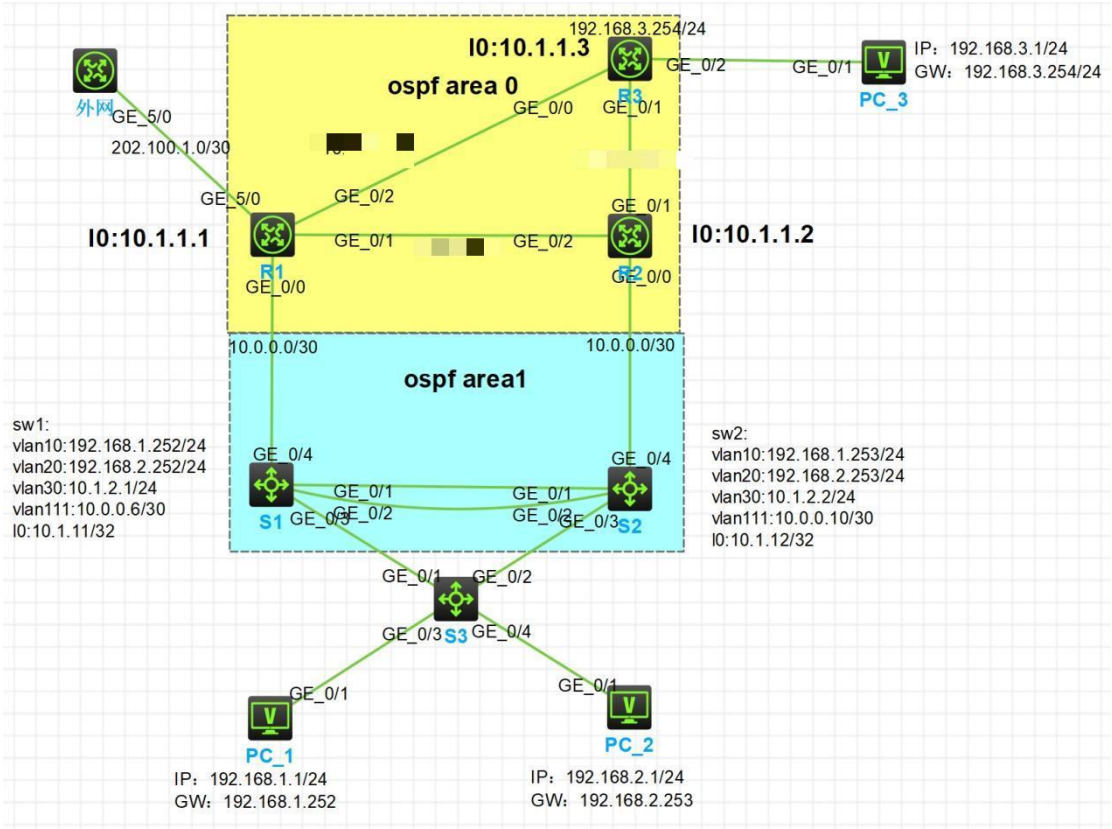

- s1 和 s2 之间的直连链路配置链路聚合
- 公司内部业务网段为 Vlan10 和 Vlan20；PC1 属于 Vlan10，PC2 属于 Vlan20，Vlan30 用于 s1 和 s2 建立 OSPF 邻居；Vlan111 为 s1 和 R1 的互联 Vlan，Vlan222 为 s2 和 R2 的互联 Vlan
- 所有交换机相连的端口配置为 Trunk，允许相关流量通过
- 交换机连接 PC 的端口配置为边缘端口
- 在 S1，S2，S3 上配置 mstp，mst 域为 scyd，vlan10 映射到 instance1，vlan20 映射到 instance2，要求 vlan10 流量默认走 s1，vlan20 的流量默认走 s2
- s1 和 s2 配置 VRRP 互为备份，监听上行接口，避免抢占
- 在 s1 上配置 DHCP 服务，为 Vlan10 和 Vlan20 的 PC 动态分配 IP 地址、网关和 DNS 地址；要求 Vlan10 的网关是 192.168.1.252，Vlan20 的网关是 192.168.2.253
- 配置 OSPF 实现公司内部网络全网互通，ABR 的环回口宣告进骨干区域；业务网段不允许出现协议报文
- R1 上配置默认路由指向互联网，并引入到 OSPF
- 配置 easy ip，只有业务网段 192.168.1.0/24 和 192.168.2.0/24 的数据流可以通过 R1 访问互联网
- R1 开启 TELNET 远程管理，使用用户 telnet 登录，密码 dzkd123456，只允许 PC2 远程管理 R1

