Case Study
R.NO:CB.EN.U4CSE19156
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Title: Railway Zone Management

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Roll Number : CB.EN.U4CSE19156

Description of the case study:

Railway zones play a very crucial part in maintenance of Indian Railway system

various data that need to be managed between the stations coming under a particular zone such as maintaining the record of passenger data, health system, amount sanctioned to the station for development etc. All this data must be collected from various stations falling under a particular zone must be managed by the zone headquarters

So In order to operate effectively exchange of data among railway stations located in various place is crucial and needs a proper architecture. Our case study is aimed to demonstrate how different departments within a railway zone headquarter mange this effectively.

Railway Zone Network

NETWORKS

Tourism And Catering Department – Wide Area Network

Railway Reservation – Wide Area Network

Railway Hospital – Local Area Network

Accounts Department – Virtual Private Network

Client configuration	**Server Configuration**
Intel(R) Core 4005U Series Processor	2 Intel(R) Itanium 2 9100 Series Processors
8 GB RAM	23.98 GB RAM
8 MB Cache	12 MB Cache
1 TB	4.5 TB Storage (EMC Box)
Dual External Storage Connectivity	Dual External Storage Connectivity
DVD ROM Drive	DVD ROM Drive

SERVERS

Database Server

Proxy Server

Mail Server

Application Server

Client Server

CABLES

Coaxial Fibre

Twisted Fibre

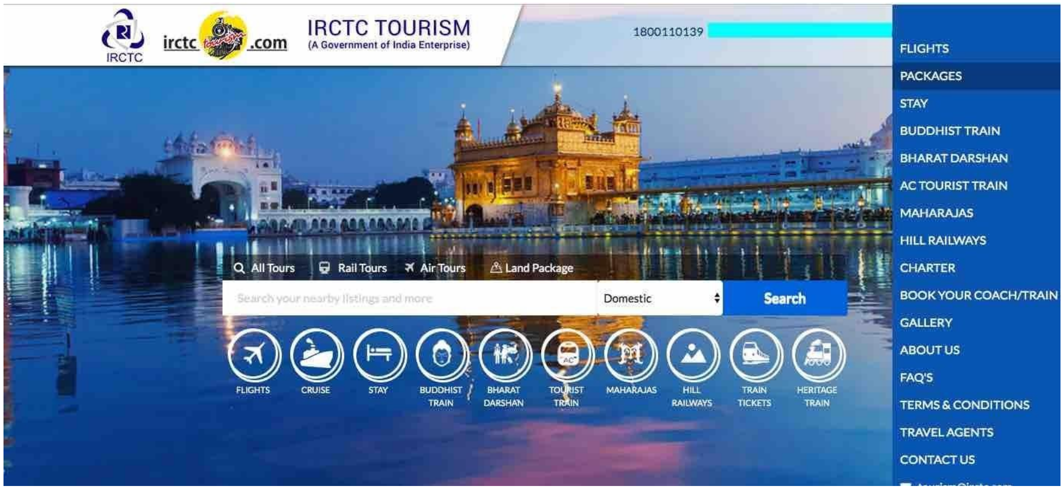
Optical Fibre

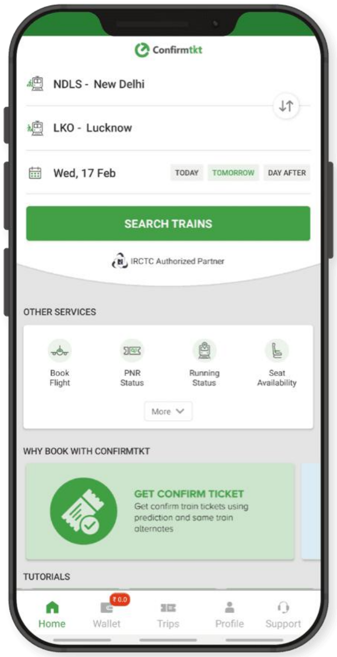
TOPOLOGY

Reservation, Accounts - Star Topology

Medical - Bus Topology

Tourism And Catering Department -





NDLS - New Delhi

LKO - Lucknow

Wed, 17 Feb

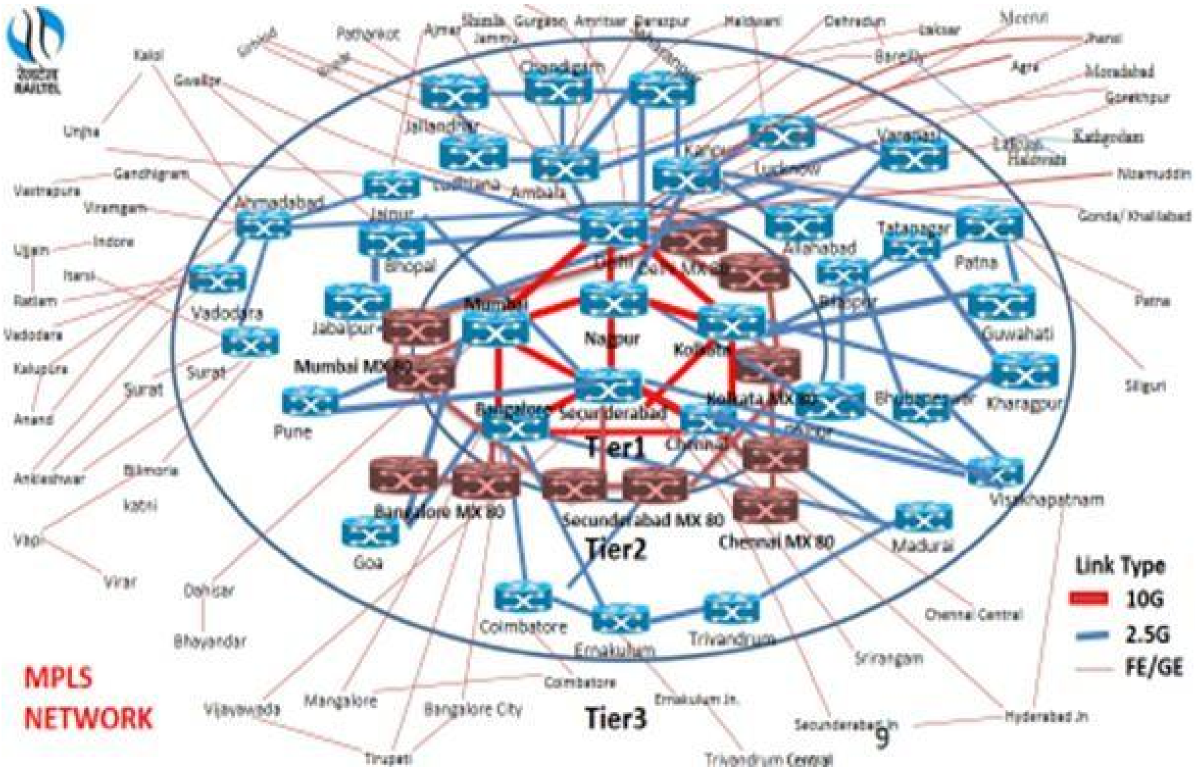
Get confirm train tickets using prediction and some train alternates

मण्डल रेलवे अस्पताल
DIVISIONAL RAILWAY HOSPITAL
DIVISIONAL RAILWAY HOSPITAL
BENGALURU

मध्य रेल
CENTRAL RAILWAY
मंडल रेल प्रबंधक कार्यालय
DIVISIONAL RAILWAY MANAGER OFFICE

Why is Networking required?

As we saw before railway zone headquarters needs to collect and send info to various railway stations and should be able to manage the passenger data. So computer network plays a vital role to establish a proper connection between various departments. A proper architecture is needed because various devices like printer, ip phone, pcs are to be connected. So that a zone headquarter can manage all the railway stations effectively.



