CENG 476
Project

Project #18:
Bus Simulation

Onur Yılmaz

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1. Project Description

In this project, a transportation problem will be simulated. Firstly, the problem which is the subject of this project is presented. Following that, activities related to this problem is mentioned and then thirdly, design approach is presented. Providing the actual GPSS model of simulation approach, inputs and outputs are analyzed. Finally two experiments are undertaken in order to control the responsiveness of simulation model and findings are presented.

2. Problem Definition

In this project, the problem given below will be simulated.

[Problem 18]

A party of 100 people has been taken to a football game in four buses, each of capacity 25. When the game is over, each person returns independently to the bus that brought him to the game. The time taken to reach a bus is normally distributed with mean values of 10, 12, 15 and 18 minutes for the four buses. When a bus is full, it leaves, and arrives home after a drive that is normally distributed with a mean of 80 and a standard deviation of 5 minutes. Begin a simulation from the time the game finishes and find the time at which the last bus arrives home.

3. Activities

Complete list of activities in the problem can be listed as following:

1. 100 people come to stadium with 4 buses, 25 people in each

2. Football game is over

3. People start walking from stadium to the buses

4. People take the bus which brought them

5. When a bus is full (25 people in each), it leaves

As mentioned in the problem definition, simulation will start from the Step 3.

4. Design Approach

Design approach in this project is based on four parts, in each the activities of people from different buses are simulated. As a diagram, this approach can be summarized as following:
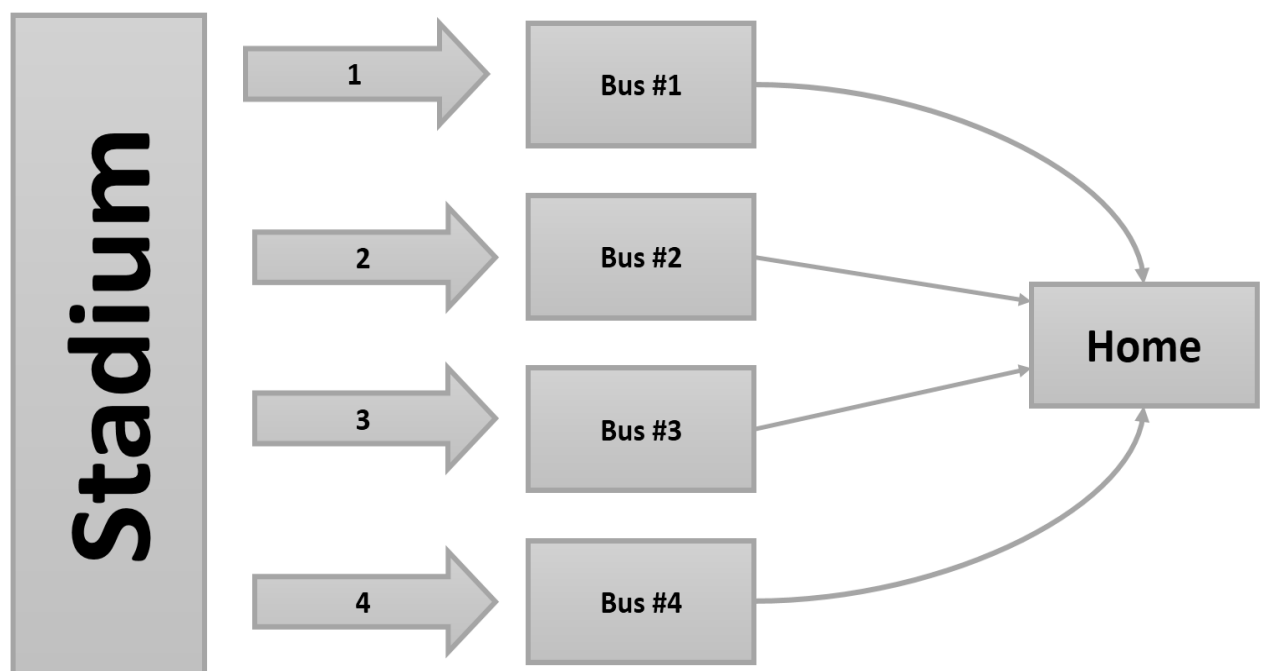
Figure 4.1: Design Approach

As can be seen from the figure above, people will be simulated so that they will walk to their buses and then buses will be simulated so that they will reach home.