步骤一：vlan,ip 地址以及环回口配置

R1：

```
[R1]int g0/0
[R1-GigabitEthernet0/0]ip address 10.0.0.5 30
[R1-GigabitEthernet0/0]int g0/1
[R1-GigabitEthernet0/1]ip address 10.0.0.1 30
[R1-GigabitEthernet0/1]int g0/2
[R1-GigabitEthernet0/2]ip address 10.0.0.14 30
[R1]int LoopBack 0
[R1-LoopBack0]ip address 10.1.1.1 32
[R1]int g5/0
[R1-GigabitEthernet5/0]ip address 202.100.1.1 30
```

R2：

```
[R2]int g0/0
[R2-GigabitEthernet0/0]ip address 10.0.0.9 30
[R2-GigabitEthernet0/0]int g0/2
[R2-GigabitEthernet0/2]ip address 10.0.0.2 30
[R2-GigabitEthernet0/2]int g0/1
[R2-GigabitEthernet0/1]ip address 10.0.0.18 30
[R2]int LoopBack 0
[R2-LoopBack0]ip address 10.1.1.2 32
```

R3：

```
[R3]int g0/0
[R3-GigabitEthernet0/0]ip address 10.0.0.13 30
[R3-GigabitEthernet0/0]int g0/1
[R3-GigabitEthernet0/1]ip address 10.0.0.17 30
[R3-GigabitEthernet0/1]int g0/2
[R3-GigabitEthernet0/2]ip address 192.168.3.254 24
[R3]int LoopBack 0
[R3-LoopBack0]ip address 10.1.1.3 32
```

S1：

```
[S1]vlan 10
[S1-vlan10]vlan 20
[S1-vlan20]vlan 30
[S1-vlan30]vlan 111
[S1-vlan111]qu
[S1]int vlan 10
[S1-Vlan-interface10]ip address 192.168.1.252 24
[S1-Vlan-interface10]int vlan 20
[S1-Vlan-interface20]ip address 192.168.2.252 24
[S1-Vlan-interface20]int vlan 30
[S1-Vlan-interface30]ip address 10.1.2.1 30
```

```
[S1-Vlan-interface30]int vlan 111
[S1-Vlan-interface111]ip address 10.0.0.6 30
[S1-Vlan-interface111]qu
[S1]int LoopBack 0
[S1-LoopBack0]ip address 10.1.1.11 32
```
S2：
```
[S2]vlan 10
[S2-vlan10]vlan 20
[S2-vlan20]vlan 30
[S2-vlan30]vlan 222
[S2-vlan222]qu
[S2]int vlan 10
[S2-Vlan-interface10]ip address 192.168.1.253 24
[S2-Vlan-interface10]int vlan 20
[S2-Vlan-interface20]ip address 192.168.2.253 24
[S2-Vlan-interface20]int vlan 30
[S2-Vlan-interface30]ip address 10.1.2.2 30
[S2-Vlan-interface30]int vlan 222
[S2-Vlan-interface222]ip address 10.0.0.10 30
[S2-Vlan-interface222]qu
[S2]int LoopBack 0
[S2-LoopBack0]ip address 10.1.1.12 32
```
外网：
```
[H3C]int g5/0
[H3C-GigabitEthernet5/0]ip ad
[H3C-GigabitEthernet5/0]ip address 202.100.1.2 30
[H3C]int LoopBack 0
[H3C-LoopBack0]ip address 100.1.1.1 32
```

步骤二：链路聚合配置

S1：
```
[S1]int Bridge-Aggregation 1
[S1-Bridge-Aggregation1]port link-type trunk
[S1-Bridge-Aggregation1]port trunk permit vlan 10 20 30
[S1]int range g1/0/1 g1/0/2
[S1-if-range]port link-type trunk
[S1-if-range]port trunk permit vlan 10 20 30
[S1-if-range]port link-aggregation group 1
```
S2：
```
[S2]int Bridge-Aggregation 1
[S2-Bridge-Aggregation1]port link-type trunk
[S2-Bridge-Aggregation1]port trunk permit vlan 10 20 30
```

```
[S2]int range g1/0/1 g1/0/2
[S2-if-range]port link-type trunk
[S2-if-range]port trunk permit vlan 10 20 30
[S2-if-range]port link-aggregation group 1
```