List of Network performance parameters:

Bandwidth:

bandwidth is defined as the maximum number of bits that can flow through a network connection in a given period of time. The fundamental unit of network bandwidth is bits per second.

Formula:

Expressed as bits per second (bps), modern network links have greater capacity, which is typically measured in millions of bits per second
(megabits per second , or Mbps) or billions of bits per second (gigabits per second ,or Gbps).

Possible Value In General Scenario.

normally speeds ranging from 10–1,000 Mbps

Throughput:

The purpose of throughput is measuring the number of messages successfully transmitted per unit time.

Formula:

F = Frames per minute

A = Average of bits each frame carries

Through Put = ((F x A)/Unit Time)

Possible Value In General Scenario:

16.2 mbps

Latency (Delay):

Latency meaning in networking is best thought of as the amount of time it takes for a packet of data to be captured, transmitted, processed through multiple devices, then received at its destination and decoded.

Formula:

Propagation time = Distance/Propagation speed

Transmission time=Message size / Bandwidth

Queuing Time = Directly Proportional to the congestion in the network

Processing Delay = Directly proportional to processing speed of the routers.

Latency = Propagation Time + Transmission Time + Queuing Time + Processing Delay

Possible Value In General Scenario:

1ms to 20ms

Bandwidth-Delay Product:

Bandwidth and delay are two performance measurements of a link. However, what is significant in data communications is the product of the two, the bandwidth-delay product.

Formula:

Bandwidth x Delay

Possible Value In General Scenario:

500kb
Example is Residential Cable internet

Jitter:

JItter is used to describe the amount of inconsistency in latency across the network, while latency measures the time it takes for data to reach its destination and ultimately make a round trip

Formula:

To measure Jitter, we take the difference between samples,then divide by the number of samples (minus-1)

Possible Value In General Scenario:

below 30ms

Railway reservation department manages the passenger reservation count of trains based on different classes like sleeper class, 3A class, 2A class.

Description of CSV file:

It consists of five columns

Train_id: Train Id is an unique id which is given to each train to avoid confusion with trains having same names.

Train name: Name of the Train.

Sleeper/3a/2a : Passenger count of respective classes on a particular day.

b. List of operations completed with the File

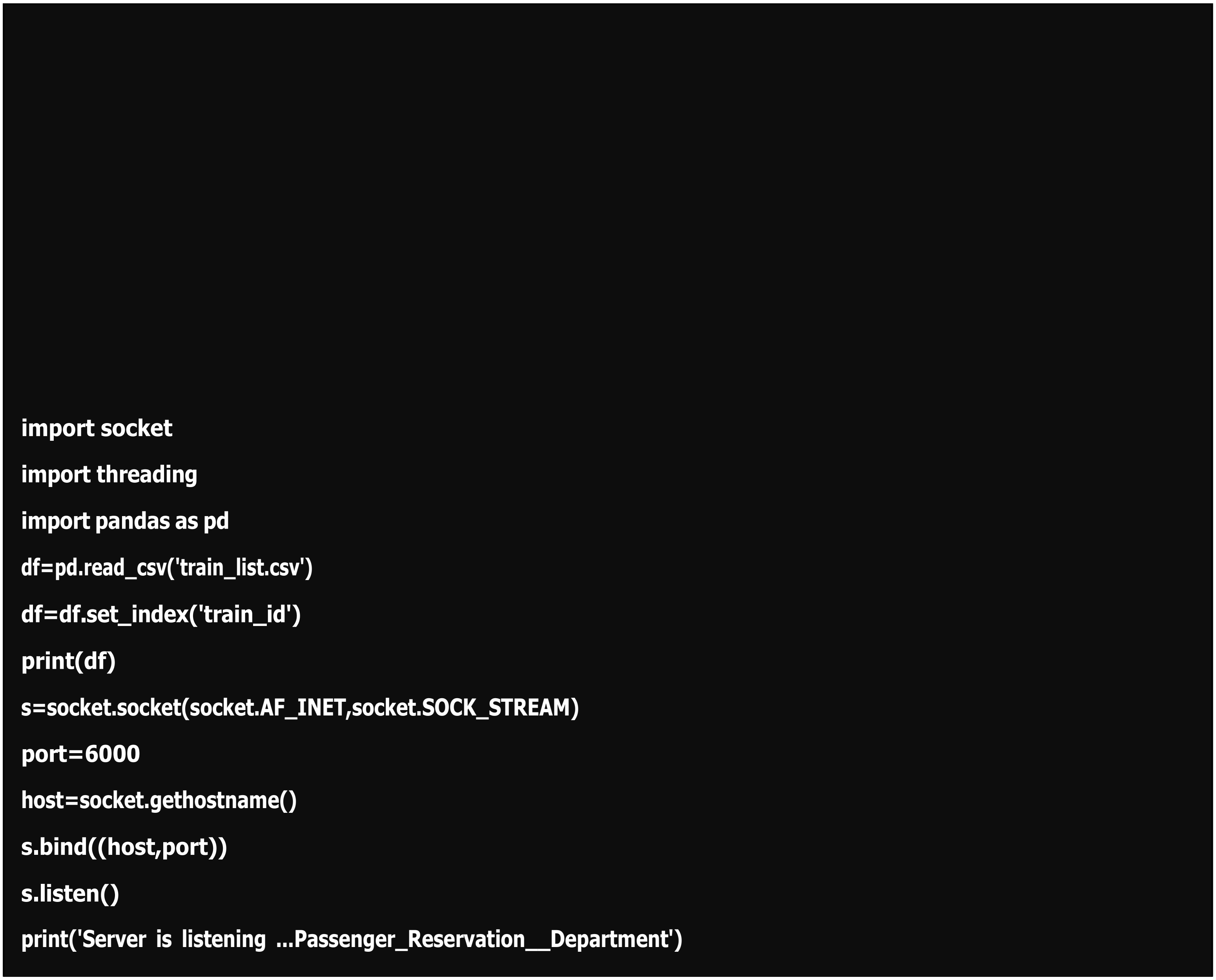
1.Adding new train details.

2.updating existing train details.

