OSPF 故障处理

前　言

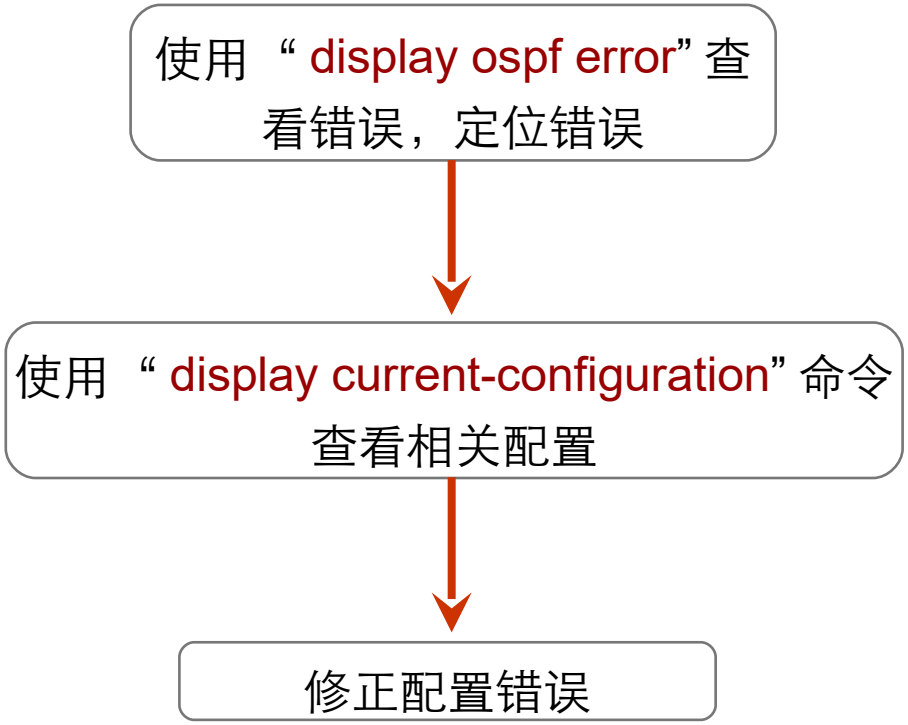
- 本课程介绍 OSPF 常见故障处理。
- 通过处理 OSPF 的常见故障，可以加深对 OSPF 协议原理的理解。

培训目标

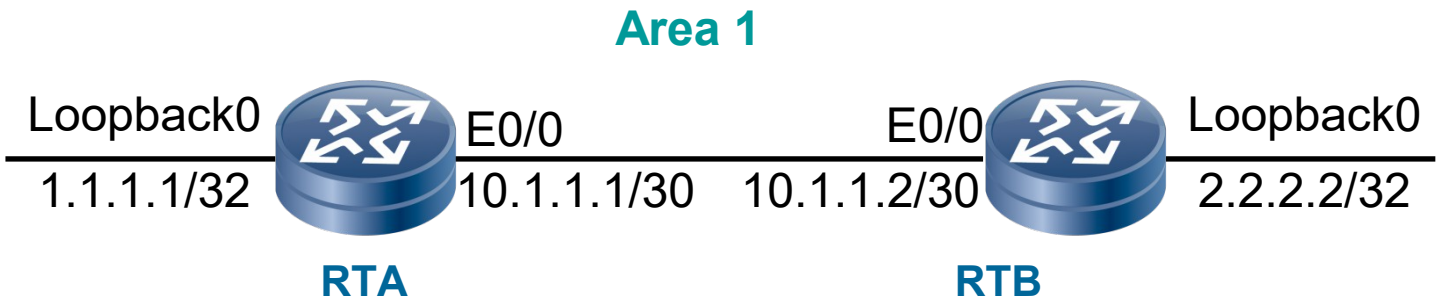
- 学完本课程后，您应该能：
  - 掌握常用 OSPF 故障处理工具的使用
  - 掌握常见 OSPF 故障的处理方法

目　录

检查邻居关系故障的思路



故障描述—缺少区域内路由




```
[RTB]display ip routing-table
 Routing Table: public net
Destination/Mask    Protocol  Pre  Cost        Nexthop         Interface
2.2.2.2/32          DIRECT    0    0           127.0.0.1       InLoopBack0
10.1.1.0/24         DIRECT    0    0           10.1.1.2        Ethernet0/0
10.1.1.2/32         DIRECT    0    0           127.0.0.1       InLoopBack0
127.0.0.0/8         DIRECT    0    0           127.0.0.1       InLoopBack0
127.0.0.1/32        DIRECT    0    0           127.0.0.1       InLoopBack0
```

查看 OSPF 错误信息— Router ID 冲突

```
[RTB]display ospf error
                 OSPF Process 1 with Router ID 1.1.1.1
                   OSPF error statistics:

General packet errors:
 0      : IP: received my own packet      0      : Bad packet
 0      : Bad version                     0      : Bad checksum
 0      : Bad area id                     0      : Drop on unnumbered interface
 0      : Bad virtual link                0      : Bad authentication type
 0      : Bad authentication key          0      : Packet too small
 0      : Packet size > ip length         0      : Transmit error
 0      : Interface down                  0      : Unknown neighbor

HELLO packet errors:
 0      : Netmask mismatch                0      : Hello timer mismatch
 0      : Dead timer mismatch             0      : Extern option mismatch
 24     : Router id confusion             0      : Virtual neighbor unknown
 0      : NBMA neighbor unknown

DD packet errors:
 0      : Neighbor state low              0      : Router id confusion
 0      : Extern option mismatch          0      : Unknown LSA type
 0      : MTU option mismatch
LS ACK packet errors:
 0      : Neighbor state low              0      : Bad ack
---- More ( Press 'Q' to break ) ----
```

