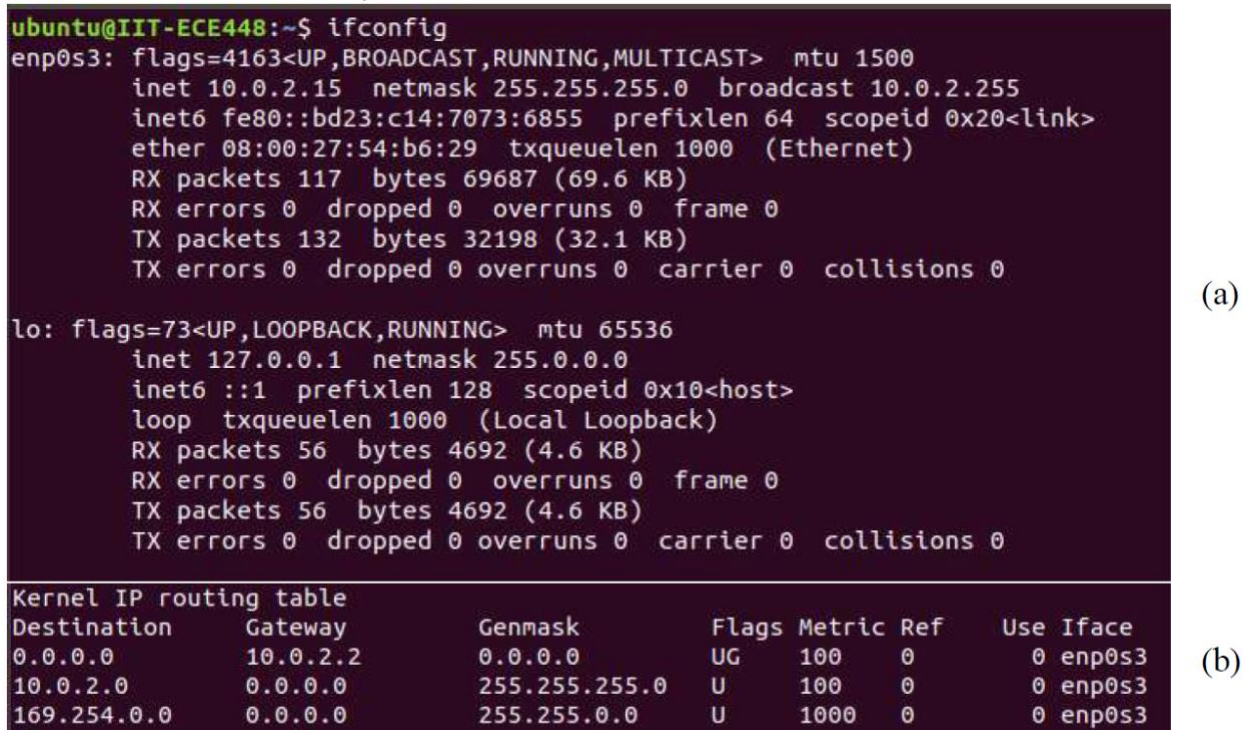


## HOMEWORK #2

**SOLUTION**

1. Execute the commands `ifconfig` and `route -n` inside the course VM. Answer the following questions based on the output (10 points)

When the IIT-VPN is disconnected, after executing `ifconfig` and `route -n`, results are as shown in below figure. You may see more interfaces if the IIT-VPN is connected, and more entries in the routing table. This is how exactly the VPN works at the network layer – packets to the IIT network will be routed differently than the one shown in the below figure.

Figure 1. (a) `ifconfig`, (b) `route -n`

- i) How many network interfaces are there and what are their names?

The `enp` prefix represents the Ethernet network Peripheral, typically seen on Ubuntu machines. VirtualBox provides an interface to our VM that is recognized by Ubuntu as `enp0s3`. VirtualBox simulates all interface functionalities so that our VM can communicate through the host network to the Internet.

The `lo` is the loopback interface which allows the host to communicate with itself.

## ECE 448/528 – Application Software Design

- ii) List the MAC addresses of the network interfaces if there are any

The `enp0s3` has the MAC address of `08:00:27:54:b6:29` as indicated by the “ether” field as shown in the above figure. There is no MAC address associated with the `lo` interface as it is a loopback interface.

- iii) What are the IP addresses and subnet associated with each interface?

`enp0s3` → IP: `10.0.2.15`; Subnet: `255.255.255.0`

`lo` → IP: `127.0.0.1`; Subnet: `255.0.0.0`

- iv) How many rules are there in the routing table? What is the address of the default gateway?

`route` is used to show or manipulate the IP routing table and `-n` is to show numerical addresses, instead of determining symbolic hostnames. This is useful to determine why the route to your nameserver has disappeared.

There are 3 rules in the routing table, the address of the default gateway is `10.0.2.2`

- v) Which rule will apply if we need to send a packet to the default gateway?

The 2nd rule applies as the default gateway is in the same subnet – no routing is needed.

2. Consider the URL `http://127.0.0.1:8080/light?action=on`. What are the protocol, host, port, path, and query respectively? (5 points)

Protocol: HTTP

Host: `127.0.0.1` (localhost)

Port: 8080

Path: `light`

Query: `action=on`

## ECE 448/528 – Application Software Design

3. Research TCP and UDP header formats and explain why UDP is considered a lighter protocol than TCP in terms of packet size. *(5 points)*

The UDP header is smaller than the TCP header, where the UDP header is 8 bytes and the TCP header can be from 20 to 60 bytes. This means there are more data to be processed for TCP compared to UDP in terms of packet size.

4. Describe the purpose of using a Java Interface in Project 2. Provide your own answer, not from the lecture notes *(5 points)*

An interface in Java is an abstract type that will specify the behavior of a class by defining the input and output. This interface can be used in form of a “Inversion of Control” or a callback where the functionality can be implemented separately and diversely in separate classes that will call this method. This is for multiple inheritances, and total abstraction of such methods.