4.1. Design Summary

For one bus and the people related to this bus, the following design elements are implemented:

- One generator for people (Batch creation of 25 people)

- One statistical queue for concurrent walking of people

- One preemptive server for bus driving (Capacity of 1)

- One generator for clock control

As mentioned, first three types of elements will be used four times corresponding to each bus.

5. Model Program

In this section, all parts of the model program is explained by dividing into parts.

```
* Counters for people
Counter_1                      VARIABLE   0
Counter_2                      VARIABLE   0
Counter_3                      VARIABLE   0
Counter_4                      VARIABLE   0

* Bus full times
Bus_Full_1      VARIABLE       0
Bus_Full_2      VARIABLE       0
Bus_Full_3      VARIABLE       0
Bus_Full_4      VARIABLE       0

* Arrival time for buses
Arrival_1                      VARIABLE   0
Arrival_2                      VARIABLE   0
Arrival_3                      VARIABLE   0
Arrival_4                      VARIABLE   0
```

Figure 5.1: Variables

The following generator, queue and server are implemented for bus #1.

```
* Generator
GENERATE 0,0,0,25

* Queue for walking
QUEUE    Walking_1                     ; Join
ADVANCE  (Normal(Counter_1,10,3))     ; Walking time
SAVEVALUE  Bus_Full_1,C1        ; Save when walking is finished
SAVEVALUE  Counter_1+,1         ; Counter for controlling
DEPART   Walking_1              ; Depart

* Driving
PREEMPT  Driver_1,,BEKLE_1      ; Preemptive so that the last
                               ; person uses completely
ADVANCE  (Normal(96,80,5))      ; Driving time
RELEASE  Driver_1              ; Release
SAVEVALUE  Arrival_1,C1         ; Save arrival time
BEKLE_1  terminate             ; Terminate
```

Figure 5.2: Implementation of Bus #1

The following generator, queue and server are implemented for bus #2.

```
* Generator
GENERATE 0,0,0,25

* Queue for walking
QUEUE    Walking_2                     ; Join
ADVANCE  (Normal(Counter_2,12,3.5))   ; Walking time
SAVEVALUE Bus_Full_2,C1         ; Save when walking is finished
SAVEVALUE Counter_2+,1          ; Counter for controlling
DEPART   Walking_2             ; Depart

* Driving
PREEMPT  Driver_2,,BEKLE_2      ; Preemptive so that the last
                               ; person uses completely
ADVANCE  (Normal(97,80,5))      ; Driving time
RELEASE  Driver_2             ; Release
SAVEVALUE Arrival_2,C1          ; Save arrival time
BEKLE_2  terminate            ; Terminate
```

Figure 5.3: Implementation of Bus #2

The following generator, queue and server are implemented for bus #3.

```
* Generator
GENERATE 0,0,0,25

* Queue for walking
QUEUE    Walking_3                   ; Join
ADVANCE  (Normal(Counter_3,15,4.5))  ; Walking time
SAVEVALUE  Bus_Full_3,C1        ; Save when walking is finished
SAVEVALUE  Counter_3+,1         ; Counter for controlling
DEPART   Walking_3              ; Depart

* Driving
PREEMPT  Driver_3,,BEKLE_2      ; Preemptive so that the last
                                ; person uses completely
ADVANCE  (Normal(98,80,5))      ; Driving time
RELEASE  Driver_3              ; Release
SAVEVALUE  Arrival_3,C1        ; Save arrival time
BEKLE_3  terminate             ; Terminate
```

Figure 5.4: Implementation of Bus #3

The following generator, queue and server are implemented for bus #4.

```
* Generator
GENERATE 0,0,0,25

* Queue for walking
QUEUE    Walking_4                   ; Join
ADVANCE  (Normal(Counter_4,18,5.5))  ; Walking time
SAVEVALUE Bus_Full_4,C1         ; Save when walking is finished
SAVEVALUE Counter_4+,1          ; Counter for controlling
DEPART   Walking_4              ; Depart

* Driving
PREEMPT  Driver_4,,BEKLE_2      ; Preemptive so that the last
                                ; person uses completely
ADVANCE  (Normal(99,80,5))      ; Driving time
RELEASE  Driver_4              ; Release
SAVEVALUE Arrival_4,C1         ; Save arrival time
BEKLE_4   terminate            ; Terminate
```

