厦門大學

信息学院软件工程系

《计算机网络》实验报告

题　　目 实验 8 9　IPv6 路由技术 IPv6 交换技术

班　　级 数字媒体技术 2022 级 1 班

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填写说明

1、本文件为 Word 模板文件，建议使用 Microsoft Word 2021 打开，在可填写的区域中如实填写；

2、填表时勿改变字体字号，保持排版工整，打印为 PDF 文件提交；

3、文件总大小尽量控制在 1MB 以下，最大勿超过 5MB；

4、应将材料清单上传在代码托管平台上；

5、在实验课结束 14 天内，按原文件发送至课程 FTP 指定位置。

1 实验目的

一、IPv6 路由技术

1. IPv6 静态路由基础实验

1）掌握路由器的 IPv6 基础配置。

2）掌握静态 IPv6 路由的基础配置。

3）理解 IPv6 数据报文的路由过程

2. OSPFv3 基础实验（单区域）

1）掌握路由器的 IPv6 基础配置。

2）掌握 OSPFv3（单区域）的基础配置。

3. OSPFv3 基础实验（多区域）

1）掌握路由器的 IPv6 基础配置。

2）掌握 OSPFv3（多区域）的基础配置。

3）掌握 OSPFv3 默认路由的通告行为及相关配置。

二、IPv6 交换技术

1. IPv6 以太网二层交换基础实验

1）掌握 VLAN 的基础配置。

2）掌握 Trunk 的基础配置

2. IPv6 以太网多层交换实验

1）掌握 VLAN 的基础配置。

2）掌握 Trunk 的基础配置。

3）掌握 VLANIF 的基础配置，并理解通过三层交换机实现 VLAN 之间通信的方案

2 实验环境

操作系统：Win11 平台：华为 eNSP

3 实验结果

8.1 IPv6 静态路由基础实验

1. 完成 R1、 R2 及 R3 的基础配置

```
[R1]ipv6
[R1]int G0/0/0
[R1-GigabitEthernet0/0/0]ipv6 en
[R1-GigabitEthernet0/0/0]ipv6 enable
[R1-GigabitEthernet0/0/0]ipv6 addr fc00:12::1 64
[R1-GigabitEthernet0/0/0]q
```

```
[R2]ipv6
[R2]int G0/0/0
[R2-GigabitEthernet0/0/0]ipv6 en
[R2-GigabitEthernet0/0/0]ipv6 enable
[R2-GigabitEthernet0/0/0]ipv6 addr fc00:12::2 64
[R2-GigabitEthernet0/0/0]q
[R2]int
Nov 10 2024 16:57:30-08:00 R2 IPV6/2/IF_IPV6CHANGE:
96.16777216.33554432.16777216.922746880.33554432.0.
v6 Interface changed. (IfIndex=50331648, IfDescr=HU
net0/0/0 Interface, IfOperStatus=16777216, IfAdminS
[R2]int
Nov 10 2024 16:57:30-08:00 R2 %%01IFNET/4/LINK_STAT
6 on the interface GigabitEthernet0/0/0 has entered
[R2]int G0/0/1
[R2-GigabitEthernet0/0/1]ipv6 en
[R2-GigabitEthernet0/0/1]ipv6 enable
[R2-GigabitEthernet0/0/1]ipv6 addr fc00:23::2 64
[R2-GigabitEthernet0/0/1]q
[R2]
```

```
[Huawei]sysname R3
[R3]ipv6
[R3]int G0/0/0
[R3-GigabitEthernet0/0/0]ipv6 en
[R3-GigabitEthernet0/0/0]ipv6 enable
[R3-GigabitEthernet0/0/0]ipv6 addr fc00:23::3 64
[R3-GigabitEthernet0/0/0]q
[R3]
```

2. 在 R1、 R2 及 R3 上完成配置，使得这三台路由器之间能够相互通信

R1 路由表中不存在到 FC00:23::3 的路由，所以 PC1 ping 不通 PC2

```
<R1>display ipv6 routing-table
Routing Table : Public
      Destinations : 4  Routes : 4

 Destination  : ::1                             PrefixLength : 128
 NextHop      : ::1                             Preference   : 0
 Cost         : 0                               Protocol     : Direct
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : InLoopBack0                     Flags        : D

 Destination  : FC00:12::                       PrefixLength : 64
 NextHop      : FC00:12::1                      Preference   : 0
 Cost         : 0                               Protocol     : Direct
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0            Flags        : D

 Destination  : FC00:12::1                      PrefixLength : 128
 NextHop      : ::1                             Preference   : 0
 Cost         : 0                               Protocol     : Direct
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0            Flags        : D

 Destination  : FE80::                          PrefixLength : 10
 NextHop      : ::                              Preference   : 0
 Cost         : 0                               Protocol     : Direct
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : NULL0                           Flags        : D
```

手动添加路由后，可以看到有了对应的路由

```
[R1]ipv6 route-static FC00:23:: 64 fc00:12::2
[R1]display ipv6 rout
[R1]display ipv6 routing-table
Routing Table : Public
      Destinations : 5  Routes : 5

 Destination  : ::1                             PrefixLength : 128
 NextHop      : ::1                             Preference   : 0
 Cost         : 0                               Protocol     : Direct
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : InLoopBack0                     Flags        : D

 Destination  : FC00:12::                       PrefixLength : 64
 NextHop      : FC00:12::1                      Preference   : 0
 Cost         : 0                               Protocol     : Direct
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0            Flags        : D

 Destination  : FC00:12::1                      PrefixLength : 128
 NextHop      : ::1                             Preference   : 0
 Cost         : 0                               Protocol     : Direct
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0            Flags        : D

 Destination  : FC00:23::                       PrefixLength : 64
 NextHop      : FC00:12::2                      Preference   : 60
 Cost         : 0                               Protocol     : Static
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0            Flags        : RD

 Destination  : FE80::                          PrefixLength : 10
 NextHop      : ::                              Preference   : 0
 Cost         : 0                               Protocol     : Direct
 RelayNextHop : ::                              TunnelID     : 0x0
 Interface    : NULL0                           Flags        : D
```

但这时只连通了 R1 到 R3 的路由，R3 无法对 ping 报文做出回应，还要手动添加 R3 的路由表

```
[R3]ipv6 route-static fc00:12:: 64 fc00:23::2
```

这次便可以了

```
[R1]ping ipv6 fc00:23::3
  PING fc00:23::3 : 56  data bytes, press CTRL_C to break
    Request time out
    Reply from FC00:23::3
    bytes=56 Sequence=2 hop limit=63  time = 80 ms
    Reply from FC00:23::3
    bytes=56 Sequence=3 hop limit=63  time = 50 ms
    Reply from FC00:23::3
    bytes=56 Sequence=4 hop limit=63  time = 50 ms
    Reply from FC00:23::3
    bytes=56 Sequence=5 hop limit=63  time = 30 ms

  --- fc00:23::3 ping statistics ---
    5 packet(s) transmitted
    4 packet(s) received
    20.00% packet loss
    round-trip min/avg/max = 30/52/80 ms

[R1]
```