查看 OSPF 相关配置

```
[RTA]display current-configuration
#
 sysname RTA
#
 FTP server enable
#
 l2tp domain suffix-separator @
#
 router id 1.1.1.1
#
radius scheme system
```

```
[RTB]display current-configuration
#
 sysname RTB
#
 FTP server enable
#
 l2tp domain suffix-separator @
#
 router id 1.1.1.1
#
radius scheme system
```

查看 OSPF 错误信息— Area ID 不匹配

```
[RTB]display ospf error
                OSPF Process 1 with Router ID 2.2.2.2
                  OSPF error statistics:

General packet errors:
 0      : IP: received my own packet      0      : Bad packet
 0      : Bad version                     0      : Bad checksum
 10     : Bad area id                     0      : Drop on unnumbered interface
 0      : Bad virtual link                0      : Bad authentication type
 0      : Bad authentication key          0      : Packet too small
 0      : Packet size > ip length         0      : Transmit error
 0      : Interface down                  0      : Unknown neighbor

HELLO packet errors:
 0      : Netmask mismatch                0      : Hello timer mismatch
 0      : Dead timer mismatch             0      : Extern option mismatch
 0      : Router id confusion             0      : Virtual neighbor unknown
 0      : NBMA neighbor unknown

DD packet errors:
 0      : Neighbor state low              0      : Router id confusion
 0      : Extern option mismatch          0      : Unknown LSA type
 0      : MTU option mismatch
LS ACK packet errors:
 0      : Neighbor state low              0      : Bad ack
---- More ( Press 'Q' to break ) ----
```

查看 OSPF 相关配置

```
[RTA]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.1
  network 1.1.1.1 0.0.0.0
  network 10.1.1.0 0.0.0.3
#
return
```

```
[RTB]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.2
  network 2.2.2.2 0.0.0.0
  network 10.1.1.0 0.0.0.3
#
return
```

查看 OSPF 错误信息—网络掩码不一致

```
[RTB]display ospf error
                OSPF Process 1 with Router ID 2.2.2.2
                  OSPF error statistics

General packet errors:
 0      : IP: received my own packet      0      : Bad packet
 0      : Bad version                     0      : Bad checksum
 0      : Bad area id                     0      : Drop on unnumbered interface
 0      : Bad virtual link                0      : Bad authentication type
 0      : Bad authentication key          0      : Packet too small
 0      : Packet size > ip length         0      : Transmit error
 0      : Interface down                  0      : Unknown neighbor

HELLO packet errors:
 10     : Netmask mismatch                0      : Hello timer mismatch
 0      : Dead timer mismatch             0      : Extern option mismatch
 0      : Router id confusion             0      : Virtual neighbor unknown
 0      : NBMA neighbor unknown

DD packet errors:
 0      : Neighbor state low              0      : Router id confusion
 0      : Extern option mismatch          0      : Unknown LSA type
 0      : MTU option mismatch
LS ACK packet errors:
 0      : Neighbor state low              0      : Bad ack
 ---- More ( Press 'Q' to break ) ----
```

查看 OSPF 相关配置

```
[RTA]display current-configuration
#
interface Ethernet0/0
 ip address 10.1.1.1 255.255.255.252
#
ospf 1
 area 0.0.0.1
  network 1.1.1.1 0.0.0.0
  network 10.1.1.0 0.0.0.3
#
return
```

```
[RTB]display current-configuration
#
interface Ethernet0/0
 ip address 10.1.1.2 255.255.255.0
#
ospf 1
 area 0.0.0.1
  network 2.2.2.2 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
return
```

查看 OSPF 错误信息—验证类型不一致

```
[RTB]display ospf error
                OSPF Process 1 with Router ID 2.2.2.2
                  OSPF error statistics

General packet errors:
 0      : IP: received my own packet     0      : Bad packet
 0      : Bad version                    0      : Bad checksum
 0      : Bad area id                    0      : Drop on unnumbered interface
 0      : Bad virtual link               2      : Bad authentication type
 0      : Bad authentication key         0      : Packet too small
 0      : Packet size > ip length        0      : Transmit error
 0      : Interface down                 0      : Unknown neighbor

HELLO packet errors:
 0      : Netmask mismatch               0      : Hello timer mismatch
 0      : Dead timer mismatch            0      : Extern option mismatch
 0      : Router id confusion            0      : Virtual neighbor unknown
 0      : NBMA neighbor unknown

DD packet errors:
 0      : Neighbor state low             0      : Router id confusion
 0      : Extern option mismatch         0      : Unknown LSA type
 0      : MTU option mismatch
LS ACK packet errors:
 0      : Neighbor state low             0      : Bad ack
 ---- More ( Press 'Q' to break ) ----
```

