OSPF 路由协议实验

一、实验目的：

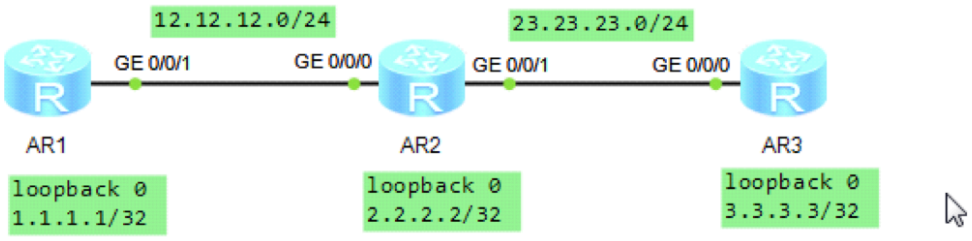
1、理解 OSPF 路由协议的基本理论；

2、掌握 OSPF 路由表的更新规则；

3、掌握 OSPF 动态路由的配置方法；

4、理解链路状态路由协议的工作过程及 OSPF 区域的意义；

二、实验拓扑图：



1.按拓扑图中标出的 ip 地址配置好各路由器的接口

2.在各路由器上配置 ospf 路由协议,其中 router id 分别为 1.1.1.1、2.2.2.2、3.3.3.3，所有接口均在同一区域内；

参考指令

router id <router-id>

ospf

area 0

network <直连网络 1> <网络 1 的反掩码>

network <直连网络 2> <网络 2 的反掩码>

quit

3.查看路由表并分析

<R2> display ospf routing

4.查看邻居表并分析

<R2> display ospf peer

4.测试网络连通性

<R1>ping 3.3.3.3

配置参考脚本及说明：

<Huawei>***system-view***

Enter system view, return user view with Ctrl+Z.

[Huawei]***sysname AR1***

#配置 g0/0/1 接口地址

[AR1]***interface g0/0/1***

[AR1-GigabitEthernet0/0/1]***ip address 12.12.12.1 24***

May 20 2019 10:51:06-08:00 AR1 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP on the interface GigabitEthernet0/0/1 has entered the UP state.

[AR1-GigabitEthernet0/0/1]***quit***

#配置 loopback 0 接口地址

[AR1]***int loopback 0***

[AR1-LoopBack0]***ip add 1.1.1.1 32***

[AR1-LoopBack0]***quit***

#配置 OSPF 协议，路由器 id 为 1.1.1.1

[AR1]***ospf 1 router-id 1.1.1.1***

[AR1-ospf-1]***area 0***

#声明 loopback0 接口及 12.12.12.0/24 网络

[AR1-ospf-1-area-0.0.0.0]***network 1.1.1.1 0.0.0.0***

[AR1-ospf-1-area-0.0.0.0]***network 12.12.12.0 0.0.0.255***

[AR1-ospf-1-area-0.0.0.0]***quit***

[AR1-ospf-1]***quit***

[AR1]

May 20 2019 10:53:45-08:00 AR1 %%01OSPF/4/NBR_CHANGE_E(l)[2]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.12.12.12, NeighborEvent=HelloReceived, NeighborPreviousState=Down, NeighborCurrentState=Init)

[AR1]

May 20 2019 10:53:52-08:00 AR1 %%01OSPF/4/NBR_CHANGE_E(l)[3]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.12.12.12, NeighborEvent=2WayReceived, NeighborPreviousState=Init, NeighborCurrentState=ExStart)

[AR1]

May 20 2019 10:53:52-08:00 AR1 %%01OSPF/4/NBR_CHANGE_E(l)[4]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.12.12.12, NeighborEvent=NegotiationDone, NeighborPreviousState=ExStart, NeighborCurrentState=Exchange)

[AR1]

May 20 2019 10:53:52-08:00 AR1 %%01OSPF/4/NBR_CHANGE_E(l)[5]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.12.12.12, NeighborEvent=ExchangeDone, NeighborPreviousState=Exchange, NeighborCurrentState=Loading)

[AR1]

May 20 2019 10:53:52-08:00 AR1 %%01OSPF/4/NBR_CHANGE_E(l)[6]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.12.12.12, NeighborEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full)

[AR1]

<Huawei>

<Huawei>***system-view***

Enter system view, return user view with Ctrl+Z.

[Huawei]***sysname AR2***

#配置 g0/0/0 接口地址

[AR2]***interface g0/0/0***

[AR2-GigabitEthernet0/0/0]***ip add 12.12.12.2 24***

[AR2-GigabitEthernet0/0/0]

May 20 2019 10:52:36-08:00 AR2 %%01IFNET/4/LINK_STATE(l)[4]:The line protocol IP on the interface GigabitEthernet0/0/0 has entered the UP state.