Figure 5.5: Implementation of Bus #4

The following generator is used for clock control.

```
* Clock control
GENERATE   250
TERMINATE 1
```

Figure 5.6: Clock control

For each bus, firstly, people are generated at a batch of 25 and then sent to statistical queue "Walking_X", where people are advanced according to their walking time distributions. When people depart this queue, they join "Driver_X" for driving action of buses. This server is implemented as preemptive, so that each coming person will preempt the server and at the end the last person arrives at the bus will advance as driving time. All preempted people are sent to termination since they are not necessary in the later stages. In addition, this model is simulated for 250 time units ensuring that all buses arrives at home.

6. Analysis of Design

In this section, implemented design will be analyzed in the sense of inputs and outputs so that we can evaluate behavior of model.

6.1. Input Analysis

In this model, five statistical inputs are used which needs further analysis. Four of these inputs are used for walking times of people and the final one is used for driving time of buses. Since the analysis of these inputs are made in the previous project report and validated, they will not be added again in this report.

To sum up, all statistical inputs used can be listed as following:

Value #	Input Name	Input Value
Input #1	Walking time for Bus#1 people	NORMAL (10, 3)
Input #2	Walking time for Bus#2 people	NORMAL (12, 3.5)
Input #3	Walking time for Bus#3 people	NORMAL (15, 4.5)
Input #4	Walking time for Bus#4 people	NORMAL (18, 5.5)
Input #5	Driving time	NORMAL (80, 5)
Table 6.1: Inputs used in the model		

6.2. Output Analysis

After running the GPSS model provided in part 5, all gathered outputs are provided in Appendix. In this section, the important ones will be analyzed with their expected values.

Firstly, average walking times of people are recorded. When people grouped according to their buses, the following table is constructed:

Value #	Value Description	Expected	First Run	Difference
Output #1	Average walking time for Bus#1 people	10	9.395	6.05 %
Output #2	Average walking time for Bus#2 people	12	11.261	6.16 %
Output #3	Average walking time for Bus#3 people	15	15.045	0.30 %
Output #4	Average walking time for Bus#4 people	18	18.435	2.42 %
Table 6.2.1: Walking time outputs				
(Reference to (1) in Appendix)				

In the table above, expected average values are taken from the mean values of inputs provided in Table 6.1. As can be seen above, there is no important difference between "First Run" and "Expected" outputs.

Secondly, departure times of the buses are analyzed. Since the last person's walking time determines this value, probability of the maximum value is considered. In other words, instead of using a calculated expected value, probability of having a higher maximum value will be considered. With this reasoning these probabilities are calculated considering:
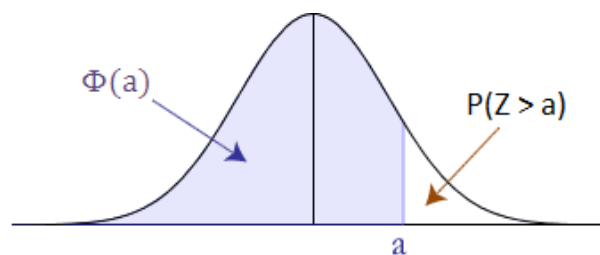

Figure 6.2.1: Normal distribution

Value #	Value Description	First Run	Probability of having a greater value
Output #5	Full time for Bus#1	16.010	2.26 %
Output #6	Full time for Bus#2	18.916	2.41 %
Output #7	Full time for Bus#3	20.997	9.13 %
Output #8	Full time for Bus#4	30.374	1.22 %
Table 6.2.2: Full time of buses			
(Reference to (2) in Appendix)			

As can be seen from the table above, full time of the buses gave a little chance to be longer than the output values in the first run. In other words, these maximum values are acceptable for the input values provided in Table 6.1.