3. 在 R1、 R2、 R3、 PC1 及 PC2 上完成配置， 使得 PC1 与 PC2 所在网段能够相互通信

```
[R1]int G0/0/1
[R1-GigabitEthernet0/0/1]ipv6 en
[R1-GigabitEthernet0/0/1]ipv6 enable
[R1-GigabitEthernet0/0/1]ipv6 addr fc00:1::ffff 64
[R1-GigabitEthernet0/0/1]q
```

```
[R3]int g0/0/1
[R3-GigabitEthernet0/0/1]ipv6 en
[R3-GigabitEthernet0/0/1]ipv6 addr fc00:2::ffff 64
[R3-GigabitEthernet0/0/1]q
```

这时 PC1 还 ping 不通 PC2，是因为 R1 没有到 PC2 的路由

```
PC>ping fc00:2::1 -6

Ping fc00:2::1: 32 data bytes, Press Ctrl_C to break
Request timeout!
Request timeout!
Request timeout!
Request timeout!
Request timeout!

--- fc00:2::1 ping statistics ---
  5 packet(s) transmitted
  0 packet(s) received
  100.00% packet loss
```

进行配置

```
[R1]ipv6 route-static fc00:2:: 64 fc00:12::2
```

```
[R2]ipv6 route-static fc00:1:: 64 fc00:12::1
[R2]ipv6 route-static fc00:2:: 64 fc00:23::3
```

```
[R3]ipv6 route-static fc00:1:: 64 fc00:23::2
```

这次就可以 ping 通了

```
PC>ping fc00:2::1 -6

Ping fc00:2::1: 32 data bytes, Press Ctrl_C to break
Request timeout!
From fc00:2::1: bytes=32 seq=2 hop limit=252 time=78 ms
From fc00:2::1: bytes=32 seq=3 hop limit=252 time=16 ms
From fc00:2::1: bytes=32 seq=4 hop limit=252 time=31 ms
From fc00:2::1: bytes=32 seq=5 hop limit=252 time=31 ms

--- fc00:2::1 ping statistics ---
  5 packet(s) transmitted
  4 packet(s) received
  20.00% packet loss
  round-trip min/avg/max = 0/39/78 ms
```

8.2 OSPFv3 基础实验（单区域）

1. 完成 R1、 R2 及 R3 的基础配置

```
[R1]ipv6
[R1]int G0/0/0
[R1-GigabitEthernet0/0/0]ipv6 en
[R1-GigabitEthernet0/0/0]ipv6 addr fc00:12::1 64
[R1-GigabitEthernet0/0/0]ipv
Nov 10 2024 17:24:55-08:00 R1 IPV6/2/IF_IPV6CHANGE:
96.16777216.33554432.16777216.922746880.33554432.0.
v6 Interface changed. (IfIndex=50331648, IfDescr=HU
net0/0/0 Interface, IfOperStatus=16777216, IfAdmin
[R1-GigabitEthernet0/0/0]ipv
Nov 10 2024 17:24:55-08:00 R1 %%01IFNET/4/LINK_STA
6 on the interface GigabitEthernet0/0/0 has entere
[R1-GigabitEthernet0/0/0]q
[R1]int g0/0/1
[R1-GigabitEthernet0/0/1]ipv6 en
[R1-GigabitEthernet0/0/1]ipv6 addr fc00:1;:ffff 64
                                                  ^
Error: Wrong parameter found at '^' position.
[R1-GigabitEthernet0/0/1]q
[R1]q
```

```
[R2]ipv6
[R2]int g0/0/0
[R2-GigabitEthernet0/0/0]ipv6 en
[R2-GigabitEthernet0/0/0]ipv6 addr fc00:12::2 64
[R2-GigabitEthernet0/0/0]q
[R2]
Nov 10 2024 17:27:28-08:00 R2 IPV6/2/IF_IPV6CHANG
96.16777216.33554432.16777216.922746880.33554432.
v6 Interface changed. (IfIndex=50331648, IfDescr=
net0/0/0 Interface, IfOperStatus=16777216, IfAdmi
[R2]in
Nov 10 2024 17:27:28-08:00 R2 %%01IFNET/4/LINK_ST
6 on the interface GigabitEthernet0/0/0 has enter
[R2]int g0/0/1
[R2-GigabitEthernet0/0/1]ipv6 en
[R2-GigabitEthernet0/0/1]ipv6 addr
                                  ^
Error:Incomplete command found at '^' position.
[R2-GigabitEthernet0/0/1]ipv6 addr fc00:23::2 64
```

```
[R3]ipv6
[R3]int g0/0/0
[R3-GigabitEthernet0/0/0]ipv6 en
[R3-GigabitEthernet0/0/0]ipv6 addr fc00:23::3 64
[R3-GigabitEthernet0/0/0]
Nov 10 2024 17:28:53-08:00 R3 IPV6/2/IF_IPV6CHANGE:
96.16777216.33554432.16777216.922746880.33554432.0.
v6 Interface changed. (IfIndex=50331648, IfDescr=HU
net0/0/0 Interface, IfOperStatus=16777216, IfAdmin
[R3-GigabitEthernet0/0/0]
Nov 10 2024 17:28:53-08:00 R3 %%01IFNET/4/LINK_STA
6 on the interface GigabitEthernet0/0/0 has entere
[R3-GigabitEthernet0/0/0]q
[R3]int g0/0/1
[R3-GigabitEthernet0/0/1]ipv6 en
[R3-GigabitEthernet0/0/1]ipv6 addr fc00:2::ffff 64
[R3-GigabitEthernet0/0/1]q
```