查看 OSPF 相关配置

```
[RTA]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.1
  network 1.1.1.1 0.0.0.0
  network 10.1.1.0 0.0.0.3
  authentication-mode md5 1 plain huawei
#
return
```

```
[RTB]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.1
  network 2.2.2.2 0.0.0.0
  network 10.1.1.0 0.0.0.3
  authentication-mode simple plain huawei
#
return
```

查看 OSPF 错误信息—验证密码不一致

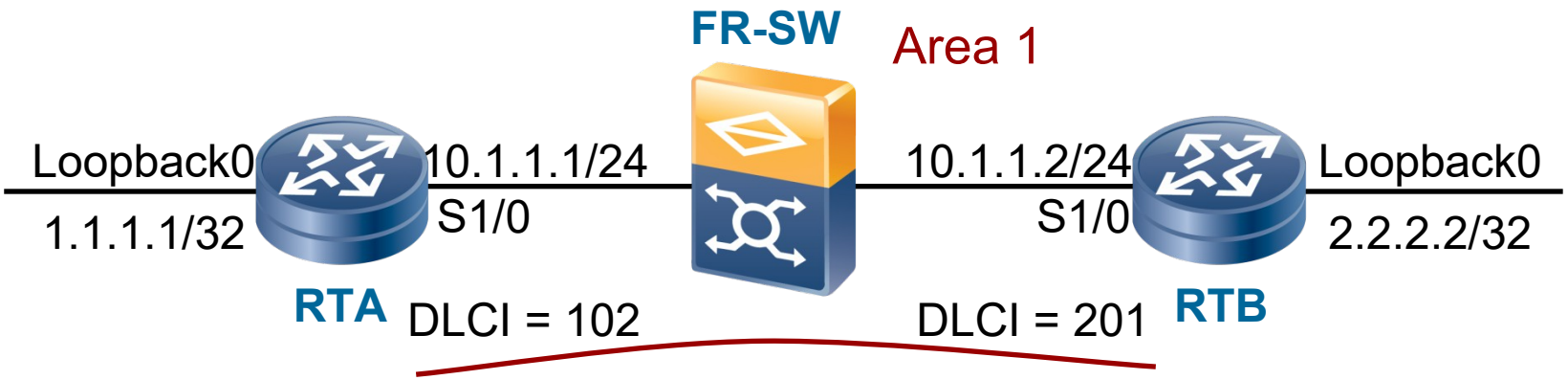
```
[RTB]display ospf error
                 OSPF Process 1 with Router ID 2.2.2.2
                   OSPF error statistics

General packet errors:
 0      : IP: received my own packet      0      : Bad packet
 0      : Bad version                     0      : Bad checksum
 0      : Bad area id                     0      : Drop on unnumbered interface
 0      : Bad virtual link                0      : Bad authentication type
 2      : Bad authentication key          0      : Packet too small
 0      : Packet size > ip length         0      : Transmit error
 0      : Interface down                  0      : Unknown neighbor

HELLO packet errors:
 0      : Netmask mismatch                0      : Hello timer mismatch
 0      : Dead timer mismatch             0      : Extern option mismatch
 0      : Router id confusion             0      : Virtual neighbor unknown
 0      : NBMA neighbor unknown

DD packet errors:
 0      : Neighbor state low              0      : Router id confusion
 0      : Extern option mismatch          0      : Unknown LSA type
 0      : MTU option mismatch
LS ACK packet errors:
 0      : Neighbor state low              0      : Bad ack
 ---- More ( Press 'Q' to break ) ----
```

查看 OSPF 相关配置

```
[RTA]display current-configuration interface Ethernet 0/0
#
interface Ethernet0/0
 ip address 10.1.1.1 255.255.255.252
 ospf authentication-mode simple plain huawei
#
return
```

```
[RTB]display current-configuration interface Ethernet 0/0
#
interface Ethernet0/0
 ip address 10.1.1.2 255.255.255.252
 ospf authentication-mode simple plain hello
#
return
```

故障描述－ NBMA 网络无法学习路由




```
[RTA]display ip routing-table
 Routing Table: public net
Destination/Mask    Protocol  Pre  Cost        Nexthop         Interface
1.1.1.1/32          DIRECT    0    0           127.0.0.1       InLoopBack0
10.1.1.0/24         DIRECT    0    0           10.1.1.1        Serial1/0
10.1.1.1/32         DIRECT    0    0           127.0.0.1       InLoopBack0
10.1.1.2/32         DIRECT    0    0           10.1.1.2        Serial1/0
127.0.0.0/8         DIRECT    0    0           127.0.0.1       InLoopBack0
127.0.0.1/32        DIRECT    0    0           127.0.0.1       InLoopBack0
```

查看 NBMA 静态邻居配置

```
[RTA]display current-configuration configuration ospf
#
ospf 1
 peer 10.1.1.3
 area 0.0.0.1
  network 1.1.1.1 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
return
```

```
[RTB]display current-configuration configuration ospf
#
ospf 1
 peer 10.1.1.3
 area 0.0.0.1
  network 2.2.2.2 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
return
```