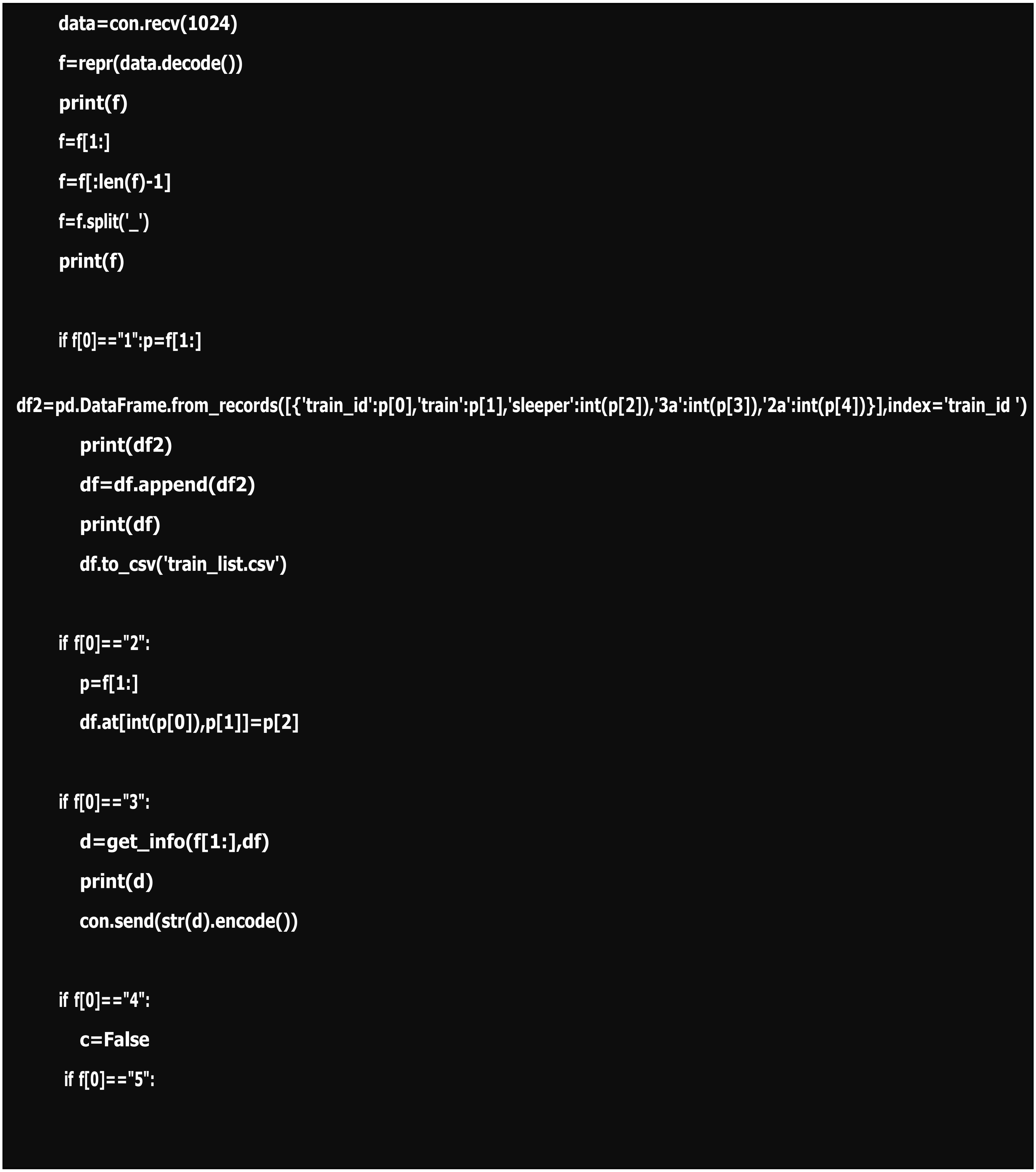
3.Retrieving the particular train details.

4.Viewing all train details on a particular Day.

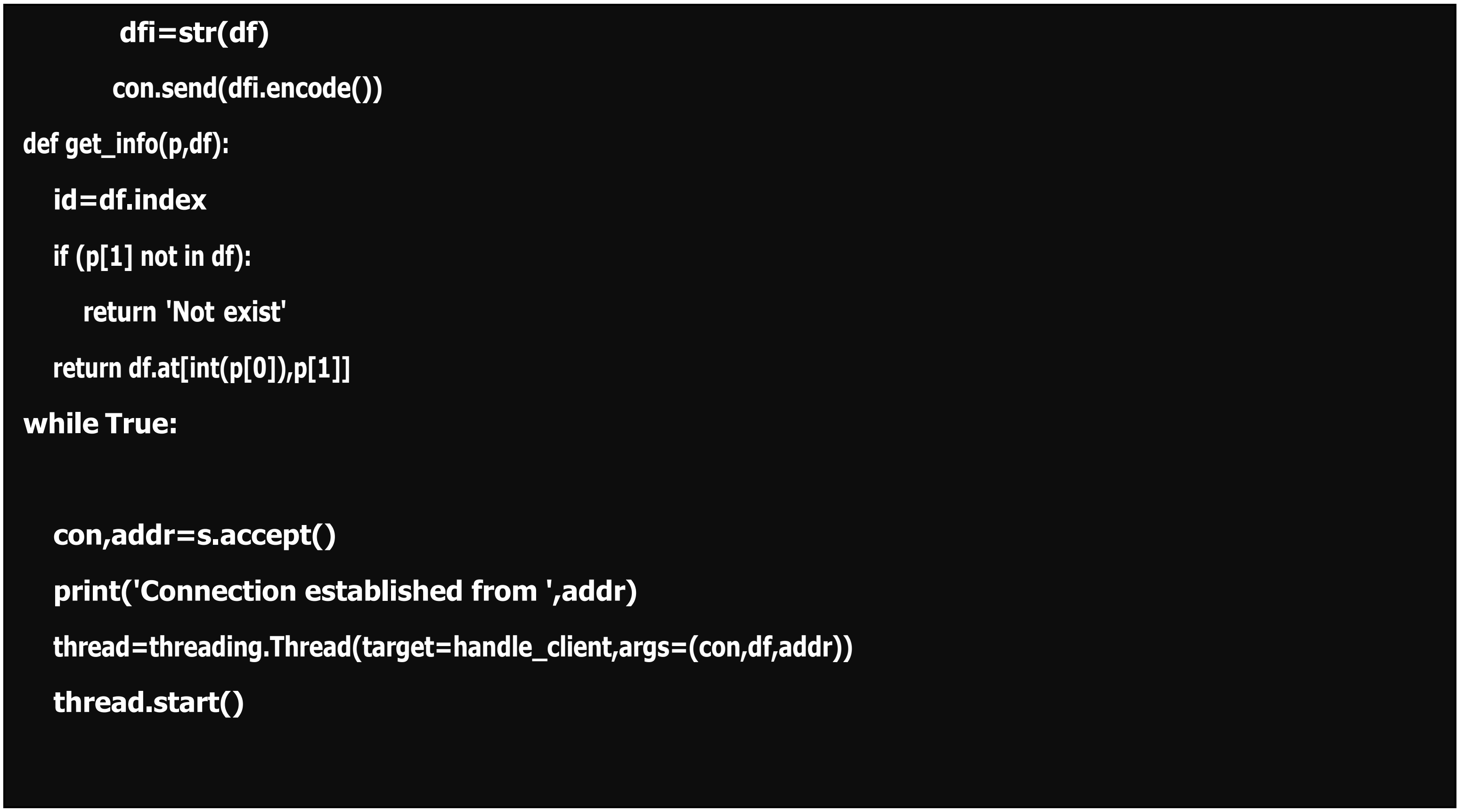
CODE:
SERVER.PY



```
import socket
import threading
import pandas as pd
df=pd.read_csv('train_list.csv')
df=df.set_index('train_id')
print(df)
s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
port=6000
host=socket.gethostname()
s.bind((host,port))
s.listen()
print('Server is listening ...Passenger_Reservation__Department')
```



```
    data=con.recv(1024)
    f=repr(data.decode())
    print(f)
    f=f[1:]
    f=f[:len(f)-1]
    f=f.split('_')
    print(f)

    if f[0]=="1":p=f[1:]
df2=pd.DataFrame.from_records([{'train_id':p[0],'train':p[1],'sleeper':int(p[2]),'3a':int(p[3]),'2a':int(p[4])}],index='train_id ')
        print(df2)
        df=df.append(df2)
        print(df)
        df.to_csv('train_list.csv')

    if f[0]=="2":
        p=f[1:]
        df.at[int(p[0]),p[1]]=p[2]

    if f[0]=="3":
        d=get_info(f[1:],df)
        print(d)
        con.send(str(d).encode())

    if f[0]=="4":
        c=False
     if f[0]=="5":
```