2. 在 R1、 R2 及 R3 上完成 OSPFv3 配置

```
[R1]ospfv3 1
[R1-ospfv3-1]router-i
[R1-ospfv3-1]router-id 1.1.1.1
[R1-ospfv3-1]q
[R1]int g0/0/0
[R1-GigabitEthernet0/0/0]os
[R1-GigabitEthernet0/0/0]ospf
[R1-GigabitEthernet0/0/0]ospfv3 1 a
[R1-GigabitEthernet0/0/0]ospfv3 1 area 0
[R1-GigabitEthernet0/0/0]q
[R1]int g0/0/1
[R1-GigabitEthernet0/0/1]osp
[R1-GigabitEthernet0/0/1]ospf
[R1-GigabitEthernet0/0/1]ospfv3 1 ar
[R1-GigabitEthernet0/0/1]ospfv3 1 area 0
```

```
[R2]ospfv3 1
[R2-ospfv3-1]router
[R2-ospfv3-1]router-id 2.2.2.2
[R2-ospfv3-1]q
[R2]int g0/0/0
[R2-GigabitEthernet0/0/0]os
[R2-GigabitEthernet0/0/0]ospf
[R2-GigabitEthernet0/0/0]ospfv3 1 a
[R2-GigabitEthernet0/0/0]ospfv3 1 area 0
[R2-GigabitEthernet0/0/0]q
[R2]int g0/0/1
[R2-GigabitEthernet0/0/1]os
[R2-GigabitEthernet0/0/1]ospf
[R2-GigabitEthernet0/0/1]ospfv3 1 a
[R2-GigabitEthernet0/0/1]ospfv3 1 area 0
```

```
[R3]ospfv3 1
[R3-ospfv3-1]router
[R3-ospfv3-1]router-id 3.3.3.3
[R3-ospfv3-1]q
[R3]int g0/0/0
[R3-GigabitEthernet0/0/0]osp
[R3-GigabitEthernet0/0/0]ospf
[R3-GigabitEthernet0/0/0]ospfv3 1 a
[R3-GigabitEthernet0/0/0]ospfv3 1 area 0
[R3-GigabitEthernet0/0/0]q
[R3]int g0/0/1
[R3-GigabitEthernet0/0/1]os
[R3-GigabitEthernet0/0/1]ospf
[R3-GigabitEthernet0/0/1]ospfv3 1 a
[R3-GigabitEthernet0/0/1]ospfv3 1 area 0
```

R1 的路由表中出现了对应的路由

```
<R1>display ipv6 routing-table
Routing Table : Public
      Destinations : 6  Routes : 6

 Destination  : ::1                              PrefixLength : 128
 NextHop      : ::1                              Preference   : 0
 Cost         : 0                                Protocol     : Direct
 RelayNextHop : ::                               TunnelID     : 0x0
 Interface    : InLoopBack0                      Flags        : D

 Destination  : FC00:2::                         PrefixLength : 64
 NextHop      : FE80::2E0:FCFF:FE42:7DFA         Preference   : 10
 Cost         : 3                                Protocol     : OSPFv3
 RelayNextHop : ::                               TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0             Flags        : D

 Destination  : FC00:12::                        PrefixLength : 64
 NextHop      : FC00:12::1                       Preference   : 0
 Cost         : 0                                Protocol     : Direct
 RelayNextHop : ::                               TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0             Flags        : D

 Destination  : FC00:12::1                       PrefixLength : 128
 NextHop      : ::1                              Preference   : 0
 Cost         : 0                                Protocol     : Direct
 RelayNextHop : ::                               TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0             Flags        : D

 Destination  : FC00:23::                        PrefixLength : 64
 NextHop      : FE80::2E0:FCFF:FE42:7DFA         Preference   : 10
 Cost         : 2                                Protocol     : OSPFv3
 RelayNextHop : ::                               TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0             Flags        : D

 Destination  : FE80::                           PrefixLength : 10
 NextHop      : ::                               Preference   : 0
 Cost         : 0                                Protocol     : Direct
 RelayNextHop : ::                               TunnelID     : 0x0
 Interface    : NULL0                            Flags        : D
```

3. PC1 及 PC2 上完成配置，测试网络连通性

完美

```
PC>ping fc00:2::1 -6

Ping fc00:2::1: 32 data bytes, Press Ctrl_C to break
From fc00:2::1: bytes=32 seq=1 hop limit=252 time=16 ms
From fc00:2::1: bytes=32 seq=2 hop limit=252 time=31 ms
From fc00:2::1: bytes=32 seq=3 hop limit=252 time=31 ms
From fc00:2::1: bytes=32 seq=4 hop limit=252 time=16 ms
From fc00:2::1: bytes=32 seq=5 hop limit=252 time=15 ms

--- fc00:2::1 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 15/21/31 ms
```

