Name : Abhishek N N

Reg.No : 20BCE1025

Email : abhishek.nn2020@vitstudent.ac.in

VIT® UNIVERSITY
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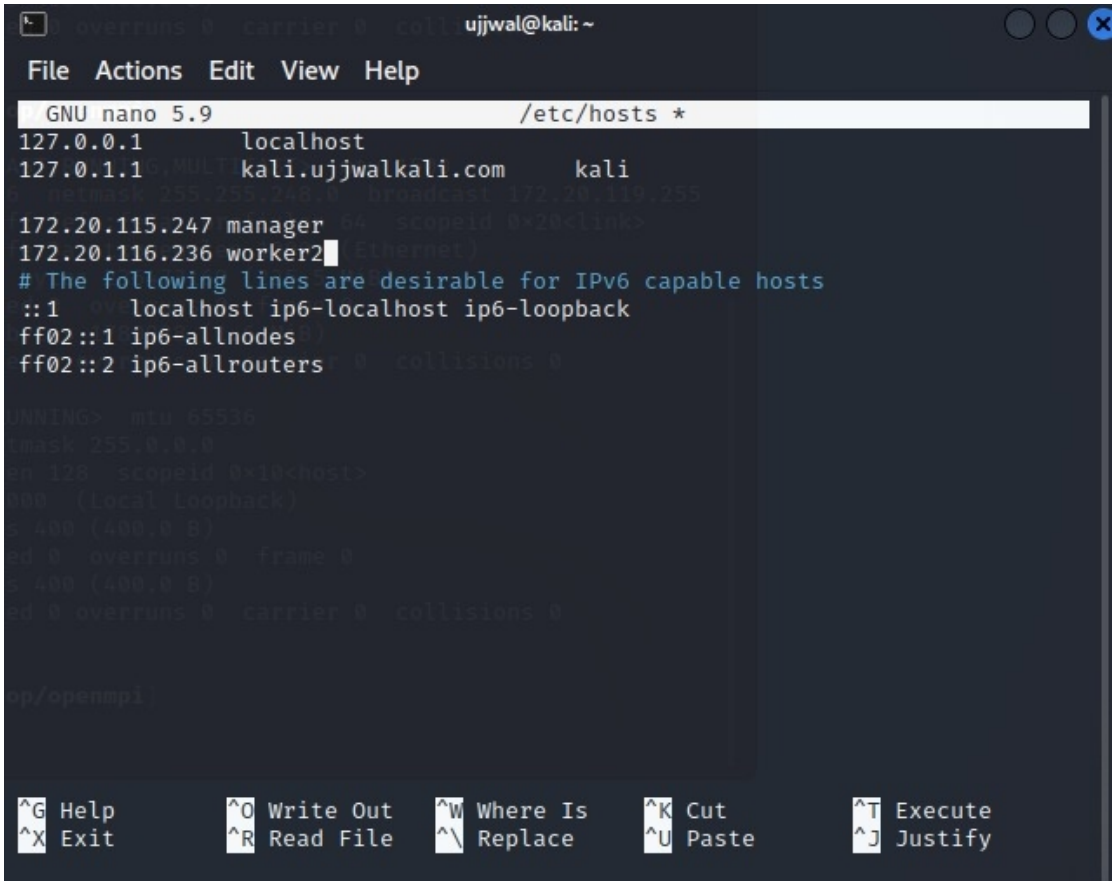
www.vit.ac.in
Vellore - Chennai
CHENNAI CAMPUS
Vandalur - Kelambakkam Road, Chennai - 600127