Thirdly, average driving time of the buses is analyzed. Considering the normal distribution with the mean of 80, it can be said that driving time is acceptable as can be seen from the table below:

Value #	Value Description	Expected	First Run	Difference
Output #9	Average driving time of buses	80	82.480	3.10 %
Table 6.2.3: Driving time of buses				
(Reference to (2) in Appendix)				

Finally, as asked in the problem definition, arrival time of the last bus is analyzed. Considering the walking times, it is expected that the last bus that departures will be the bus #4 because it is related to the slowest walking people in average. Considering the average driving time of 80, the following table can be constructed:

Mean (1)	+ / - Sigma (2)	Probability	Value (3) = (1) + (2)	Average Driving Time (4)	Result (3) + (4)
18	-3 x 5,5	2,1 %	1,5	80	81,5
18	-2 x 5,5	13,6 %	7	80	87
18	-1 x 5,5	34,1 %	12,5	80	92,5
18	0 x 5,5	50 %	18	80	98
18	1 x 5,5	68,2 %	23,5	80	103,5
18	2 x 5,5	95,4 %	29	80	109
18	3 x 5,5	99,7 %	34,5	80	114,5
Table 6.2.4: Normal distribution analysis for maximum value					

As can be seen from the table above, arrival time of 114,5 can be expected for the arrival of the last bus in the worst scenario. With this reasoning, as summarized below, result of the run is acceptable.

Value #	Value Description	Expected	First Run	Difference
Output #10	Arrival of the last bus	114.5	116.910	2.10 %
Table 6.2.5: Arrival of the last bus *(Reference to (2) in Appendix)*				

As expectation calculation is made according to the fourth bus, it can be seen from the table below, actually the fourth bus arrives as the last bus:

Bus	Time
Bus #1	100.924
Bus #2	91.677
Bus #3	106.710
Bus #4	116.910
Table 6.2.6: Arrival times of the buses	
(Reference to (2) in Appendix)	

7. Experiments and Results

In order to check responsiveness of the model to parameter changes, two experiments are undertaken.

7.1. Experiment #1: Increase in walking times

Firstly, mean of the walking time of people related to bus #3 and #4 increased by 10. These changed inputs can be tabulated as below:

Value #	Input Name	Input Value
Input #3	Walking time for Bus#3 people	NORMAL (25, 4.5)
Input #4	Walking time for Bus#4 people	NORMAL (28, 5.5)
Table 7.1: Changed inputs used in Experiment #1		

When the simulation is run, it is thought that departure time of bus #3 and #4 will increase by 10 and arrival of the latest bus will increase too. It is considered in this way because in this experiment walking time of the two slowest groups are increased. Outputs can be tabulated after run:

Value #	Value Description	First Run	Experiment #1	Expected Change
Output #1	Average walking time for Bus#1 people	9.395	9.395	0
Output #2	Average walking time for Bus#2 people	11.261	11.261	0
Output #3	Average walking time for Bus#3 people	15.045	25.045	+10
Output #4	Average walking time for Bus#4 people	18.435	28.435	+10
Output #5	Full time for Bus#1	16.010	16.010	0
Output #6	Full time for Bus#2	18.916	18.916	0
Output #7	Full time for Bus#3	20.997	30.997	+10
Output #8	Full time for Bus#4	30.374	40.374	+10
Output #9	Average driving time of buses	82.480	80.130	0
Output #10	Arrival of the last bus	116.910	125.994	+10
Table 7.2: Changed outputs in Experiment #1				
(Reference to (3) and (4) in Appendix)				

As expected, shift on the mean resulted with a late departure and arrival of the last bus. In addition, Bus #4 became the last arrived bus again.

7.2. Experiment #2: Decrease in driving times

Secondly, mean of the driving time of the buses is decreased to 60 to check whether arrival of the last bus will change.

Value #	Value Description	First Run
Input #5	Driving time	NORMAL (60, 5)
Table 7.3: Inputs used in the Experiment #2		

After making this change, the simulation is run with the expectation of decrease in average driving time of buses and the arrival of the last bus.