8.3 OSPFv3 基础实验（多区域）

1. 完成 R1~R6 的 IPv6 接口配置

```
[R1]ipv6
[R1]int g0/0/0
[R1-GigabitEthernet0/0/0]ipv6 en
[R1-GigabitEthernet0/0/0]ipv6 addr fc00:12::1 64
[R1-GigabitEthernet0/0/0]q
[R1]int g0
Nov 10 2024 17:55:45-08:00 R1 IPV6/2/IF_IPV6CHANGE
96.16777216.33554432.16777216.922746880.33554432.0
v6 Interface changed. (IfIndex=50331648, IfDescr=HU
net0/0/0 Interface, IfOperStatus=16777216, IfAdmin
[R1]int g0
Nov 10 2024 17:55:45-08:00 R1 %%01IFNET/4/LINK_STA
6 on the interface GigabitEthernet0/0/0 has entere
[R1]int g0/0/1
[R1-GigabitEthernet0/0/1]ipv6 en
[R1-GigabitEthernet0/0/1]ipv6 addr fc00:14::1 64
[R1-GigabitEthernet0/0/1]q
```

```
[R2]ipv6
[R2]int g0/0/0
[R2-GigabitEthernet0/0/0]ipv6 en
[R2-GigabitEthernet0/0/0]ipv6 addr fc00:12::2 64
[R2-GigabitEthernet0/0/0]q
[R2]int g0
Nov 10 2024 17:56:44-08:00 R2 IPV6/2/IF_IPV6CHANGE
96.16777216.33554432.16777216.922746880.33554432.0
v6 Interface changed. (IfIndex=50331648, IfDescr=H
net0/0/0 Interface, IfOperStatus=16777216, IfAdmin
[R2]int g0
Nov 10 2024 17:56:44-08:00 R2 %%01IFNET/4/LINK_STA
6 on the interface GigabitEthernet0/0/0 has entere
[R2]int g0/0/1
[R2-GigabitEthernet0/0/1]ipv6 en
[R2-GigabitEthernet0/0/1]ipv6 addr fc00:23::2 64
[R2-GigabitEthernet0/0/1]q
[R2]int
[R2]interface
Nov 10 2024 17:56:58-08:00 R2 IPV6/2/IF_IPV6CHANGE
96.16777216.33554432.16777216.922746880.33554432.0
v6 Interface changed. (IfIndex=67108864, IfDescr=H
net0/0/1 Interface, IfOperStatus=16777216, IfAdmin
[R2]interface
Nov 10 2024 17:56:58-08:00 R2 %%01IFNET/4/LINK_STA
6 on the interface GigabitEthernet0/0/1 has entere
[R2]interface loo
[R2]interface LoopBack 0
[R2-LoopBack0]ipv6 en
[R2-LoopBack0]ipv6 enable
[R2-LoopBack0]ipv6 addr fc00:2::2 128
[R2-LoopBack0]q
```

```
[R3]ipv6
[R3]int g0/0/0
[R3-GigabitEthernet0/0/0]ipv6 en
[R3-GigabitEthernet0/0/0]ipv6 addr fc00:23::3 64
[R3-GigabitEthernet0/0/0]int g0
Nov 10 2024 17:58:11-08:00 R3 IPV6/2/IF_IPV6CHANGE
96.16777216.33554432.16777216.922746880.33554432.0
v6 Interface changed. (IfIndex=50331648, IfDescr=H
net0/0/0 Interface, IfOperStatus=16777216, IfAdmin
[R3-GigabitEthernet0/0/0]int g0
Nov 10 2024 17:58:11-08:00 R3 %%01IFNET/4/LINK_STA
6 on the interface GigabitEthernet0/0/0 has entere
[R3-GigabitEthernet0/0/0]int g0/0/1
[R3-GigabitEthernet0/0/1]ipv6 en
[R3-GigabitEthernet0/0/1]ipv6 addr fc00:35::5 64
[R3-GigabitEthernet0/0/1]q
[R3]int g0/0
Nov 10 2024 17:58:29-08:00 R3 IPV6/2/IF_IPV6CHANGE
96.16777216.33554432.16777216.922746880.33554432.0
v6 Interface changed. (IfIndex=67108864, IfDescr=H
net0/0/1 Interface, IfOperStatus=16777216, IfAdmin
[R3]int g0/0
Nov 10 2024 17:58:29-08:00 R3 %%01IFNET/4/LINK_STA
6 on the interface GigabitEthernet0/0/1 has entere
[R3]int g0/0/2
[R3-GigabitEthernet0/0/2]ipv6 en
[R3-GigabitEthernet0/0/2]ipv6 addr fc00:36::3 64
[R3-GigabitEthernet0/0/2]q
```

```
[R4]ipv6
[R4]int g0/0/0
[R4-GigabitEthernet0/0/0]ipv6 en
[R4-GigabitEthernet0/0/0]ipv6 addr fc00:14::4 64
[R4-GigabitEthernet0/0/0]q
[R4]q
```

```
[R5]ipv6
[R5]int g0/0/0
[R5-GigabitEthernet0/0/0]en
                         ^
Error:Ambiguous command found at '^' position.
[R5-GigabitEthernet0/0/0]ipv6 en
[R5-GigabitEthernet0/0/0]ipv6 addr fc00:35::5 64
```

```
[R6]ipv6
[R6]int g0/0/0
[R6-GigabitEthernet0/0/0]ipv6 en
[R6-GigabitEthernet0/0/0]ipv6 addr fc00:36::6 64
[R6-GigabitEthernet0/0/0]q
```

2. 完成 R1~R6 的 OSPFv3 基础配置

```
[R1]ospfv3 1
[R1-ospfv3-1]router
[R1-ospfv3-1]router-id 1.1.1.1
[R1-ospfv3-1]int g0/0/0
[R1-GigabitEthernet0/0/0]osp
[R1-GigabitEthernet0/0/0]ospf
[R1-GigabitEthernet0/0/0]ospfv3 1 area 0
[R1-GigabitEthernet0/0/0]q
[R1]int g0/0/1
[R1-GigabitEthernet0/0/1]os
[R1-GigabitEthernet0/0/1]ospf
[R1-GigabitEthernet0/0/1]ospfv3 1 a
[R1-GigabitEthernet0/0/1]ospfv3 1 area 1
[R1-GigabitEthernet0/0/1]q
```

```
[R2]ospfv3 1
[R2-ospfv3-1]rout
[R2-ospfv3-1]route-tag
[R2-ospfv3-1]router-id 2.2.2.2
[R2-ospfv3-1]int g0/0/0
[R2-GigabitEthernet0/0/0]os
[R2-GigabitEthernet0/0/0]ospf
[R2-GigabitEthernet0/0/0]ospfv3 1 a
[R2-GigabitEthernet0/0/0]ospfv3 1 area 0
[R2-GigabitEthernet0/0/0]int g0/0/1
[R2-GigabitEthernet0/0/1]os
[R2-GigabitEthernet0/0/1]ospf
[R2-GigabitEthernet0/0/1]ospfv3 1 a
[R2-GigabitEthernet0/0/1]ospfv3 1 area 0
[R2-GigabitEthernet0/0/1]q
```

```
[R3]ospfv3 1
[R3-ospfv3-1]router
[R3-ospfv3-1]router-id 3.3.3.3
[R3-ospfv3-1]int g0/0/0
[R3-GigabitEthernet0/0/0]os
[R3-GigabitEthernet0/0/0]ospf
[R3-GigabitEthernet0/0/0]ospfv3 1 a
[R3-GigabitEthernet0/0/0]ospfv3 1 area 0
[R3-GigabitEthernet0/0/0]int g0/0/1
[R3-GigabitEthernet0/0/1]os
[R3-GigabitEthernet0/0/1]ospf
[R3-GigabitEthernet0/0/1]ospfv3 1 ar
[R3-GigabitEthernet0/0/1]ospfv3 1 area 2
[R3-GigabitEthernet0/0/1]int g0/0/2
[R3-GigabitEthernet0/0/2]os
[R3-GigabitEthernet0/0/2]ospf
[R3-GigabitEthernet0/0/2]ospfv3 1 a
[R3-GigabitEthernet0/0/2]ospfv3 1 area 2
[R3-GigabitEthernet0/0/2]q
```

```
[R4]ospfv3 1
[R4-ospfv3-1]router
[R4-ospfv3-1]router-id 4.4.4.4
[R4-ospfv3-1]int g0/0/0
[R4-GigabitEthernet0/0/0]os
[R4-GigabitEthernet0/0/0]ospf
[R4-GigabitEthernet0/0/0]ospfv3 1 a
[R4-GigabitEthernet0/0/0]ospfv3 1 area 1
[R4-GigabitEthernet0/0/0]q
```

```
[R5]ospfv3 1
[R5-ospfv3-1]router
[R5-ospfv3-1]router-id 5.5.5.5
[R5-ospfv3-1]int g0/0/0
[R5-GigabitEthernet0/0/0]os
[R5-GigabitEthernet0/0/0]ospf
[R5-GigabitEthernet0/0/0]ospfv3 1 a
[R5-GigabitEthernet0/0/0]ospfv3 1 area 2
[R5-GigabitEthernet0/0/0]q
```

```
[R6]ospfv3 1
[R6-ospfv3-1]router
[R6-ospfv3-1]router-id 6.6.6.6
[R6-ospfv3-1]int g0/0/0
[R6-GigabitEthernet0/0/0]os
[R6-GigabitEthernet0/0/0]ospf
[R6-GigabitEthernet0/0/0]ospfv3 1 ar
[R6-GigabitEthernet0/0/0]ospfv3 1 area 2
[R6-GigabitEthernet0/0/0]q
```

