IPv6 Routing Technologies

Foreword

- The changes to the address architecture have introduced the need for routing protocols that are capable of supporting IPv6. IPv6 Routing protocols include OSPFv3.

- The characteristics and operation of each of OSPFv3 generally reflects those used in OSPFv2, however contain some distinct differences that are required to be understood to support the implementation of IPv6 based routing protocols within an IPv6 founded network.
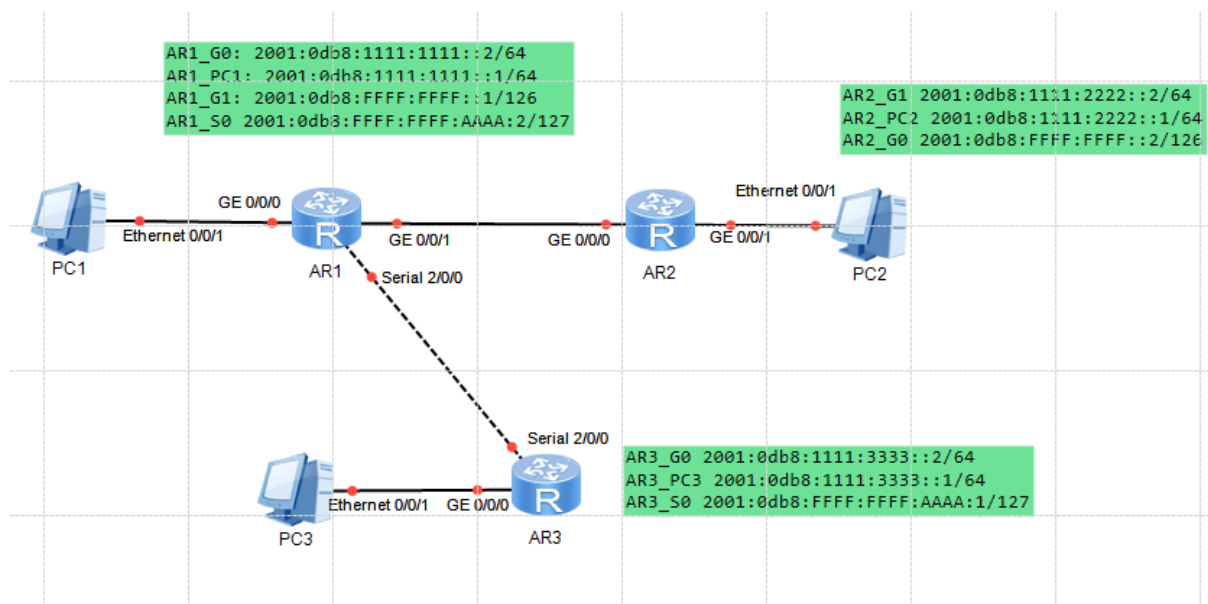
HUAWEI

Objectives

- Upon completion of this section, you will be able to:

  - Describe the characteristics and operation of OSPFv3.

  - Configure OSPFv3 routing protocols for IPv6.

