Semester: V (2023-24)   **Subject:** Communication Protocols

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Roll No: 52   **Batch: A3**

Experiment No: 03

Name of the Experiment: Study of GNS3 simulator and basic network configurations

Performed on: 04/09/2023

Submitted on: 30/10/2023

Aim: To study GNS3 simulator and basic network configurations.

Pre requisite: Basic knowledge of network components and its working principle.

Objectives:

- To study GNS3 network simulator
- To simulate a basic network using GNS3

Components and equipment required/studied:

- Computer with GNS3 software installed on the system (preferably Windows).

Theory:

The Graphical Network Simulator-3 is an open source, free network software emulator that is used by over one million network engineers, students, and architects all over the world to simulate, configure, test, and troubleshoot virtual and real networks.

- When building a new enterprise network, it can be useful to simulate the network before going live. A simulation allows for better testing and troubleshooting, as well as creating different models to find the one that is most effective for the desired need.
- GNS3 that allows simulation of complex networks. You may be familiar with VMware or Virtual PC that are used to emulate various operating systems in a virtual environment.
- During this process, you need to create network devices and host them on the server process. In principle, the server component can be executed as a local virtual machine (VM) and as a remote VM

- The software allows users to simulate a wide range of networks, from running a small topology that consists of only a few devices on your laptop, to those that consist of many devices hosted on multiple servers or in the cloud.

GNS3 supports many devices from various network vendors including Cisco virtual switches, Cumulus Linux switches, Cisco ASAs, Brocade vRouters, HPE VSRs, Docker instances, multiple Linux appliances and many others.

Procedure:

1) Open GNS3 and enter name of new project
2) On left-hand side of screen browse to Router option and select a router IOS image (preferably c1700). Drag two routers on the screen. If no routers are available follow the given steps:
   a) Download an IOS image from internet
   b) In GNS3 menu bar select **Edit—Preferences**
   c) In the preferences window under **Dynamips** select **IOS routers**
   d) Click on the **New** button and browse to the location of newly downloaded router image (c1700)
   e) A new router image has been added to the **Router option**
3) Browse to End devices to select VPCS. These will be the node/workstation connected to routers
4) To make connections, click on Add a link option on left-hand side and execute the following steps
   a) Select PC1, and in drop down menu choose Ethernet0/0.
   b) Drag your mouse to and click R1, choose Ethernet0 from drop down menu.
   c) Repeat steps a) and b) for PC2
   d) To connect the routers R1 & R2, click on R1 and choose FastEthernet0/0, drag and select FastEthernet0/0 option in R2.
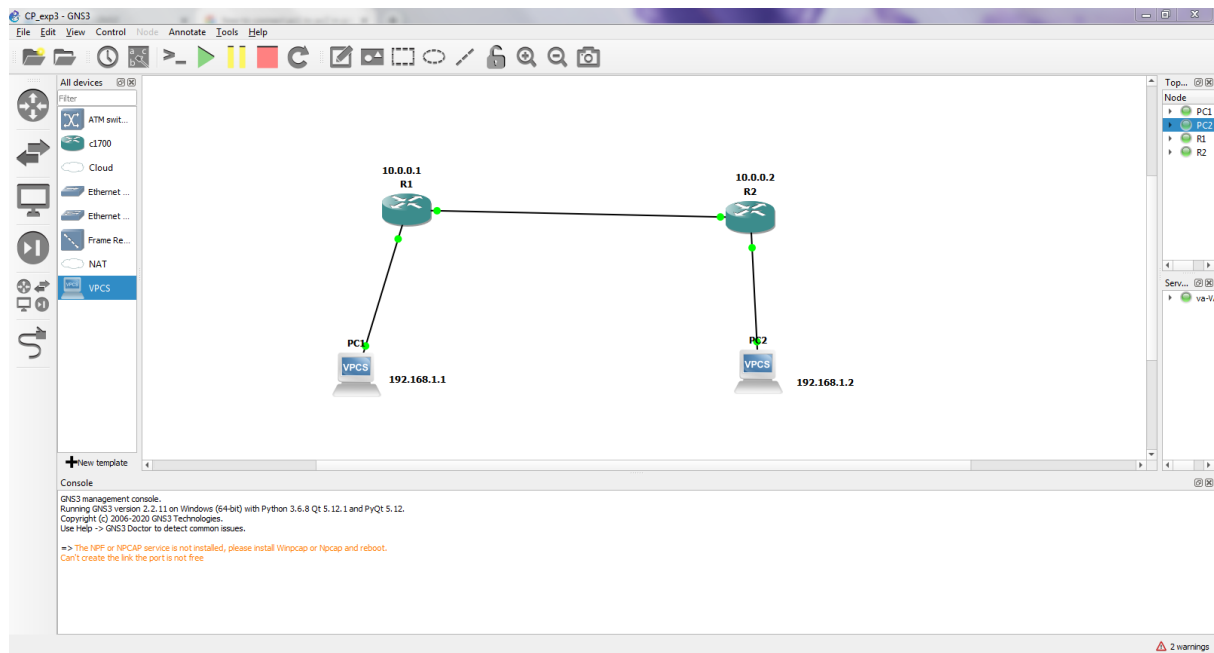
   1. Assigning IP address to PC