R1 的邻居关系

```
<R1>display ospfv3 peer
OSPFv3 Process (1)
OSPFv3 Area (0.0.0.0)
Neighbor ID     Pri  State            Dead Time Interface            Instance
2.2.2.2           1  Full/Backup      00:00:38  GE0/0/0
OSPFv3 Area (0.0.0.1)
Neighbor ID     Pri  State            Dead Time Interface            Instance
4.4.4.4           1  Full/Backup      00:00:37  GE0/0/1
```

R4 的 ipv6 路由表

```
<R4>display ipv6 routing-table protocol ospfv3
Public Routing Table : OSPFv3
Summary Count : 5

OSPFv3 Routing Table's Status : < Active >
Summary Count : 4

 Destination  : FC00:12::                    PrefixLength : 64
 NextHop      : FE80::2E0:FCFF:FE4C:5E48     Preference   : 10
 Cost         : 2                           Protocol     : OSPFv3
 RelayNextHop : ::                          TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0        Flags        : D

 Destination  : FC00:23::                    PrefixLength : 64
 NextHop      : FE80::2E0:FCFF:FE4C:5E48     Preference   : 10
 Cost         : 3                           Protocol     : OSPFv3
 RelayNextHop : ::                          TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0        Flags        : D

 Destination  : FC00:35::                    PrefixLength : 64
 NextHop      : FE80::2E0:FCFF:FE4C:5E48     Preference   : 10
 Cost         : 4                           Protocol     : OSPFv3
 RelayNextHop : ::                          TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0        Flags        : D

 Destination  : FC00:36::                    PrefixLength : 64
 NextHop      : FE80::2E0:FCFF:FE4C:5E48     Preference   : 10
 Cost         : 4                           Protocol     : OSPFv3
 RelayNextHop : ::                          TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0        Flags        : D

OSPFv3 Routing Table's Status : < Inactive >
Summary Count : 1

 Destination  : FC00:14::                    PrefixLength : 64
 NextHop      : ::                          Preference   : 10
 Cost         : 1                           Protocol     : OSPFv3
 RelayNextHop : ::                          TunnelID     : 0x0
 Interface    : GigabitEthernet0/0/0        Flags        :
```

3. 在 R2 上通告 OSPFv3 默认路由。

default-route-advertise always 命令用于向 OSPFv3 网络通告默认路由

```
[R2]ospfv3 1
[R2-ospfv3-1]de
[R2-ospfv3-1]default
[R2-ospfv3-1]default-route-advertise al
[R2-ospfv3-1]default-route-advertise always
```

查看一下 R4 的路由表

```
Destination  : ::                                  PrefixLength : 0
NextHop      : FE80::2E0:FCFF:FE4C:5E48            Preference   : 150
Cost         : 1                                   Protocol     : OSPFv3ASE
RelayNextHop : ::                                  TunnelID     : 0x0
Interface    : GigabitEthernet0/0/0                Flags        : D

Destination  : FC00:12::                           PrefixLength : 64
NextHop      : FE80::2E0:FCFF:FE4C:5E48            Preference   : 10
Cost         : 2                                   Protocol     : OSPFv3
RelayNextHop : ::                                  TunnelID     : 0x0
Interface    : GigabitEthernet0/0/0                Flags        : D

Destination  : FC00:23::                           PrefixLength : 64
NextHop      : FE80::2E0:FCFF:FE4C:5E48            Preference   : 10
Cost         : 3                                   Protocol     : OSPFv3
RelayNextHop : ::                                  TunnelID     : 0x0
Interface    : GigabitEthernet0/0/0                Flags        : D

Destination  : FC00:35::                           PrefixLength : 64
NextHop      : FE80::2E0:FCFF:FE4C:5E48            Preference   : 10
Cost         : 4                                   Protocol     : OSPFv3
RelayNextHop : ::                                  TunnelID     : 0x0
Interface    : GigabitEthernet0/0/0                Flags        : D

Destination  : FC00:36::                           PrefixLength : 64
NextHop      : FE80::2E0:FCFF:FE4C:5E48            Preference   : 10
Cost         : 4                                   Protocol     : OSPFv3
RelayNextHop : ::                                  TunnelID     : 0x0
Interface    : GigabitEthernet0/0/0                Flags        : D

SPFv3 Routing Table's Status : < Inactive >
ummary Count : 1

Destination  : FC00:14::                           PrefixLength : 64
NextHop      : ::                                  Preference   : 10
Cost         : 1                                   Protocol     : OSPFv3
RelayNextHop : ::                                  TunnelID     : 0x0
Interface    : GigabitEthernet0/0/0                Flags        :
```

R4 可以连到 fc00:2::2 了

```
<R4>ping ipv6 fc00:2::2
  PING fc00:2::2 : 56  data bytes, press CTRL_C to break
    Reply from FC00:2::2
    bytes=56 Sequence=1 hop limit=63  time = 40 ms
    Reply from FC00:2::2
    bytes=56 Sequence=2 hop limit=63  time = 30 ms
    Reply from FC00:2::2
    bytes=56 Sequence=3 hop limit=63  time = 30 ms
    Reply from FC00:2::2
    bytes=56 Sequence=4 hop limit=63  time = 20 ms
    Reply from FC00:2::2
    bytes=56 Sequence=5 hop limit=63  time = 20 ms

  --- fc00:2::2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/28/40 ms
```

