

# Project 3 Performance Study Report

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## Experiment 1:

```
e5-cse-204-01.cse.psu.edu 105$ ./simulator input5exp1.txt
Error opening file (null).
Could not write output to file
User time = 3132
OS time = 130085878
Context switched = 28
Start time = 0
End time = 130089010
Total Number of Disk Interrupts = 13
Total TLB Misses (Absolute) = 31
Total TLB Misses (Ratio) = 1.000000
Total Page Faults (Absolute) = 13
Total Page Faults (Ratio) = 0.419355
Total Fraction of Time in Blocked State = 0.691683

Process: process21:
Hit Ratio = 0.500000    Process completion time = 50022199    user time = 404 OS time = 40000
Context Switches: 5    Disk Interrupts: 2
TLB Miss (Absolute): 4    Page Faults (Absolute): 2    Fraction of Time in Blocked State: 0.999290
TLB Miss (Ratio): 1.000000    Page Faults (Ratio): 0.500000

Process: process20:
Hit Ratio = 0.636364    Process completion time = 90022303    user time = 1112    OS time = 80000
Context Switches: 8    Disk Interrupts: 4
TLB Miss (Absolute): 11    Page Faults (Absolute): 4    Fraction of Time in Blocked State: 0.999454
TLB Miss (Ratio): 1.000000    Page Faults (Ratio): 0.363636

Process: process22:
Hit Ratio = 0.562500    Process completion time = 130089006    user time = 1616    OS time = 140000
Context Switches: 15    Disk Interrupts: 7
TLB Miss (Absolute): 16    Page Faults (Absolute): 7    Fraction of Time in Blocked State: 0.999171
TLB Miss (Ratio): 1.000000    Page Faults (Ratio): 0.437500
```

```

e5-cse-204-01.cse.psu.edu 131$ ./simulator input9exp223.txt
Error opening file (null).
Could not write output to file
User time = 9250511
OS time = 95522637284
Context switched = 19110
Start time = 0
End time = 95531887795
Total Number of Disk Interrupts = 9553
Total TLB Misses (Absolute) = 88409
Total TLB Misses (Ratio) = 0.987236
Total Page Faults (Absolute) = 9553
Total Page Faults (Ratio) = 0.108055
Total Fraction of Time in Blocked State = 0.987754

Process: process38:
Hit Ratio = 0.895122   Process completion time = 93390022698   user time = 2301793   OS time = 46700000
Context Switches: 4672   Disk Interrupts: 2335
TLB Miss (Absolute): 21994   Page Faults (Absolute): 2335   Fraction of Time in Blocked State: 0.999675
TLB Miss (Ratio): 0.987873   Page Faults (Ratio): 0.104878

Process: process39:
Hit Ratio = 0.895180   Process completion time = 93940022591   user time = 2318253   OS time = 47060000
Context Switches: 4707   Disk Interrupts: 2353
TLB Miss (Absolute): 22159   Page Faults (Absolute): 2353   Fraction of Time in Blocked State: 0.999674
TLB Miss (Ratio): 0.987126   Page Faults (Ratio): 0.104820

Process: process36:
Hit Ratio = 0.892340   Process completion time = 94710022207   user time = 2294792   OS time = 47840000
Context Switches: 4784   Disk Interrupts: 2392
TLB Miss (Absolute): 21924   Page Faults (Absolute): 2392   Fraction of Time in Blocked State: 0.999673
TLB Miss (Ratio): 0.986767   Page Faults (Ratio): 0.107660

Process: process37:
Hit Ratio = 0.890682   Process completion time = 95531887785   user time = 2335673   OS time = 49460000
Context Switches: 4947   Disk Interrupts: 2473
TLB Miss (Absolute): 22332   Page Faults (Absolute): 2473   Fraction of Time in Blocked State: 0.999665
TLB Miss (Ratio): 0.987181   Page Faults (Ratio): 0.109318