      - Open console and type the following command **ip <ip address> <gateway> <mask>**

   2. Assigning ip address to Router

      - Execute the following commands in R1 window
         o config t
         o int f0 (for FastEthernet port) || int e0 (for Ethernet port)
         o ip add <ip address> <255.255.255.0>
         o no shut

5) Similar way, we need to configure all the devices. Once it is done, we can check whether the network is correctly configured or not by using ping command at different interfaces or by pinging from one PC to other PC.

Figure 2 Configuration of PC

Figure 3 Configuration of Router

Conclusion:

Post Lab Questions:

1. What is Gateway? Why does a PC need to be assigned a gateway?
2. What is Fast Ethernet?
3. Write advantages of GNS3
4. Explain the command: no shut
5. What is mean by IOS?

Screenshot 1 — PC2 console

```
PC2> ip 10.1.1.2
Checking for duplicate address...
PC1 : 10.1.1.2 255.255.255.0

PC2> ping 10.1.1.3
84 bytes from 10.1.1.3 icmp_seq=1 ttl=64 time=0.569 ms
84 bytes from 10.1.1.3 icmp_seq=2 ttl=64 time=0.592 ms
84 bytes from 10.1.1.3 icmp_seq=3 ttl=64 time=0.628 ms
84 bytes from 10.1.1.3 icmp_seq=4 ttl=64 time=0.530 ms
84 bytes from 10.1.1.3 icmp_seq=5 ttl=64 time=0.700 ms

PC2>
```

Topology Summary

Node	Console
PC1	telnet localhost:5002
PC2	telnet localhost:5004
PC3	telnet localhost:5006
PC4	telnet localhost:5008
PC5	telnet localhost:5010
PC6	telnet localhost:5012
Switch1	none
Switch2	none

Servers Summary

LAPTOP-9427QIQJ CPU 3.3...

Console

GNS3 management console.
Running GNS3 version 2.2.42 on Windows (64-bit) with Pyth
Copyright (c) 2006-2023 GNS3 Technologies.
Use Help -> GNS3 Doctor to detect common issues.

=> Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Error while creating link: Dynamips error when running com
': unable to create UDP NIO
Can't create the link the port is not free
This node must be started before a console can be opened

⚠ 7 warnings

Screenshot 2 — PC3 console

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file


PC3> ip 10.1.1.3
Checking for duplicate address...
PC1 : 10.1.1.3 255.255.255.0

PC3> ping 10.1.1.4
84 bytes from 10.1.1.4 icmp_seq=1 ttl=64 time=0.849 ms
84 bytes from 10.1.1.4 icmp_seq=2 ttl=64 time=0.818 ms
84 bytes from 10.1.1.4 icmp_seq=3 ttl=64 time=0.766 ms
84 bytes from 10.1.1.4 icmp_seq=4 ttl=64 time=0.850 ms
84 bytes from 10.1.1.4 icmp_seq=5 ttl=64 time=0.924 ms

