

# CS 553 PROGRAMMING ASSIGNMENT-1

# MANUAL

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## 1) CPU

The code for CPU is written in C. To run the file you need to run the script

```
chmod 777 CPU
./CPU
```

**\*NOTE**

This program has both the normal IOPS and FLOPS program and also the 10 min sampling. After output of FLOPS and IOPS for 1,2,4 Threads, you might have to wait for 20 mins for the program to finish. The output for the samples will be in two TXT files.

### Iteration 1

[illegible]

## Iteration 2

```
[ec2-user@ip-172-31-36-66 ~]$ gcc cpumodt.c -pthread -o cpt
[ec2-user@ip-172-31-36-66 ~]$ ./cpt
-----FLOPS For 1 Thread-----
GigFLOPS 6.146171
-----FLOPS For 2 Thread-----
GigFLOPS 6.164513
-----FLOPS For 4 Thread-----
GigFLOPS 6.166488
-----IOPS For 1 Thread-----
GigIOPS 7.171229
-----IOPS For 2 Thread-----
GigIOPS 7.177593
-----IOPS For 4 Thread-----
GigIOPS 7.199679
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
```

## Iteration 3

```
ec2-user@ip-172-31-36-66:~
[ec2-user@ip-172-31-36-66 ~]$ ls
c  c600  cpt      cpumod600.c  -ct d  disk.c  dt      iozone3_394.tar  iozone.sh  m  memory.c  prog1-v2.pdf  stream-scaling-master
-c2 cc3  cpumod2.c  cpumod.c    ctt dd  dm      File.txt  iozone3_394.tar.1  lin_xeon64.txt  m10 mm      Sample FLOPS.txt
c3  ccc  cpumod3.c  cpumodt.c   cu -dd -dm    iozone3_394     iozone3_394.tar.2  lshw-2.14-1.el4.rf.i386.rpm  m30 mm2      Sample IOPS.txt
[ec2-user@ip-172-31-36-66 ~]$ ./cc3
-----FLOPS For 1 Thread-----
GigFLOPS 6.985806
-----FLOPS For 2 Thread-----
GigFLOPS 6.984988
-----FLOPS For 4 Thread-----
GigFLOPS 6.967125
-----IOPS For 1 Thread-----
GigIOPS 6.995608
-----IOPS For 2 Thread-----
GigIOPS 6.987513
-----IOPS For 4 Thread-----
GigIOPS 6.993852
```

To Run the LINPACK code you need to run the script  
**chmod 777 linpack**  
**./linpack**