9.1 IPv6 以太网二层交换基础实验

1. 在 AS1 上创建相关 VLAN，并完成接口配置

```
<Huawei>sys
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sys
[Huawei]sysname AS1
[AS1]
Nov  9 2024 18:51:57-08:00 AS1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25
.191.3.1 configurations have been changed. The current change number is 4, the c
hange loop count is 0, and the maximum number of records is 4095.
[AS1]vlan batch 10 10
Error: The VLAN list is invalid.
[AS1]in
[AS1]inter
[AS1]interface Gi
[AS1]interface GigabitEthernet 0/0/1
[AS1-GigabitEthernet0/0/1]port link
[AS1-GigabitEthernet0/0/1]port link-ty
[AS1-GigabitEthernet0/0/1]port link-type access
[AS1-GigabitEthernet0/0/1]port
Nov  9 2024 18:52:37-08:00 AS1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25
.191.3.1 configurations have been changed. The current change number is 5, the c
hange loop count is 0, and the maximum number of records is 4095
Error: The interface is already a L2 interface.
[AS1-GigabitEthernet0/0/1]port default vlan 10
Error: The VLAN does not exist.
[AS1-GigabitEthernet0/0/1]quit
[AS1]inter
[AS1]interface Gi
[AS1]interface GigabitEthernet 0/0/2
[AS1-GigabitEthernet0/0/2]port link
[AS1-GigabitEthernet0/0/2]port link-
[AS1-GigabitEthernet0/0/2]port link-flap
[AS1-GigabitEthernet0/0/2]port link-type access
[AS1-GigabitEthernet0/0/2]
Nov  9 2024 18:53:07-08:00 AS1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25
.191.3.1 configurations have been changed. The current change number is 6, the c
hange loop count is 0, and the maximum number of records is 4095.
[AS1-GigabitEthernet0/0/2]port default vlan 20
Error: The VLAN does not exist.
[AS1-GigabitEthernet0/0/2]quit
[AS1]inter
[AS1]interface Gi
[AS1]interface GigabitEthernet 0/0/24
[AS1-GigabitEthernet0/0/24]port link-type trunk
[AS1-GigabitEthernet0/0/24]port trunk allow
[AS1-GigabitEthernet0/0/24]port trunk allow-pass vlan
Nov  9 2024 18:53:37-08:00 AS1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25
.191.3.1 configurations have been changed. The current change number is 7, the c
hange loop count is 0, and the maximum number of records is 4095.10 20
[AS1-GigabitEthernet0/0/24]port trunk allow-pass vlan 10 20
[AS1-GigabitEthernet0/0/24]
Nov  9 2024 18:53:47-08:00 AS1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25
.191.3.1 configurations have been changed. The current change number is 8, the c
hange loop count is 0, and the maximum number of records is 4095.quit
[AS1]
```

```
[AS1]display vlan
The total number of vlans is : 1
--------------------------------------------------------------------------------
U: Up;         D: Down;         TG: Tagged;         UT: Untagged;
MP: Vlan-mapping;               ST: Vlan-stacking;
#: ProtocolTransparent-vlan;    *: Management-vlan;
--------------------------------------------------------------------------------

VID  Type    Ports
--------------------------------------------------------------------------------
1    common  UT:GE0/0/1(U)      GE0/0/2(U)      GE0/0/3(D)      GE0/0/4(D)
                GE0/0/5(D)      GE0/0/6(D)      GE0/0/7(D)      GE0/0/8(D)
                GE0/0/9(D)      GE0/0/10(D)     GE0/0/11(D)     GE0/0/12(D)
                GE0/0/13(D)     GE0/0/14(D)     GE0/0/15(D)     GE0/0/16(D)
                GE0/0/17(D)     GE0/0/18(D)     GE0/0/19(D)     GE0/0/20(D)
                GE0/0/21(D)     GE0/0/22(D)     GE0/0/23(D)     GE0/0/24(U)


VID  Status  Property      MAC-LRN Statistics Description
--------------------------------------------------------------------------------

1    enable  default       enable  disable    VLAN 0001
[AS1]display port vlan
Port                    Link Type    PVID  Trunk VLAN List
--------------------------------------------------------------------------------
GigabitEthernet0/0/1    access       1     -
GigabitEthernet0/0/2    access       1     -
GigabitEthernet0/0/3    hybrid       1     -
GigabitEthernet0/0/4    hybrid       1     -
GigabitEthernet0/0/5    hybrid       1     -
GigabitEthernet0/0/6    hybrid       1     -
GigabitEthernet0/0/7    hybrid       1     -
GigabitEthernet0/0/8    hybrid       1     -
GigabitEthernet0/0/9    hybrid       1     -
GigabitEthernet0/0/10   hybrid       1     -
GigabitEthernet0/0/11   hybrid       1     -
GigabitEthernet0/0/12   hybrid       1     -
GigabitEthernet0/0/13   hybrid       1     -
GigabitEthernet0/0/14   hybrid       1     -
GigabitEthernet0/0/15   hybrid       1     -
GigabitEthernet0/0/16   hybrid       1     -
GigabitEthernet0/0/17   hybrid       1     -
GigabitEthernet0/0/18   hybrid       1     -
GigabitEthernet0/0/19   hybrid       1     -
GigabitEthernet0/0/20   hybrid       1     -
GigabitEthernet0/0/21   hybrid       1     -
GigabitEthernet0/0/22   hybrid       1     -
GigabitEthernet0/0/23   hybrid       1     -
GigabitEthernet0/0/24   trunk        1     1 10 20
[AS1]
```

2. 在 AS2 上创建相关 VLAN，并完成接口配置

```
[AS2]display vlan
The total number of vlans is : 3
--------------------------------------------------------------------------------
U: Up;         D: Down;         TG: Tagged;         UT: Untagged;
MP: Vlan-mapping;               ST: Vlan-stacking;
#: ProtocolTransparent-vlan;    *: Management-vlan;
--------------------------------------------------------------------------------

VID  Type    Ports
--------------------------------------------------------------------------------
1    common  UT:GE0/0/3(D)      GE0/0/4(D)      GE0/0/5(D)      GE0/0/6(D)
                GE0/0/7(D)      GE0/0/8(D)      GE0/0/9(D)      GE0/0/10(D)
                GE0/0/11(D)     GE0/0/12(D)     GE0/0/13(D)     GE0/0/14(D)
                GE0/0/15(D)     GE0/0/16(D)     GE0/0/17(D)     GE0/0/18(D)
                GE0/0/19(D)     GE0/0/20(D)     GE0/0/21(D)     GE0/0/22(D)
                GE0/0/23(D)     GE0/0/24(U)

10   common  UT:GE0/0/1(D)

             TG:GE0/0/24(U)

20   common  UT:GE0/0/2(U)

             TG:GE0/0/24(U)


VID  Status  Property      MAC-LRN Statistics Description
--------------------------------------------------------------------------------

1    enable  default       enable  disable    VLAN 0001
10   enable  default       enable  disable    VLAN 0010
20   enable  default       enable  disable    VLAN 0020
[AS2]display port vlan
Port                        Link Type    PVID  Trunk VLAN List
--------------------------------------------------------------------------------
GigabitEthernet0/0/1    access       10    -
GigabitEthernet0/0/2    access       20    -
GigabitEthernet0/0/3    hybrid       1     -
GigabitEthernet0/0/4    hybrid       1     -
GigabitEthernet0/0/5    hybrid       1     -
GigabitEthernet0/0/6    hybrid       1     -
GigabitEthernet0/0/7    hybrid       1     -
GigabitEthernet0/0/8    hybrid       1     -
GigabitEthernet0/0/9    hybrid       1     -
GigabitEthernet0/0/10   hybrid       1     -
GigabitEthernet0/0/11   hybrid       1     -
GigabitEthernet0/0/12   hybrid       1     -
GigabitEthernet0/0/13   hybrid       1     -
GigabitEthernet0/0/14   hybrid       1     -
GigabitEthernet0/0/15   hybrid       1     -
GigabitEthernet0/0/16   hybrid       1     -
GigabitEthernet0/0/17   hybrid       1     -
GigabitEthernet0/0/18   hybrid       1     -
GigabitEthernet0/0/19   hybrid       1     -
GigabitEthernet0/0/20   hybrid       1     -
GigabitEthernet0/0/21   hybrid       1     -
GigabitEthernet0/0/22   hybrid       1     -
GigabitEthernet0/0/23   hybrid       1     -
GigabitEthernet0/0/24   trunk        1     1 10 20
[AS2] User interface con0 is available
```