```

```

e5-cse-204-01.cse.psu.edu 106$ ./simulator input6exp1.txt
Error opening file (null).
Could not write output to file
User time = 146701056
OS time = 4248423125094
Context switched = 849716
Start time = 0
End time = 4248569826150
Total Number of Disk Interrupts = 424856
Total TLB Misses (Absolute) = 1412762
Total TLB Misses (Ratio) = 0.990865
Total Page Faults (Absolute) = 424856
Total Page Faults (Ratio) = 0.300727
Total Fraction of Time in Blocked State = 0.994919

Process: process25:
Hit Ratio = 0.703937   Process completion time = 4206530022310 user time = 29238931   OS time = 1682620000
Context Switches: 168263   Disk Interrupts: 84131
TLB Miss (Absolute): 281548   Page Faults (Absolute): 84131   Fraction of Time in Blocked State: 0.999753
TLB Miss (Ratio): 0.990787   Page Faults (Ratio): 0.296063

Process: process26:
Hit Ratio = 0.704095   Process completion time = 4210780022301 user time = 29291437   OS time = 1684740000
Context Switches: 168475   Disk Interrupts: 84237
TLB Miss (Absolute): 282072   Page Faults (Absolute): 84237   Fraction of Time in Blocked State: 0.999753
TLB Miss (Ratio): 0.990853   Page Faults (Ratio): 0.295905

Process: process27:
Hit Ratio = 0.701906   Process completion time = 4230140022187 user time = 29297382   OS time = 1697640000
Context Switches: 169765   Disk Interrupts: 84882
TLB Miss (Absolute): 282125   Page Faults (Absolute): 84882   Fraction of Time in Blocked State: 0.999752
TLB Miss (Ratio): 0.990785   Page Faults (Ratio): 0.298094

Process: process23:
Hit Ratio = 0.700417   Process completion time = 4244150022445 user time = 29396183   OS time = 1711660000
Context Switches: 171166   Disk Interrupts: 85583
TLB Miss (Absolute): 283106   Page Faults (Absolute): 85583   Fraction of Time in Blocked State: 0.999751
TLB Miss (Ratio): 0.991011   Page Faults (Ratio): 0.299583

Process: process24:
Hit Ratio = 0.699767   Process completion time = 4248569826146 user time = 29477123   OS time = 1720460000
Context Switches: 172047   Disk Interrupts: 86023
TLB Miss (Absolute): 283911   Page Faults (Absolute): 86023   Fraction of Time in Blocked State: 0.999750
TLB Miss (Ratio): 0.990891   Page Faults (Ratio): 0.300233