## 2) Memory

The code for CPU is written in C. To run the file you need to run the script

**chmod 777 memory**  
**./memory**

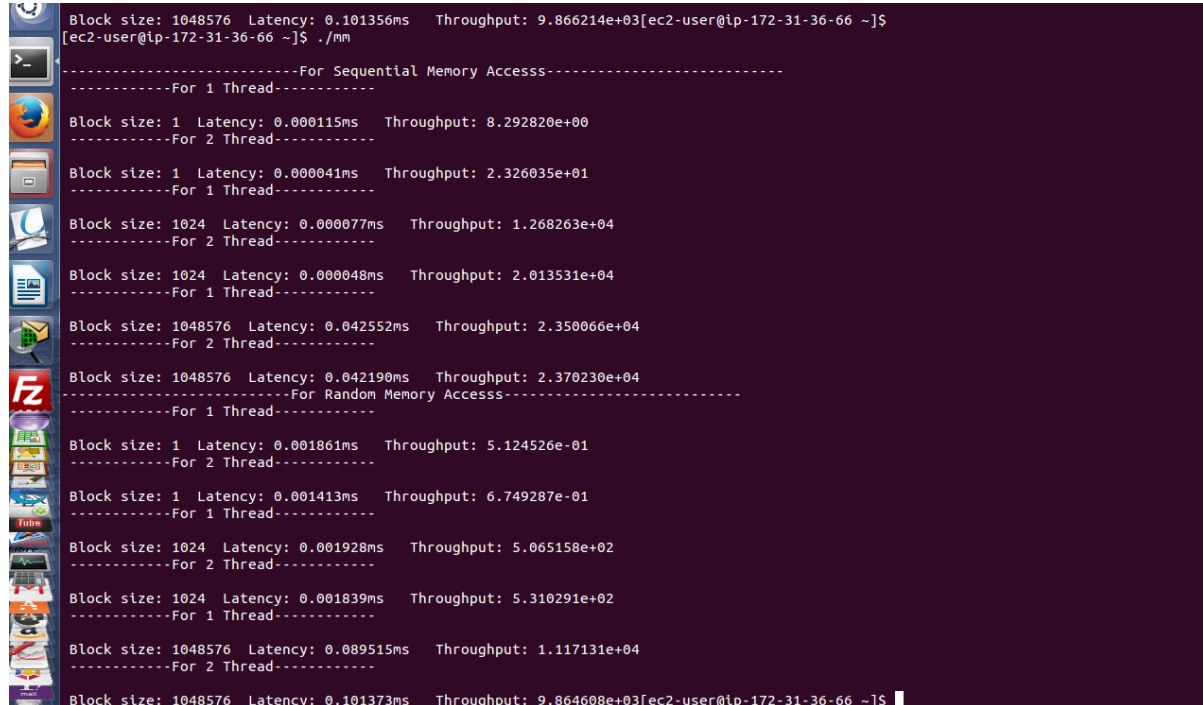
### Iteration 1

```
Block size: 1048576 Latency: 0.100649ms Throughput: 9.935518e+03[ec2-user@ip-172-31-36-66 ~]$ ./mm
-----For Sequential Memory Accesss-----
-----For 1 Thread-----
Block size: 1 Latency: 0.000116ms Throughput: 8.221330e+00
-----For 2 Thread-----
Block size: 1 Latency: 0.000041ms Throughput: 2.354751e+01
-----For 1 Thread-----
Block size: 1024 Latency: 0.000079ms Throughput: 1.236155e+04
-----For 2 Thread-----
Block size: 1024 Latency: 0.000056ms Throughput: 1.759572e+04
-----For 1 Thread-----
Block size: 1048576 Latency: 0.041718ms Throughput: 2.397047e+04
-----For 2 Thread-----
Block size: 1048576 Latency: 0.041572ms Throughput: 2.405436e+04
-----For Random Memory Accesss-----
-----For 1 Thread-----
Block size: 1 Latency: 0.001706ms Throughput: 5.590119e-01
-----For 2 Thread-----
Block size: 1 Latency: 0.001365ms Throughput: 6.984067e-01
-----For 1 Thread-----
Block size: 1024 Latency: 0.001833ms Throughput: 5.327673e+02
-----For 2 Thread-----
Block size: 1024 Latency: 0.001763ms Throughput: 5.539209e+02
-----For 1 Thread-----
Block size: 1048576 Latency: 0.084215ms Throughput: 1.187437e+04
-----For 2 Thread-----
Block size: 1048576 Latency: 0.098892ms Throughput: 1.011199e+04[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
```