3. 测试网络联通性

```
PC>ping fc00:10::2

Ping fc00:10::2: 32 data bytes, Press Ctrl_C to break
From fc00:10::2: bytes=32 seq=1 hop limit=255 time=63 ms
From fc00:10::2: bytes=32 seq=2 hop limit=255 time=63 ms
From fc00:10::2: bytes=32 seq=3 hop limit=255 time=78 ms
From fc00:10::2: bytes=32 seq=4 hop limit=255 time=63 ms
From fc00:10::2: bytes=32 seq=5 hop limit=255 time=78 ms

--- fc00:10::2 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 63/69/78 ms
```

9.2 IPv6 以太网多层交换实验

1. 在 AS1 上创建相关 VLAN，并完成接口配置

```
<AS1>display vlan
The total number of vlans is : 3
--------------------------------------------------------------------------------
U: Up;         D: Down;         TG: Tagged;         UT: Untagged;
MP: Vlan-mapping;               ST: Vlan-stacking;
#: ProtocolTransparent-vlan;    *: Management-vlan;
--------------------------------------------------------------------------------

VID  Type    Ports
--------------------------------------------------------------------------------
1    common  UT:GE0/0/3(D)      GE0/0/4(D)      GE0/0/5(D)      GE0/0/6(D)
                GE0/0/7(D)      GE0/0/8(D)      GE0/0/9(D)      GE0/0/10(D)
                GE0/0/11(D)     GE0/0/12(D)     GE0/0/13(D)     GE0/0/14(D)
                GE0/0/15(D)     GE0/0/16(D)     GE0/0/17(D)     GE0/0/18(D)
                GE0/0/19(D)     GE0/0/20(D)     GE0/0/21(D)     GE0/0/22(D)
                GE0/0/23(U)     GE0/0/24(D)

10   common  UT:GE0/0/1(U)
             TG:GE0/0/23(U)

20   common  UT:GE0/0/2(U)

             TG:GE0/0/23(U)


VID  Status  Property      MAC-LRN Statistics Description
--------------------------------------------------------------------------------

1    enable  default       enable  disable    VLAN 0001
10   enable  default       enable  disable    VLAN 0010
20   enable  default       enable  disable    VLAN 0020
<AS1>
```

2. 在 AS2 上创建相关 VLAN，并完成接口配置

```
<AS2>display vlan
The total number of vlans is : 2
--------------------------------------------------------------------------------
U: Up;         D: Down;         TG: Tagged;         UT: Untagged;
MP: Vlan-mapping;               ST: Vlan-stacking;
#: ProtocolTransparent-vlan;    *: Management-vlan;
--------------------------------------------------------------------------------

VID  Type    Ports
--------------------------------------------------------------------------------
1    common  UT:GE0/0/2(D)      GE0/0/3(D)      GE0/0/4(D)      GE0/0/5(D)
                GE0/0/6(D)      GE0/0/7(D)      GE0/0/8(D)      GE0/0/9(D)
                GE0/0/10(D)     GE0/0/11(D)     GE0/0/12(D)     GE0/0/13(D)
                GE0/0/14(D)     GE0/0/15(D)     GE0/0/16(D)     GE0/0/17(D)
                GE0/0/18(D)     GE0/0/19(D)     GE0/0/20(D)     GE0/0/21(D)
                GE0/0/22(D)     GE0/0/23(D)     GE0/0/24(U)

30   common  UT:GE0/0/1(U)

             TG:GE0/0/24(U)


VID  Status  Property      MAC-LRN Statistics Description
--------------------------------------------------------------------------------

1    enable  default       enable  disable    VLAN 0001
30   enable  default       enable  disable    VLAN 0030
```

3. 在 CoreSwitch 上创建相关 VLAN，完成接口配置，并配置 VLANIF，实现 VLAN 间通信

```
<CoreSwitch>display vlan
The total number of vlans is : 4
--------------------------------------------------------------------------------
U: Up;         D: Down;         TG: Tagged;         UT: Untagged;
MP: Vlan-mapping;               ST: Vlan-stacking;
#: ProtocolTransparent-vlan;    *: Management-vlan;
--------------------------------------------------------------------------------

VID  Type    Ports
--------------------------------------------------------------------------------
1    common  UT:GE0/0/1(D)       GE0/0/2(D)       GE0/0/3(D)       GE0/0/4(D)
                GE0/0/5(D)       GE0/0/6(D)       GE0/0/7(D)       GE0/0/8(D)
                GE0/0/9(D)       GE0/0/10(D)      GE0/0/11(D)      GE0/0/12(D)
                GE0/0/13(D)      GE0/0/14(D)      GE0/0/15(D)      GE0/0/16(D)
                GE0/0/17(D)      GE0/0/18(D)      GE0/0/19(D)      GE0/0/20(D)
                GE0/0/21(D)      GE0/0/22(D)      GE0/0/23(U)      GE0/0/24(U)

10   common  TG:GE0/0/23(U)

20   common  TG:GE0/0/23(U)

30   common  TG:GE0/0/24(U)


VID  Status  Property      MAC-LRN Statistics Description
--------------------------------------------------------------------------------

1    enable  default       enable  disable    VLAN 0001
10   enable  default       enable  disable    VLAN 0010
20   enable  default       enable  disable    VLAN 0020
30   enable  default       enable  disable    VLAN 0030
```

```
<CoreSwitch>display ipv6 interface
Vlanif10 current state : UP
IPv6 protocol current state : UP
IPv6 is enabled, link-local address is FE80::4E1F:CCFF:FEBC:DE7
  Global unicast address(es):
    FC00:10::FFFF, subnet is FC00:10::/64
  Joined group address(es):
    FF02::1:FF00:FFFF
    FF02::1:FFBC:DE7
    FF02::2
    FF02::1
  MTU is 1500 bytes
  ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds
  ND retransmit interval is 1000 milliseconds
  Hosts use stateless autoconfig for addresses

Vlanif20 current state : UP
IPv6 protocol current state : UP
IPv6 is enabled, link-local address is FE80::4E1F:CCFF:FEBC:DE7
  Global unicast address(es):
    FC00:20::FFFF, subnet is FC00:20::/64
  Joined group address(es):
    FF02::1:FF00:FFFF
    FF02::1:FFBC:DE7
    FF02::2
    FF02::1
  MTU is 1500 bytes
  ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds
  ND retransmit interval is 1000 milliseconds
  Hosts use stateless autoconfig for addresses

Vlanif30 current state : UP
IPv6 protocol current state : UP
IPv6 is enabled, link-local address is FE80::4E1F:CCFF:FEBC:DE7
  Global unicast address(es):
    FC00:30::FFFF, subnet is FC00:30::/64
  Joined group address(es):
    FF02::1:FF00:FFFF
    FF02::1:FFBC:DE7
    FF02::2
    FF02::1
  MTU is 1500 bytes
  ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds
  ND retransmit interval is 1000 milliseconds
  Hosts use stateless autoconfig for addresses
```