Static Routing – Broadcast media


```
AR1_G0: 2001:0db8:1111:1111::2/64
AR1_PC1: 2001:0db8:1111:1111::1/64
AR1_G1: 2001:0db8:FFFF:FFFF::1/126
AR1_S0 2001:0db8:FFFF:FFFF:AAAA:2/127
```

```
AR2_G1 2001:0db8:1111:2222::2/64
AR2_PC2 2001:0db8:1111:2222::1/64
AR2_G0 2001:0db8:FFFF:FFFF::2/126
```

```
AR3_G0 2001:0db8:1111:3333::2/64
AR3_PC3 2001:0db8:1111:3333::1/64
AR3_S0 2001:0db8:FFFF:FFFF:AAAA:1/127
```
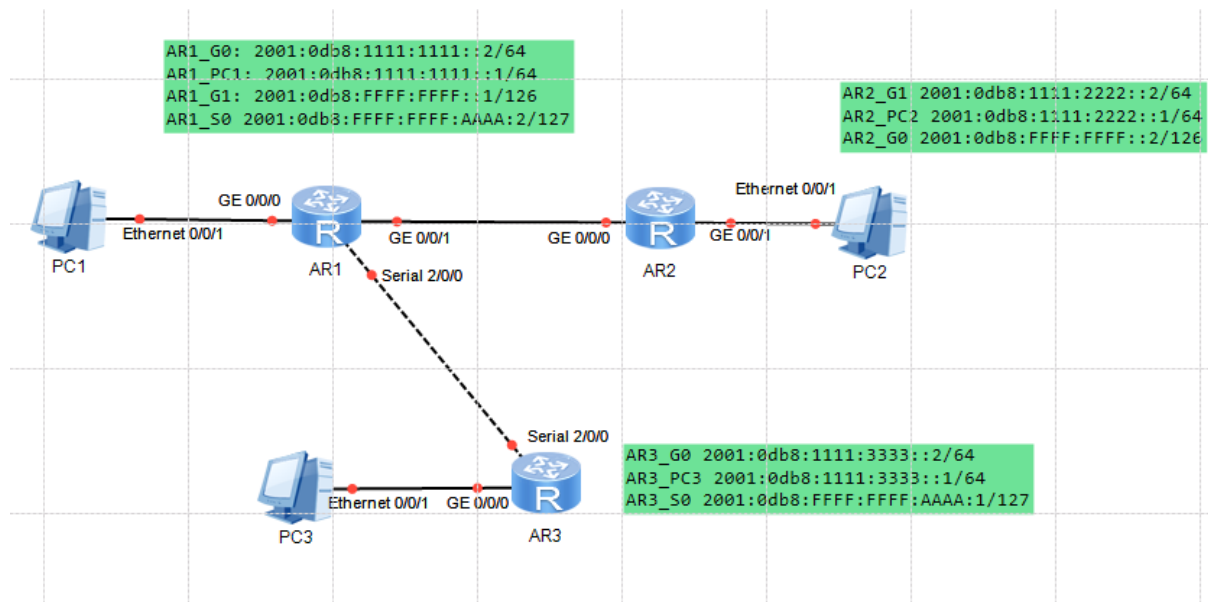
```
<R1>system-view

[R1]ipv6 route-static 2001:0db8:1111:2222:: 64 2001:0db8:ffff:ffff::2


<R2>system-view

[R2]ipv6 route-static 2001:0db8:1111:1111:: 64 2001:0db8:ffff:ffff::1
```

Static Routing – Serial Link


```
AR1_G0:  2001:0db8:1111:1111::2/64
AR1_PC1: 2001:0db8:1111:1111::1/64
AR1_G1:  2001:0db8:FFFF:FFFF::1/126
AR1_S0 2001:0db8:FFFF:FFFF:AAAA:2/127
```

```
AR2_G1 2001:0db8:1111:2222::2/64
AR2_PC2 2001:0db8:1111:2222::1/64
AR2_G0 2001:0db8:FFFF:FFFF::2/126
```

```
AR3_G0 2001:0db8:1111:3333::2/64
AR3_PC3 2001:0db8:1111:3333::1/64
AR3_S0 2001:0db8:FFFF:FFFF:AAAA:1/127
```

```
<R1>system-view

[R1] ipv6 route-static 2001:0db8:1111:3333:: 64 Serial 2/0/0


<R3>system-view

[R3] ipv6 route-static 2001:0db8:1111:1111:: 64 Serial 2/0/0
```