Value #	Value Description	First Run	Experiment #2	Expected Change
Output #1	Average walking time for Bus#1 people	9.395	9.395	0
Output #2	Average walking time for Bus#2 people	11.261	11.261	0
Output #3	Average walking time for Bus#3 people	15.045	15.045	0
Output #4	Average walking time for Bus#4 people	18.435	18.435	0
Output #5	Full time for Bus#1	16.010	16.010	0
Output #6	Full time for Bus#2	18.916	18.916	0
Output #7	Full time for Bus#3	20.997	20.997	0
Output #8	Full time for Bus#4	30.374	30.374	0
Output #9	Average driving time of buses	82.480	62.480	-20
Output #10	Arrival of the last bus	116.910	96.910	-20
Table 7.4: Changed outputs in Experiment #2				
(Reference to (5) and (6) in Appendix)				

As expected, driving faster yielded an early arrival of the last bus. Considering two parts of the model, it is showed that the model make reasonable responses to the change in parameters.

8. Conclusion and Comparison

To sum up, in this project a bus simulation model is constructed for the question given in problem definition. Following the analysis of inputs and outputs, responsiveness of the model is checked by the help of two experiments.

All output values can be tabulated as below:

Value #	Value Description	First Run	Experiment #1	Experiment #2
Output #1	Average walking time for Bus#1 people	9.395	9.395	9.395
Output #2	Average walking time for Bus#2 people	11.261	11.261	11.261
Output #3	Average walking time for Bus#3 people	15.045	25.045	15.045
Output #4	Average walking time for Bus#4 people	18.435	28.435	18.435
Output #5	Full time for Bus#1	16.010	16.010	16.010
Output #6	Full time for Bus#2	18.916	18.916	18.916
Output #7	Full time for Bus#3	20.997	30.997	20.997
Output #8	Full time for Bus#4	30.374	40.374	30.374
Output #9	Average driving time of buses	82.480	80.130	62.480
Output #10	Arrival of the last bus	116.910	125.994	96.910
Table 8.1: Summary table				

Important remarks can be listed as:

- **In the first experiment**, since average walking times are increased, an increase in the arrival of the last bus is expected. As expected, shift on the mean of walking times resulted with a late departure and arrival of the last bus. Expected changes and changed variables are also shown as below:

Value #	Value Description	First Run	Experiment #1	Expected Change
Output #3	Average walking time for Bus#3 people	15.045	25.045	+10
Output #4	Average walking time for Bus#4 people	18.435	28.435	+10
Output #7	Full time for Bus#3	20.997	30.997	+10
Output #8	Full time for Bus#4	30.374	40.374	+10
Output #10	Arrival of the last bus	116.910	125.994	+10

Table 8.2: Changed outputs in Experiment #1

(Reference to (3) and (4) in Appendix)

- **In the second experiment,** average driving time is decreased and an earlier arrival is expected. As expected, reducing mean of driving time yielded an early arrival of the last bus. Changed outputs and expected changes can be seen also below:

Value #	Value Description	First Run	Experiment #2	Expected Change
Output #9	Average driving time of buses	82.480	62.480	-20
Output #10	Arrival of the last bus	116.910	96.910	-20

Table 8.3: Changed outputs in Experiment #2

(Reference to (5) and (6) in Appendix)

9. Appendix

9.1. Simulation Report for Original Model:

```
             GPSS World Simulation Report - 476-Project.368.1


             Wednesday, December 12, 2012 01:09:16

        START TIME          END TIME   BLOCKS   FACILITIES  STORAGES
          0.000000         250.000000    46         4           0


             NAME                         VALUE
          ARRIVAL_1                    10008.000000
          ARRIVAL_2                    10009.000000
          ARRIVAL_3                    10010.000000
          ARRIVAL_4                    10011.000000
          BEKLE_1                         11.000000
          BEKLE_2                         22.000000
          BEKLE_3                         33.000000
          BEKLE_4                         44.000000
          BUS_FULL_1                   10004.000000
          BUS_FULL_2                   10005.000000
          BUS_FULL_3                   10006.000000
          BUS_FULL_4                   10007.000000
          COUNTER_1                    10000.000000
          COUNTER_2                    10001.000000
          COUNTER_3                    10002.000000
          COUNTER_4                    10003.000000
          DRIVER_1                     10016.000000
          DRIVER_2                     10019.000000
          DRIVER_3                     10018.000000
          DRIVER_4                     10017.000000
          WALKING_1                    10012.000000
          WALKING_2                    10013.000000
          WALKING_3                    10014.000000
          WALKING_4                    10015.000000


 LABEL              LOC  BLOCK TYPE    ENTRY COUNT CURRENT COUNT RETRY
                     1   GENERATE         25            0       0
                     2   QUEUE            25            0       0
                     3   ADVANCE          25            0       0
                     4   SAVEVALUE        25            0       0
                     5   SAVEVALUE        25            0       0
                     6   DEPART           25            0       0
                     7   PREEMPT          25            0       0
                     8   ADVANCE          25            0       0
                     9   RELEASE           1            0       0
                    10   SAVEVALUE         1            0       0
 BEKLE_1            11   TERMINATE        25            0       0
                    12   GENERATE         25            0       0
                    13   QUEUE            25            0       0
                    14   ADVANCE          25            0       0
                    15   SAVEVALUE        25            0       0
```