4. 进行通信

```
PC>ping fc00:30::1 -6

Ping fc00:30::1: 32 data bytes, Press Ctrl_C to break
From fc00:30::1: bytes=32 seq=1 hop limit=254 time=219 ms
From fc00:30::1: bytes=32 seq=2 hop limit=254 time=125 ms
From fc00:30::1: bytes=32 seq=3 hop limit=254 time=78 ms
From fc00:30::1: bytes=32 seq=4 hop limit=254 time=78 ms
From fc00:30::1: bytes=32 seq=5 hop limit=254 time=78 ms

--- fc00:30::1 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 78/115/219 ms

PC>
```

4 实验代码

本次实验的代码已上传于以下代码仓库：[CNI-Exp: 厦门大学计算机网络课程实验项目集 (gitee.com)]

5 课后思考题

8.1

1. 在本实验中，如果在 R1 与 R3 上部署 IPv6 默认路由，而不配置具体的 IPv6 静态路由，是否可以满足实验需求？

不可以，尽管将 R1 的默认路由设为 R2，R2 的设为 R3，但这解决不了 R3 回复时需要 R2 发送到 R1 的问题，所以不能满足需求

2. 在本实验中， 为什么需要在 R1 及 R3 上分别配置到达 FC00:23::/64 及 FC00:12::/64 的路由，却无需在 R2 上配置上述路由？

因为 R2 和 R1、R3 直接相连，不存在不直接相连的地址，所以能够直接转发，不需要另外配置

8.2

1. OSPFv3 的 Router-ID 有什么作用？

Router-ID 作为标识符，用来区分不同的路由器，当两个 OSPF 路由器开始建立邻接关系时，它们通过彼此的 Router-ID 来确认彼此是相同的 OSPF 实例

2. 在本实验中，是否必须为设备配置 OSPFv3 Router-ID，为什么？

是必须的，OSPF 协议通过交换 Hello 包 来建立邻接关系。在 Hello 包 中，路由器会使用 Router-ID 来标识自己，并与邻居路由器进行沟通

8.3

1. 为什么 OSPF 协议要设计多区域，有什么意义？

一是减少路由器中保存的路由信息的数量；二是将网络划分为多个区域后，每个区域只需要在该区域内运行 SPF 算法，减少了算法计算的复杂度；三是在添加其他网络时变得

容易扩展

2. 在本例中，我们在 R2 的 OSPFv3 视图下配置的 default-route-advertise always 命令中， always 关键字的作用是？

文档说明 always 的含义为 Always advertise default route，也就是该路由器会会始终向其他 OSPF 路由器通告默认路由，指定这个 OSPF 下的默认路由

9.1

1. 在本例中，处于相同 VLAN 内的 PC1 和 PC3 使用相同的 IPv6 地址段，二者能够相互通信，但是如果使用不同的 IPv6 地址段，二者之间是否能够实现相互通信？为什么？

```
PC>ping fc00:30::1 -6

Ping fc00:30::1: 32 data bytes, Press Ctrl_C to break
From fc00:10::1: Destination host unreachable
From fc00:10::1: Destination host unreachable

PC>ping fc00:10::2 -6

Ping fc00:10::2: 32 data bytes, Press Ctrl_C to break
From fc00:10::2: bytes=32 seq=1 hop limit=255 time=94 ms
From fc00:10::2: bytes=32 seq=2 hop limit=255 time=78 ms
From fc00:10::2: bytes=32 seq=3 hop limit=255 time=79 ms

--- fc00:10::2 ping statistics ---
  3 packet(s) transmitted
  3 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 78/83/94 ms
```

经过测试，发现不可以通信。

因为 vlan 中，ipv6 地址段用来辨识是在哪个子网内，比如 fc00:10::1 是在 vlan 10 中，fc00:20::1 是在 vlan 20 中，两者不能进行通信

9.2

1. 在本例中， PC1 与 PC2 连接在同一台二层交换机 AS1 上，如果给这两台 PC 配置相同网段的 IPv6 地址，二者是否能够不经过 CoreSwitch 直接通信？为什么？

```
PC>ping fc00:10::2 -6

Ping fc00:10::2: 32 data bytes, Press Ctrl_C to break
From fc00:10::1: Destination host unreachable
From fc00:10::1: Destination host unreachable

PC>
```

经过测试，发现不能直接通信

主要是他们不在同一个虚拟局域网上，如果在同一个 vlan 下就可以（如下图）

```
PC>ping fc00:10::2 -6

Ping fc00:10::2: 32 data bytes, Press Ctrl_C to break
From fc00:10::2: bytes=32 seq=1 hop limit=255 time=32 ms
From fc00:10::2: bytes=32 seq=2 hop limit=255 time=47 ms
From fc00:10::2: bytes=32 seq=3 hop limit=255 time=31 ms

--- fc00:10::2 ping statistics ---
  3 packet(s) transmitted
  3 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 31/36/47 ms

PC>
```

另外，原来之所以能实现不同 vlan 之间的通信，主要在于 CoreSwitch 对虚拟接口提供了 ip 地址，用作各 vlan 的默认网关，从而能通过该交换机实现到不同 vlan 的转发

6 实验总结

本次实验，对 IPv6 交换技术、路由技术都有了一定的实践。

在交换技术中，对 VLAN 的配置、Trunk 的配置、VLANIF 的配置都进行了一定的实践，对二层交换机结构、三层交换机结构的功能和原理有了了解，实现了数据链路层通信。

在路由技术中，对静态路由、OSPFv3 支持的动态路由、以及多区域 OSPF 的配置进行了实践，实现了网络层通信。