```

```
e5-cse-204-01.cse.psu.edu 107$ ./simulator input7exp1.txt
Error opening file (null).
Could not write output to file
User time = 58531847
OS time = 1699416506549
Context switched = 339897
Start time = 0
End time = 1699475038396
Total Number of Disk Interrupts = 169947
Total TLB Misses (Absolute) = 563619
Total TLB Misses (Ratio) = 0.991026
Total Page Faults (Absolute) = 169947
Total Page Faults (Ratio) = 0.301528
Total Fraction of Time in Blocked State = 0.990323
```

```
Process: process28:
Hit Ratio = 0.706752    Process completion time = 1648130023059 user time = 14464804    OS time = 824080000
Context Switches: 82408    Disk Interrupts: 41204
TLB Miss (Absolute): 139236    Page Faults (Absolute): 41204    Fraction of Time in Blocked State: 0.999691
TLB Miss (Ratio): 0.990940    Page Faults (Ratio): 0.293248
```

```
Process: process29:
Hit Ratio = 0.700940    Process completion time = 1689390022838 user time = 14649879    OS time = 851580000
Context Switches: 85159    Disk Interrupts: 42579
TLB Miss (Absolute): 141073    Page Faults (Absolute): 42579    Fraction of Time in Blocked State: 0.999689
TLB Miss (Ratio): 0.990848    Page Faults (Ratio): 0.299060
```

```
Process: process30:
Hit Ratio = 0.699018    Process completion time = 1697220022212 user time = 14693170    OS time = 859400000
Context Switches: 85941    Disk Interrupts: 42970
TLB Miss (Absolute): 141502    Page Faults (Absolute): 42970    Fraction of Time in Blocked State: 0.999688
TLB Miss (Ratio): 0.991146    Page Faults (Ratio): 0.300982
```

```
Process: process31:
Hit Ratio = 0.698096    Process completion time = 1699475038393 user time = 14723994    OS time = 863880000
Context Switches: 86389    Disk Interrupts: 43194
TLB Miss (Absolute): 141808    Page Faults (Absolute): 43194    Fraction of Time in Blocked State: 0.999686
TLB Miss (Ratio): 0.991165    Page Faults (Ratio): 0.301904
```

```
e5-cse-204-01.cse.psu.edu 108$ ./simulator input8exp1.txt
Error opening file (null).
Could not write output to file
User time = 29435850
OS time = 861472879572
Context switched = 172303
Start time = 0
End time = 861502315422
Total Number of Disk Interrupts = 86150
Total TLB Misses (Absolute) = 283497
Total TLB Misses (Ratio) = 0.990947
Total Page Faults (Absolute) = 86150
Total Page Faults (Ratio) = 0.303883
Total Fraction of Time in Blocked State = 0.989118
```

```
Process: process35:
Hit Ratio = 0.704782    Process completion time = 837440022389 user time = 7297736    OS time = 418720000
Context Switches: 41873    Disk Interrupts: 20936
TLB Miss (Absolute): 70268    Page Faults (Absolute): 20936    Fraction of Time in Blocked State: 0.999691
TLB Miss (Ratio): 0.990848    Page Faults (Ratio): 0.295218
```

```
Process: process34:
Hit Ratio = 0.701434    Process completion time = 850160022194 user time = 7360860    OS time = 427200000
Context Switches: 42721    Disk Interrupts: 21360
TLB Miss (Absolute): 70895    Page Faults (Absolute): 21360    Fraction of Time in Blocked State: 0.999690
TLB Miss (Ratio): 0.990956    Page Faults (Ratio): 0.298566
```

```
Process: process32:
Hit Ratio = 0.695108    Process completion time = 860470022620 user time = 7382076    OS time = 437520000
Context Switches: 43752    Disk Interrupts: 21876
TLB Miss (Absolute): 71102    Page Faults (Absolute): 21876    Fraction of Time in Blocked State: 0.999686
TLB Miss (Ratio): 0.990969    Page Faults (Ratio): 0.304892
```

```
Process: process33:
Hit Ratio = 0.694232    Process completion time = 861502315419 user time = 7395178    OS time = 439560000
Context Switches: 43957    Disk Interrupts: 21978
TLB Miss (Absolute): 71232    Page Faults (Absolute): 21978    Fraction of Time in Blocked State: 0.999685
TLB Miss (Ratio): 0.991013    Page Faults (Ratio): 0.305768
```

```

e5-cse-204-01.cse.psu.edu 109$ ./simulator input9exp1.txt
Error opening file (null).
Could not write output to file
User time = 11794523
OS time = 346235187953
Context switched = 69249
Start time = 0
End time = 346246982476
Total Number of Disk Interrupts = 34623
Total TLB Misses (Absolute) = 113599
Total TLB Misses (Ratio) = 0.991075
Total Page Faults (Absolute) = 34623
Total Page Faults (Ratio) = 0.304783
Total Fraction of Time in Blocked State = 0.975481

Process: process39:
Hit Ratio = 0.709344   Process completion time = 329360022591   user time = 2914734   OS time = 164680000
Context Switches: 16469   Disk Interrupts: 8234
TLB Miss (Absolute): 28065   Page Faults (Absolute): 8234   Fraction of Time in Blocked State: 0.999691
TLB Miss (Ratio): 0.990681   Page Faults (Ratio): 0.290656

Process: process38:
Hit Ratio = 0.701108   Process completion time = 337220022293   user time = 2926796   OS time = 169920000
Context Switches: 16993   Disk Interrupts: 8496
TLB Miss (Absolute): 28183   Page Faults (Absolute): 8496   Fraction of Time in Blocked State: 0.999689
TLB Miss (Ratio): 0.991486   Page Faults (Ratio): 0.298892

Process: process36:
Hit Ratio = 0.698271   Process completion time = 338630022207   user time = 2921467   OS time = 171340000
Context Switches: 17134   Disk Interrupts: 8567
TLB Miss (Absolute): 28129   Page Faults (Absolute): 8567   Fraction of Time in Blocked State: 0.999688
TLB Miss (Ratio): 0.990702   Page Faults (Ratio): 0.301729

Process: process37:
Hit Ratio = 0.683596   Process completion time = 346246982466   user time = 3031526   OS time = 186520000
Context Switches: 18653   Disk Interrupts: 9326
TLB Miss (Absolute): 29222   Page Faults (Absolute): 9326   Fraction of Time in Blocked State: 0.999668
TLB Miss (Ratio): 0.991416   Page Faults (Ratio): 0.316404

```

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As you can see from the screenshots, the simulator runs the experiment 1 input files and returns and output with reasonable values. Our Page Table hits approximately 70% of the time with some process exceptions. The TLB misses 99% of the time and this is due to the TLB flushing after every context switch. The last value to notice is the fraction of time in the blocked state which most of the process's time is spent. This is due to the very large amount of time it takes for a disk interrupt.