在设备上查看：

S1：

```
[S1]dis link-aggregation v
[S1]dis link-aggregation verbose
Loadsharing Type: Shar -- Loadsharing, NonS -- Non-Loadsharing
Port Status: S -- Selected, U -- Unselected, I -- Individual
Port: A -- Auto port, M -- Management port, R -- Reference port
Flags:  A -- LACP_Activity, B -- LACP_Timeout, C -- Aggregation,
        D -- Synchronization, E -- Collecting, F -- Distributing,
        G -- Defaulted, H -- Expired

Aggregate Interface: Bridge-Aggregation1
Aggregation Mode: Static
Loadsharing Type: Shar
Management VLANs: None
  Port            Status  Priority Oper-Key
  GE1/0/1(R)      S       32768    1
  GE1/0/2         S       32768    1
```

S2：

```
[S2]dis link-aggregation verbose
Loadsharing Type: Shar -- Loadsharing, NonS -- Non-Loadsharing
Port Status: S -- Selected, U -- Unselected, I -- Individual
Port: A -- Auto port, M -- Management port, R -- Reference port
Flags:  A -- LACP_Activity, B -- LACP_Timeout, C -- Aggregation,
        D -- Synchronization, E -- Collecting, F -- Distributing,
        G -- Defaulted, H -- Expired

Aggregate Interface: Bridge-Aggregation1
Aggregation Mode: Static
Loadsharing Type: Shar
Management VLANs: None
  Port            Status  Priority Oper-Key
  GE1/0/1(R)      S       32768    1
  GE1/0/2         S       32768    1
```

步骤三：配置边缘端口

S3：

```
[S3]int GigabitEthernet 1/0/3
[S3-GigabitEthernet1/0/3]stp edged-port
[S3-GigabitEthernet1/0/3]int g1/0/4
[S3-GigabitEthernet1/0/4]stp edged-port
```

步骤四：配置 MSTP

S1：

```
[S1]stp region-configuration
[S1-mst-region]region-name scyd
[S1-mst-region]instance 1 vlan 10
[S1-mst-region]instance 2 vlan 20
```

```
[S1-mst-region]active region-configuration
[S1-mst-region]qu
[S1]stp instance 1 root primary
[S1]stp instance 2 root secondary
```
S2：
```
[S2]stp region-configuration
[S2-mst-region]region-name scyd
[S2-mst-region]instance 1 vlan 10
[S2-mst-region]instance 2 vlan 20
[S2-mst-region]active region-configuration
[S2-mst-region]qu
[S2]stp instance 1 root secondary
[S2]stp instance 2 root primary
```
S3：
```
[S3]stp region-configuration
[S3-mst-region]region-name scyd
[S3-mst-region]instance 1 vlan 10
[S3-mst-region]instance 2 vlan 20
[S3-mst-region]active region-configuration
```
步骤五：配置 VRRP

S1：
```
[S1]track 1 interface g1/0/4
[S1-track-1]int vlan 10
[S1-Vlan-interface10]vrrp vrid 10 virtual-ip 192.168.1.254
[S1-Vlan-interface10]vrrp vrid 10 priority 120
[S1-Vlan-interface10]vrrp vrid 10 track 1 priority reduced 30
[S1-Vlan-interface10]int vlan 20
[S1-Vlan-interface20]vrrp vrid 20 virtual-ip 192.168.2.254
```
S2：
```
[S2]track 1 interface g1/0/4
[S2-track-1]int vlan 10
[S2-Vlan-interface10]vrrp vrid 10 virtual-ip 192.168.1.254
[S2-Vlan-interface10]int vlan 20
[S2-Vlan-interface20]vrrp vrid 20 virtual-ip 192.168.2.254
[S2-Vlan-interface20]vrrp vrid 20 priority 120
[S2-Vlan-interface20]vrrp vrid 20 track 1 priority reduced 30
```
在设备上查看：

S1：
```
[S1]dis vrrp
IPv4 Virtual Router Information:
 Running mode : Standard
 Total number of virtual routers : 2
 Interface          VRID  State        Running Adver   Auth            Virtual
                                       Pri     Timer   Type               IP
 --------------------------------------------------------------------------------
 Vlan10             10    Master       120     100     Not supported   192.168.1.254
 Vlan20             20    Backup       100     100     Not supported   192.168.2.254
```