邻居关系无法建立原因总结

参数	配置要点
router id	每台 OSPF 路由器的 router id 必须唯一
area id	同一网段的所有端口应当配置在同一区域内
network mask	除了点到点网络之外，同一网段的所有端口应当配置相同的掩码
authentication type	同一区域的验证类型必须一致
authentication data	同一网段的验证码必须一致
extern option	配置 stub 区域或者 NSSA 时，区域内的所有路由器都需要指定 stub 特性或者 NSSA 特性
peer	NBMA 网络上的邻居需要手动指定

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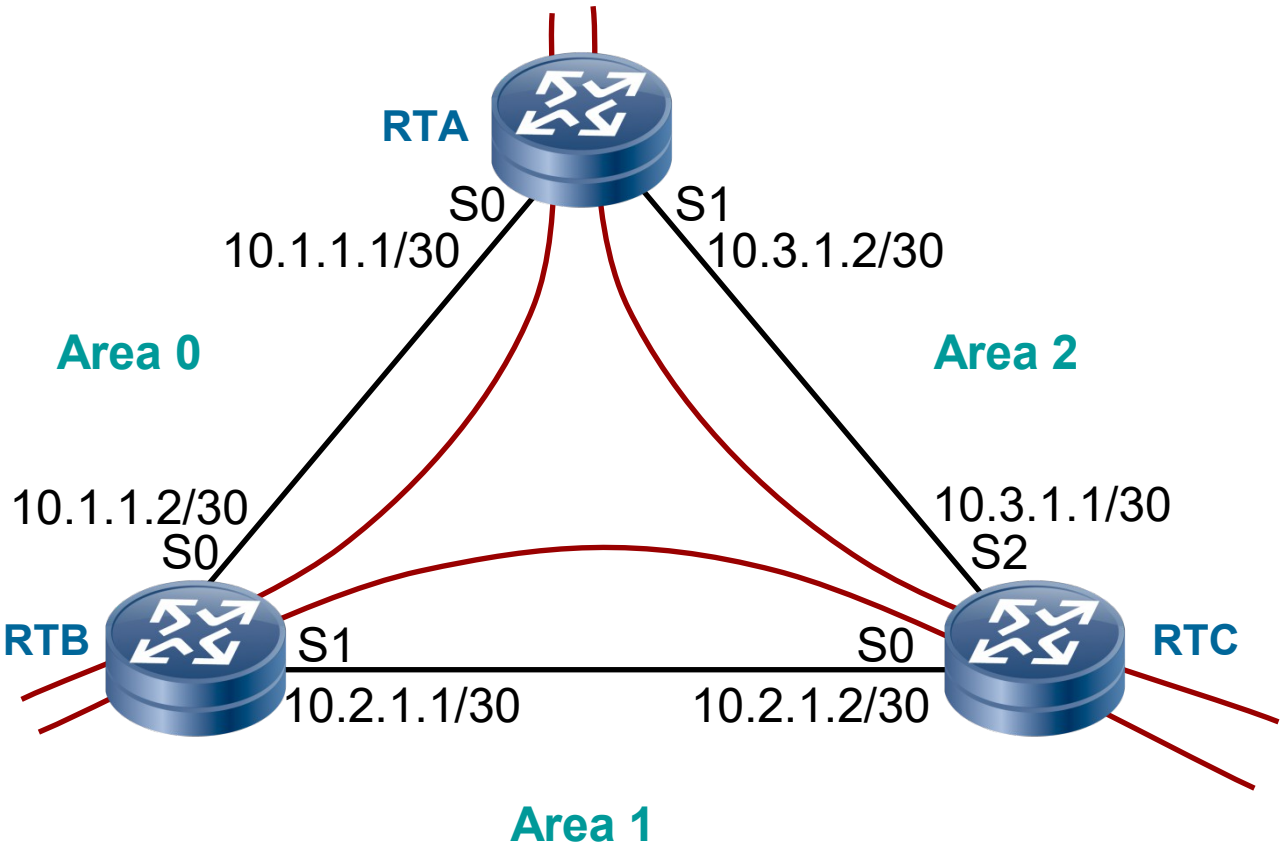
故障描述－区域间路由不正确



故障描述－区域间路由不正确

```
[RTA]display ip routing-table
Routing Tables: Public
Destination/Mask    Proto   Pre  Cost        NextHop         Interface
        10.1.1.0/30  Direct 0    0           10.1.1.1        Serial0
        10.1.1.1/32  Direct 0    0           127.0.0.1       InLoopBack0
        10.1.1.2/32  Direct 0    0           10.1.1.2        Serial0
        10.2.1.0/30  OSPF   10   3124        10.1.1.2        Serial0
        10.3.1.0/30  Direct 0    0           10.3.1.2        Serial1
        10.3.1.1/32  Direct 0    0           10.3.1.1        Serial1
        10.3.1.2/32  Direct 0    0           127.0.0.1       InLoopBack0
```

```
[RTB]display ip routing-table
Routing Tables: Public
Destination/Mask    Proto   Pre  Cost        NextHop         Interface
        10.1.1.0/30  Direct 0    0           10.1.1.2        Serial0
        10.1.1.1/32  Direct 0    0           10.1.1.1        Serial0
        10.1.1.2/32  Direct 0    0           127.0.0.1       InLoopBack0
        10.2.1.0/30  Direct 0    0           10.2.1.1        Serial1
        10.2.1.1/32  Direct 0    0           127.0.0.1       InLoopBack0
        10.2.1.2/32  Direct 0    0           10.2.1.2        Serial1
        10.3.1.0/30  OSPF   10   3124        10.1.1.1        Serial0
```