## Experiment 2:

```
e5-cse-204-01.cse.psu.edu 110$ ./simulator input9exp211.txt
Error opening file (null).
Could not write output to file
User time = 11794523
OS time = 346235187953
Context switched = 69249
Start time = 0
End time = 346246982476
Total Number of Disk Interrupts = 34623
Total TLB Misses (Absolute) = 113599
Total TLB Misses (Ratio) = 0.991075
Total Page Faults (Absolute) = 34623
Total Page Faults (Ratio) = 0.304783
Total Fraction of Time in Blocked State = 0.975481

Process: process39:
Hit Ratio = 0.709344    Process completion time = 329360022591    user time = 2914734    OS time = 164680000
Context Switches: 16469    Disk Interrupts: 8234
TLB Miss (Absolute): 28065    Page Faults (Absolute): 8234    Fraction of Time in Blocked State: 0.999691
TLB Miss (Ratio): 0.990681    Page Faults (Ratio): 0.290656

Process: process38:
Hit Ratio = 0.701108    Process completion time = 337220022293    user time = 2926796    OS time = 169920000
Context Switches: 16993    Disk Interrupts: 8496
TLB Miss (Absolute): 28183    Page Faults (Absolute): 8496    Fraction of Time in Blocked State: 0.999689
TLB Miss (Ratio): 0.991486    Page Faults (Ratio): 0.298892

Process: process36:
Hit Ratio = 0.698271    Process completion time = 338630022207    user time = 2921467    OS time = 171340000
Context Switches: 17134    Disk Interrupts: 8567
TLB Miss (Absolute): 28129    Page Faults (Absolute): 8567    Fraction of Time in Blocked State: 0.999688
TLB Miss (Ratio): 0.990702    Page Faults (Ratio): 0.301729

Process: process37:
Hit Ratio = 0.683596    Process completion time = 346246982466    user time = 3031526    OS time = 186520000
Context Switches: 18653    Disk Interrupts: 9326
TLB Miss (Absolute): 29222    Page Faults (Absolute): 9326    Fraction of Time in Blocked State: 0.999668
TLB Miss (Ratio): 0.991416    Page Faults (Ratio): 0.316404
```

```

e5-cse-204-01.cse.psu.edu 111$ ./simulator input9exp212.txt
Error opening file (null).
Could not write output to file
User time = 5317071
OS time = 89704795899
Context switched = 17945
Start time = 0
End time = 89710112970
Total Number of Disk Interrupts = 8971
Total TLB Misses (Absolute) = 49081
Total TLB Misses (Ratio) = 0.551658
Total Page Faults (Absolute) = 8971
Total Page Faults (Ratio) = 0.182779
Total Fraction of Time in Blocked State = 0.991937

Process: process36:
Hit Ratio = 0.900486    Process completion time = 87610022413    user time = 1368191    OS time = 43820000
Context Switches: 4382    Disk Interrupts: 2191
TLB Miss (Absolute): 12660    Page Faults (Absolute): 2191    Fraction of Time in Blocked State: 0.999684
TLB Miss (Ratio): 0.575010    Page Faults (Ratio): 0.099514

Process: process39:
Hit Ratio = 0.899749    Process completion time = 89080022391    user time = 1385939    OS time = 44780000
Context Switches: 4479    Disk Interrupts: 2239
TLB Miss (Absolute): 12837    Page Faults (Absolute): 2239    Fraction of Time in Blocked State: 0.999682
TLB Miss (Ratio): 0.574774    Page Faults (Ratio): 0.100251

Process: process38:
Hit Ratio = 0.897824    Process completion time = 89660022293    user time = 1273268    OS time = 45360000
Context Switches: 4537    Disk Interrupts: 2268
TLB Miss (Absolute): 11710    Page Faults (Absolute): 2268    Fraction of Time in Blocked State: 0.999682
TLB Miss (Ratio): 0.527549    Page Faults (Ratio): 0.102176

Process: process37:
Hit Ratio = 0.898626    Process completion time = 89710112960    user time = 1289673    OS time = 45460000
Context Switches: 4547    Disk Interrupts: 2273
TLB Miss (Absolute): 11874    Page Faults (Absolute): 2273    Fraction of Time in Blocked State: 0.999681
TLB Miss (Ratio): 0.529569    Page Faults (Ratio): 0.101374