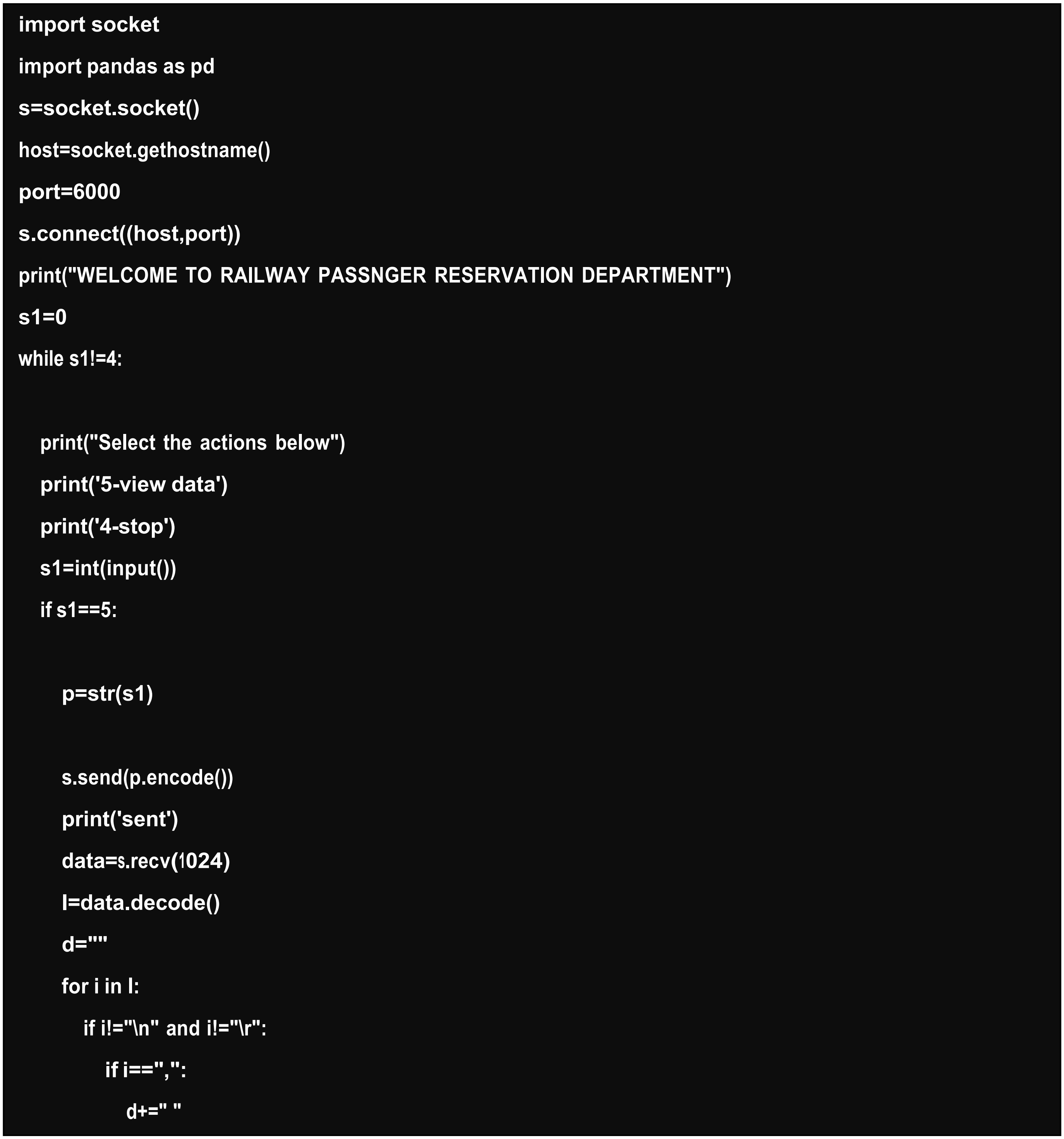
```
            dfi=str(df)
            con.send(dfi.encode())
def get_info(p,df):
    id=df.index
    if (p[1] not in df):
        return 'Not exist'
    return df.at[int(p[0]),p[1]]
while True:

    con,addr=s.accept()
    print('Connection established from ',addr)
    thread=threading.Thread(target=handle_client,args=(con,df,addr))
    thread.start()
```

CLIENT.PY

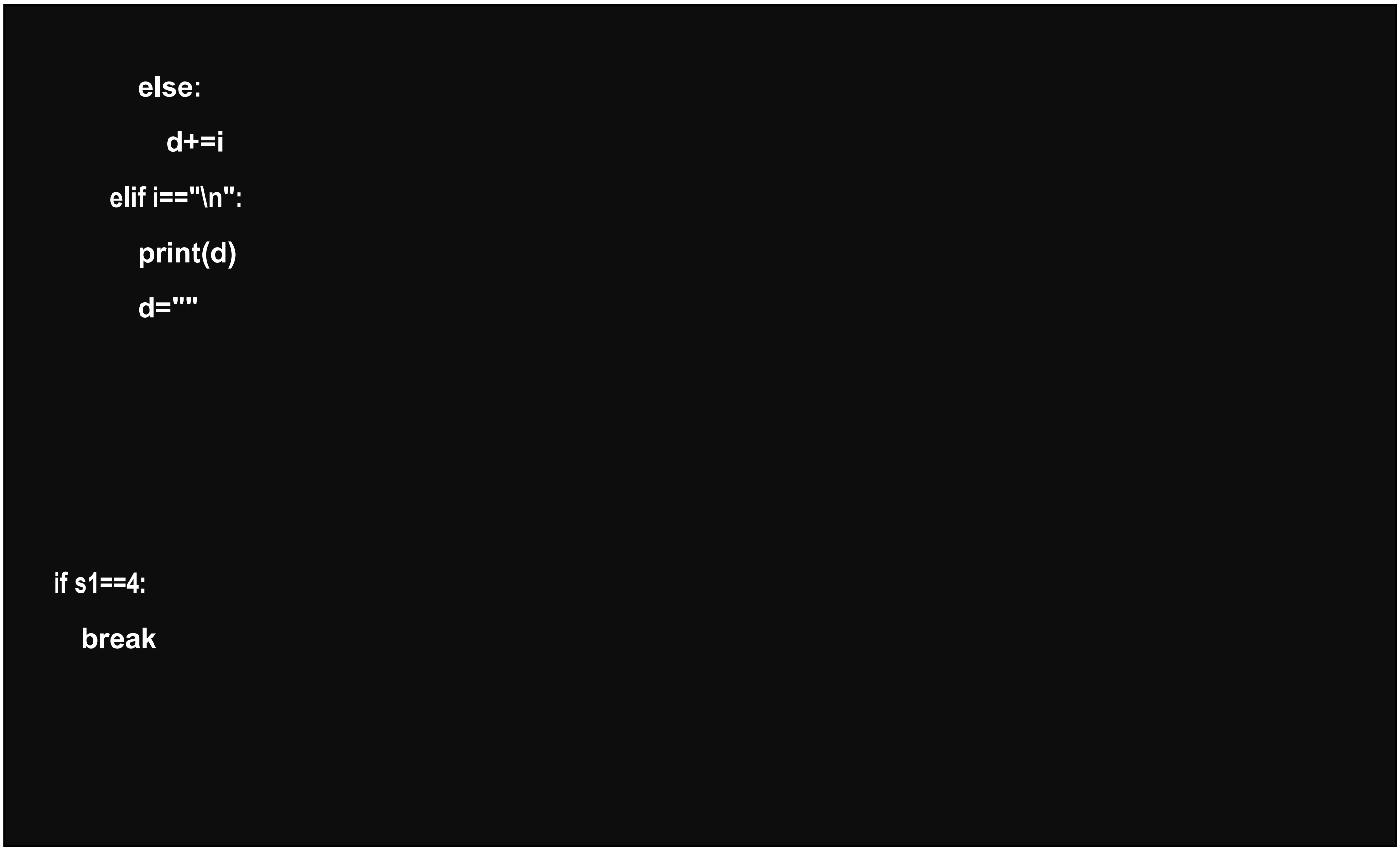
```
import socket
s=socket.socket(socket.AF_INET,socket.SOCK_STREAM)
host=socket.gethostname()
port=6000
s.connect((host,port))
print("WELCOME TO RAILWAY PASSNGER RESERVATION DEPARTMENT")
s1=0
while s1!=4:

    print("Select the actions below")
    print('1-add_info')
    print('2-update_info')
    print('3-get_info')
    print('4-stop')
    s1=int(input())
    if s1==1:
        train_id=input('enter train id:')
        train=input('enter train name:')
        sleeper=input('enter number of passengers in sleeper:')
        ac3=input('enter no of passengers in 3A:')
        ac2=input('enter no of passengers in 2A:')
        p=str(s1)+'_'+str(train_id)+'_'+str(train)+'_'+str(sleeper)+'_'+str(ac3)+'_'+str(ac2)

        s.send(p.encode())
        print('sent')
    if s1==2:
```

```
    train_id=input('enter train id:')
    sleeper=input('enter class(sleeper/3a/2a:')
    num=input('enter no of passengers to update:')
    p=str(s1)+'_'+str(train_id)+'_'+str(sleeper)+'_'+str(num)

    p=str(p)
    s.send(p.encode())
    print('updated')

if s1==3:
    train=input('enter train id:')
    sleeper=input('enter class(sleeper/3a/2a:')



    p=str(s1)+'_'+str(train)+'_'+str(sleeper)
    p=str(p)
    s.send(p.encode())
    print('sent')
    data=s.recv(1024)
    print('no of pasengers are',data.decode())
if s1==4:
    break
```