HUAWEI

Static Routing - Verifica

```
[R3]dis ipv6 routing-table
Routing Table : Public
        Destinations : 7      Routes : 7


 Destination  : 2001:DB8:1111:1111::          PrefixLength : 64
 NextHop      : 2001:DB8:FFFF:FFFF:AAAA::1    Preference   : 60
 Cost         : 0                             Protocol     : Static
 RelayNextHop : ::                            TunnelID     : 0x0
 Interface    : Serial2/0/0                   Flags        : D
(...)
```
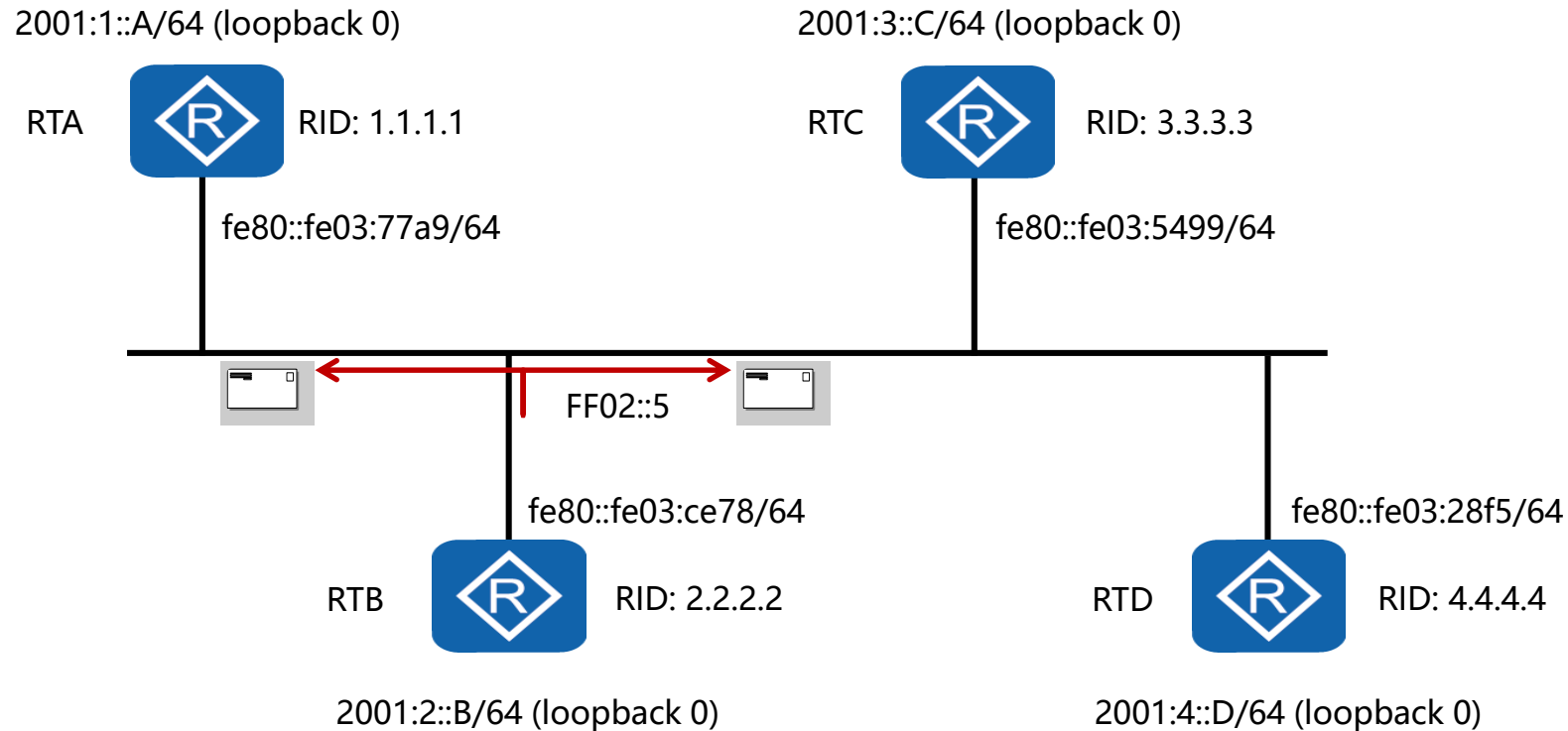
Static Routing - Verifica

```