```

```

e5-cse-204-01.cse.psu.edu 112$ ./simulator input9exp213.txt
Error opening file (null).
Could not write output to file
User time = 5886401
OS time = 96006216461
Context switched = 19205
Start time = 0
End time = 96012102862
Total Number of Disk Interrupts = 9601
Total TLB Misses (Absolute) = 54768
Total TLB Misses (Ratio) = 0.611250
Total Page Faults (Absolute) = 9601
Total Page Faults (Ratio) = 0.175303
Total Fraction of Time in Blocked State = 0.990998

Process: process39:
Hit Ratio = 0.894662    Process completion time = 94640022291    user time = 1466066    OS time = 47320000
Context Switches: 4733    Disk Interrupts: 2366
TLB Miss (Absolute): 13637    Page Faults (Absolute): 2366    Fraction of Time in Blocked State: 0.999684
TLB Miss (Ratio): 0.607141    Page Faults (Ratio): 0.105338

Process: process36:
Hit Ratio = 0.892902    Process completion time = 94980022207    user time = 1460378    OS time = 47560000
Context Switches: 4756    Disk Interrupts: 2378
TLB Miss (Absolute): 13580    Page Faults (Absolute): 2378    Fraction of Time in Blocked State: 0.999684
TLB Miss (Ratio): 0.611602    Page Faults (Ratio): 0.107098

Process: process38:
Hit Ratio = 0.893237    Process completion time = 95080022944    user time = 1465482    OS time = 47640000
Context Switches: 4765    Disk Interrupts: 2382
TLB Miss (Absolute): 13631    Page Faults (Absolute): 2382    Fraction of Time in Blocked State: 0.999684
TLB Miss (Ratio): 0.610954    Page Faults (Ratio): 0.106763

Process: process37:
Hit Ratio = 0.890603    Process completion time = 96012102852    user time = 1494475    OS time = 49500000
Context Switches: 4951    Disk Interrupts: 2475
TLB Miss (Absolute): 13920    Page Faults (Absolute): 2475    Fraction of Time in Blocked State: 0.999675
TLB Miss (Ratio): 0.615276    Page Faults (Ratio): 0.109397

```



```

e5-cse-204-01.cse.psu.edu 113$ ./simulator input9exp214.txt
Error opening file (null).
Could not write output to file
User time = 8359155
OS time = 353984413
Context switched = 998
Start time = 0
End time = 362343568
Total Number of Disk Interrupts = 36
Total TLB Misses (Absolute) = 79145
Total TLB Misses (Ratio) = 0.988880
Total Page Faults (Absolute) = 36
Total Page Faults (Ratio) = 0.000455
Total Fraction of Time in Blocked State = 0.951795

Process: process36:
Hit Ratio = 0.999546    Process completion time = 332306116    user time = 2075396    OS time = 180000
Context Switches: 247    Disk Interrupts: 9
TLB Miss (Absolute): 19642    Page Faults (Absolute): 9    Fraction of Time in Blocked State: 0.992740
TLB Miss (Ratio): 0.990270    Page Faults (Ratio): 0.000454

Process: process37:
Hit Ratio = 0.999554    Process completion time = 342349514    user time = 2104144    OS time = 180000
Context Switches: 251    Disk Interrupts: 9
TLB Miss (Absolute): 19929    Page Faults (Absolute): 9    Fraction of Time in Blocked State: 0.992828
TLB Miss (Ratio): 0.988640    Page Faults (Ratio): 0.000446

Process: process38:
Hit Ratio = 0.999549    Process completion time = 352288398    user time = 2081790    OS time = 180000
Context Switches: 249    Disk Interrupts: 9
TLB Miss (Absolute): 19705    Page Faults (Absolute): 9    Fraction of Time in Blocked State: 0.993068
TLB Miss (Ratio): 0.988314    Page Faults (Ratio): 0.000451

Process: process39:
Hit Ratio = 0.999552    Process completion time = 362343543    user time = 2097825    OS time = 180000
Context Switches: 251    Disk Interrupts: 9
TLB Miss (Absolute): 19869    Page Faults (Absolute): 9    Fraction of Time in Blocked State: 0.993180
TLB Miss (Ratio): 0.988311    Page Faults (Ratio): 0.000448