[AR2-GigabitEthernet0/0/0]***quit***

#配置 g0/0/1 接口地址

[AR2]***int g0/0/1***

[AR2-GigabitEthernet0/0/1]***ip add 23.23.23.2 24***

May 20 2019 10:52:51-08:00 AR2 %%01IFNET/4/LINK_STATE(l)[5]:The line protocol IP on the interface GigabitEthernet0/0/1 has entered the UP state.

[AR2-GigabitEthernet0/0/1]***quit***

#配置 loopback 0 接口地址

[AR2]***int loopback 0***

[AR2-LoopBack0]***ip add 2.2.2.2 32***

[AR2-LoopBack0]***quit***

#配置 OSPF 协议，路由器 id 为 2.2.2.2

[AR2]***ospf 1 router-id 2.2.2.2***

[AR2-ospf-1]***area 0***

#声明 loopback0 接口及 12.12.12.0/24 网络

[AR2-ospf-1-area-0.0.0.0]***network 2.2.2.2 0.0.0.0***

[AR2-ospf-1-area-0.0.0.0]***network 12.12.12.0 0.0.0.255***

May 20 2019 10:53:53-08:00 AR2 %%01OSPF/4/NBR_CHANGE_E(l)[6]:Neighbor changes event: neighbor status changed. (ProcessId=256,

NeighborAddress=1.12.12.12, NeighborEvent=HelloReceived, NeighborPreviousState=Down, NeighborCurrentState=Init)

May 20 2019 10:53:53-08:00 AR2 %%01OSPF/4/NBR_CHANGE_E(l)[7]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=1.12.12.12, NeighborEvent=2WayReceived, NeighborPreviousState=Init, NeighborCurrentState=2Way)

May 20 2019 10:53:53-08:00 AR2 %%01OSPF/4/NBR_CHANGE_E(l)[8]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=1.12.12.12, NeighborEvent=AdjOk?, NeighborPreviousState=2Way, NeighborCurrentState=ExStart)

May 20 2019 10:53:53-08:00 AR2 %%01OSPF/4/NBR_CHANGE_E(l)[9]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=1.12.12.12, NeighborEvent=NegotiationDone, NeighborPreviousState=ExStart, NeighborCurrentState=Exchange)

May 20 2019 10:53:53-08:00 AR2 %%01OSPF/4/NBR_CHANGE_E(l)[10]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=1.12.12.12, NeighborEvent=ExchangeDone, NeighborPreviousState=Exchange, NeighborCurrentState=Loading)

May 20 2019 10:53:53-08:00 AR2 %%01OSPF/4/NBR_CHANGE_E(l)[11]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=1.12.12.12,

NeighborEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full)

#声明 23.23.23.0/24 网络

[AR2-ospf-1-area-0.0.0.0]***network 23.23.23.0 0.0.0.255***

[AR2-ospf-1-area-0.0.0.0]***quit***

[AR2-ospf-1]***quit***

[AR2]

May 20 2019 10:55:37-08:00
AR2 %%01OSPF/4/NBR_CHANGE_E(l)[12]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=3.23.23.23, NeighborEvent=HelloReceived, NeighborPreviousState=Down, NeighborCurrentState=Init)

[AR2]

May 20 2019 10:55:44-08:00
AR2 %%01OSPF/4/NBR_CHANGE_E(l)[13]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=3.23.23.23, NeighborEvent=2WayReceived, NeighborPreviousState=Init, NeighborCurrentState=ExStart)

[AR2]

May 20 2019 10:55:44-08:00
AR2 %%01OSPF/4/NBR_CHANGE_E(l)[14]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=3.23.23.23, NeighborEvent=NegotiationDone, NeighborPreviousState=ExStart, NeighborCurrentState=Exchange)

[AR2]

May 20 2019 10:55:44-08:00
AR2 %%01OSPF/4/NBR_CHANGE_E(l)[15]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=3.23.23.23, NeighborEvent=ExchangeDone, NeighborPreviousState=Exchange, NeighborCurrentState=Loading)

[AR2]

May 20 2019 10:55:44-08:00
AR2 %%01OSPF/4/NBR_CHANGE_E(l)[16]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=3.23.23.23, NeighborEvent=LoadingDone, NeighborPreviousState=Loading, NeighborCurrentState=Full)

<Huawei>***system-view***

Enter system view, return user view with Ctrl+Z.

[Huawei]***sysname AR3***

#配置 g0/0/0 接口地址

[AR3]***int g0/0/0***

[AR3-GigabitEthernet0/0/0]***ip add 23.23.23.3 24***

[AR3-GigabitEthernet0/0/0]

May 20 2019 10:54:35-08:00 AR3 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP on the interface GigabitEthernet0/0/0 has entered the UP state.