PC3>
```

Topology Summary

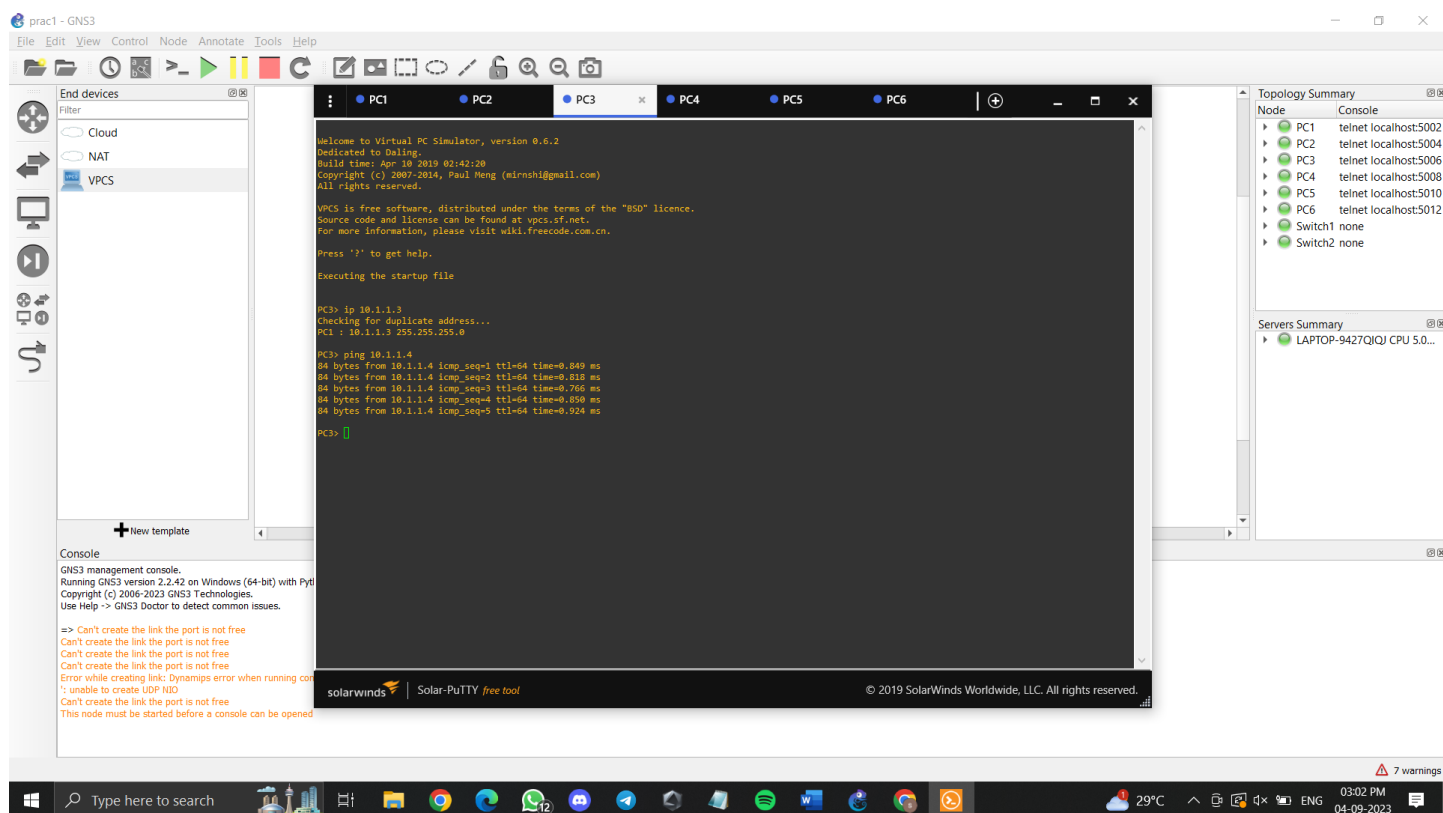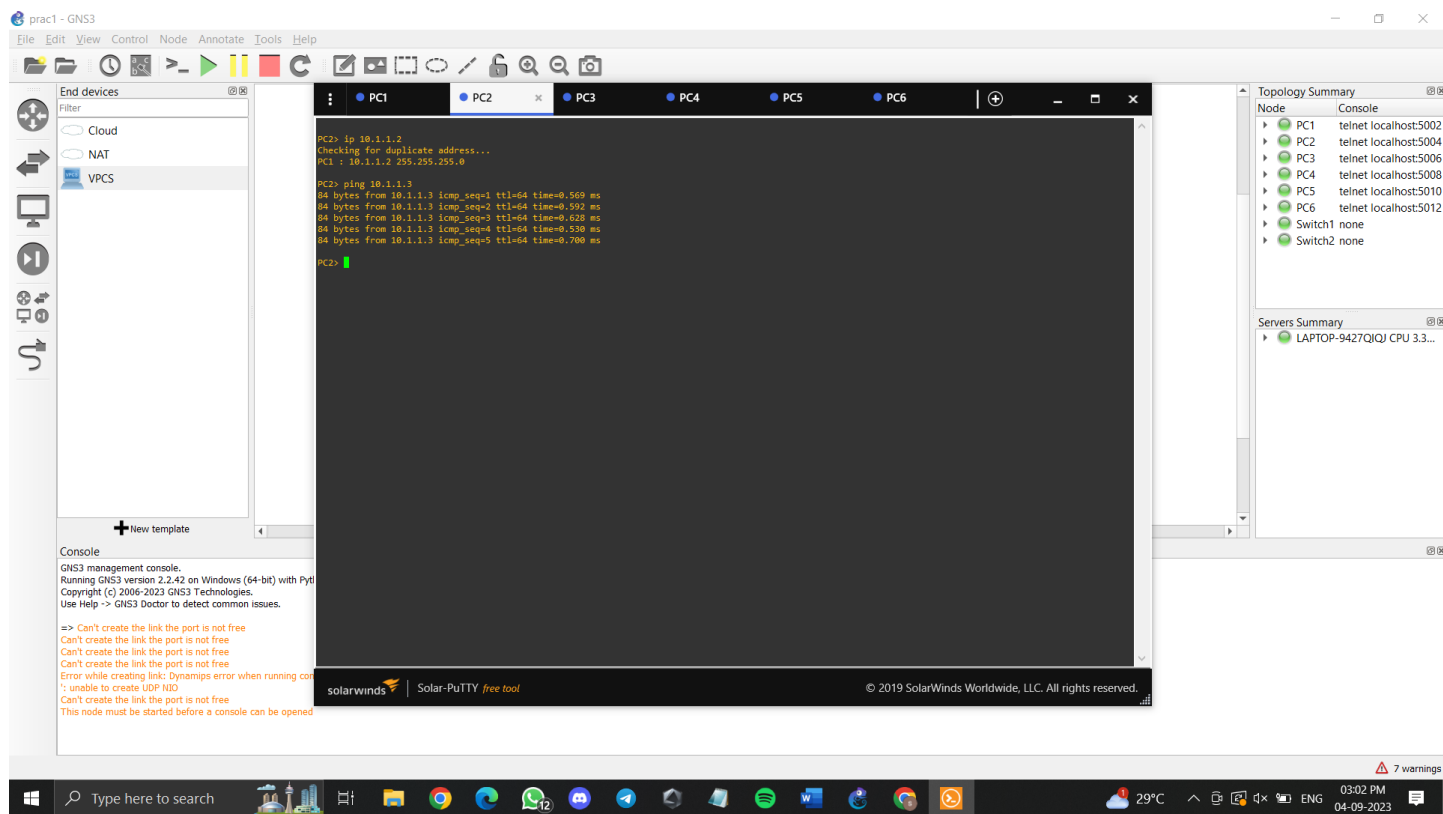| Node	Console
PC1	telnet localhost:5002
PC2	telnet localhost:5004
PC3	telnet localhost:5006
PC4	telnet localhost:5008
PC5	telnet localhost:5010
PC6	telnet localhost:5012
Switch1	none
Switch2	none

Servers Summary

LAPTOP-9427QIQJ CPU 5.0...

Console

GNS3 management console.
Running GNS3 version 2.2.42 on Windows (64-bit) with Pyth
Copyright (c) 2006-2023 GNS3 Technologies.
Use Help -> GNS3 Doctor to detect common issues.

=> Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Error while creating link: Dynamips error when running com
': unable to create UDP NIO
Can't create the link the port is not free
This node must be started before a console can be opened

⚠ 7 warnings

Screenshot 1 (top):

prac1 - GNS3

File Edit View Control Node Annotate Tools Help

End devices
Filter
- Cloud
- NAT
- VPCS

New template

Console

GNS3 management console.
Running GNS3 version 2.2.42 on Windows (64-bit) with Pyt...
Copyright (c) 2006-2023 GNS3 Technologies.
Use Help -> GNS3 Doctor to detect common issues.

=> Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Error while creating link: Dynamips error when running co...
': unable to create UDP NIO
Can't create the link the port is not free
This node must be started before a console can be opened

PC1 PC2 PC3 PC4 PC5 PC6

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC4> ip 10.1.1.4
Checking for duplicate address...
PC1 : 10.1.1.4 255.255.255.0

PC4> ping 10.1.1.5
84 bytes from 10.1.1.5 icmp_seq=1 ttl=64 time=0.600 ms
84 bytes from 10.1.1.5 icmp_seq=2 ttl=64 time=0.483 ms
84 bytes from 10.1.1.5 icmp_seq=3 ttl=64 time=0.930 ms
84 bytes from 10.1.1.5 icmp_seq=4 ttl=64 time=0.870 ms
84 bytes from 10.1.1.5 icmp_seq=5 ttl=64 time=0.667 ms

PC4>
```

