Arquiteturas de Comunicação

Simple Network Management Protocol (SNMP)

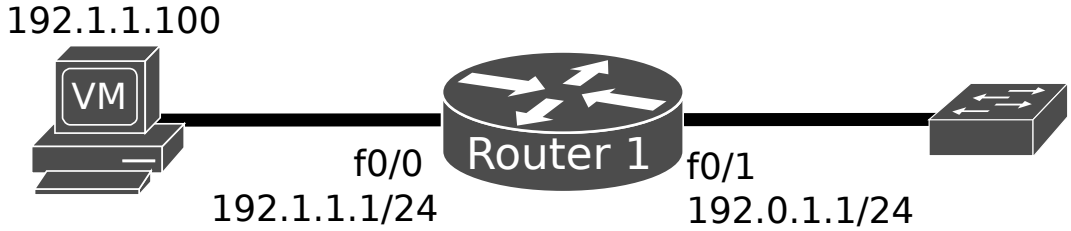
SNMP v2c

1. Configure a network according to the following figure and using a **7200 family router**. The VM PC should be a Linux (Debian) with SNMP tools installed:

```
(Debian/Ubuntu) – sudo apt install snmp
(Arch/Manjaro) – sudo pacman -S net-snmp
```

Note: if your VM does not have all the required MIBS installed, download the zip file (mibs.zip) with all MIBS, unzip it and use the option -M (with commands snmpwalk and snmpset) to define the location of the MIBS directory:

```
snmpwalk -M ./mibs ...
```



2. At the router, configure a SNMP community (using the default name "public") with Read-Only permissions:

```
Router(config)# snmp-server community public RO
```

Start a capture with Wireshark. Using the Linux SNMP tools (type "*man snmpwalk*" for more details), retrieve the Router's complete MIB information (starting from .1 base object ID):

```
snmpwalk -v2c -c public 192.1.1.1 .1
```

Analyze the information present in Router's MIB and the captured SNMP packets.

3. Retrieve partial MIB information using a filter string:

```
snmpwalk -v2c -c public 192.1.1.1 <filter>
```

Retrieve the Router's general information:

```
snmpwalk -v2c -c public 192.1.1.1 sysDescr
snmpwalk -v2c -c public 192.1.1.1 .1.3.6.1.2.1.1.1
```

Retrieve the Router's ARP table:

```
snmpwalk -v2c -c public 192.1.1.1 at                                #IOS < 15.0
snmpwalk -v2c -c public 192.1.1.1 ipNetToMediaPhysAddress           #IOS >= 15.0
snmpwalk -v2c -c public 192.1.1.1 .1.3.6.1.2.1.3                    #IOS < 15.0
```

Retrieve the Router's IP routing table:

```
snmpwalk -v2c -c public 192.1.1.1 ipRoute            #IOS < 15.0
snmpwalk -v2c -c public 192.1.1.1 ipCidr             #IOS >= 15.0
snmpwalk -v2c -c public 192.1.1.1 .1.3.6.1.2.1.4.21  #IOS < 15.0
```

Retrieve the Router's interfaces information and identify the interfaces' names and status:

```
snmpwalk -v2c -c public 192.1.1.1 interfaces
snmpwalk -v2c -c public 192.1.1.1 .1.3.6.1.2.1.2
```

Try other filter strings. Also, analyze the contents of the MIB CISCO-RHINO-MIB located at ~/.snmp/mibs or /usr/share/snmp/mibs.

4. Start a capture with Wireshark and try to obtain a specific MIB entry. For system description:

```
snmpget -v2c -c public 192.1.1.1 SNMPv2-MIB::sysDescr.0
snmpget -v2c -c public 192.1.1.1 .1.3.6.1.2.1.1.1.0
```

Try to obtain other MIB objects.

5. Start a capture with Wireshark and try to change the status of the Ethernet interface connected to 192.0.1.0/24 using the *snmpset* command (type "*man snmpset*" for more details):

```
snmpset -v2c -c public 192.1.1.1 IF-MIB::ifAdminStatus.2 i 2
```

Create a new community with Read-Write permission

```
Router(config)# snmp-server community myrouter1 RW
```

Retry the above *snmpset* command with the new community, verify at the router the correct change of the interface status and analyze the captured SNMP packets.