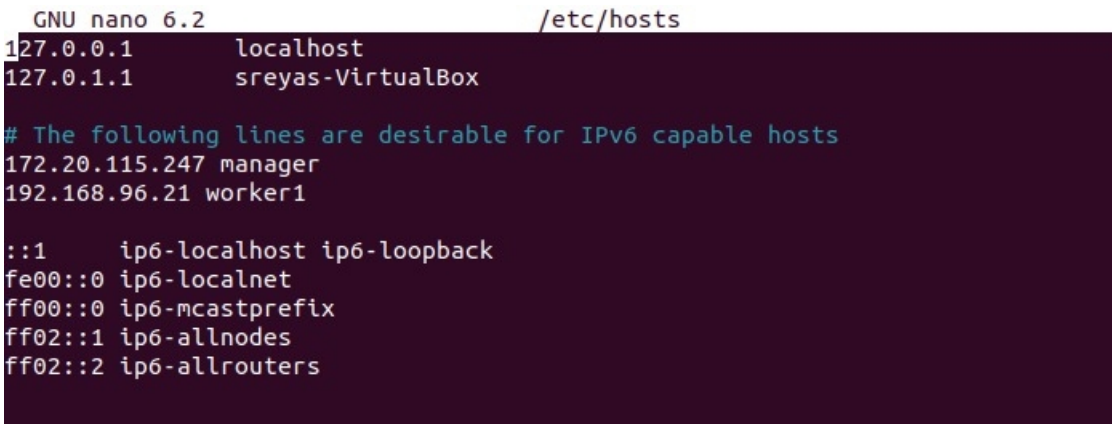
Programme	:	**B.Tech.(CSE)**	Semester	:	**Fall '22-23**
Course	:	**Parallel and Distributed Computing**	Code	:	**CSE4001**
Faculty	:	**R. Kumar**	Slot	:	**L9+L10**

```
abhishek_n_n_20bce1025@ud:~$ ifconfig
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 3234  bytes 402338 (402.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 3234  bytes 402338 (402.3 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 192.168.122.1  netmask 255.255.255.0  broadcast 192.168.122.255
        ether 52:54:00:d3:0d:be  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlp44s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.20.115.247  netmask 255.255.248.0  broadcast 172.20.119.255
        inet6 fe80::8553:cd3a:236d:e426  prefixlen 64  scopeid 0x20<link>
        ether a4:97:b1:aa:fb:05  txqueuelen 1000  (Ethernet)
        RX packets 299921  bytes 311385781 (311.3 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 109973  bytes 19903605 (19.9 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

abhishek_n_n_20bce1025@ud:~$
```

```
  GNU nano 6.2
127.0.0.1       localhost
127.0.1.1       ud

#MPI CLUSTERS
172.20.115.247 manager
192.168.96.21 worker1
172.20.116.236 worker2
172.20.116.203 worker3

# The following lines are desirable for IPv6
::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

```
  GNU nano 6.2
127.0.0.1 localhost
127.0.1.1 us1

172.20.115.247 manager
172.20.116.203 worker3

# The following lines are desirable for IPv6
::1     ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```


ujjwal@kali: ~
File Actions Edit View Help
GNU nano 5.9 /etc/hosts *
127.0.0.1 localhost
127.0.1.1 kali.ujjwalkali.com kali
172.20.115.247 manager
172.20.116.236 worker2
The following lines are desirable for IPv6 capable hosts
::1 localhost ip6-localhost ip6-loopback
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute
^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify


GNU nano 6.2 /etc/hosts
127.0.0.1 localhost
127.0.1.1 sreyas-VirtualBox
The following lines are desirable for IPv6 capable hosts
172.20.115.247 manager
192.168.96.21 worker1
::1 ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters

```
abhishek_n_n_20bce1025@ud:~$ sudo adduser 20BCE1025_Abhishek_N_N --force-badname
Allowing use of questionable username.
Adding user `20BCE1025_Abhishek_N_N' ...
Adding new group `20BCE1025_Abhishek_N_N' (1002) ...
Adding new user `20BCE1025_Abhishek_N_N' (1001) with group `20BCE1025_Abhishek_N_N' ...
Creating home directory `/home/20BCE1025_Abhishek_N_N' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for 20BCE1025_Abhishek_N_N
Enter the new value, or press ENTER for the default
        Full Name []:
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] y
abhishek_n_n_20bce1025@ud:~$
```

```
us1@us1:~$ sudo adduser 20BCE1025_Abhishek_N_N_worker --force-badname
Allowing use of questionable username.
Adding user `20BCE1025_Abhishek_N_N_worker' ...
Adding new group `20BCE1025_Abhishek_N_N_worker' (1001) ...
Adding new user `20BCE1025_Abhishek_N_N_worker' (1001) with group `20BCE1025_Abhishek_N_N_worker' ...
Creating home directory `/home/20BCE1025_Abhishek_N_N_worker' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for 20BCE1025_Abhishek_N_N_worker
Enter the new value, or press ENTER for the default
        Full Name []:
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] Y
us1@us1:~$
```