Client 3.py:



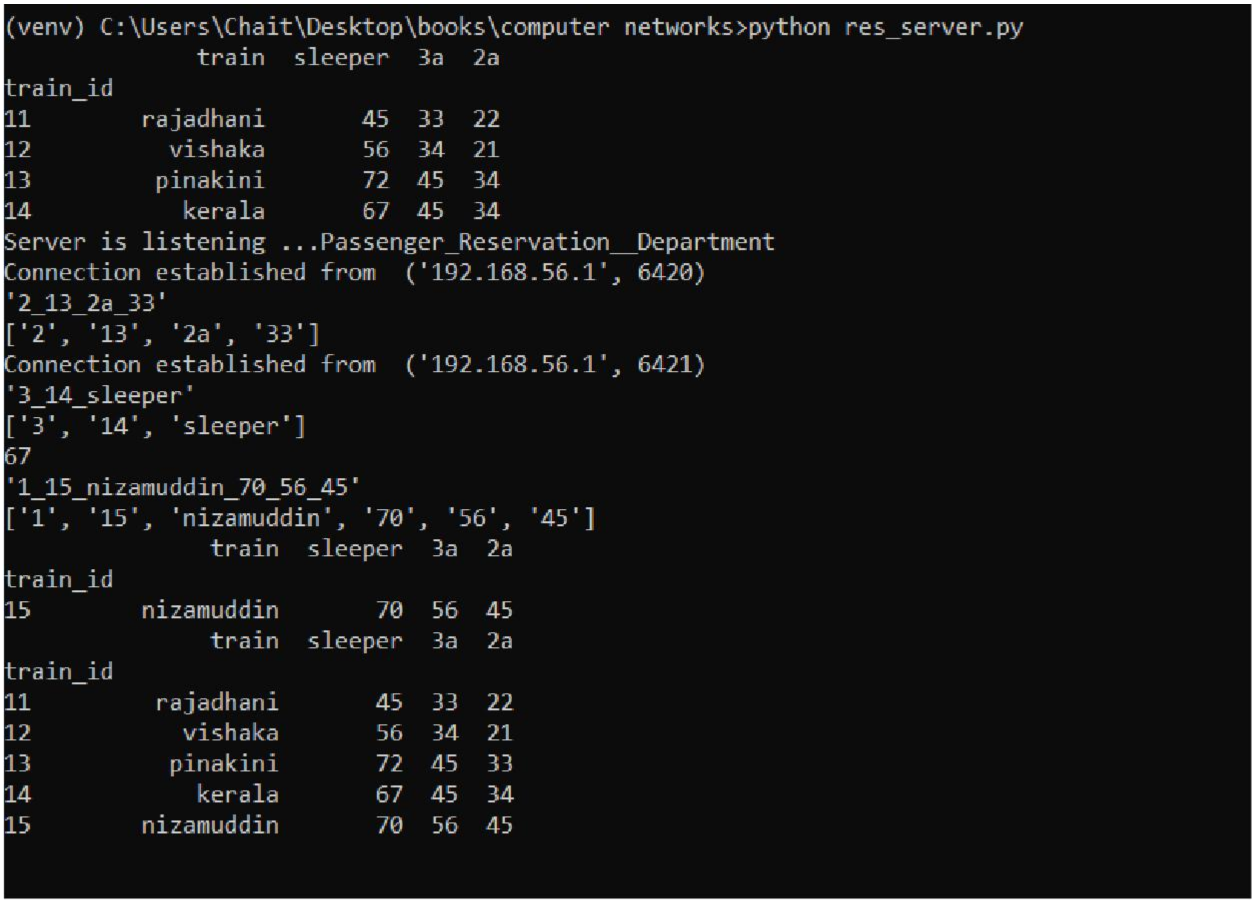
```
import socket
import pandas as pd
s=socket.socket()
host=socket.gethostname()
port=6000
s.connect((host,port))
print("WELCOME TO RAILWAY PASSNGER RESERVATION DEPARTMENT")
s1=0
while s1!=4:

    print("Select the actions below")
    print('5-view data')
    print('4-stop')
    s1=int(input())
    if s1==5:

        p=str(s1)

        s.send(p.encode())
        print('sent')
        data=s.recv(1024)
        l=data.decode()
        d=""
        for i in l:
            if i!="\n" and i!="\r":
                if i==",":
                    d+=" "
```



```
            else:
                d+=i
        elif i=="\n":
            print(d)
            d=""



if s1==4:
    break
```