```

```

e5-cse-204-01.cse.psu.edu 114$ ./simulator input9exp215.txt
Error opening file (null).
Could not write output to file
User time = 8211496
OS time = 154097005
Context switched = 943
Start time = 0
End time = 162308501
Total Number of Disk Interrupts = 16
Total TLB Misses (Absolute) = 77662
Total TLB Misses (Ratio) = 0.970593
Total Page Faults (Absolute) = 16
Total Page Faults (Ratio) = 0.000206
Total Fraction of Time in Blocked State = 0.893073

Process: process36:
Hit Ratio = 0.999798    Process completion time = 132278083    user time = 2035582    OS time = 80000
Context Switches: 233    Disk Interrupts: 4
TLB Miss (Absolute): 19240    Page Faults (Absolute): 4    Fraction of Time in Blocked State: 0.982548
TLB Miss (Ratio): 0.970247    Page Faults (Ratio): 0.000202

Process: process37:
Hit Ratio = 0.999802    Process completion time = 142314212    user time = 2067345    OS time = 80000
Context Switches: 238    Disk Interrupts: 4
TLB Miss (Absolute): 19559    Page Faults (Absolute): 4    Fraction of Time in Blocked State: 0.983449
TLB Miss (Ratio): 0.970526    Page Faults (Ratio): 0.000198

Process: process38:
Hit Ratio = 0.999799    Process completion time = 152290502    user time = 2046242    OS time = 80000
Context Switches: 235    Disk Interrupts: 4
TLB Miss (Absolute): 19352    Page Faults (Absolute): 4    Fraction of Time in Blocked State: 0.984619
TLB Miss (Ratio): 0.970852    Page Faults (Ratio): 0.000201

Process: process39:
Hit Ratio = 0.999801    Process completion time = 162308476    user time = 2062327    OS time = 80000
Context Switches: 237    Disk Interrupts: 4
TLB Miss (Absolute): 19511    Page Faults (Absolute): 4    Fraction of Time in Blocked State: 0.985388
TLB Miss (Ratio): 0.970745    Page Faults (Ratio): 0.000199

