

Application for monitoring network devices and protocols

It is necessary to implement a system that monitors the operation of part of the network or some of its functionality using the SNMP protocol. The network that is monitored is realized within the GNS3 simulator, and the entire environment is given on a virtual machine for VMware player (the operating system of the virtual machine is Ubuntu 22.04) which students can download via a link from the Project Task section on the eLearning platform. The virtual machine is configured to have 4GB of RAM (if the resources of the computer on which it runs do not allow it to reduce to 2GB of RAM). On the virtual machine, next to the GNS3 software, there are:

- **Java** (see if everything you need is there)
- **Eclipse IDE**
- **Sublime** tekstualni editor
- **ireasoning MIB browser** that can help search for SNMP variables and explain their functioning. The MIB browser starts from the terminal with:
`/home/student/Downloads/ireasoning/mibbrowser/browser.sh`

The Ubuntu virtual machine has a connection to the Internet via the computer on which it is located, so it is possible to install additional software if necessary.

SNMP Java API can be used to monitor the device:

<https://ireasoning.com/snmpapi.shtml>

Additional information regarding this app is provided here:

User guide: <http://www.ireasoning.com/docs/SnmpUserGuide.pdf>

FAQ: <https://ireasoning.com/snmpfaq.shtml>

Javadocs: <http://www.ireasoning.com/javadocs/index.html>

Instructions for working in the environment

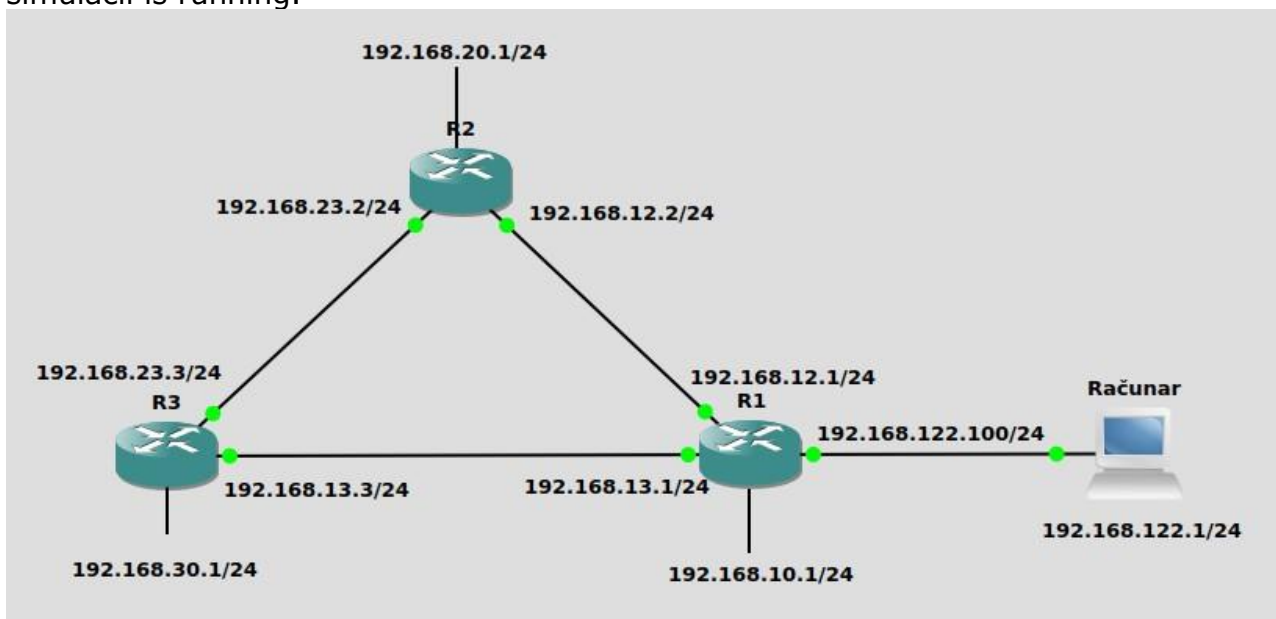
GNS3 topologija

The GNS3 program starts by clicking on the icon:



In the first window, you should click on the option "Open projects" and select the project "SNMP_setup" located in the folder "GNS3". When the topology is started, the network that is configured will be displayed. To start the network simulation, you need to click on the > and wait a little while for all connections to turn green, which is a sign that all routers have started and that the network has started working.

The network to be monitored, with the addresses of all devices and networks is given in the image. The computer in this image is a virtual machine on which the GNS3 simulacii is running.