[R3]ping ipv6 -a 2001:0db8:1111:3333::2 2001:0db8:1111:1111::1
  PING 2001:0db8:1111:1111::1 : 56  data bytes, press CTRL_C to break
    Reply from 2001:DB8:1111:1111::1
    bytes=56 Sequence=1 hop limit=254  time = 60 ms
    Reply from 2001:DB8:1111:1111::1
    bytes=56 Sequence=2 hop limit=254  time = 30 ms
    Reply from 2001:DB8:1111:1111::1
    bytes=56 Sequence=3 hop limit=254  time = 20 ms
    Reply from 2001:DB8:1111:1111::1
    bytes=56 Sequence=4 hop limit=254  time = 20 ms
    Reply from 2001:DB8:1111:1111::1
```
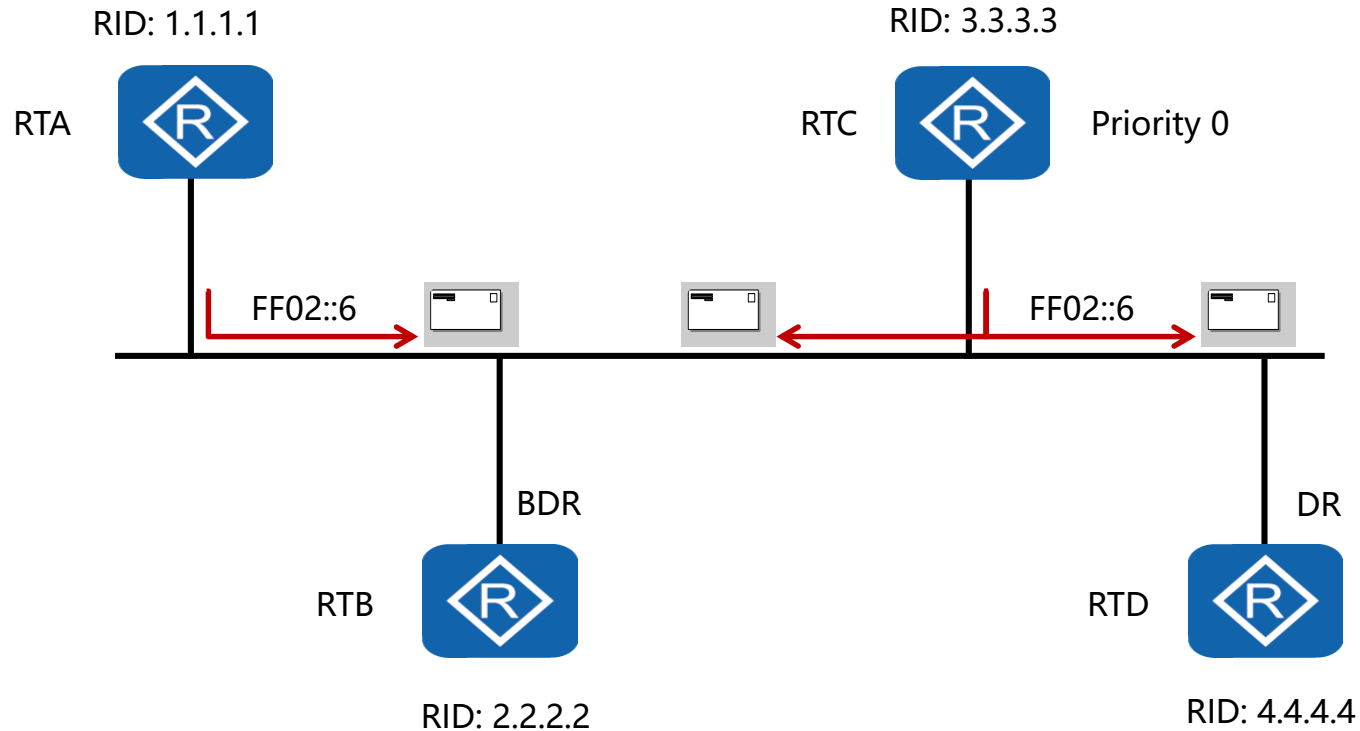
HUAWEI