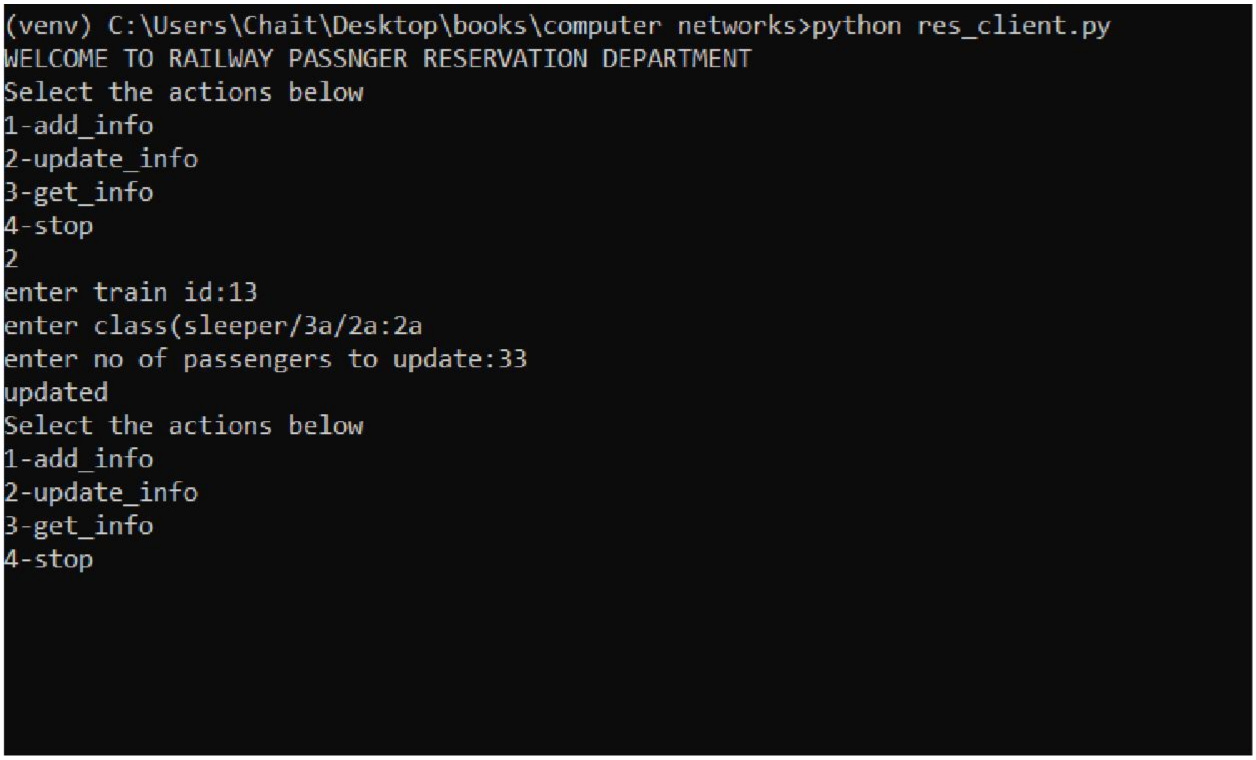
<u>Output screen shorts:</u>

<u>SERVER:</u>



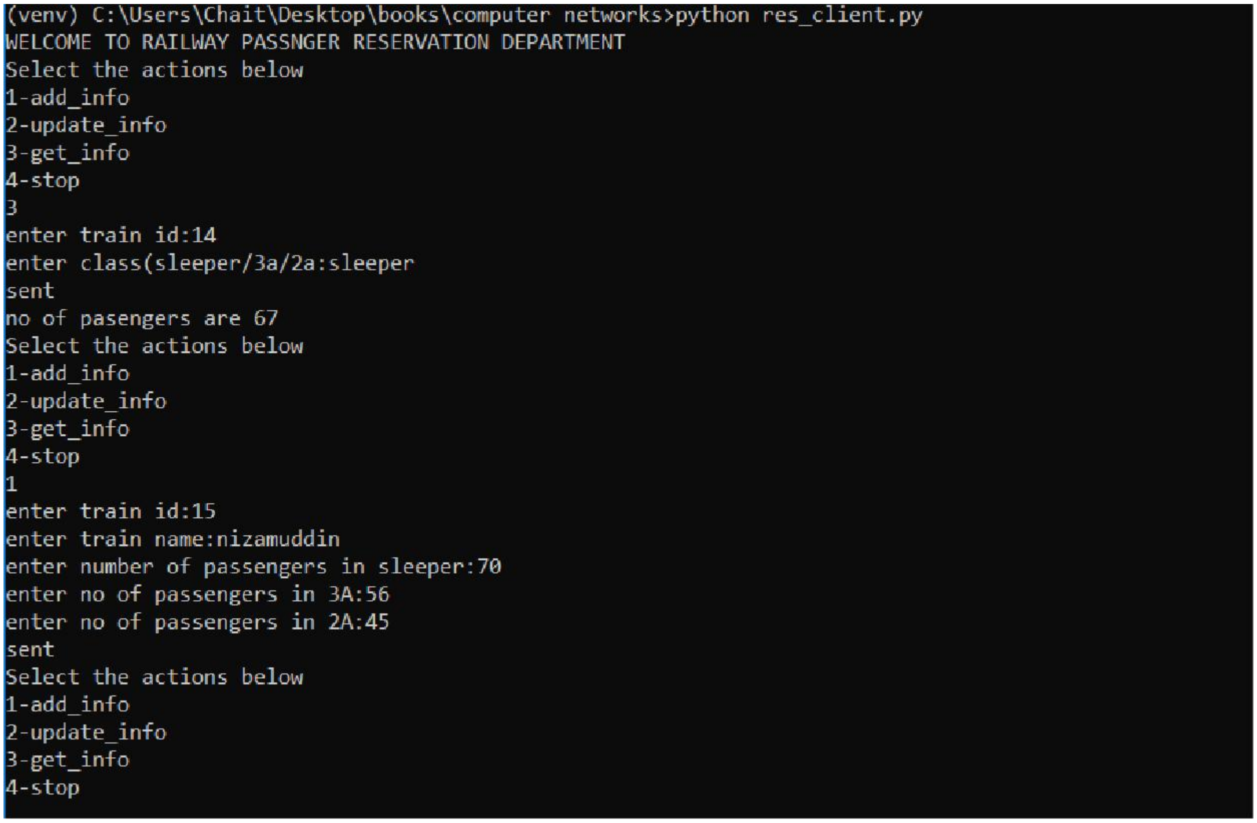
```
(venv) C:\Users\Chait\Desktop\books\computer networks>python res_server.py
              train  sleeper  3a  2a
train_id
11        rajadhani       45  33  22
12          vishaka       56  34  21
13         pinakini       72  45  34
14           kerala       67  45  34
Server is listening ...Passenger_Reservation__Department
Connection established from  ('192.168.56.1', 6420)
'2_13_2a_33'
['2', '13', '2a', '33']
Connection established from  ('192.168.56.1', 6421)
'3_14_sleeper'
['3', '14', 'sleeper']
67
'1_15_nizamuddin_70_56_45'
['1', '15', 'nizamuddin', '70', '56', '45']
               train  sleeper  3a  2a
train_id
15        nizamuddin       70  56  45
               train  sleeper  3a  2a
train_id
11         rajadhani       45  33  22
12           vishaka       56  34  21
13          pinakini       72  45  33
14            kerala       67  45  34
15        nizamuddin       70  56  45
```

CLIENT 1:



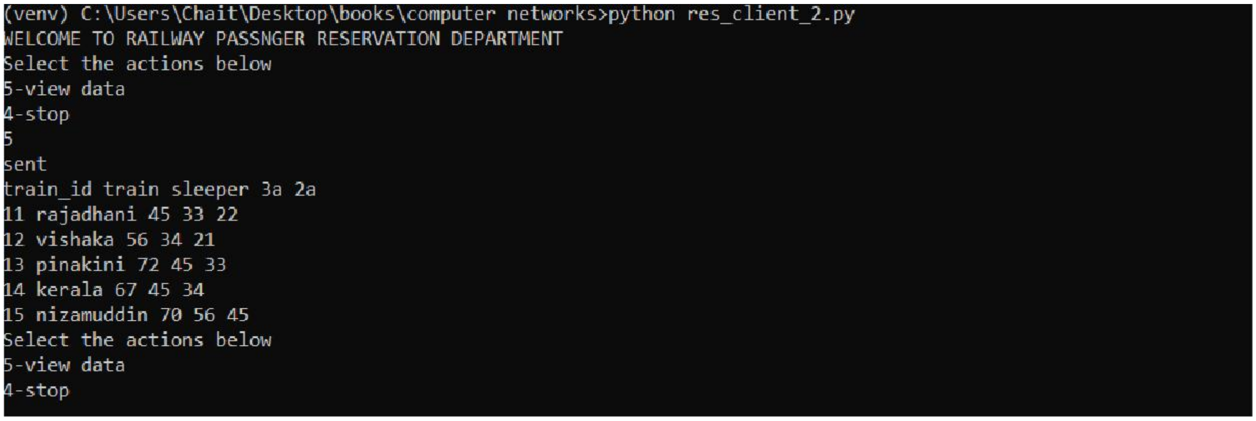
```
(venv) C:\Users\Chait\Desktop\books\computer networks>python res_client.py
WELCOME TO RAILWAY PASSNGER RESERVATION DEPARTMENT
Select the actions below
1-add_info
2-update_info
3-get_info
4-stop
2
enter train id:13
enter class(sleeper/3a/2a:2a
enter no of passengers to update:33
updated
Select the actions below
1-add_info
2-update_info
3-get_info
4-stop
```