Check ing a topology connection to a virtual machine

In order for the computer in the image (virtual machine) on which the GNS3 simulation is running to communicate with all the routers in the simulation, it is necessary to add the following routes in the virtual machine terminal (since the commands are executed with root privileges when entering the first command, it will be necessary to enter the user's password):

```
sudo ip route add 192.168.10.0/24 via 192.168.122.100 dev virbr0 sudo
ip route add 192.168.20.0/24 via 192.168.122.100 dev virbr0 sudo ip
route add 192.168.30.0/24 via 192.168.122.100 dev virbr0 sudo ip
route add 192.168.12.0/24 via 192.168.122.100 dev virbr0 sudo ip route
add 192.168.13.0/24 via 192.168.122.100 dev virbr0 sudo ip route add
192.168.23.0/24 via 192.168.122.100 dev virbr0
```

After this, the virtual machine routing table should look like this (obtained using the route command, and red are marked with new routes that are used to access the routers):

```
student@rm2 ~
```

```
$ route
```

```
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
default	_gateway	0.0.0.0	UG	100	0	0	ens33
link-local	0.0.0.0	255.255.0.0	In	1000	0	0	ens33
192.168.10.0	192.168.122.100	255.255.255.0	UG	0	0	0	virbr0
192.168.12.0	192.168.122.100	255.255.255.0	UG	0	0	0	virbr0
192.168.13.0	192.168.122.100	255.255.255.0	UG	0	0	0	virbr0
192.168.20.0	192.168.122.100	255.255.255.0	UG	0	0	0	virbr0
192.168.23.0	192.168.122.100	255.255.255.0	UG	0	0	0	virbr0
192.168.30.0	192.168.122.100	255.255.255.0	UG	0	0	0	virbr0
192.168.122.0	0.0.0.0	255.255.255.0	In	0	0	0	virbr0
192.168.245.0	0.0.0.0	255.255.255.0	In	100	0	0	ens33

SNMP konfiguracija

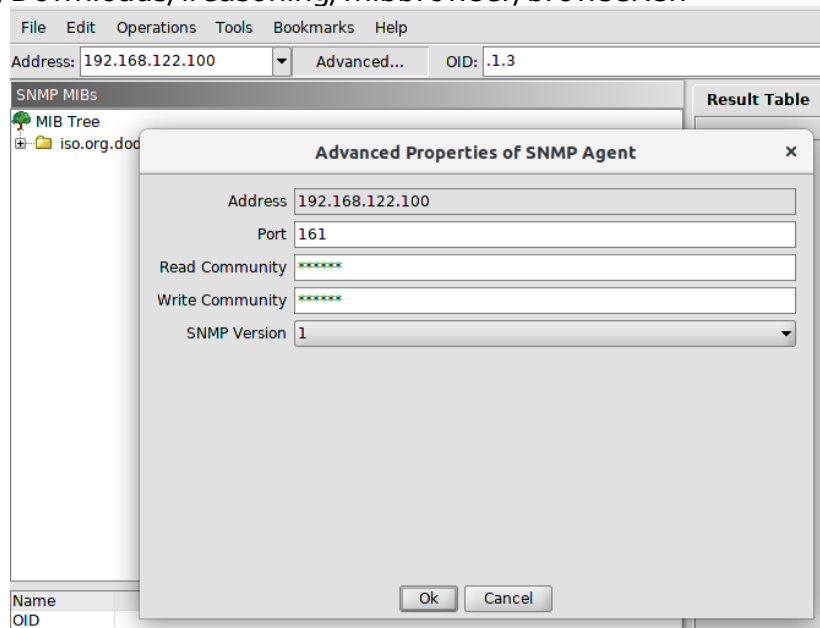
All routers in the virtual network are configured SNMP protocol, which works in versions 1 and 2c with community values set si2019 for reading and writing data. The router addresses that can be used to access via SNMP are:

- R1: 192.168.10.1
- R2: 192.168.20.1
- R3: 192.168.30.1

ireasoning MIB browser

In order to test the functioning of the SNMP protocol on routers, and to see what certain SNMP variables are for, you can use a MIB browser installed on a virtual machine. The MIB browser starts from the terminal with the command:

```
/home/student/Downloads/ireasoning/mibbrowser/browser.sh
```



After starting in the Address field, the IP address of the router to be monitored should be entered, and by clicking on the Advanced button, the window in which to enter the community values for Read and Write (si2019) should be entered. Selecting a variable in the MIB tree and clicking the Get or GetBulk and Go commands returns the values of the variables as recorded on the router.

If it is necessary to load the MIB for some special functionality, it is done through the File / Load MIB menu.

Description of the problem

The application should read and monitor the status of all interfaces on all routers in the network and display for each interface the following data: description, type, MTU, interface speed, physical address, administrative and operational status. The administrative and operational status should be displayed in the form of two-tone (red/green) indicators for states down (red - ●) and up (green - ●). Data is collected periodically with a period of 10s, so the last read status is displayed on the screen. Data should be grouped by router, as follows:

- Route 1
 - Interface 1
 - description
 - tip
 - ...
 - Interface 2
 - description
 - tip
 - ...
 - ...
- Route 2
 - interface...

Solution verification :

The verification of the solution will be done by changing the interface status (shut/no shut), which should be seen in the application as a change in the corresponding status.