**Enterprise Network Management Using SNMP**

Student Version



Huawei Technologies Co., Ltd.

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# Enterprise Network Management Using SNMP

## Background

The company Jan16 has three office areas that are interconnected through routers R1, R2, and R3. These routers are deployed for the technology department, financial department, and marketing department, respectively. The routers need to be configured with single-area OSPF routing so that all PCs of the three departments can communicate with each other. The company also wants to deploy SNMP for convenient device management and monitoring.

Figure 1-1 shows the network topology. The specific requirements are as follows:

* OSPF routes are configured on routers to implement network interconnection.
* SNMP is enabled on each router so that they can be managed by the network management system (NMS).
* The IP addresses and interfaces of the PCs and routers are shown in the following topology.

## Objectives

Upon completion of this task, you will be able to:

Learn how to configure SNMPv2c

Learn how to configure SNMP trap

## Topology

Lab Topology



Single-area OSPF routing needs to be configured on routers to enable communication among devices including PCs in the three office areas. SNMP needs to be enabled on all routers so that the NMS server in the technology department can manage and monitor the routers through SNMP.

## Implementation

### Roadmap

1. Configure interfaces on the routers.
2. Deploy a single-area OSPF network.
3. Configure SNMP on the routers.
4. Configure the NMS server.
5. Configure an IP address for each PC.

### Procedure

Configure interfaces on the routers.

#Configure R1.

[Huawei]system-view

[Huawei]sysname R1

[R1]interface GigabitEthernet 0/0/0

[R1-GigabitEthernet0/0/0]ip address 192.168.1.10 255.255.255.0

[R1]interface GigabitEthernet 0/0/1

[R1-GigabitEthernet0/0/1]ip address 20.20.20.1 255.255.255.0

[R1]interface GigabitEthernet 0/0/2

[R1-GigabitEthernet0/0/2]ip address 30.30.30.1 255.255.255.0

#Configure R2.

[Huawei]system-view

[Huawei]sysname R2

[R2]interface GigabitEthernet 0/0/0

[R2-GigabitEthernet0/0/0]ip address 172.16.1.10 255.255.255.0

[R2]interface GigabitEthernet 0/0/1

[R2-GigabitEthernet0/0/1]ip address 20.20.20.10 255.255.255.0

[R2]interface GigabitEthernet 0/0/2

[R2-GigabitEthernet0/0/2]ip address 40.40.40.10 255.255.255.0

#Configure R3.

[Huawei]system-view

[Huawei]sysname R3

[R3]interface GigabitEthernet 0/0/0

[R3-GigabitEthernet0/0/0]ip address 10.10.10.10 255.255.255.0

[R3]interface GigabitEthernet 0/0/1

[R3-GigabitEthernet0/0/1]ip address 40.40.40.1 255.255.255.0

[R3]interface GigabitEthernet 0/0/2

[R3-GigabitEthernet0/0/2]ip address 30.30.30.10 255.255.255.0

Deploy a single-area OSPF network.

Create and run an OSPF process. Then, create an OSPF area, enter the OSPF area view, and specify the interface that runs OSPF and the area to which the interface belongs.

#Configure R1.

[R1]ospf 1

[R1-ospf-1]area 0

[R1-ospf-1-area-0.0.0.0]network 192.168.1.0 0.0.0.255

[R1-ospf-1-area-0.0.0.0]network 20.20.20.0 0.0.0.255

[R1-ospf-1-area-0.0.0.0]network 30.30.30.0 0.0.0.255

#configure R2.

[R2]ospf 1

[R2-ospf-1]area 0

[R2-ospf-1-area-0.0.0.0]network 172.16.1.0 0.0.0.255

[R2-ospf-1-area-0.0.0.0]network 20.20.20.0 0.0.0.255

[R2-ospf-1-area-0.0.0.0]network 40.40.40.0 0.0.0.255

#Configure R3.

[R3]ospf 1

[R3-ospf-1]area 0

[R3-ospf-1-area-0.0.0.0]network 10.10.10.0 0.0.0.255

[R3-ospf-1-area-0.0.0.0]network 40.40.40.0 0.0.0.255

[R3-ospf-1-area-0.0.0.0]network 30.30.30.0 0.0.0.255

Configure SNMP on the routers.

#Configure R1.

