

Master:-

=====

*Created the container for the master taking husseinabdallah2/mpi4py-cluster:master as the base image and mounted the source files on local machine directory

```
docker run --name mpi4py_master --mount type=bind,source=E:/Assignment3_MPI,target=/DS_COMP6231 -it husseinabdallah2/mpi4py-cluster:master
```

*Checked the ip of master

172.17.0.2

*Once ssh service started on all the three workers, checked if ssh to workers from master was working

```
ssh 172.17.0.3
exit
ssh 172.17.0.4
exit
ssh 172.17.0.5
exit
```

*For MPI to work, passwordless ssh from master to worker nodes is required, to enable passwordless ssh did the below steps:-

*Created machinefile at path ~/machinefile , added and saved ip addresses of master and workers to it.

```
nano ~/machinefile
```

*Generated rsa key

```
ssh-keygen -t rsa
```

*Copied this key to all three workers one by one to let them add master to their trusted host list and allow passwordless ssh from master.

```
ssh-copy-id -i ~/.ssh/id_rsa.pub root@172.17.0.3
ssh-copy-id -i ~/.ssh/id_rsa.pub root@172.17.0.4
ssh-copy-id -i ~/.ssh/id_rsa.pub root@172.17.0.5
```

*Verified if passwordless ssh was working

```
ssh 172.17.0.3
exit
ssh 172.17.0.4
exit
ssh 172.17.0.5
exit
```

*Ran Q1-T3 to Q4-T3 from assignment 2 after changing path to desired directory

```
cd DS_COMP6231/Q1
mpiexec -n 4 -machinefile ~/machinefile python -m mpi4py T3.py
```

Output

=====

Southwest Airlines Co. had the most canceled flights in September 2021

time taken with (MPI execution): 81.24 second(s)

```
cd ../Q2
mpiexec -n 4 -machinefile ~/machinefile python -m mpi4py T3.py
```