OSPFv3

2001:1::A/64 (loopback 0)

2001:3::C/64 (loopback 0)

RTA   RID: 1.1.1.1

RTC   RID: 3.3.3.3

fe80::fe03:77a9/64

fe80::fe03:5499/64

FF02::5

fe80::fe03:ce78/64

fe80::fe03:28f5/64

RTB   RID: 2.2.2.2

RTD   RID: 4.4.4.4

2001:2::B/64 (loopback 0)

2001:4::D/64 (loopback 0)

- OSPFv3 updates are sent to the All-SPF-Routers address ,that is FF02::5.

- Link-local addressing used by default to define the next-hop.
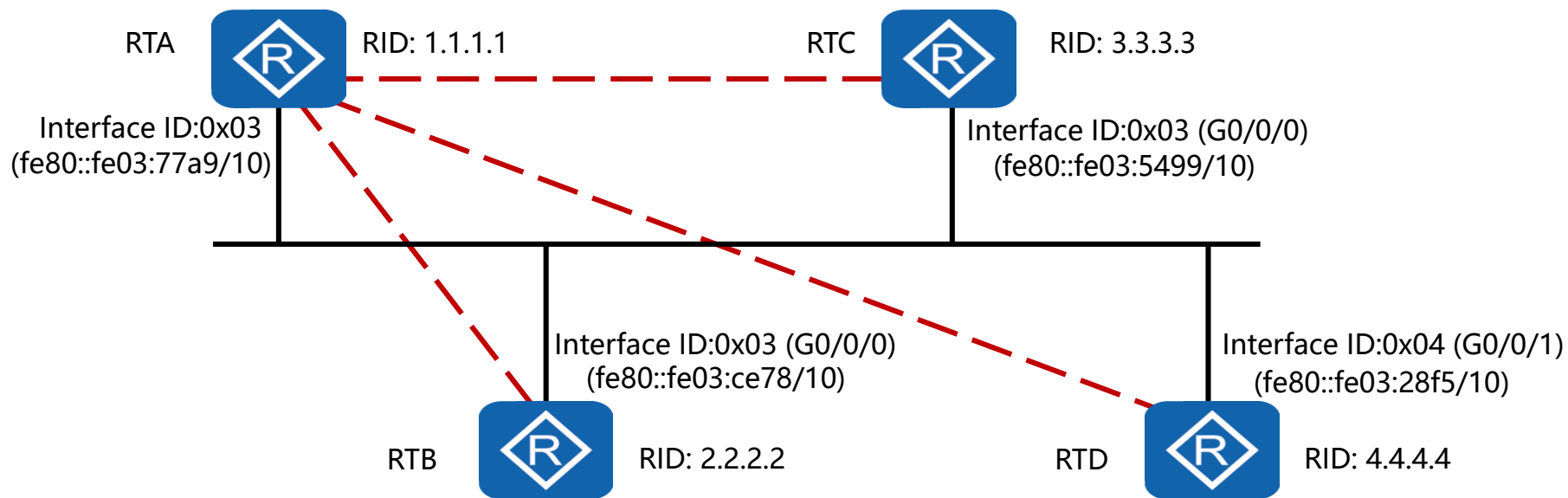
HUAWEI

OSPFv3 Router ID

- Not based on any IP address, must be manually defined.

- Router ID continues to be used to support DR and BDR election.

OSPFv3 Per Link Behavior

RTA   RID: 1.1.1.1   RTC   RID: 3.3.3.3

Interface ID:0x03
(fe80::fe03:77a9/10)

Interface ID:0x03 (G0/0/0)
(fe80::fe03:5499/10)

Interface ID:0x03 (G0/0/0)
(fe80::fe03:ce78/10)

Interface ID:0x04 (G0/0/1)
(fe80::fe03:28f5/10)

RTB   RID: 2.2.2.2   RTD   RID: 4.4.4.4

- OSPFv3 operates on the principle of per-link as opposed to the per-network or per-subnet concept used in IPv4.
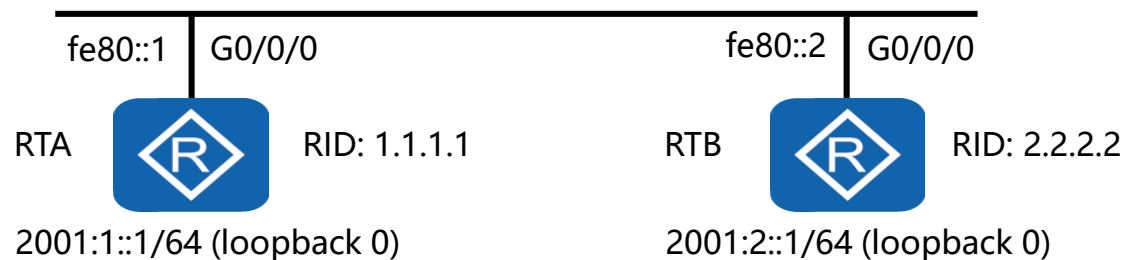
HUAWEI

