**Kennesaw State University**

**College of Computing and Software Engineering**

**DEPARTMENT OF COMPUTER SCIENCE**

**CS 3502 / Operating Systems / Section 01**

**Assignment 1**

**Alex Kimbell /** [**jkimbel2@students.kennesaw.edu**](mailto:jkimbel2@students.kennesaw.edu)

**August 8th, 2017**

**Summary and Purpose of the Assignment**

The purpose of the assignment is to run simulations of a batch system on the CS3 server with Linux. By running the simulation multiple times and changing the input parameters to affect the performance one can gain a better understanding of not only modeling and simulation, but also how these variables can increase or decrease run speeds.

**Results**

Unmodified Test 1

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (12.65) Lower bound mean memory demand: (8) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (200) System memory: (40) Processor object created

environment created with 10.55 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 18:31:03 2017

Service factor: 0.0824288

Processor utilization: 0.415277

Total jobs arrived: 100

Total jobs rejected: 0

Throughput (jobs completed): 100

Proportion Rejected: 0

Average job wait period: 138.682

Average memory used: 4.5191

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End of simulation Simple Batch System Mon Aug 28 18:31:03 2017

Unmodified Test 2

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (12.65) Lower bound mean memory demand: (8) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (200) System memory: (40) Processor object created

environment created with 10.55 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 18:31:19 2017

Service factor: 0.13003

Processor utilization: 0.375511

Total jobs arrived: 96

Total jobs rejected: 0

Throughput (jobs completed): 96

Proportion Rejected: 0

Average job wait period: 78.5119

Average memory used: 3.99877

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End of simulation Simple Batch System Mon Aug 28 18:31:19 2017

Unmodified Test 3

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (12.65) Lower bound mean memory demand: (8) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (200) System memory: (40) Processor object created

environment created with 10.55 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 18:31:34 2017

Service factor: 0.0626609

Processor utilization: 0.465195

Total jobs arrived: 102

Total jobs rejected: 0

Throughput (jobs completed): 102

Proportion Rejected: 0

Average job wait period: 204.671

Average memory used: 5.12423

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End of simulation Simple Batch System Mon Aug 28 18:31:34 2017

Modified mean\_int arr Test 1

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (50) Mean CPU service demand: (12.65) Lower bound mean memory demand: (8) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (40) System memory: (200) Processor object created

environment created with 50 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 22:08:20 2017

Service factor: 0.776942

Processor utilization: 0.0877793

Total jobs arrived: 18

Total jobs rejected: 0

Throughput (jobs completed): 18

Proportion Rejected: 0

Average job wait period: 4.2002

Average memory used: 1.03724

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End of simulation Simple Batch System Mon Aug 28 20:16:09 2017

Modified mean\_int arr Test 2

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (5) Mean CPU service demand: (12.65) Lower bound mean memory demand: (8) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (40) System memory: (200) Processor object created

environment created with 5 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 22:08:43 2017

Service factor: 0.0353831

Processor utilization: 0.487199

Total jobs arrived: 202

Total jobs rejected: 81

Throughput (jobs completed): 121

Proportion Rejected: 0.40099

Average job wait period: 329.307

Average memory used: 5.42954

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End of simulation Simple Batch System Mon Aug 28 22:08:43 2017

Modified mean\_ser Test 1

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (50) Lower bound mean memory demand: (8) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (40) System memory: (200) Processor object created

environment created with 10.55 50

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 22:09:49 2017

Service factor: 0.0438659

Processor utilization: 0.945909

Total jobs arrived: 86

Total jobs rejected: 29

Throughput (jobs completed): 52

Proportion Rejected: 0.337209

Average job wait period: 1189.49

Average memory used: 10.3958

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End of simulation Simple Batch System Mon Aug 28 22:09:49 2017

Modified mean\_ser Test 2

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (5) Lower bound mean memory demand: (8) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (40) System memory: (200) Processor object created

environment created with 10.55 5

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 22:10:28 2017

Service factor: 0.477865

Processor utilization: 0.175925

Total jobs arrived: 101

Total jobs rejected: 0

Throughput (jobs completed): 101

Proportion Rejected: 0

Average job wait period: 5.70957

Average memory used: 2.01926

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End of simulation Simple Batch System Mon Aug 28 22:10:28 2017

Modified mem\_l Test 1

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (12.65) Lower bound mean memory demand: (16) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (40) System memory: (200) Processor object created

environment created with 10.55 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 22:10:53 2017

Service factor: 0.0510391

Processor utilization: 0.428178

Total jobs arrived: 95

Total jobs rejected: 0

Throughput (jobs completed): 95

Proportion Rejected: 0

Average job wait period: 251.401

Average memory used: 0

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End of simulation Simple Batch System Mon Aug 28 22:10:53 2017

Modified mem\_l Test 2

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (12.65) Lower bound mean memory demand: (4) Upper bound mean mem demand: (14)

Systems parameters

Queue capacity: (40) System memory: (200) Processor object created

environment created with 10.55 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 22:11:34 2017

Service factor: 0.0792477

Processor utilization: 0.415025

Total jobs arrived: 104

Total jobs rejected: 0

Throughput (jobs completed): 104

Proportion Rejected: 0

Average job wait period: 139.097

Average memory used: 3.9436

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End of simulation Simple Batch System Mon Aug 28 22:11:34 2017

Modified mem\_up Test 1

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (12.65) Lower bound mean memory demand: (8) Upper bound mean mem demand: (28)

Systems parameters

Queue capacity: (40) System memory: (200) Processor object created

environment created with 10.55 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 22:13:01 2017

Service factor: 0.0535667

Processor utilization: 0.46159

Total jobs arrived: 109

Total jobs rejected: 0

Throughput (jobs completed): 109

Proportion Rejected: 0

Average job wait period: 224.464

Average memory used: 8.32324

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End of simulation Simple Batch System Mon Aug 28 22:13:01 2017

Modified mem\_up Test 2

Simulation parameters

Simulation interval: (3000) Close arrival time: (1000)

Workload Parameters

Mean inter-arrival: (10.55) Mean CPU service demand: (12.65) Lower bound mean memory demand: (8) Upper bound mean mem demand: (7)

Systems parameters

Queue capacity: (40) System memory: (200) Processor object created

environment created with 10.55 12.65

Psim3 project: Simple Batch System

Simulation date: Mon Aug 28 22:13:27 2017

Service factor: 0.0909038

Processor utilization: 0.366575

Total jobs arrived: 83

Total jobs rejected: 0

Throughput (jobs completed): 83

Proportion Rejected: 0

Average job wait period: 132.506

Average memory used: 0

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End of simulation Simple Batch System Mon Aug 28 22:13:27 2017

**Assignment Questions**

What aspect of an operating system is the model representing?

* The queuing and completion of processes

What performance measures does the model compute?

* The model computes the processor utilization for its performance measures.

What is noticeable in the dynamic behavior of the system?

* All of the results fluctuate within a given range based on the generated variables despite the parameters not being changed.

What changes in the results do you notice?

* Increasing the mean inter-arrival caused processor utilization to decrease while decreasing it showed an increase in utilization.
* Increasing the Mean CPU service demand cause the processor utilization to increase while decreasing the variable cause utilization to decrease.
* Increasing the lower and upper bound mean memory demand saw no noticeable change in the processor utilization while decreasing it saw no change as well.

What other performance measures can this model compute?

* The model can also compute throughput of a system as well as average job wait time and average memory usage.