```



```
e5-cse-204-01.cse.psu.edu 115$ ./simulator input9exp221.txt
Error opening file (null).
Could not write output to file
User time = 11794523
OS time = 346235187953
Context switched = 69249
Start time = 0
End time = 346246982476
Total Number of Disk Interrupts = 34623
Total TLB Misses (Absolute) = 113599
Total TLB Misses (Ratio) = 0.991075
Total Page Faults (Absolute) = 34623
Total Page Faults (Ratio) = 0.304783
Total Fraction of Time in Blocked State = 0.975481
```

```
Process: process39:
Hit Ratio = 0.709344 Process completion time = 329360022591 user time = 2914734 OS time = 164680000
Context Switches: 16469 Disk Interrupts: 8234
TLB Miss (Absolute): 28065 Page Faults (Absolute): 8234 Fraction of Time in Blocked State: 0.999691
TLB Miss (Ratio): 0.990681 Page Faults (Ratio): 0.290656
```

```
Process: process38:
Hit Ratio = 0.701108 Process completion time = 337220022293 user time = 2926796 OS time = 169920000
Context Switches: 16993 Disk Interrupts: 8496
TLB Miss (Absolute): 28183 Page Faults (Absolute): 8496 Fraction of Time in Blocked State: 0.999689
TLB Miss (Ratio): 0.991486 Page Faults (Ratio): 0.298892
```

```
Process: process36:
Hit Ratio = 0.698271 Process completion time = 338630022207 user time = 2921467 OS time = 171340000
Context Switches: 17134 Disk Interrupts: 8567
TLB Miss (Absolute): 28129 Page Faults (Absolute): 8567 Fraction of Time in Blocked State: 0.999688
TLB Miss (Ratio): 0.990702 Page Faults (Ratio): 0.301729
```

```
Process: process37:
Hit Ratio = 0.683596 Process completion time = 346246982466 user time = 3031526 OS time = 186520000
Context Switches: 18653 Disk Interrupts: 9326
TLB Miss (Absolute): 29222 Page Faults (Absolute): 9326 Fraction of Time in Blocked State: 0.999668
TLB Miss (Ratio): 0.991416 Page Faults (Ratio): 0.316404
```

```
e5-cse-204-01.cse.psu.edu 116$ ./simulator input9exp222.txt
Error opening file (null).
Could not write output to file
User time = 8498131
OS time = 19892339750
Context switched = 4610
Start time = 0
End time = 19900837881
Total Number of Disk Interrupts = 1990
Total TLB Misses (Absolute) = 80654
Total TLB Misses (Ratio) = 0.983717
Total Page Faults (Absolute) = 1990
Total Page Faults (Ratio) = 0.024673
Total Fraction of Time in Blocked State = 0.997190
```

```
Process: process38:
Hit Ratio = 0.975812 Process completion time = 19750434900 user time = 2116767 OS time = 9880000
Context Switches: 1142 Disk Interrupts: 494
TLB Miss (Absolute): 20090 Page Faults (Absolute): 494 Fraction of Time in Blocked State: 0.999584
TLB Miss (Ratio): 0.983695 Page Faults (Ratio): 0.024188
```

```
Process: process37:
Hit Ratio = 0.975880 Process completion time = 19870756648 user time = 2138804 OS time = 9960000
Context Switches: 1154 Disk Interrupts: 498
TLB Miss (Absolute): 20309 Page Faults (Absolute): 498 Fraction of Time in Blocked State: 0.999583
TLB Miss (Ratio): 0.983630 Page Faults (Ratio): 0.024120
```

```
Process: process36:
Hit Ratio = 0.975449 Process completion time = 19890710781 user time = 2107881 OS time = 9980000
Context Switches: 1156 Disk Interrupts: 499
TLB Miss (Absolute): 19991 Page Faults (Absolute): 499 Fraction of Time in Blocked State: 0.999585
TLB Miss (Ratio): 0.983567 Page Faults (Ratio): 0.024551
```

```
Process: process39:
Hit Ratio = 0.975770 Process completion time = 19900837856 user time = 2134679 OS time = 9980000
Context Switches: 1158 Disk Interrupts: 499
TLB Miss (Absolute): 20264 Page Faults (Absolute): 499 Fraction of Time in Blocked State: 0.999582
TLB Miss (Ratio): 0.983976 Page Faults (Ratio): 0.024230
```

```

e5-cse-204-01.cse.psu.edu 131$ ./simulator input9exp223.txt
Error opening file (null).
Could not write output to file
User time = 9250511
OS time = 95522637284
Context switched = 19110
Start time = 0
End time = 95531887795
Total Number of Disk Interrupts = 9553
Total TLB Misses (Absolute) = 88409
Total TLB Misses (Ratio) = 0.987236
Total Page Faults (Absolute) = 9553
Total Page Faults (Ratio) = 0.108055
Total Fraction of Time in Blocked State = 0.987754

Process: process38:
Hit Ratio = 0.895122   Process completion time = 93390022698   user time = 2301793   OS time = 46700000
Context Switches: 4672   Disk Interrupts: 2335
TLB Miss (Absolute): 21994   Page Faults (Absolute): 2335   Fraction of Time in Blocked State: 0.999675
TLB Miss (Ratio): 0.987873   Page Faults (Ratio): 0.104878

Process: process39:
Hit Ratio = 0.895180   Process completion time = 93940022591   user time = 2318253   OS time = 47060000
Context Switches: 4707   Disk Interrupts: 2353
TLB Miss (Absolute): 22159   Page Faults (Absolute): 2353   Fraction of Time in Blocked State: 0.999674
TLB Miss (Ratio): 0.987126   Page Faults (Ratio): 0.104820

Process: process36:
Hit Ratio = 0.892340   Process completion time = 94710022207   user time = 2294792   OS time = 47840000
Context Switches: 4784   Disk Interrupts: 2392
TLB Miss (Absolute): 21924   Page Faults (Absolute): 2392   Fraction of Time in Blocked State: 0.999673
TLB Miss (Ratio): 0.986767   Page Faults (Ratio): 0.107660

Process: process37:
Hit Ratio = 0.890682   Process completion time = 95531887785   user time = 2335673   OS time = 49460000
Context Switches: 4947   Disk Interrupts: 2473
TLB Miss (Absolute): 22332   Page Faults (Absolute): 2473   Fraction of Time in Blocked State: 0.999665
TLB Miss (Ratio): 0.987181   Page Faults (Ratio): 0.109318

```

As you can see from the outputs of experiment 2, the values appear reasonable. In some of the cases our TLB has a much lower miss ratio than in the previous experiment, and our Page Table also appears to have a lower page fault ratio. The input files that use a single or 2 level page table also appear to have good values.