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Topology Summary
Node / Console
- PC1 telnet localhost:5002
- PC2 telnet localhost:5004
- PC3 telnet localhost:5006
- PC4 telnet localhost:5008
- PC5 telnet localhost:5010
- PC6 telnet localhost:5012
- Switch1 none
- Switch2 none

Servers Summary
- LAPTOP-9427QIQJ CPU 3.6...

7 warnings

29°C ENG 03:02 PM 04-09-2023

Screenshot 2 (bottom):

prac1 - GNS3

File Edit View Control Node Annotate Tools Help

End devices
Filter
- Cloud
- NAT
- VPCS

New template

Console

GNS3 management console.
Running GNS3 version 2.2.42 on Windows (64-bit) with Pyt...
Copyright (c) 2006-2023 GNS3 Technologies.
Use Help -> GNS3 Doctor to detect common issues.

=> Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Error while creating link: Dynamips error when running co...
': unable to create UDP NIO
Can't create the link the port is not free
This node must be started before a console can be opened

PC1 PC2 PC3 PC4 PC5 PC6

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC5> ip 10.1.1.5
Checking for duplicate address...
PC1 : 10.1.1.5 255.255.255.0

PC5> ping 10.1.1.6
84 bytes from 10.1.1.6 icmp_seq=1 ttl=64 time=0.620 ms
84 bytes from 10.1.1.6 icmp_seq=2 ttl=64 time=0.631 ms
84 bytes from 10.1.1.6 icmp_seq=3 ttl=64 time=0.511 ms
84 bytes from 10.1.1.6 icmp_seq=4 ttl=64 time=0.736 ms
84 bytes from 10.1.1.6 icmp_seq=5 ttl=64 time=0.456 ms