S2：

```
[S2]dis vrrp
IPv4 Virtual Router Information:
 Running mode : Standard
 Total number of virtual routers : 2
 Interface         VRID  State        Running Adver   Auth            Virtual
                                      Pri     Timer   Type              IP
 --------------------------------------------------------------------------------
 Vlan10            10    Backup       100     100     Not supported   192.168.1.254
 Vlan20            20    Master       120     100     Not supported   192.168.2.254
```

步骤六：配置 DHCP 服务

S1：

```
[S1]dhcp enable
[S1]dhcp server ip-pool 1
[S1-dhcp-pool-1]gateway-list 192.168.1.252
[S1-dhcp-pool-1]network 192.168.1.0 mask 255.255.255.0
[S1-dhcp-pool-1]dns-list 8.8.8.8
[S1-dhcp-pool-1]qu
[S1]dhcp server ip-pool 2
[S1-dhcp-pool-2]gateway-list 192.168.2.253
[S1-dhcp-pool-2]network 192.168.2.0 mask 255.255.255.0
[S1-dhcp-pool-2]dns-list 8.8.8.8
[S1]int g1/0/3
[S1-GigabitEthernet1/0/3]port link-type trunk
[S1-GigabitEthernet1/0/3]port trunk permit vlan 10 20
```

S2：

```
[S2]int g1/0/3
[S2-GigabitEthernet1/0/3]port link-type trunk
[S2-GigabitEthernet1/0/3]port trunk permit vlan 10 20
```

S3：

```
[S3]vlan 10
[S3-vlan10]vlan 20
[S3-vlan20]qu
[S3]int g1/0/3
[S3-GigabitEthernet1/0/3]port access vlan 10
[S3-GigabitEthernet1/0/3]int g1/0/4
[S3-GigabitEthernet1/0/4]port access vlan 20
[S3-GigabitEthernet1/0/4]qu
[S3]int range g1/0/1 g1/0/2
[S3-if-range]port link-type trunk
[S3-if-range]port trunk permit vlan 10 20
```

DHCP 查看：

PC1：


配置PC_1
接口 状态 IPv4地址 IPv6地址
G0/0/1 UP 192.168.1.1/24
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
IPv6配置：
DHCPv6
静态
IPv6地址：
前缀长度：
IPv6网关：
启用

PC2：

步骤七：配置 OSPF 服务

R1：

```
[R1]ospf 1 router-id 10.1.1.1
[R1-ospf-1]area 0.0.0.0
[R1-ospf-1-area-0.0.0.0]network 10.0.0.1 0.0.0.0
[R1-ospf-1-area-0.0.0.0]network 10.0.0.14 0.0.0.0
[R1-ospf-1-area-0.0.0.0]network 10.1.1.1 0.0.0.0
[R1-ospf-1-area-0.0.0.0]area 0.0.0.1
[R1-ospf-1-area-0.0.0.1]network 10.0.0.5 0.0.0.0
```

R2：

```
[R2]ospf 1 router-id 10.1.1.2
[R2-ospf-1]area 0.0.0.0
[R2-ospf-1-area-0.0.0.0]network 10.0.0.2 0.0.0.0
[R2-ospf-1-area-0.0.0.0]network 10.0.0.18 0.0.0.0
[R2-ospf-1-area-0.0.0.0]network 10.1.1.2 0.0.0.0
[R2-ospf-1-area-0.0.0.0]area 0.0.0.1
[R2-ospf-1-area-0.0.0.1]network 10.0.0.9 0.0.0.0
```

R3：

```
[R3]ospf 1 router-id 10.1.1.3
[R3-ospf-1]silent-interface g0/2
[R3-ospf-1]area 0.0.0.0
[R3-ospf-1-area-0.0.0.0]network 10.0.0.13 0.0.0.0
[R3-ospf-1-area-0.0.0.0]network 10.0.0.17 0.0.0.0
[R3-ospf-1-area-0.0.0.0]network 10.1.1.3 0.0.0.0
[R3-ospf-1-area-0.0.0.0]network 192.168.3.254 0.0.0.0
```

S1：

```
[S1]ospf 1 router-id 10.1.1.11
[S1-ospf-1]silent-interface vlan 10
[S1-ospf-1]silent-interface vlan 20
[S1-ospf-1]area 0.0.0.1
[S1-ospf-1-area-0.0.0.1]network 10.0.0.6 0.0.0.0
[S1-ospf-1-area-0.0.0.1]network 10.1.1.11 0.0.0.0
[S1-ospf-1-area-0.0.0.1]network 10.1.2.1 0.0.0.0
[S1-ospf-1-area-0.0.0.1]network 192.168.1.252 0.0.0.0
[S1-ospf-1-area-0.0.0.1]network 192.168.2.252 0.0.0.0
[S1]int g1/0/4
[S1-GigabitEthernet1/0/4]port access vlan 111
```