6. **For security reasons never use common community names (e.g public, private, etc...).** Therefore, remove the public community defined above and give the RO community another name:

```
Router(config)# no snmp-server community public RO
Router(config)# snmp-server community myrouter0 RO
```

Test the new community:

```
snmpwalk -v2c -c myrouter0 192.1.1.1 sysDescr
```

7. **For security reasons the SNMP access should be restricted to some IP addresses.** Restrict the access to myrouter0 community to PC VM (IP address 192.1.1.100):

```
Router(config)# access-list 10 permit 192.1.1.100
Router(config)# snmp-server community myrouter0 RO 10
```

Test the configuration by accessing the MIB from your PC:

```
snmpwalk -v2c -c myrouter0 192.1.1.1 sysDescr
```

8. Redefine the access restrictions to allow a RO access to all computers in the network 192.1.1.0/24 and a RW access just to your PC. Test the configuration.

9. **For security reasons the SNMP access should be restricted to some MIB objects.** Define a MIB view restriction just to allow the RO access to the system objects:

```
Router(config)# snmp-server view myview system included
Router(config)# snmp-server community myrouter0 view myview RO 10
```

Test the configuration by trying to access the Router's interfaces information:

```
snmpwalk -v2c -c myrouter0 192.1.1.1 interfaces
```

Redefine the SNMP view to allow the access to the MIB's interfaces objects.

10. Remove all SNMP v2c configurations.

SNMP v3

11. **SNMP version 3 allows the authentication and/or encryption of data.** Configure the SNMP v3 access by defining 4 different users and 4 different user groups to establish:

1) An access without authentication/encryption,

2) An access without authentication/encryption but with view limitations,

3) An access with authentication (MD5) and no encryption,

4) An access with authentication (MD5) and encryption (DES56).

```
Router(config)# snmp-server engineID local 123456789A
Router(config)# snmp-server user user1 group1 v3
Router(config)# snmp-server user user2 group2 v3
Router(config)# snmp-server user user3 group3 v3 auth md5 authpass
Router(config)# snmp-server user user4 group4 v3 auth md5 authpass priv des56 encpassword
Router(config)# snmp-server group group1 v3 noauth
Router(config)# snmp-server group group2 v3 noauth read myview
Router(config)# snmp-server group group3 v3 auth
Router(config)# snmp-server group group4 v3 priv
Router(config)# snmp-server view myview system included
Router(config)# snmp-server community myrouter RO
```

Use the following commands to verify the SNMP v3 users/groups information:

```
Router# show snmp user
Router# show snmp group
```

12. Start a capture with Wireshark, test the following SNMP v3 requests and analyze the outputs and captured SNMP packets:

```
snmpwalk -v1 -c myrouter 192.1.1.1 sysDescr
snmpwalk -v2c -c myrouter 192.1.1.1 sysDescr
snmpwalk -v3 -u user1 -l noauthnopriv 192.1.1.1
snmpwalk -v3 -u user2 -l noauthnopriv 192.1.1.1
snmpwalk -v3 -u user1 -l noauthnopriv 192.1.1.1 sysDescr
snmpwalk -v3 -u user2 -l noauthnopriv 192.1.1.1 sysDescr
snmpwalk -v3 -u user1 -l noauthnopriv 192.1.1.1 interfaces
snmpwalk -v3 -u user2 -l noauthnopriv 192.1.1.1 interfaces
snmpwalk -v3 -u user3 -l authnopriv 192.1.1.1 sysDescr
snmpwalk -v3 -u user3 -A authpass -l authnopriv 192.1.1.1 sysDescr
snmpwalk -v3 -u user4 -A authpass -l authpriv 192.1.1.1 sysDescr
snmpwalk -v3 -u user4 -A authpass -X encpassword -l authpriv 192.1.1.1 sysDescr
```

SNMP traps

13. Routers can generate automatic SNMP messages to notify a specif event (SNMP traps). Perform the following configurations to generate a SNMP trap every time the Router's system log has a new entry:

```
Router(config)# snmp-server enable traps syslog
Router(config)# snmp-server host 192.1.1.100 version 2c myrouter
```

Start a capture with Wireshark. At the router, change (several times) the status of the Ethernet interface connected to 192.0.1.0/24. Analyze the captured packets.