### Iteration 2

```
Block size: 1048576 Latency: 0.099713ms Throughput: 1.002873e+04[ec2-user@ip-172-31-36-66 ~]$ ./mm
-----For Sequential Memory Accesss-----
-----For 1 Thread-----
Block size: 1 Latency: 0.000128ms Throughput: 7.450581e+00
-----For 2 Thread-----
Block size: 1 Latency: 0.000039ms Throughput: 2.414365e+01
-----For 1 Thread-----
Block size: 1024 Latency: 0.000066ms Throughput: 1.479640e+04
-----For 2 Thread-----
Block size: 1024 Latency: 0.000052ms Throughput: 1.860119e+04
-----For 1 Thread-----
Block size: 1048576 Latency: 0.042561ms Throughput: 2.349569e+04
-----For 2 Thread-----
Block size: 1048576 Latency: 0.042520ms Throughput: 2.351862e+04
-----For Random Memory Accesss-----
-----For 1 Thread-----
Block size: 1 Latency: 0.001824ms Throughput: 5.228478e-01
-----For 2 Thread-----
Block size: 1 Latency: 0.001417ms Throughput: 6.730235e-01
-----For 1 Thread-----
Block size: 1024 Latency: 0.001861ms Throughput: 5.247515e+02
-----For 2 Thread-----
Block size: 1024 Latency: 0.001813ms Throughput: 5.384960e+02
-----For 1 Thread-----
Block size: 1048576 Latency: 0.088540ms Throughput: 1.129433e+04
-----For 2 Thread-----
Block size: 1048576 Latency: 0.101356ms Throughput: 9.866214e+03[ec2-user@ip-172-31-36-66 ~]$
[ec2-user@ip-172-31-36-66 ~]$
```

### Iteration 3



```
Block size: 1048576 Latency: 0.101356ms Throughput: 9.866214e+03[ec2-user@ip-172-31-36-66 ~]$  
[ec2-user@ip-172-31-36-66 ~]$ ./mm  
  
-----For Sequential Memory Accesss-----  
-----For 1 Thread-----  
  
Block size: 1 Latency: 0.000115ms Throughput: 8.292820e+00  
-----For 2 Thread-----  
  
Block size: 1 Latency: 0.000041ms Throughput: 2.326035e+01  
-----For 1 Thread-----  
  
Block size: 1024 Latency: 0.000077ms Throughput: 1.268263e+04  
-----For 2 Thread-----  
  
Block size: 1024 Latency: 0.000048ms Throughput: 2.013531e+04  
-----For 1 Thread-----  
  
Block size: 1048576 Latency: 0.042552ms Throughput: 2.350066e+04  
-----For 2 Thread-----  
  
Block size: 1048576 Latency: 0.042190ms Throughput: 2.370230e+04  
-----For Random Memory Accesss-----  
-----For 1 Thread-----  
  
Block size: 1 Latency: 0.001861ms Throughput: 5.124526e-01  
-----For 2 Thread-----  
  
Block size: 1 Latency: 0.001413ms Throughput: 6.749287e-01  
-----For 1 Thread-----  
  
Block size: 1024 Latency: 0.001928ms Throughput: 5.065158e+02  
-----For 2 Thread-----  
  
Block size: 1024 Latency: 0.001839ms Throughput: 5.310291e+02  
-----For 1 Thread-----  
  
Block size: 1048576 Latency: 0.089515ms Throughput: 1.117131e+04  
-----For 2 Thread-----  
  
Block size: 1048576 Latency: 0.101373ms Throughput: 9.864608e+03[ec2-user@ip-172-31-36-66 ~]$
```

To Run the STREAM code you need to run the script

```
cd stream  
chmod 777 stream  
./stream
```

### 3) Disk

The code for CPU is written in C. To run the file you need to run the script  
**chmod 777 disk**  
**./disk**

NOTE:

You need to do `cd ..` to get out of the stream folder, if you have executed the stream benchmark