修改 OSPF 配置

```
[RTB]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.0
  network 10.1.1.0 0.0.0.3
 area 0.0.0.1
  network 10.2.1.0 0.0.0.3
  vlink-peer 3.3.3.3
#
return
```

```
[RTC]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.1
  network 10.2.1.0 0.0.0.3
  vlink-peer 2.2.2.2
 area 0.0.0.2
  network 10.3.1.0 0.0.0.3
#
return
```

查看路由表

```
[RTA]display ip routing-table
Routing Tables: Public
Destination/Mask    Proto   Pre  Cost        NextHop         Interface
        10.1.1.0/30  Direct 0    0           10.1.1.1        Serial0
        10.1.1.1/32  Direct 0    0           127.0.0.1       InLoopBack0
        10.1.1.2/32  Direct 0    0           10.1.1.2        Serial0
        10.2.1.0/30  OSPF   10   3124        10.1.1.2        Serial0
        10.3.1.0/30  Direct 0    0           10.3.1.2        Serial1
        10.3.1.1/32  Direct 0    0           10.3.1.1        Serial1
        10.3.1.2/32  Direct 0    0           127.0.0.1       InLoopBack0
```

```
[RTB]display ip routing-table
Routing Tables: Public
Destination/Mask    Proto   Pre  Cost        NextHop         Interface
        10.1.1.0/30  Direct 0    0           10.1.1.2        Serial0
        10.1.1.1/32  Direct 0    0           10.1.1.1        Serial0
        10.1.1.2/32  Direct 0    0           127.0.0.1       InLoopBack0
        10.2.1.0/30  Direct 0    0           10.2.1.1        Serial1
        10.2.1.1/32  Direct 0    0           127.0.0.1       InLoopBack0
        10.2.1.2/32  Direct 0    0           10.2.1.2        Serial1
        10.3.1.0/30  OSPF   10   3124        10.1.1.1        Serial0
                     OSPF   10   3124        10.2.1.2        Serial1
```

修改 OSPF 配置

```
[RTA]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.0
  network 10.1.1.0 0.0.0.3
 area 0.0.0.2
  network 10.3.1.0 0.0.0.3
  vlink-peer 3.3.3.3
#
return
```

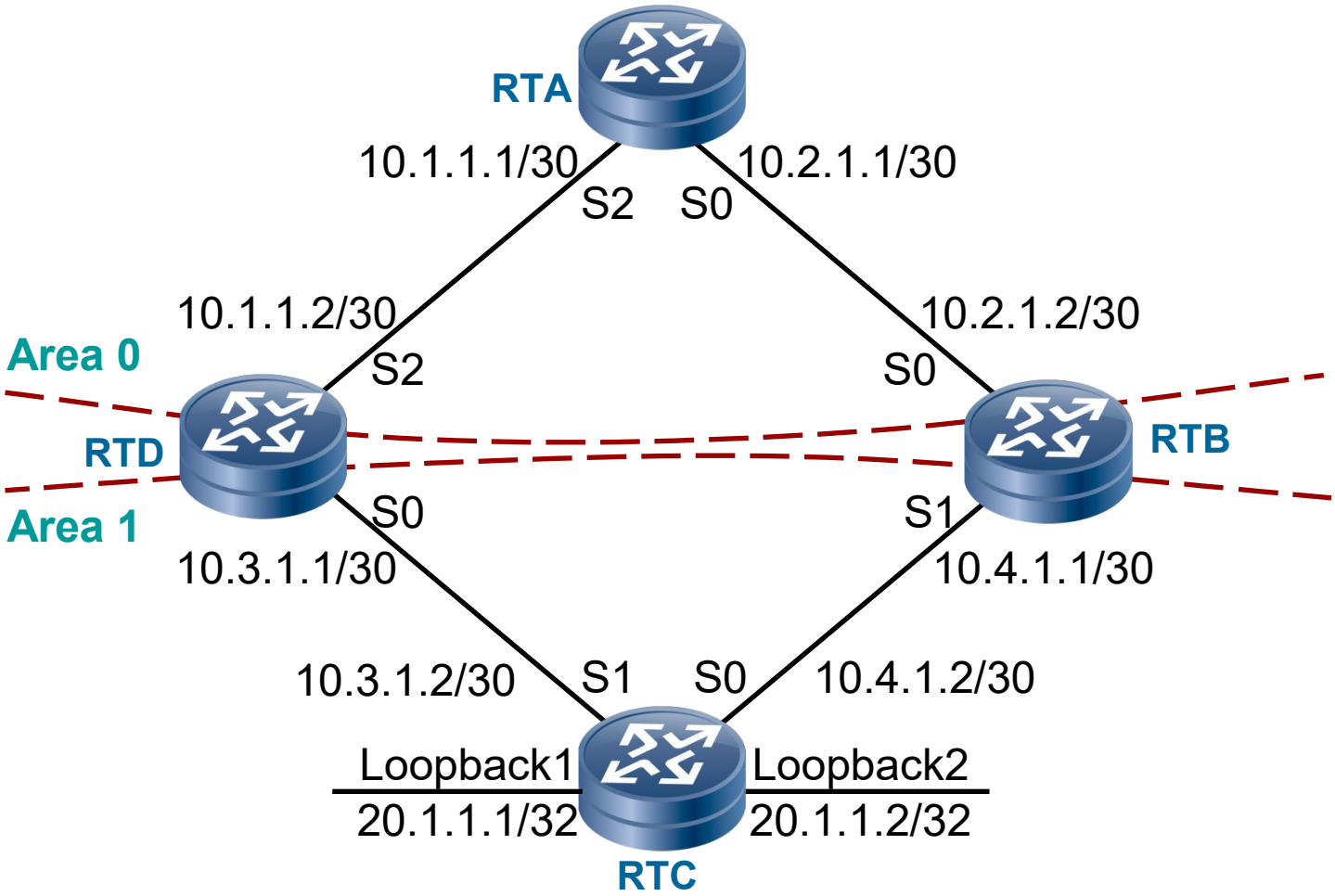
```
[RTC]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.1
  network 10.2.1.0 0.0.0.3
  vlink-peer 2.2.2.2
 area 0.0.0.2
  network 10.3.1.0 0.0.0.3
  vlink-peer 1.1.1.1
#
return
```