CLIENT 2:



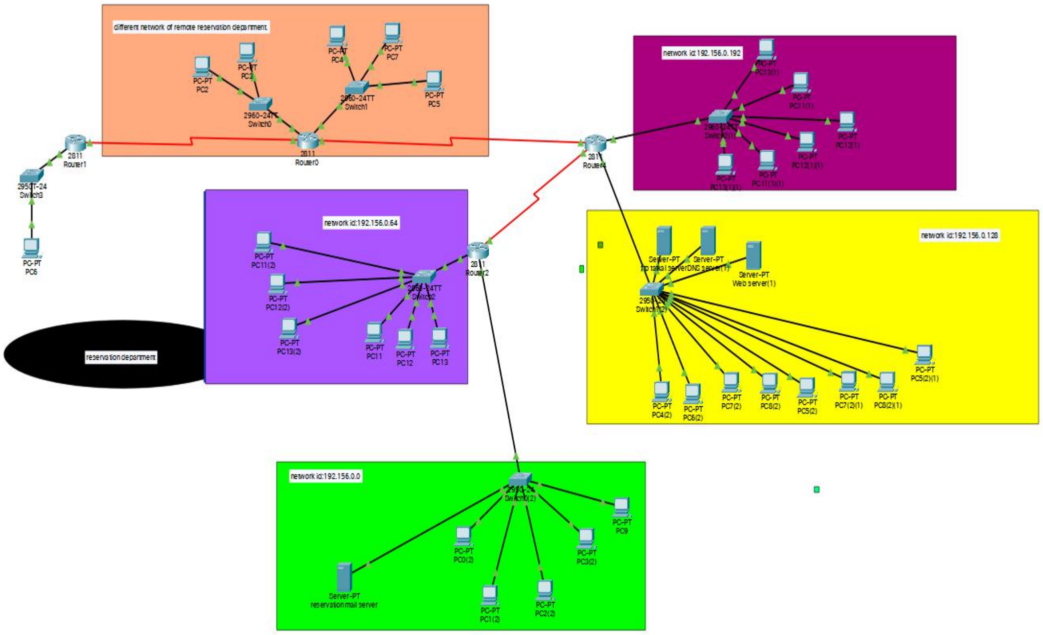
```
(venv) C:\Users\Chait\Desktop\books\computer networks>python res_client.py
WELCOME TO RAILWAY PASSNGER RESERVATION DEPARTMENT
Select the actions below
1-add_info
2-update_info
3-get_info
4-stop
3
enter train id:14
enter class(sleeper/3a/2a:sleeper
sent
no of pasengers are 67
Select the actions below
1-add_info
2-update_info
3-get_info
4-stop
1
enter train id:15
enter train name:nizamuddin
enter number of passengers in sleeper:70
enter no of passengers in 3A:56
enter no of passengers in 2A:45
sent
Select the actions below
1-add_info
2-update_info
3-get_info
4-stop
```

Client 3:



```
(venv) C:\Users\Chait\Desktop\books\computer networks>python res_client_2.py
WELCOME TO RAILWAY PASSNGER RESERVATION DEPARTMENT
Select the actions below
5-view data
4-stop
5
sent
train_id train sleeper 3a 2a
11 rajadhani 45 33 22
12 vishaka 56 34 21
13 pinakini 72 45 33
14 kerala 67 45 34
15 nizamuddin 70 56 45
Select the actions below
5-view data
4-stop
```

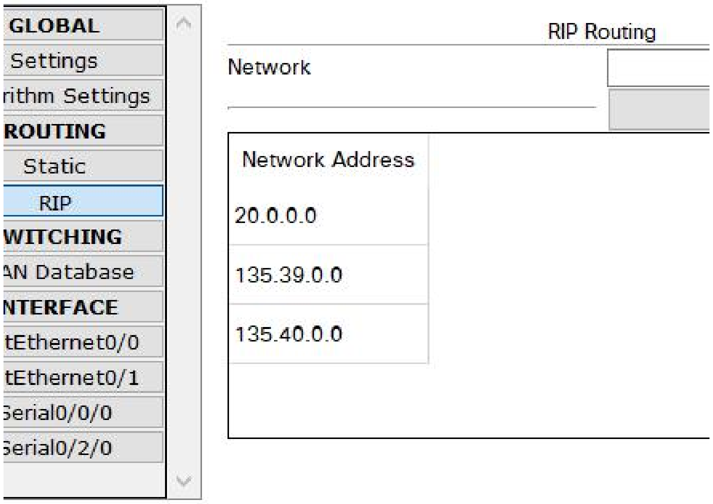
Cisco Packet Tracer Design(RAILWAY RESERVATION):



Reservation Department Local Office	Reservation	Range of IP address: 192.156.0.1-192.156.0.63 Subnet address: 192.156.0.0 Subnet mask :255.255.255.192 Protocols configured:ospf	Organizing reservation info.
	Tatkal	Range of IP address: 192.156.0.65-192.156.0.127 Subnet address: 192.156.0.64 Subnet mask :255.255.255.192 Protocols configured:ospf	Managing Tatkal operations
	Management	Range of IP address: 192.156.0.129-192.156.0.191 Subnet address: 192.156.0.128 Subnet mask :255.255.255.192	Updating reservation info about any changes

		Protocols configured:ospf	
	Subnetwork name	Range of IP address: 192.156.0.193-192.156.0.255 Subnet address: 192.156.0.192 Subnet mask :255.255.255.192 Protocols configured:ospf	Back office management
Remote Reservation Offices		Showing how remote networks are connected.	
	FTP server	Category: FTP	
	Email server	Category: Email	
	Application server	Category: Web	
	OSPF	Routing protocol	Between subnets and outer network
	RIP	Routing protocol	Between remote office and local office.

RIP:

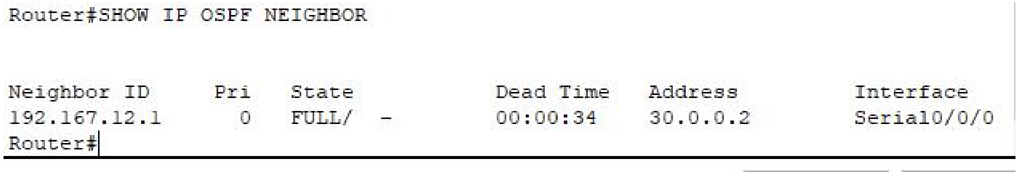


RIP Routing

Network

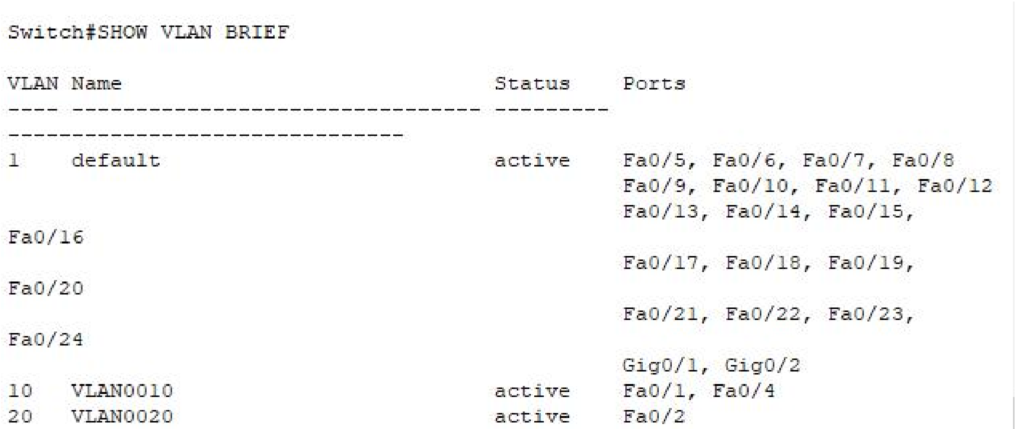
Network Address
20.0.0.0
135.39.0.0
135.40.0.0