1. Write a program in MPI to create two processes in two different machines. Process 0 pings Process 1 and awaits for return ping using Non-blocking message passing routines. Execute your code on MPI cluster.

```
#include < stdio.h>
#include < unistd.h>

#include "mpi.h"
int main(int argc, char *argv[]) {
int num, r, dest, src, rc, c, tag = 1;
char inmsg, outmsg = 'x';
MPI_Request send_msg, recv_msg;
MPI_Init(&argc, &argv);
MPI_Comm_size(MPI_COMM_WORLD, &num);
MPI_Comm_rank(MPI_COMM_WORLD, &r);
if (r == 1) {
dest = 0;
src = 0;
rc = MPI_Isend(&outmsg, 1, MPI_CHAR, dest, tag, MPI_COMM_WORLD,
&send_msg);
printf("Process %d: Pinged Process %d\n", r, dest);
rc = MPI_Irecv(&inmsg, 1, MPI_CHAR, src, tag, MPI_COMM_WORLD,
&recv_msg);
printf("Process %d: Received a ping from Process %d\n", r, src);
else {
dest = 1;
src = 1;
rc = MPI_Isend(&outmsg, 1, MPI_CHAR, dest, tag, MPI_COMM_WORLD,
&send_msg);
printf("Process %d: Pinged Process %d\n", r, dest);
sleep(1);
rc = MPI_Irecv(&inmsg, 1, MPI_CHAR, src, tag, MPI_COMM_WORLD,
&recv_msg);
printf("Process %d: Received a ping from Process %d\n", r, src);
}
MPL Finalize();
}
```

```
20BCE1025_Abhishek_N_N@ud:~$ mpicc ping_lab9.c -o ping_lab9
20BCE1025_Abhishek_N_N@ud:~$ mpiexec -np 2 ./ping_lab9
Process 1: Pinged Process 0
Process 0: Pinged Process 1
Process 1: Received a ping from Process 0
Process 0: Received a ping from Process 1
```

2. Write a program in MPI to create 10 tasks. Construct a ring topology to exchange message to its nearest neighbour in the ring using blocking massage passing routines. Execute your code on MPI cluster.

```
#include "mpi.h" #include < stdio.h>
int main(int argc, char *argv[]) {
int num, r, dest, src, rc, c, tag = 1;
char in_msg, out_msg = 'x';
MPI_Status Stat;
MPI_Init(&argc, &argv);
MPI_Comm_size(MPI_COMM_WORLD, &num);
MPI_Comm_rank(MPI_COMM_WORLD, &r);
dest = r + 1;
src = r - 1;
if (dest > 9) {
dest = 0;
}
if (src < 0) {
src = 9;
}
rc = MPI_Send(&out_msg, 1, MPI_CHAR, dest, tag, MPI_COMM_WORLD);
printf("Node %d: Pinged Process %d\n", r, dest);
rc = MPI_Recv(&in_msg, 1, MPI_CHAR, src, tag, MPI_COMM_WORLD,
&Stat);
printf("Node %d: Recieved a ping from Node %d\n", r, src);
MPI_Finalize();
}
```

```
20BCE1025_Abhishek_N_N@ud:~$ mpicc ring_topology_lab9.c -o ring_topology_lab9
20BCE1025_Abhishek_N_N@ud:~$ mpiexec -np 10 ./ring_topology_lab9
Node 4: Pinged Process 5
Node 8: Pinged Process 9
Node 6: Pinged Process 7
Node 0: Pinged Process 1
Node 1: Pinged Process 2
Node 1: Recieved a ping from Node 0
Node 5: Pinged Process 6
Node 6: Recieved a ping from Node 5
Node 9: Pinged Process 0
Node 9: Recieved a ping from Node 8
Node 3: Pinged Process 4
Node 5: Recieved a ping from Node 4
Node 2: Pinged Process 3
Node 2: Recieved a ping from Node 1
Node 4: Recieved a ping from Node 3
Node 7: Pinged Process 8
Node 7: Recieved a ping from Node 6
```