PC5>
```

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Topology Summary
Node / Console
- PC1 telnet localhost:5002
- PC2 telnet localhost:5004
- PC3 telnet localhost:5006
- PC4 telnet localhost:5008
- PC5 telnet localhost:5010
- PC6 telnet localhost:5012
- Switch1 none
- Switch2 none

Servers Summary
- LAPTOP-9427QIQJ CPU 3.0...

7 warnings

29°C ENG 03:02 PM 04-09-2023

File Edit View Control Node Annotate Tools Help

End devices

Filter

Cloud

NAT

VPCS

+ New template

Console

GNS3 management console.
Running GNS3 version 2.2.42 on Windows (64-bit) with Pyt
Copyright (c) 2006-2023 GNS3 Technologies.
Use Help -> GNS3 Doctor to detect common issues.

=> Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Can't create the link the port is not free
Error while creating link: Dynamips error when running co
': unable to create UDP NIO
Can't create the link the port is not free
This node must be started before a console can be opened

PC1   PC2   PC3   PC4   PC5   PC6

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC6> ip 10.1.1.6
Checking for duplicate address...
PC1 : 10.1.1.6 255.255.255.0

PC6> ping 10.1.1.1
host (10.1.1.1) not reachable

PC6> ping 10.1.1.5
84 bytes from 10.1.1.5 icmp_seq=1 ttl=64 time=0.887 ms
84 bytes from 10.1.1.5 icmp_seq=2 ttl=64 time=0.685 ms
84 bytes from 10.1.1.5 icmp_seq=3 ttl=64 time=0.606 ms
84 bytes from 10.1.1.5 icmp_seq=4 ttl=64 time=0.618 ms
84 bytes from 10.1.1.5 icmp_seq=5 ttl=64 time=0.856 ms

PC6>
```

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Topology Summary

Node	Console
PC1	telnet localhost:5002
PC2	telnet localhost:5004
PC3	telnet localhost:5006
PC4	telnet localhost:5008
PC5	telnet localhost:5010
PC6	telnet localhost:5012
Switch1	none
Switch2	none

Servers Summary

LAPTOP-9427QIQJ CPU 3.4...

⚠ 7 warnings

Type here to search

29°C   ENG   03:02 PM   04-09-2023

MIT-WPU
Dr. Vishwanath Karad
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Name: Shreerang Mhatre
Rollno: 52
Batch: A3
Class: TY
Date: 04/09/2023

*Post-Lab Questions

Q1) What is Gateway? Why does a PC need to be assigned a gateway?

→ A gateway in the context of computer networking, is a device or software component that acts as an intermediary or bridge between two different networks, allowing them to communicate with each other.

A PC needs to be assigned a gateway for the following reasons -
① Interconnecting Networks
② Routing Traffic
③ Network Address Translation (NAT)
④ Firewall & security
⑤ Protocol Translation
⑥ Access Control

Q2) what is Fast Ethernet?

→   Fast Ethernet is a networking technology that represents an evolution of standard Ethernet, designed to provide significantly higher data transfer rates compared to traditional Ethernet. Its part of the IEEE 802.30 standard and is often reffered to as 100 Base-T or 100 Mbps.

Q3) write advantages of GNS3

→ GNS3 (Graphical Network Simulator3) is a popular open-source network simulation & emulation tool.
Advantages -
① Realistic Network Simulation
② Emulator of various Network Devices
③ Cost- Efficiency
④ Flexibility and Customization
⑤ Integration with Real Hardware
⑥ Community support
⑦ Dynamic & Scalable.

Q4) Explain the command: no shut

→ The 'no shut' command is a configuration command used in Ciscols IOS and other network device operating systems. It is short for 'no shutdown'. The primary purpose of this command is to re-enable or active a previously disable or administratively down network interface.

Q5) what is mean by IOS?

→ IOS typically refers to "Internetworking Operating System", which is a specific operating system developed by Cisco System for their networking hardware. Cisco ISO is the software that runs on Cisco routers and switches, controlling and managing these network devices. Cisco IOS is a key component in configuring, maintaining, and securing Cisco's networking equipment.