#### Iteration 1

```
ec2-user@ip-172-31-36-66:~$ ./dt
-----For Sequential Memory Write-----
-----For 1 Thread-----
Memory: 1 Latency: 1.006000e+00ms Throughput: 9.479864e-04
-----For 2 Thread-----
Memory: 1 Latency: 5.900000e-02ms Throughput: 1.616397e-02
-----For 1 Thread-----
Memory: 1024 Latency: 9.200000e-02ms Throughput: 1.061481e+01
-----For 2 Thread-----
Memory: 1024 Latency: 6.850000e-02ms Throughput: 1.425639e+01
-----For 1 Thread-----
Memory: 1048576 Latency: 2.277600e+01ms Throughput: 4.390587e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 2.253200e+01ms Throughput: 4.438132e+01
-----For Sequential Memory Read-----
-----For 1 Thread-----
Memory: 1 Latency: 1.150000e-01ms Throughput: 8.292820e-03
-----For 2 Thread-----
Memory: 1 Latency: 3.600000e-02ms Throughput: 2.649095e-02
-----For 1 Thread-----
Memory: 1024 Latency: 1.040000e-01ms Throughput: 9.390024e+00
-----For 2 Thread-----
Memory: 1024 Latency: 8.500000e-02ms Throughput: 1.148897e+01
-----For 1 Thread-----
Memory: 1048576 Latency: 5.489900e+01ms Throughput: 1.821527e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 5.484000e+01ms Throughput: 1.823487e+01
-----For Random Memory Write-----
-----For 1 Thread-----
Memory: 1 Latency: 1.840000e+00ms Throughput: 5.183013e-04
-----For 2 Thread-----
Memory: 1 Latency: 1.399000e+00ms Throughput: 6.816829e-04
-----For 1 Thread-----
Memory: 1024 Latency: 1.404000e+00ms Throughput: 6.955573e-01
-----For 2 Thread-----
Memory: 1024 Latency: 1.356000e+00ms Throughput: 7.201788e-01
-----For 1 Thread-----
```

```
Memory: 1048576 Latency: 5.484000e+01ms Throughput: 1.823487e+01
-----For 1 Thread-----
-----For Random Memory Write-----
Memory: 1 Latency: 1.840000e+00ms Throughput: 5.183013e-04
-----For 2 Thread-----
Memory: 1 Latency: 1.399000e+00ms Throughput: 6.816829e-04
-----For 1 Thread-----
Memory: 1024 Latency: 1.404000e+00ms Throughput: 6.955573e-01
-----For 2 Thread-----
Memory: 1024 Latency: 1.356000e+00ms Throughput: 7.201788e-01
-----For 1 Thread-----
Memory: 1048576 Latency: 2.479200e+01ms Throughput: 4.033559e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 2.455650e+01ms Throughput: 4.072242e+01
-----For Random Memory Read-----
-----For 1 Thread-----
Memory: 1 Latency: 2.620000e-01ms Throughput: 3.639978e-03
-----For 2 Thread-----
Memory: 1 Latency: 1.755000e-01ms Throughput: 5.434042e-03
-----For 1 Thread-----
Memory: 1024 Latency: 3.470000e-01ms Throughput: 2.814301e+00
-----For 2 Thread-----
Memory: 1024 Latency: 3.050000e-01ms Throughput: 3.201844e+00
-----For 1 Thread-----
Memory: 1048576 Latency: 1.779150e+02ms Throughput: 5.620662e+00
-----For 2 Thread-----
Memory: 1048576 Latency: 1.783745e+02ms Throughput: 5.606182e+00[ec2-user@ip-172-31-36-66 ~]$
```