OSPF:



```
Router#SHOW IP OSPF NEIGHBOR


Neighbor ID     Pri   State           Dead Time   Address         Interface
192.167.12.1      0   FULL/  -        00:00:34    30.0.0.2        Serial0/0/0
Router#
```

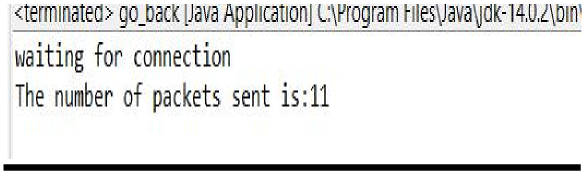
VLAN:



```
Switch#SHOW VLAN BRIEF

VLAN Name                             Status    Ports
---- -------------------------------- ---------
-------------------------------
1    default                          active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                Fa0/13, Fa0/14, Fa0/15,
Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19,
Fa0/20
                                                Fa0/21, Fa0/22, Fa0/23,
Fa0/24
                                                Gig0/1, Gig0/2
10   VLAN0010                         active    Fa0/1, Fa0/4
20   VLAN0020                         active    Fa0/2
```

Go back N and Selective Repeat:

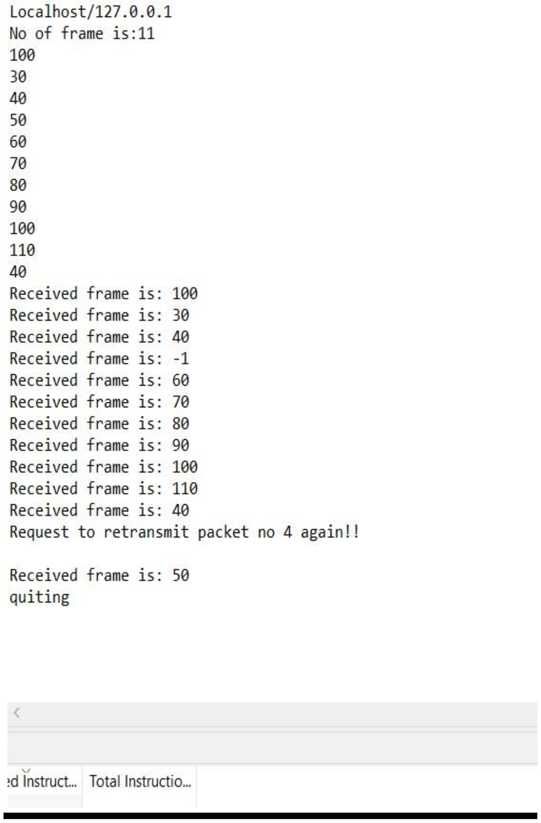
Server side:



```
<terminated> go_back [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\
waiting for connection
The number of packets sent is:11
```

```
package snippet;

import java.io.DataInputStream;
   import java.io.DataOutputStream;
   import java.io.IOException;
   import java.net.ServerSocket;
   import java.net.Socket;
   import java.net.SocketException;

public class go_back {

            static ServerSocket Serversocket;
     static DataInputStream dis;
     static DataOutputStream dos;

     public static void main(String[] args) throws
SocketException {

     try {
        int a[] = { 100,30, 40, 50, 60, 70, 80, 90,
100, 110,40 };
        Serversocket = new ServerSocket(8011);
        System.out.println("waiting for
connection");
        Socket client = Serversocket.accept();
        dis = new
DataInputStream(client.getInputStream());
        dos = new
DataOutputStream(client.getOutputStream());
        System.out.println("The number of packets
sent is:" + a.length);
        int y = a.length;
        dos.write(y);
        dos.flush();

        for (int i = 0; i < a.length; i++) {
           dos.write(a[i]);
           dos.flush();
        }

        int k = dis.read();

        dos.write(a[k]);
        dos.flush();

        } catch (IOException e) {
           System.out.println(e);
        } finally {
           try {
              dis.close();
              dos.close();
    }  catch (IOException e) {
              e.printStackTrace(); }
  }}}
```

Client Side:



```
Localhost/127.0.0.1
No of frame is:11
100
30
40
50
60
70
80
90
100
110
40
Received frame is: 100
Received frame is: 30
Received frame is: 40
Received frame is: -1
Received frame is: 60
Received frame is: 70
Received frame is: 80
Received frame is: 90
Received frame is: 100
Received frame is: 110
Received frame is: 40
Request to retransmit packet no 4 again!!

Received frame is: 50
quiting
```

```
package snippet;

import java.lang.System;
import java.net.*;
import java.io.*;

public class client {
  static Socket connection;

  public static void main(String a[]) throws SocketException
{
      try {
        int v[] = new int[11];
        //int g[] = new int[8];
        int n = 0;
        InetAddress addr =
InetAddress.getByName("Localhost");
        System.out.println(addr);
        connection = new Socket(addr, 8011);
        DataOutputStream out = new DataOutputStream(
            connection.getOutputStream());
        DataInputStream in = new DataInputStream(
            connection.getInputStream());
        int p = in.read();
        System.out.println("No of frame is:" + p);

        for (int i = 0; i < p; i++) {
          v[i] = in.read();
          System.out.println(v[i]);
          //g[i] = v[i];
        }
        v[3] = -1;
        for (int i = 0; i < p; i++)
         {
          System.out.println("Received frame is: " + v[i]);
 }
        for (int i = 0; i < p; i++)
          if (v[i] == -1) {
        System.out.println("Request to retransmit packet no
"
                  + (i+1) + " again!!");
            n = i;
            out.write(n);
            out.flush();
          }
        System.out.println();
                  v[n] = in.read();
        System.out.println("Received frame is: " + v[n]);
   System.out.println("quiting");
      } catch (Exception e) {
        System.out.println(e);
      }

   }
}
```

Cloud Virtualization:

Now a days it is very difficult to bring every employee around the world to work at same place where all the data centers of a company are located or it will be very costly for a small organization to purchase heavy hardware material for limited amount of work.

To answer all these problems , CLOUD concept comes into play where you can virtually use hardware or software present in some other parts of the world right from your home.

Having physical devices or copies of these things can be difficult to move or copy when you need to move something. A virtual server or desktop can be easily moved and accessed from a different location.
In addition, physical devices are limited by the specific set of hardware they're installed on, while virtual devices can easily be allocated resources as necessary. Physical hardware can be consolidated, and a virtual machine could access resources from multiple pieces of hardware.

Networking with in CLOUD:

Normally with the help of internet you can login to your cloud provider. After that within the cloud you can create your virtual private cloud and access the storage and software facilities so that your data is protected from accessing by some other clients.
Cloud providers will provide separate network ids and subnets to work on.