S2：

```
[S2]ospf 1 router-id 10.1.1.12
[S2-ospf-1]silent-interface vlan 10
[S2-ospf-1]silent-interface vlan 20
[S2-ospf-1]area 0.0.0.1
[S2-ospf-1-area-0.0.0.1]network 10.0.0.10 0.0.0.0
[S2-ospf-1-area-0.0.0.1]network 10.1.1.12 0.0.0.0
[S2-ospf-1-area-0.0.0.1]network 10.1.2.2 0.0.0.0
[S2-ospf-1-area-0.0.0.1]network 192.168.1.253 0.0.0.0
[S2-ospf-1-area-0.0.0.1]network 192.168.2.253 0.0.0.0
[S1]int g1/0/4
[S1-GigabitEthernet1/0/4]port access vlan 222
```

ospf 邻居验证：

R1：

```
[R2]dis ospf peer

        OSPF Process 1 with Router ID 10.1.1.2
              Neighbor Brief Information

 Area: 0.0.0.0
 Router ID       Address         Pri Dead-Time  State             Interface
 10.1.1.3        10.0.0.17       1   31         Full/DR           GE0/1
 10.1.1.1        10.0.0.1        1   37         Full/BDR          GE0/2

 Area: 0.0.0.1
 Router ID       Address         Pri Dead-Time  State             Interface
 10.1.1.12       10.0.0.10       1   39         Full/BDR          GE0/0
```

R2：

```
[R2]dis ospf peer

        OSPF Process 1 with Router ID 10.1.1.2
              Neighbor Brief Information

 Area: 0.0.0.0
 Router ID       Address         Pri Dead-Time  State             Interface
 10.1.1.3        10.0.0.17       1   31         Full/DR           GE0/1
 10.1.1.1        10.0.0.1        1   37         Full/BDR          GE0/2

 Area: 0.0.0.1
 Router ID       Address         Pri Dead-Time  State             Interface
 10.1.1.12       10.0.0.10       1   39         Full/BDR          GE0/0
```

R3：

```
<R3>sys
System View: return to User View with Ctrl+Z.
[R3]dis ospf peer

        OSPF Process 1 with Router ID 10.1.1.3
              Neighbor Brief Information

 Area: 0.0.0.0
 Router ID       Address         Pri Dead-Time  State             Interface
 10.1.1.1        10.0.0.14       1   31         Full/BDR          GE0/0
 10.1.1.2        10.0.0.18       1   32         Full/BDR          GE0/1
```

S1：

```
[S1-GigabitEthernet1/0/4]qu
[S1]dis ospf peer

        OSPF Process 1 with Router ID 10.1.1.11
              Neighbor Brief Information

 Area: 0.0.0.1
 Router ID       Address         Pri Dead-Time  State             Interface
 10.1.1.12       10.1.2.2        1   37         Full/DR           Vlan30
 10.1.1.1        10.0.0.5        1   33         Full/DR           Vlan111
```

S2：

```
[S2]dis ospf peer

        OSPF Process 1 with Router ID 10.1.1.12
              Neighbor Brief Information

 Area: 0.0.0.1
 Router ID       Address         Pri Dead-Time  State             Interface
 10.1.1.11       10.1.2.1        1   38         Full/BDR          Vlan30
 10.1.1.2        10.0.0.9        1   35         Full/DR           Vlan222
```

配置默认路由引入到 ospf：

R1：

```
[R1]ip route-static 0.0.0.0 0 202.100.1.1
[R1]ospf 1 router-id 10.1.1.1
[R1-ospf-1]default-route-advertise
```