OSPFv3 Authentication
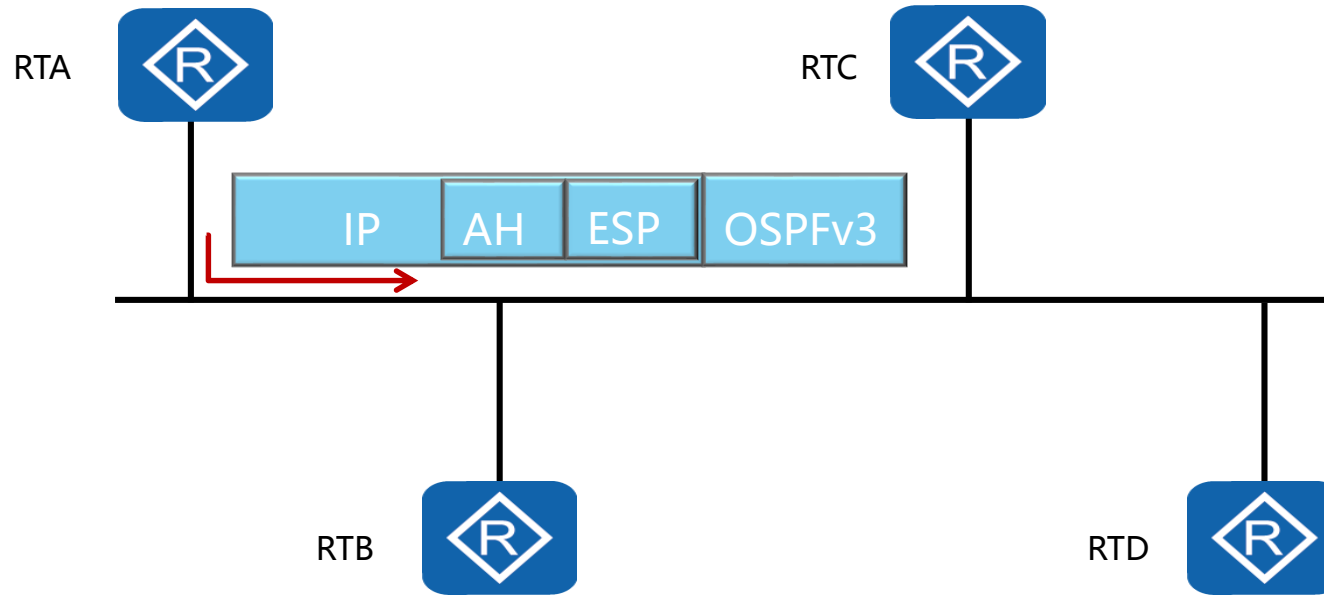
- OSPF authentication removed in OSPFv3, instead relying on the AH & ESP extension headers of IP for security.

Enabling OSPFv3


```
[RTA]ipv6

[RTA]ospfv3

[RTA-ospfv3-1]router-id 1.1.1.1

[RTA-GigabitEthernet0/0/0]ipv6 enable

[RTA-GigabitEthernet0/0/0]ipv6 address fe80::1 link-local

[RTA-GigabitEthernet0/0/0]ospfv3 1 area 0.0.0.0

[RTA-LoopBack0]ipv6 enable

[RTA-LoopBack0]ipv6 address 2001:1::1/64

[RTA-LoopBack0]ospfv3 1 area 0.0.0.0
```