## Iteration 2

```
ec2-user@ip-172-31-36-66:~$ ./dt
-----For Sequential Memory Write-----
-----For 1 Thread-----
Memory: 1 Latency: 1.024000e+00ms Throughput: 9.313226e-04
-----For 2 Thread-----
Memory: 1 Latency: 5.950000e-02ms Throughput: 1.602814e-02
-----For 1 Thread-----
Memory: 1024 Latency: 9.400000e-02ms Throughput: 1.038896e+01
-----For 2 Thread-----
Memory: 1024 Latency: 7.150000e-02ms Throughput: 1.365822e+01
-----For 1 Thread-----
Memory: 1048576 Latency: 2.279600e+01ms Throughput: 4.386735e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 2.263450e+01ms Throughput: 4.418034e+01
-----For Sequential Memory Read-----
-----For 1 Thread-----
Memory: 1 Latency: 1.210000e-01ms Throughput: 7.881606e-03
-----For 2 Thread-----
Memory: 1 Latency: 3.750000e-02ms Throughput: 2.543132e-02
-----For 1 Thread-----
Memory: 1024 Latency: 1.060000e-01ms Throughput: 9.212854e+00
-----For 2 Thread-----
Memory: 1024 Latency: 8.650000e-02ms Throughput: 1.128974e+01
-----For 1 Thread-----
Memory: 1048576 Latency: 5.505400e+01ms Throughput: 1.816398e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 5.540800e+01ms Throughput: 1.804794e+01
-----For Random Memory Write-----
-----For 1 Thread-----
Memory: 1 Latency: 1.870000e+00ms Throughput: 5.099863e-04
-----For 2 Thread-----
Memory: 1 Latency: 1.416500e+00ms Throughput: 6.732611e-04
-----For 1 Thread-----
Memory: 1024 Latency: 1.413000e+00ms Throughput: 6.911279e-01
-----For 2 Thread-----
Memory: 1024 Latency: 1.385500e+00ms Throughput: 7.048448e-01
-----For 1 Thread-----
```

```
ec2-user@ip-172-31-36-66:~$ ./dt
-----For 1 Thread-----
Memory: 1 Latency: 1.210000e-01ms Throughput: 7.881606e-03
-----For 2 Thread-----
Memory: 1 Latency: 3.750000e-02ms Throughput: 2.543132e-02
-----For 1 Thread-----
Memory: 1024 Latency: 1.060000e-01ms Throughput: 9.212854e+00
-----For 2 Thread-----
Memory: 1024 Latency: 8.650000e-02ms Throughput: 1.128974e+01
-----For 1 Thread-----
Memory: 1048576 Latency: 5.505400e+01ms Throughput: 1.816398e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 5.540800e+01ms Throughput: 1.804794e+01
-----For Random Memory Write-----
-----For 1 Thread-----
Memory: 1 Latency: 1.870000e+00ms Throughput: 5.099863e-04
-----For 2 Thread-----
Memory: 1 Latency: 1.416500e+00ms Throughput: 6.732611e-04
-----For 1 Thread-----
Memory: 1024 Latency: 1.413000e+00ms Throughput: 6.911279e-01
-----For 2 Thread-----
Memory: 1024 Latency: 1.385500e+00ms Throughput: 7.048448e-01
-----For 1 Thread-----
Memory: 1048576 Latency: 2.484700e+01ms Throughput: 4.024631e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 2.463750e+01ms Throughput: 4.058853e+01
-----For Random Memory Read-----
-----For 1 Thread-----
Memory: 1 Latency: 2.740000e-01ms Throughput: 3.480563e-03
-----For 2 Thread-----
Memory: 1 Latency: 1.825000e-01ms Throughput: 5.225613e-03
-----For 1 Thread-----
Memory: 1024 Latency: 3.600000e-01ms Throughput: 2.712674e+00
-----For 2 Thread-----
Memory: 1024 Latency: 3.215000e-01ms Throughput: 3.037519e+00
-----For 1 Thread-----
Memory: 1048576 Latency: 1.819470e+02ms Throughput: 5.496106e+00
-----For 2 Thread-----
Memory: 1048576 Latency: 1.817575e+02ms Throughput: 5.501836e+00[ec2-user@ip-172-31-36-66:~]$
```