Output

=====

263 flights were diverted between the period of 20th-30th November 2021

time taken with (MPI execution): 83.25 second(s)

```
cd ../Q3
mpiexec -n 4 -machinefile ~/machinefile python -m mpi4py T3.py
Output
```

```
=====
72.73502159224518 minutes is the average airtime for flights that were flying from Nashville to Chicago
time taken with (MPI execution): 83.35 second(s)
```

```
cd ../Q4
mpiexec -n 4 -machinefile ~/machinefile python -m mpi4py T3.py
Output
```

```
=====
Departure time (DepTime) was not recorded/went missing for dates ['2021-01-01', '2021-01-02', '2021-01-03', '2021-
01-04', '2021-01-05', '2021-01-06', '2021-01-07',
'2021-01-08', '2021-01-09', '2021-01-10', '2021-01-11', '2021-01-12', '2021-01-13', '2021-01-14', '2021-01-15', '2021
-01-16', '2021-01-17', '2021-01-18',
'2021-01-19', '2021-01-20', '2021-01-21', '2021-01-22', '2021-01-23', '2021-01-24', '2021-01-25', '2021-01-26', '2021
-01-27', '2021-01-28', '2021-01-29',
'2021-01-30', '2021-01-31', '2021-02-01', '2021-02-02', '2021-02-03', '2021-02-04', '2021-02-05', '2021-02-06', '2021
-02-07', '2021-02-08', '2021-02-09',
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-02-18', '2021-02-19', '2021-02-20',
'2021-02-21', '2021-02-22', '2021-02-23', '2021-02-24', '2021-02-25', '2021-02-26', '2021-02-27', '2021-02-28', '2021
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-03-12', '2021-03-13', '2021-03-14',
'2021-03-15', '2021-03-16', '2021-03-17', '2021-03-18', '2021-03-19', '2021-03-20', '2021-03-21', '2021-03-22', '2021
-03-23', '2021-03-24', '2021-03-25',
'2021-03-26', '2021-03-27', '2021-03-28', '2021-03-29', '2021-03-30', '2021-03-31', '2021-04-01', '2021-04-02', '2021
-04-03', '2021-04-04', '2021-04-05',
'2021-04-06', '2021-04-07', '2021-04-08', '2021-04-09', '2021-04-10', '2021-04-11', '2021-04-12', '2021-04-13', '2021
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'2021-04-17', '2021-04-18', '2021-04-19', '2021-04-20', '2021-04-21', '2021-04-22', '2021-04-23', '2021-04-24', '2021
-04-25', '2021-04-26', '2021-04-27',
'2021-04-28', '2021-04-29', '2021-04-30', '2021-05-01', '2021-05-02', '2021-05-03', '2021-05-04', '2021-05-05', '2021
-05-06', '2021-05-07', '2021-05-08',
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-05-17', '2021-05-18', '2021-05-19',
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'2021-06-22', '2021-06-23', '2021-06-24', '2021-06-25', '2021-06-26', '2021-06-27', '2021-06-28', '2021-06-29', '2021
-06-30', '2021-07-01', '2021-07-02',
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-07-11', '2021-07-12', '2021-07-13',
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-07-22', '2021-07-23', '2021-07-24',
'2021-07-25', '2021-07-26', '2021-07-27', '2021-07-28', '2021-07-29', '2021-07-30', '2021-07-31', '2021-08-01', '2021
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-08-13', '2021-08-14', '2021-08-15',
'2021-08-16', '2021-08-17', '2021-08-18', '2021-08-19', '2021-08-20', '2021-08-21', '2021-08-22', '2021-08-23', '2021
-08-24', '2021-08-25', '2021-08-26',
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'2021-09-29', '2021-09-30', '2021-10-01', '2021-10-02', '2021-10-03', '2021-10-04', '2021-10-05', '2021-10-06', '2021-10-07', '2021-10-08', '2021-10-09',
'2021-10-10', '2021-10-11', '2021-10-12', '2021-10-13', '2021-10-14', '2021-10-15', '2021-10-16', '2021-10-17', '2021-10-18', '2021-10-19', '2021-10-20',
'2021-10-21', '2021-10-22', '2021-10-23', '2021-10-24', '2021-10-25', '2021-10-26', '2021-10-27', '2021-10-28', '2021-10-29', '2021-10-30', '2021-10-31',
'2021-11-01', '2021-11-02', '2021-11-03', '2021-11-04', '2021-11-05', '2021-11-06', '2021-11-07', '2021-11-08', '2021-11-09', '2021-11-10', '2021-11-11',
'2021-11-12', '2021-11-13', '2021-11-14', '2021-11-15', '2021-11-16', '2021-11-17', '2021-11-18', '2021-11-19', '2021-11-20', '2021-11-21', '2021-11-22',
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'2021-12-26', '2021-12-27', '2021-12-28', '2021-12-29', '2021-12-30', '2021-12-31']
time taken with (MPI execution): 104.56 second(s)

Worker1

=====

*Created the container for the worker1 taking husseinabdallah2/mpi4py-cluster:master as the base image and mounted the source files on local machine directory
docker run --name mpi4py_worker1 --mount type=bind,source=E:/Assignment3_MPI,target=/DS_COMP6231 -it husseinabdallah2/mpi4py-cluster:master

*Started the ssh service on worker1
service ssh start

*Checked the ip of worker1
ifconfig
172.17.0.3

Worker2

=====

*Created the container for the worker2 taking husseinabdallah2/mpi4py-cluster:master as the base image and mounted the source files on local machine directory
docker run --name mpi4py_worker2 --mount type=bind,source=E:/Assignment3_MPI,target=/DS_COMP6231 -it husseinabdallah2/mpi4py-cluster:master

*Started the ssh service on worker2
service ssh start

*Checked the ip of worker2
ifconfig

172.17.0.4

Worker3

=====

*Created the container for the worker3 taking husseinabdallah2/mpi4py-cluster:master as the base image and mounted the source files on local machine directory

`docker run --name mpi4py_worker3 --mount type=bind,source=E:/Assignment3_MPI,target=/DS_COMP6231 -it husseinabdallah2/mpi4py-cluster:master`

*Started the ssh service on worker3

`service ssh start`

*Checked the ip of worker3

`ifconfig`

172.17.0.5