Assignment No 3
Distributed System

Go to website :-
https://www.open-mpi.org/software/ompi/v4.1/

Download and Extract (below folder):-
openmpi-4.1.6.tar.gz

Open folder with Terminal :-
"Type the Command"

cn@cn-OptiPlex-3000:~/openmpi-4.1.6$ **sudo apt-get update**
cn@cn-OptiPlex-3000:~/openmpi-4.1.6$ **sudo apt install gcc**
cn@cn-OptiPlex-3000:~/openmpi-4.1.6$ **sudo apt-get upgrade**
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cn@cn-OptiPlex-3000:~/openmpi-4.1.6$ **./configure –prefix=$HOME/opt/openmpi**
cn@cn-OptiPlex-3000:~/openmpi-4.1.6$ **make all**
cn@cn-OptiPlex-3000:~/openmpi-4.1.6$ **make install**

- **opt** folder will generated.
- go to **opt** file then in **openmpi** then in **bin**
- paste **add.c** file in **bin**
- open bin with **terminal**
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cn@cn-OptiPlex-3000:~/opt/openmpi/bin$ **mpicc add.c**
cn@cn-OptiPlex-3000:~/opt/openmpi/bin$ **mpirun -np N ./a.out**
cn@cn-OptiPlex-3000:~/opt/openmpi/bin$ **mpirun -np 2 ./a.out**
cn@cn-OptiPlex-3000:~/opt/openmpi/bin$ **mpirun -np 3 ./a.out**
cn@cn-OptiPlex-3000:~/opt/openmpi/bin$ **mpirun -np 4 ./a.out**

Output:
Distribution at rank 0
local sum at rank 1 is 40
local sum at rank 2 is 65
local sum at rank 3 is 90
local sum at rank 0 is 15
final sum = 210

CODE:-

```c
#include <stdio.h>
#include "mpi.h"
int main(int argc, char* argv[])
{
int rank, size;
int num[20]; //N=20, n=4
MPI_Init(&argc, &argv);
MPI_Comm_rank(MPI_COMM_WORLD, &rank);
MPI_Comm_size(MPI_COMM_WORLD, &size);
for(int i=0;i<20;i++)
num[i]=i+1;
if(rank == 0){ // (Determine the label of calling process )( i.e. Label all the process)
int s[4];
printf("Distribution at rank %d \n", rank);
for(int i=1;i<4;i++)
MPI_Send(&num[i*5], 5, MPI_INT, i, 1, MPI_COMM_WORLD); //N/n i.e. 20/4=5
int sum=0, local_sum=0;
for(int i=0;i<5;i++)

{
local_sum=local_sum+num[i];
}
for(int i=1;i<4;i++)
{
MPI_Recv(&s[i], 1, MPI_INT, i, 1, MPI_COMM_WORLD, MPI_STATUS_IGNORE);
}
printf("local sum at rank %d is %d\n", rank,local_sum);
sum=local_sum;
for(int i=1;i<4;i++)
sum=sum+s[i];
printf("final sum = %d\n\n",sum);
}
else
{
int k[5];
MPI_Recv(k, 5, MPI_INT, 0, 1, MPI_COMM_WORLD, MPI_STATUS_IGNORE);
int local_sum=0;
for(int i=0;i<5;i++)
{
local_sum=local_sum+k[i];
}
printf("local sum at rank %d is %d\n", rank, local_sum);
MPI_Send(&local_sum, 1, MPI_INT, 0, 1, MPI_COMM_WORLD);
}
MPI_Finalize();

return 0;
}
```

Save the code file with **add.c**