查看路由表

```
[RTA]display ip routing-table
Routing Tables: Public
Destination/Mask    Proto   Pre  Cost        NextHop         Interface
        10.1.1.0/30  Direct  0    0           10.1.1.1        Serial0
        10.1.1.1/32  Direct  0    0           127.0.0.1       InLoopBack0
        10.1.1.2/32  Direct  0    0           10.1.1.2        Serial0
        10.2.1.0/30  OSPF    10   3124        10.1.1.2        Serial0
                     OSPF    10   3124        10.3.1.1        Serial1
        10.3.1.0/30  Direct  0    0           10.3.1.2        Serial1
        10.3.1.1/32  Direct  0    0           10.3.1.1        Serial1
        10.3.1.2/32  Direct  0    0           127.0.0.1       InLoopBack0
```

```
[RTB]display ip routing-table
Routing Tables: Public
Destination/Mask    Proto   Pre  Cost        NextHop         Interface
        10.1.1.0/30  Direct  0    0           10.1.1.2        Serial0
        10.1.1.1/32  Direct  0    0           10.1.1.1        Serial0
        10.1.1.2/32  Direct  0    0           127.0.0.1       InLoopBack0
        10.2.1.0/30  Direct  0    0           10.2.1.1        Serial1
        10.2.1.1/32  Direct  0    0           127.0.0.1       InLoopBack0
        10.2.1.2/32  Direct  0    0           10.2.1.2        Serial1
        10.3.1.0/30  OSPF    10   3124        10.1.1.1        Serial0
                     OSPF    10   3124        10.2.1.2        Serial1
```

故障描述－路由汇聚不正确



故障描述—路由汇聚不正确

```
[RTA]display ip routing-table
Routing Tables: Public
         Destinations : 13        Routes : 13

Destination/Mask    Proto   Pre  Cost        NextHop         Interface

        10.1.1.0/30  Direct  0    0           10.1.1.1        Serial2
        10.1.1.1/32  Direct  0    0           127.0.0.1       InLoopBack0
        10.1.1.2/32  Direct  0    0           10.1.1.2        Serial2
        10.2.1.0/30  Direct  0    0           10.2.1.1        Serial0
        10.2.1.1/32  Direct  0    0           127.0.0.1       InLoopBack0
        10.2.1.2/32  Direct  0    0           10.2.1.2        Serial0
        10.3.1.0/30  OSPF    10   3124        10.1.1.2        Serial2
        10.4.1.0/30  OSPF    10   3124        10.2.1.2        Serial0
        20.1.1.0/24  OSPF    10   3125        10.2.1.2        Serial0
        20.1.1.1/32  OSPF    10   3125        10.1.1.2        Serial2
        20.1.1.2/32  OSPF    10   3125        10.1.1.2        Serial2
       127.0.0.0/8   Direct  0    0           127.0.0.1       InLoopBack0
       127.0.0.1/32  Direct  0    0           127.0.0.1       InLoopBack0
```

故障描述—路由汇聚不正确

```
[RTD]display ip routing-table
Routing Tables: Public
         Destinations : 13        Routes : 13

Destination/Mask    Proto   Pre  Cost        NextHop         Interface
        10.1.1.0/30  Direct  0    0           10.1.1.2        Serial2
        10.1.1.1/32  Direct  0    0           10.1.1.1        Serial2
        10.1.1.2/32  Direct  0    0           127.0.0.1       InLoopBack0
        10.2.1.0/30  OSPF    10   3124        10.1.1.1        Serial2
        10.3.1.0/30  Direct  0    0           10.3.1.1        Serial0
        10.3.1.1/32  Direct  0    0           127.0.0.1       InLoopBack0
        10.3.1.2/32  Direct  0    0           10.3.1.2        Serial0
        10.4.1.0/30  OSPF    10   3124        10.3.1.2        Serial0
        20.1.1.0/24  OSPF    10   4687        10.1.1.1        Serial2
        20.1.1.1/32  OSPF    10   1563        10.3.1.2        Serial0
        20.1.1.2/32  OSPF    10   1563        10.3.1.2        Serial0
       127.0.0.0/8   Direct  0    0           127.0.0.1       InLoopBack0
       127.0.0.1/32  Direct  0    0           127.0.0.1       InLoopBack0
```