Configuration Validation

```
[RTA]display ospfv3
 Routing Process "OSPFv3 (1)" with ID 1.1.1.1
 Route Tag: 0
 Multi-VPN-Instance is not enabled
 SPF Intelligent Timer[millisecs] Max: 10000, Start: 500, Hold: 2000
 LSA Intelligent Timer[millisecs] Max: 5000, Start: 500, Hold: 1000
 LSA Arrival interval 1000 millisecs
 Default ASE parameters: Metric: 1 Tag: 1 Type: 2
 Number of AS-External LSA 0. AS-External LSA's Checksum Sum 0x0000
 Number of AS-Scoped Unknown LSA 0. AS-Scoped Unknown LSA's Checksum
Sum 0x0000
 Number of FULL neighbors 1
 Number of Exchange and Loading neighbors 0
……
```
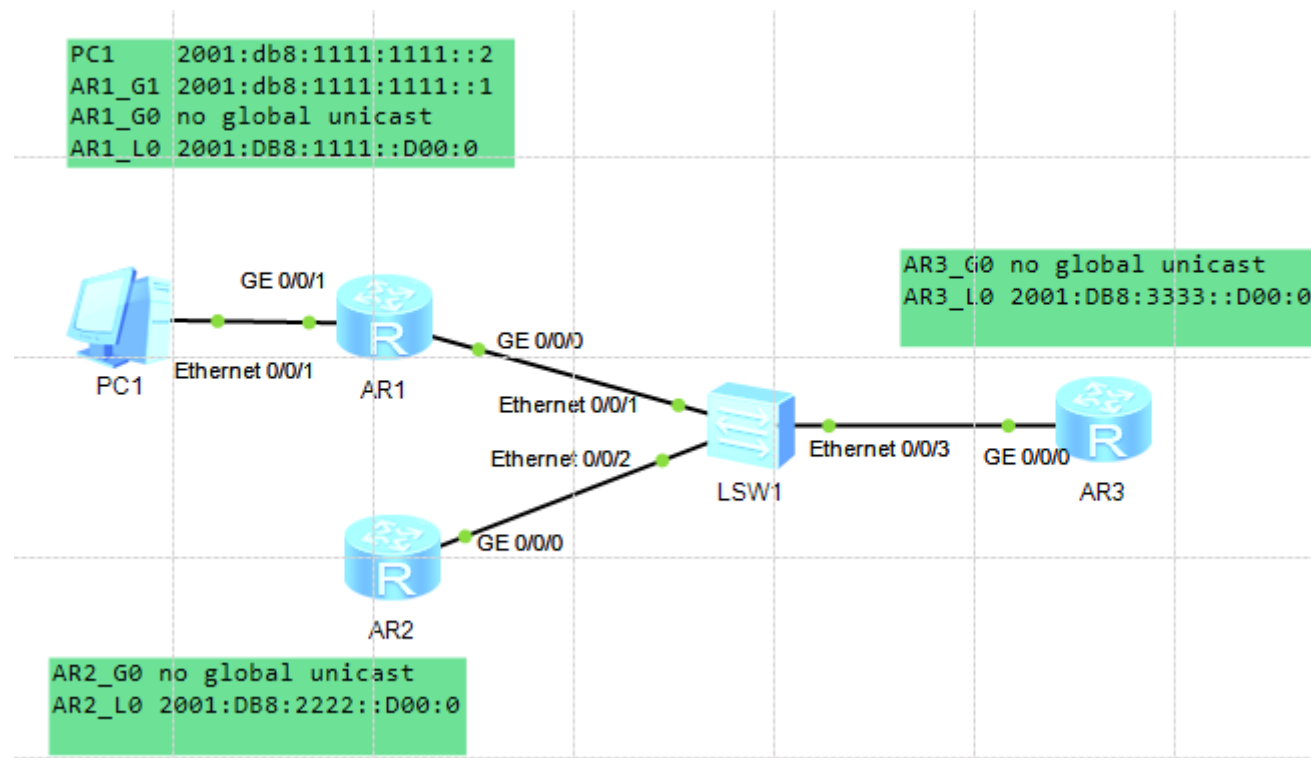
Check OSPFv3

Protocol Grab

Configuration Validation


```
PC1     2001:db8:1111:1111::2
AR1_G1  2001:db8:1111:1111::1
AR1_G0  no global unicast
AR1_L0  2001:DB8:1111::D00:0
```

```
AR3_G0  no global unicast
AR3_L0  2001:DB8:3333::D00:0
```

```
AR2_G0  no global unicast
AR2_L0  2001:DB8:2222::D00:0
```

GE 0/0/1

GE 0/0/0

Ethernet 0/0/1

PC1   Ethernet 0/0/1   AR1

Ethernet 0/0/1

Ethernet 0/0/2

Ethernet 0/0/3   GE 0/0/0

LSW1   AR3

GE 0/0/0

AR2

         HUAWEI

Configuration Validation

```
<R3>dis ipv6 routing-table protocol ospfv3
```

AR1 L0
```
Destination : 2001:DB8:1111::D00:0          PrefixLength : 128
NextHop     : FE80::2E0:FCFF:FEC8:15FB      Preference   : 10
Cost        : 1                             Protocol     : OSPFv3
RelayNextHop : ::                           TunnelID     : 0x0
Interface   : GigabitEthernet0/0/0          Flags        : D
```

AR1 PC1
```
Destination : 2001:DB8:1111:1111::          PrefixLength : 64
NextHop     : FE80::2E0:FCFF:FEC8:15FB      Preference   : 10
Cost        : 2                             Protocol     : OSPFv3
RelayNextHop : ::                           TunnelID     : 0x0
Interface   : GigabitEthernet0/0/0          Flags        : D
```

AR2 L0
```
Destination : 2001:DB8:2222::D00:0          PrefixLength : 128
NextHop     : FE80::2E0:FCFF:FE55:224       Preference   : 10
Cost        : 1                             Protocol     : OSPFv3
RelayNextHop : ::                           TunnelID     : 0x0
Interface   : GigabitEthernet0/0/0          Flags        : D
```

Copyright © 2019 Huawei Technologies Co., Ltd. All rights reserved.

HUAWEI

Summary

- What is used to uniquely identify each neighboring node running OSPFv3?

Thank You

www.huawei.com