### Iteration 3

```
ec2-user@ip-172-31-36-66:~$ clear
[ec2-user@ip-172-31-36-66 ~]$ ./dt
-----For Sequential Memory Write-----
-----For 1 Thread-----
Memory: 1 Latency: 1.064000e+00ms Throughput: 8.963104e-04
-----For 2 Thread-----
Memory: 1 Latency: 6.050000e-02ms Throughput: 1.576321e-02
-----For 1 Thread-----
Memory: 1024 Latency: 9.400000e-02ms Throughput: 1.038896e+01
-----For 2 Thread-----
Memory: 1024 Latency: 6.050000e-02ms Throughput: 1.425639e+01
-----For 1 Thread-----
Memory: 1048576 Latency: 2.284500e+01ms Throughput: 4.377325e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 2.255000e+01ms Throughput: 4.433410e+01
-----For Sequential Memory Read-----
-----For 1 Thread-----
Memory: 1 Latency: 1.020000e-01ms Throughput: 9.349748e-03
-----For 2 Thread-----
Memory: 1 Latency: 4.200000e-02ms Throughput: 2.270653e-02
-----For 1 Thread-----
Memory: 1024 Latency: 1.050000e-01ms Throughput: 9.300595e+00
-----For 2 Thread-----
Memory: 1024 Latency: 9.250000e-02ms Throughput: 1.055743e+01
-----For 1 Thread-----
Memory: 1048576 Latency: 5.506000e+01ms Throughput: 1.816003e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 5.546450e+01ms Throughput: 1.802955e+01
-----For Random Memory Write-----
-----For 1 Thread-----
Memory: 1 Latency: 1.830000e+00ms Throughput: 5.211335e-04
-----For 2 Thread-----
Memory: 1 Latency: 1.397500e+00ms Throughput: 6.824145e-04
-----For 1 Thread-----
Memory: 1024 Latency: 1.472000e+00ms Throughput: 6.634256e-01
-----For 2 Thread-----
Memory: 1024 Latency: 1.352000e+00ms Throughput: 7.223095e-01
-----For 1 Thread-----
```

```
ec2-user@ip-172-31-36-66:~$ ./dt
-----For 1 Thread-----
Memory: 1 Latency: 1.020000e-01ms Throughput: 9.349748e-03
-----For 2 Thread-----
Memory: 1 Latency: 4.200000e-02ms Throughput: 2.270653e-02
-----For 1 Thread-----
Memory: 1024 Latency: 1.050000e-01ms Throughput: 9.300595e+00
-----For 2 Thread-----
Memory: 1024 Latency: 9.250000e-02ms Throughput: 1.055743e+01
-----For 1 Thread-----
Memory: 1048576 Latency: 5.506000e+01ms Throughput: 1.816003e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 5.546450e+01ms Throughput: 1.802955e+01
-----For Random Memory Write-----
-----For 1 Thread-----
Memory: 1 Latency: 1.830000e+00ms Throughput: 5.211335e-04
-----For 2 Thread-----
Memory: 1 Latency: 1.397500e+00ms Throughput: 6.824145e-04
-----For 1 Thread-----
Memory: 1024 Latency: 1.472000e+00ms Throughput: 6.634256e-01
-----For 2 Thread-----
Memory: 1024 Latency: 1.352000e+00ms Throughput: 7.223095e-01
-----For 1 Thread-----
Memory: 1048576 Latency: 2.435900e+01ms Throughput: 4.105259e+01
-----For 2 Thread-----
Memory: 1048576 Latency: 2.439050e+01ms Throughput: 4.099957e+01
-----For Random Memory Read-----
-----For 1 Thread-----
Memory: 1 Latency: 2.750000e-01ms Throughput: 3.467907e-03
-----For 2 Thread-----
Memory: 1 Latency: 1.875000e-01ms Throughput: 5.086263e-03
-----For 1 Thread-----
Memory: 1024 Latency: 3.760000e-01ms Throughput: 2.597241e+00
-----For 2 Thread-----
Memory: 1024 Latency: 3.045000e-01ms Throughput: 3.207102e+00
-----For 1 Thread-----
Memory: 1048576 Latency: 1.785820e+02ms Throughput: 5.599668e+00
-----For 2 Thread-----
Memory: 1048576 Latency: 1.791610e+02ms Throughput: 5.581572e+00[ec2-user@ip-172-31-36-66 ~]$
```

To Run the IOZONE code you need to run the script  
**sh iozone.sh**