[R1]snmp-agent

[R1]snmp-agent sys-info version v2c

[R1]snmp-agent community read Huawei12#$

[R1]snmp-agent trap enable

[R1]snmp-agent target-host trap-paramsname R1 v2c securityname R1snmp

[R1]snmp-agent target-host trap-hostname R1 address 192.168.1.1 udp-port 162 trap-paramsname R1

#Configure R2.

[R2]snmp-agent

[R2]snmp-agent sys-info version v2c

[R2]snmp-agent community read Huawei12#$

[R2]snmp-agent trap enable

[R2]snmp-agent target-host trap-paramsname R2 v2c securityname R2snmp

[R2]snmp-agent target-host trap-hostname R2 address 192.168.1.1 udp-port 162 trap-paramsname R2

#Configure R3.

[R3]snmp-agent

[R3]snmp-agent sys-info version v2c

[R3]snmp-agent community read Huawei12#$

[R3]snmp-agent trap enable

[R3]snmp-agent target-host trap-paramsname R3 v2c securityname R3snmp

[R3]snmp-agent target-host trap-hostname R3 address 192.168.1.1 udp-port 162 trap-paramsname R3

Configure the NMS server.

# This example assumes that an IP address has been configured for the NMS server.

[root@localhost~]# yum install -y net-snmp net-snmp-utils

[root@localhost~]#echo authCommunity log,execute,net Huawei12#$ >> /etc/snmp/snmptrapd.conf

Configure an IP address for each PC.

Configure the IP addresses of PCs referred by the appendix.

* 1. **Verification**

Check the SNMP configuration on routers.

The following uses the SNMP configuration on R1 as an example, which includes the community name and SNMP protocol version.

<R1>display snmp-agent sys-info

The contact person for this managed node:

R&D Shenzhen, Huawei Technologies Co., Ltd.

The physical location of this node:

Shenzhen China

SNMP version running in the system:

SNMPv2c

<R1>display snmp-agent community read

Community name: Huawei12#$

Storage type: nonVolatile

View name: ViewDefault

Total number is 1

<R1>display snmp-agent target-host

Traphost list:

Target host name: R1

Traphost address: 192.168.1.1

Traphost portnumber: 162

Target host parameter: R1

Total number is 1

Parameter list trap target host:

Parameter name of the target host: R1

Message mode of the target host: SNMPV2C

Trap version of the target host: v2c

Security name of the target host: R1snmp

Total number is 1

Obtain SNMP information on the NMS server.

On the NMS server, run the **snmpwalk** command to obtain the system information of the routers.

[root@ localhost ~]# snmpwalk -v 2c -c Huawei12#$ 192.168.1.2 system

SNMPv2-MIB::sysDescr.0 = STRING: Huawei AR2220 Huawei Versatile Routing Platform Software VRP (R) software,Version 5.130 (AR2220 V200R003C00) Copyright (C) 2011-2012 Huawei Technologies Co., Ltd

SNMPv2-MIB::sysObjectID.0 = OID: SNMPv2-SMI::enterprises.2011.2.224.5

DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (199082) 0:33:10.82

SNMPv2-MIB::sysContact.0 = STRING: R&D Shenzhen, Huawei Technologies Co., Ltd.

SNMPv2-MIB::sysName.0 = STRING: R1

SNMPv2-MIB::sysLocation.0 = STRING: Shenzhen China

SNMPv2-MIB::sysServices.0 = INTEGER: 78

[root@ localhost ~]# snmpwalk -v 2c -c Huawei12#$ 172.16.1.2 system

SNMPv2-MIB::sysDescr.0 = STRING: Huawei AR2220 Huawei Versatile Routing Platform Software VRP (R) software,Version 5.130 (AR2220 V200R003C00) Copyright (C) 2011-2012 Huawei Technologies Co., Ltd

SNMPv2-MIB::sysObjectID.0 = OID: SNMPv2-SMI::enterprises.2011.2.224.5

DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (199667) 0:33:16.67

SNMPv2-MIB::sysContact.0 = STRING: R&D Shenzhen, Huawei Technologies Co., Ltd.

SNMPv2-MIB::sysName.0 = STRING: R2

SNMPv2-MIB::sysLocation.0 = STRING: Shenzhen China

SNMPv2-MIB::sysServices.0 = INTEGER: 78

Check whether the SNMP trap function takes effect.