[AR3-GigabitEthernet0/0/0]***quit***

#配置 loopback 0 接口地址

[AR3]***int loopback 0***

[AR3-LoopBack0]***ip add 3.3.3.3 32***

[AR3-LoopBack0]***quit***

#配置 OSPF 协议，路由器 id 为 3.3.3.3

[AR3]***ospf 1 router-id 3.3.3.3***

[AR3-ospf-1]***area 0***

#声明 loopback0 接口及 23.23.23.0/24 网络

[AR3-ospf-1-area-0.0.0.0]***network 3.3.3.3 0.0.0.0***

[AR3-ospf-1-area-0.0.0.0]***network 23.23.23.0 0.0.0.255***

[AR3-ospf-1-area-0.0.0.0]***quit***

[AR3-ospf-1]***quit***

[AR3]

May 20 2019 10:55:44-08:00 AR3 %%01OSPF/4/NBR_CHANGE_E(l)[1]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.23.23.23, NeighborEvent=HelloReceived, NeighborPreviousState=Down, NeighborCurrentState=Init)

[AR3]

May 20 2019 10:55:44-08:00 AR3 %%01OSPF/4/NBR_CHANGE_E(l)[2]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.23.23.23, NeighborEvent=2WayReceived, NeighborPreviousState=Init, NeighborCurrentState=2Way)

[AR3]

May 20 2019 10:55:44-08:00 AR3 %%01OSPF/4/NBR_CHANGE_E(l)[3]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.23.23.23, NeighborEvent=AdjOk?, NeighborPreviousState=2Way, NeighborCurrentState=ExStart)

[AR3]

May 20 2019 10:55:44-08:00 AR3 %%01OSPF/4/NBR_CHANGE_E(l)[4]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.23.23.23, NeighborEvent=NegotiationDone, NeighborPreviousState=ExStart, NeighborCurrentState=Exchange)

[AR3]

May 20 2019 10:55:44-08:00 AR3 %%01OSPF/4/NBR_CHANGE_E(l)[5]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.23.23.23, NeighborEvent=ExchangeDone, NeighborPreviousState=Exchange, NeighborCurrentState=Loading)

[AR3]

May 20 2019 10:55:44-08:00 AR3 %%01OSPF/4/NBR_CHANGE_E(l)[6]:Neighbor changes event: neighbor status changed. (ProcessId=256, NeighborAddress=2.23.23.23, NeighborEvent=LoadingDone, NeighborPreviousState=Loading,NeighborCurrentState=Full)

[AR3]***displayospf peer***

OSPF Process 1 with Router ID 3.3.3.3

Neighbors

Area 0.0.0.0 interface 23.23.23.3(GigabitEthernet0/0/0)'s neighbors

Router ID: 2.2.2.2 Address: 23.23.23.2

State: Full Mode:Nbr is Slave Priority: 1

DR: 23.23.23.2 BDR: 23.23.23.3 MTU: 0

Dead timer due in 38 sec

Retrans timer interval: 5

Neighbor is up for 00:00:13

Authentication Sequence: [0]

[AR3]***display ospf routing***

OSPF Process 1 with Router ID 3.3.3.3

Routing Tables

Routing for Network

Destination	Cost	Type	NextHop	AdvRouter	Area
3.3.3.3/32	0	Stub	3.3.3.3	3.3.3.3	0.0.0.0
23.23.23.0/24	1	Transit	23.23.23.3	3.3.3.3	0.0.0.0
1.1.1.1/32	2	Stub	23.23.23.2	1.1.1.1	0.0.0.0
2.2.2.2/32	1	Stub	23.23.23.2	2.2.2.2	0.0.0.0
12.12.12.0/24	2	Transit	23.23.23.2	1.1.1.1	0.0.0.0

Total Nets: 5

Intra Area: 5 Inter Area: 0 ASE: 0 NSSA: 0

[AR3]ping 1.1.1.1

PING 1.1.1.1: 56 data bytes, press CTRL_C to break

```
  Reply from 1.1.1.1: bytes=56 Sequence=1 ttl=254 time=50 ms
  Reply from 1.1.1.1: bytes=56 Sequence=2 ttl=254 time=30 ms
  Reply from 1.1.1.1: bytes=56 Sequence=3 ttl=254 time=30 ms
  Reply from 1.1.1.1: bytes=56 Sequence=4 ttl=254 time=20 ms
  Reply from 1.1.1.1: bytes=56 Sequence=5 ttl=254 time=20 ms


--- 1.1.1.1 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 20/30/50 ms
```

[AR3]