故障描述—路由汇聚不正确

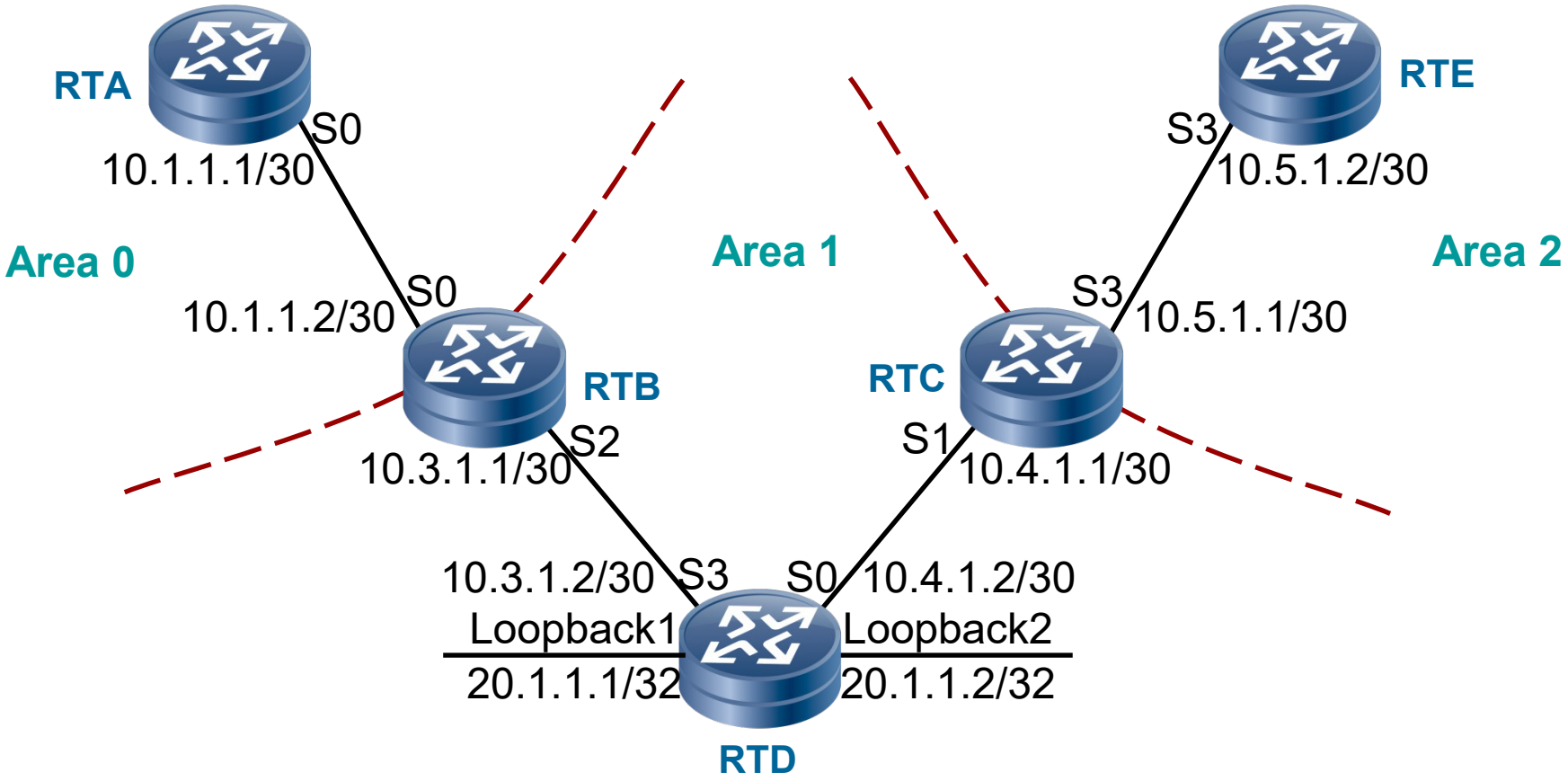
```
[RTC]display ip routing-table
Routing Tables: Public
         Destinations : 13        Routes : 13

Destination/Mask    Proto   Pre  Cost        NextHop         Interface
        10.1.1.0/30  OSPF    10   3124        10.3.1.1        Serial1
        10.2.1.0/30  OSPF    10   3124        10.4.1.1        Serial0
        10.3.1.0/30  Direct  0    0           10.3.1.2        Serial1
        10.3.1.1/32  Direct  0    0           10.3.1.1        Serial1
        10.3.1.2/32  Direct  0    0           127.0.0.1       InLoopBack0
        10.4.1.0/30  Direct  0    0           10.4.1.2        Serial0
        10.4.1.1/32  Direct  0    0           10.4.1.1        Serial0
        10.4.1.2/32  Direct  0    0           127.0.0.1       InLoopBack0
        20.1.1.0/24  OSPF    10   6249        10.3.1.1        Serial1
        20.1.1.1/32  Direct  0    0           127.0.0.1       InLoopBack0
        20.1.1.2/32  Direct  0    0           127.0.0.1       InLoopBack0
       127.0.0.0/8   Direct  0    0           127.0.0.1       InLoopBack0
       127.0.0.1/32  Direct  0    0           127.0.0.1       InLoopBack0
```

