping statistics for 192.168.1.1 ---
5 packets transmitted, 5 packets received, 0.0% packet loss
round-trip min/avg/max/std-dev = 1.849/2.513/3.071/0.451 ms
<SPOKE2>%Nov  5 09:04:45:479 2015 SPOKE2 PING/6/PING_STATISTICS: Ping stat
ansmitted, 5 packets received, 0.0% packet loss, round-trip min/avg/max/st
ping 192.168.1.2
Ping 192.168.1.2 (192.168.1.2): 56 data bytes, press CTRL_C to break
56 bytes from 192.168.1.2: icmp_seq=0 ttl=254 time=5.911 ms
56 bytes from 192.168.1.2: icmp_seq=1 ttl=254 time=3.901 ms
56 bytes from 192.168.1.2: icmp_seq=2 ttl=254 time=4.053 ms
56 bytes from 192.168.1.2: icmp_seq=3 ttl=254 time=4.607 ms
56 bytes from 192.168.1.2: icmp_seq=4 ttl=254 time=3.301 ms

--- Ping statistics for 192.168.1.2 ---
5 packets transmitted, 5 packets received, 0.0% packet loss
round-trip min/avg/max/std-dev = 3.301/4.355/5.911/0.882 ms
```

在B1上查看PW状态，可以看到与两个分支的链路为Spoke link:

```
<B1>dis l2v pw ver
VSI Name: vpls-hub
  Peer: 3.3.3.3          PW ID: 13
    Signaling Protocol  : LDP
    Link ID             : 8          PW State : Up
    In Label            : 917629     Out Label: 917629
    MTU                 : 1500
    PW Attributes       : Main, Spoke link
    VCCV CC             : Router-Alert
    VCCV BFD            : Fault Detection with BFD
    Tunnel Group ID     : 0x1000000230000000
    Tunnel NHLFE IDs    : 1027
  Peer: 4.4.4.4          PW ID: 14
    Signaling Protocol  : LDP
    Link ID             : 9          PW State : Up
    In Label            : 917628     Out Label: 917629
    MTU                 : 1500
    PW Attributes       : Main, Spoke link
    VCCV CC             : Router-Alert
    VCCV BFD            : Fault Detection with BFD
    Tunnel Group ID     : 0x1000000330000001
    Tunnel NHLFE IDs    : 1028
```

在B1上查看AC接口类型以及Hub链路：

```
<B1>dis l2v forwarding ac verbose
VSI Name: vpls-hub
  Interface: GE0/0
    Link ID      : 0
    Access Mode  : Ethernet
    AC Attributes: Hub link
```

在B1上查看VPLS MAC地址转发表：

```
<B1>dis l2v mac-address
MAC Address      State    VSI Name                        Link ID/Name  Aging
189f-4cf4-0602   Dynamic  vpls-hub                        9             Aging
189f-563b-0702   Dynamic  vpls-hub                        8             Aging
--- 2 mac address(es) found  ---
```

在Spoke1上查看PW状态，可以看到该PW为A1的Hub链路：

```
[A1]dis l2v pw ver
VSI Name: vpls-spoke
  Peer: 1.1.1.1          PW ID: 14
    Signaling Protocol  : LDP
    Link ID             : 8          PW State : Up
    In Label            : 917629     Out Label: 917628
    MTU                 : 1500
    PW Attributes       : Main, Hub link
    VCCV CC             : Router-Alert
    VCCV BFD            : Fault Detection with BFD
    Tunnel Group ID     : 0x1000000130000000
    Tunnel NHLFE IDs    : 1027
```

查看AC接口状态则为Spoke链路：

```
[A1]dis l2v fo ac  ve
VSI Name: vpls-spoke
  Interface: GE0/2
    Link ID      : 0
    Access Mode  : Ethernet
    AC Attributes: Spoke link
```

A1/A2相关表项类型，再此不在展示。

1. 配置L2VPN是需要考虑PW封装以及AC接入类型，不通的组合会对报文的Tag产生不同的影响；
2. 配置VPLS业务前，首先要保证IPRAN环网路由可达，公网MPLS隧道正常建立；
3. 无特殊需求IPRAN网络重均采用Martini方式及LDP作为L2VPN信令协议；
4. 在B1上将VSI绑定到接口上时，需要制定该接口为HUB链路，则对应的PW自动变为Spoke链路；同理在A1/A2上配置是需要指定PW为HUB链路；
5. 需要在总部网关上开启本地ARP代理功能，实现分支之间的互访；
6. A设备AC接口配置需要切换为二层接口配置服务实例，B设备使用三层接口；因为实验室用模拟器，所以配置使用三层接口配置，服务实例配置请参见相关配置手册；