在 S1 上查看是否有外部路由

```
[S1]dis ip routing-table

Destinations : 34       Routes : 35

Destination/Mask    Proto   Pre Cost        NextHop         Interface
0.0.0.0/0           O_ASE2  150 1           10.0.0.5        Vlan111
0.0.0.0/32          Direct  0   0           127.0.0.1       InLoop0
10.0.0.0/30         O_INTER 10  2           10.0.0.5        Vlan111
10.0.0.4/30         Direct  0   0           10.0.0.6        Vlan111
10.0.0.4/32         Direct  0   0           10.0.0.6        Vlan111
10.0.0.6/32         Direct  0   0           127.0.0.1       InLoop0
10.0.0.7/32         Direct  0   0           10.0.0.6        Vlan111
10.0.0.8/30         O_INTRA 10  2           10.1.2.2        Vlan30
10.0.0.12/30        O_INTER 10  2           10.0.0.5        Vlan111
10.0.0.16/30        O_INTER 10  3           10.0.0.5        Vlan111
```

步骤八：Easy ip

R1：

```
[R1]acl basic 2000
[R1-acl-ipv4-basic-2000]rule 0 permit source 192.168.1.0 0.0.0.255
[R1-acl-ipv4-basic-2000]rule 5 permit source 192.168.2.0 0.0.0.255
[R1]int g5/0
[R1-GigabitEthernet5/0]nat outbound 2000
```

步骤九：配置 telnet

R1：

```
[R1]telnet server enable
[R1]local-user telnet class manage
[R1-luser-manage-telnet]password simple dzkd123456
[R1-luser-manage-telnet]service-type telnet
[R1-luser-manage-telnet]authorization-attribute user-role level-15
[R1-luser-manage-telnet]qu
[R1]user-interface vty 0 4
[R1-line-vty0-4]authentication-mode scheme
[R1-line-vty0-4]user-role level-15
[R1-line-vty0-4]qu
[R1]acl basic 2001
[R1-acl-ipv4-basic-2001]rule 0 permit source 192.168.2.0 0.0.0.255
[R1]telnet server acl 2001
```

步骤十：验证测试连通性

pc1 和 pc2 都能通外网，pc3 被禁止

PC1：

```
<H3C>ping -a 192.168.1.1 100.1.1.1
Ping 100.1.1.1 (100.1.1.1) from 192.168.1.1: 56 data bytes, press CTRL_C to break
56 bytes from 100.1.1.1: icmp_seq=0 ttl=253 time=1.967 ms
56 bytes from 100.1.1.1: icmp_seq=1 ttl=253 time=1.499 ms
56 bytes from 100.1.1.1: icmp_seq=2 ttl=253 time=1.750 ms
56 bytes from 100.1.1.1: icmp_seq=3 ttl=253 time=1.383 ms
56 bytes from 100.1.1.1: icmp_seq=4 ttl=253 time=1.836 ms

--- Ping statistics for 100.1.1.1 ---
5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss
round-trip min/avg/max/std-dev = 1.383/1.687/1.967/0.216 ms
<H3C>%Sep 23 12:00:38:281 2024 H3C PING/6/PING_STATISTICS: Ping statistics for 100.1.1.1
: 5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss, round-trip min/avg/ma
x/std-dev = 1.383/1.687/1.967/0.216 ms.
```

PC2：

```
<H3C>ping -a 192.168.2.1 100.1.1.1
Ping 100.1.1.1 (100.1.1.1) from 192.168.2.1: 56 data bytes, press CTRL_C to break
56 bytes from 100.1.1.1: icmp_seq=0 ttl=253 time=2.197 ms
56 bytes from 100.1.1.1: icmp_seq=1 ttl=253 time=2.031 ms
56 bytes from 100.1.1.1: icmp_seq=2 ttl=253 time=2.431 ms
56 bytes from 100.1.1.1: icmp_seq=3 ttl=253 time=1.329 ms
56 bytes from 100.1.1.1: icmp_seq=4 ttl=253 time=1.907 ms

--- Ping statistics for 100.1.1.1 ---
5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss
round-trip min/avg/max/std-dev = 1.329/1.979/2.431/0.369 ms
<H3C>%Sep 23 12:01:03:767 2024 H3C PING/6/PING_STATISTICS: Ping statistics for 100.1.1.1
: 5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss, round-trip min/avg/ma
x/std-dev = 1.329/1.979/2.431/0.369 ms.
```

PC3：

```
<H3C>ping -a 192.168.3.1 100.1.1.1
Ping 100.1.1.1 (100.1.1.1) from 192.168.3.1: 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 100.1.1.1 ---
5 packet(s) transmitted, 0 packet(s) received, 100.0% packet loss
<H3C>%Sep 23 12:01:45:829 2024 H3C PING/6/PING_STATISTICS: Ping statistics for 100.1.1.1
: 5 packet(s) transmitted, 0 packet(s) received, 100.0% packet loss.
```