查看路由汇聚相关配置

```
[RTB]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.0
  network 10.2.1.0 0.0.0.3
 area 0.0.0.1
  abr-summary 20.1.1.0 255.255.255.0
  network 10.4.1.0 0.0.0.3
#
return
```

```
[RTD]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.0
  network 10.1.1.0 0.0.0.3
 area 0.0.0.1
  network 10.3.1.0 0.0.0.3
#
return
```

故障描述－路由汇聚不正确



故障描述－路由汇聚不正确

```
[RTA]display ip routing-table protocol ospf
Public Routing Table : OSPF
Destination/Mask    Proto   Pre  Cost      NextHop         Interface
        10.3.1.0/30 OSPF    10   3124      10.1.1.2        Serial0
        10.4.1.0/30 OSPF    10   4686      10.1.1.2        Serial0
        10.5.1.0/30 OSPF    10   6248      10.1.1.2        Serial0
        20.1.1.0/24 OSPF    10   3125      10.1.1.2        Serial0
        20.1.1.1/32 OSPF    10   6249      10.1.1.2        Serial0
        20.1.1.2/32 OSPF    10   6249      10.1.1.2        Serial0
```

```
[RTE]display ip routing-table protocol ospf
Public Routing Table : OSPF
Destination/Mask    Proto   Pre  Cost      NextHop         Interface
        10.1.1.0/30 OSPF    10   6248      10.5.1.1        Serial3
        10.3.1.0/30 OSPF    10   4686      10.5.1.1        Serial3
        10.4.1.0/30 OSPF    10   3124      10.5.1.1        Serial3
        20.1.1.1/32 OSPF    10   3125      10.5.1.1        Serial3
        20.1.1.2/32 OSPF    10   3125      10.5.1.1        Serial3
```

查看 OSPF 相关配置

```
[RTB]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.0
  network 10.1.1.0 0.0.0.3
 area 0.0.0.1
  abr-summary 20.1.1.0 255.255.255.0
  network 10.3.1.0 0.0.0.3
  vlink-peer 3.3.3.3
#
return
```

```
[RTC]display current-configuration configuration ospf
#
ospf 1
 area 0.0.0.1
  network 10.4.1.0 0.0.0.3
  vlink-peer 2.2.2.2
 area 0.0.0.2
  network 10.5.1.0 0.0.0.3
#
return
```

查看 RTC 的 LSDB － Area 0

```
[RTC]display ospf lsdb

         OSPF Process 1 with Router ID 3.3.3.3
                 Link State Database

                         Area: 0.0.0.0
Type       LinkState ID     AdvRouter        Age  Len   Sequence   Metric
Router     3.3.3.3          3.3.3.3          408  36    8000000A    3124
Router     2.2.2.2          2.2.2.2          413  60    8000001A    1562
Router     1.1.1.1          1.1.1.1          231  48    8000000C    1562
Sum-Net    10.3.1.0         2.2.2.2          409  28    8000000A    1562
Sum-Net    10.3.1.0         3.3.3.3          408  28    8000000B    3124
Sum-Net    10.4.1.0         2.2.2.2          409  28    8000000A    3124
Sum-Net    10.4.1.0         3.3.3.3          408  28    8000000B    1562
Sum-Net    20.1.1.1         3.3.3.3          408  28    8000000B    1563
Sum-Net    20.1.1.0         2.2.2.2         1658  28    80000001    1563
Sum-Net    20.1.1.2         3.3.3.3          408  28    8000000B    1563
Sum-Net    10.5.1.0         3.3.3.3          393  28    80000006    1562
```

查看 RTC 的 LSDB — Area 1 和 Area 2

```
[RTC]display ospf lsdb
         OSPF Process 1 with Router ID 3.3.3.3
                 Link State Database

                         Area: 0.0.0.1
 Type       LinkState ID    AdvRouter        Age  Len   Sequence   Metric
 Router     4.4.4.4         4.4.4.4          387  96    8000001C    1562
 Router     3.3.3.3         3.3.3.3          413  48    80000018    1562
 Router     2.2.2.2         2.2.2.2          414  48    80000014    1562
 Sum-Net    10.5.1.0        3.3.3.3          395  28    80000006    1562
 Sum-Net    10.1.1.0        2.2.2.2          425  28    8000000A    1562

                         Area: 0.0.0.2
 Type       LinkState ID    AdvRouter        Age  Len   Sequence   Metric
 Router     5.5.5.5         5.5.5.5          367  48    8000000B    1562
 Router     3.3.3.3         3.3.3.3          371  48    80000007    1562
 Sum-Net    10.3.1.0        3.3.3.3          395  28    80000006    3124
 Sum-Net    10.4.1.0        3.3.3.3          395  28    80000006    1562
 Sum-Net    20.1.1.1        3.3.3.3          395  28    80000006    1563
 Sum-Net    20.1.1.2        3.3.3.3          395  28    80000006    1563
 Sum-Net    10.1.1.0        3.3.3.3          395  28    80000006    4686
```

问　题

- 导致 OSPF 邻居关系不能建立的原因通常有哪些?
- ABR 一定要连接到骨干区域吗?
- 路由汇聚一定要在所有 ABR 上配置吗?