#Shut down G0/0/1 on R1.

[R1]interface GigabitEthernet 0/0/1

[R1-GigabitEthernet0/0/0]shutdown

#Check the SNMP trap information on the NMS server.

[root@localhost ~]# snmptrapd -Cc /etc/snmp/snmptrapd.conf -df -Lo

NET-SNMP version 5.8

...

Received 222 byte packet from UDP: [192.168.1.2]:50975->[192.168.1.1]:162

...

[UDP: [192.168.1.2]:50975->[192.168.1.1]:162]:

DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (226398) 0:37:43.98

SNMPv2-MIB::snmpTrapOID.0 = OID: IF-MIB::linkDown IF-MIB::ifIndex.4 = INTEGER: 4 IF-MIB::ifAdminStatus.4 = INTEGER: down(2) IF-MIB::ifOperStatus.4 = INTEGER: down(2) IF-MIB::ifDescr.4 = STRING: GigabitEthernet0/0/1 SNMPv2-SMI::enterprises.2011.5.25.41.1.20.1.0 = INTEGER: 16 SNMPv2-SMI::enterprises.2011.5.25.41.1.20.2.0 = STRING: "GigabitEthernet0/0/1"

...

[UDP: [40.40.40.1]:50167->[192.168.1.1]:162]:

DISMAN-EVENT-MIB::sysUpTimeInstance = Timeticks: (226604) 0:37:46.04 SNMPv2-MIB::snmpTrapOID.0 = OID: IF-MIB::linkDown IF-MIB::ifIndex.4 = INTEGER: 4 IF-MIB::ifAdminStatus.4 = INTEGER: up(1) IF-MIB::ifOperStatus.4 = INTEGER: down(2) IF-MIB::ifDescr.4 = STRING: GigabitEthernet0/0/1 SNMPv2-SMI::enterprises.2011.5.25.41.1.20.1.0 = INTEGER: 17 SNMPv2-SMI::enterprises.2011.5.25.41.1.20.2.0 = STRING: "GigabitEthernet0/0/1"

## Appendix

IP address planning

| Device | Interface | IP Address |
| --- | --- | --- |
| R1 | G0/0/0 | 192.168.1.2/24 |
| R1 | G0/0/1 | 20.20.20.1/24 |
| R1 | G0/0/2 | 30.30.30.1/24 |
| R2 | G0/0/0 | 172.16.1.2/24 |
| R2 | G0/0/1 | 20.20.20.2/24 |
| R2 | G0/0/2 | 40.40.40.1/24 |
| R3 | G0/0/0 | 10.10.10.2/24 |
| R3 | G0/0/1 | 40.40.40.2/24 |
| R3 | G0/0/2 | 30.30.30.2/24 |
| NMS server | Eth0/0/1 | 192.168.1.1/24 |
| PC2 | Eth0/0/1 | 172.16.1.1/24 |
| PC3 | Eth0/0/1 | 10.10.10.1/24 |

Interface planning

| Local Device | Local Interface | Peer Device | Peer Interface |
| --- | --- | --- | --- |
| R1 | G0/0/0 | SW1 | G0/0/1 |
| R1 | G0/0/1 | R2 | G0/0/1 |
| R1 | G0/0/2 | R3 | G0/0/2 |
| R2 | G0/0/0 | SW2 | G0/0/1 |
| R2 | G0/0/1 | R1 | G0/0/1 |
| R2 | G0/0/2 | R3 | G0/0/1 |
| R3 | G0/0/0 | SW3 | G0/0/1 |
| R3 | G0/0/1 | R2 | G0/0/2 |
| R3 | G0/0/2 | R1 | G0/0/2 |
| SW1 | G0/0/1 | R1 | G0/0/0 |
| SW1 | Eth0/0/1 | NMS server | Eth0/0/1 |
| SW2 | G0/0/1 | R2 | G0/0/0 |
| SW2 | Eth0/0/1 | PC2 | Eth0/0/1 |
| SW3 | G0/0/1 | R3 | G0/0/0 |
| SW3 | Eth0/0/1 | PC3 | Eth0/0/1 |
| NMS server | Eth0/0/1 | SW1 | Eth0/0/1 |
| PC2 | Eth0/0/1 | SW2 | Eth0/0/1 |
| PC3 | Eth0/0/1 | SW3 | Eth0/0/1 |