	16	SAVEVALUE	25	0	0
	17	DEPART	25	0	0
	18	PREEMPT	25	0	0
	19	ADVANCE	25	0	0
	20	RELEASE	1	0	0
	21	SAVEVALUE	1	0	0
BEKLE_2	22	TERMINATE	73	0	0
	23	GENERATE	25	0	0
	24	QUEUE	25	0	0
	25	ADVANCE	25	0	0
	26	SAVEVALUE	25	0	0
	27	SAVEVALUE	25	0	0
	28	DEPART	25	0	0
	29	PREEMPT	25	0	0
	30	ADVANCE	25	0	0
	31	RELEASE	1	0	0
	32	SAVEVALUE	1	0	0
BEKLE_3	33	TERMINATE	1	0	0
	34	GENERATE	25	0	0
	35	QUEUE	25	0	0
	36	ADVANCE	25	0	0
	37	SAVEVALUE	25	0	0
	38	SAVEVALUE	25	0	0
	39	DEPART	25	0	0
	40	PREEMPT	25	0	0
	41	ADVANCE	25	0	0
	42	RELEASE	1	0	0
	43	SAVEVALUE	1	0	0
BEKLE_4	44	TERMINATE	1	0	0
	45	GENERATE	1	0	0
	46	TERMINATE	1	0	0

FACILITY	ENTRIES	UTIL.	AVE. TIME	AVAIL.	OWNER	PEND	INTER	RETRY	DELAY
DRIVER_1	25	0.402847	4.028471	1	0	0	0	0	0
DRIVER_4	25	0.452667	4.526666	1	0	0	0	0	0
DRIVER_3	25	0.407298	4.072979	1	0	0	0	0	0
DRIVER_2	25	0.345170	3.451700	1	0	0	0	0	0

QUEUE **(1)**	MAX	CONT.	ENTRY	ENTRY(0)	AVE.CONT.	AVE.TIME	AVE.(-0)	RETRY
WALKING_1	25	0	25	0	0.939518	9.395179	9.395179	0
WALKING_2	25	0	25	0	1.126110	11.261098	11.261098	0
WALKING_3	25	0	25	0	1.504582	15.045819	15.045819	0
WALKING_4	25	0	25	0	1.843581	18.435805	18.435805	0

SAVEVALUE **(2)**	RETRY	VALUE
COUNTER_1	0	25.000000
COUNTER_2	0	25.000000
COUNTER_3	0	25.000000
COUNTER_4	0	25.000000
BUS_FULL_1	0	16.010234
BUS_FULL_2	0	18.916599
BUS_FULL_3	0	20.997683
BUS_FULL_4	0	30.374865
ARRIVAL_1	0	100.924520
ARRIVAL_2	0	91.677045
ARRIVAL_3	0	106.710227
ARRIVAL_4	0	116.910411

```
FEC XN    PRI           BDT       ASSEM   CURRENT  NEXT  PARAMETER    VALUE
  102      0        500.000000     102       0      45
```

9.2. Simulation Report for Experiment #1:

```
          GPSS World Simulation Report - 476-Project - Exp1.370.1

             Wednesday, December 12, 2012 01:17:09

     START TIME              END TIME   BLOCKS  FACILITIES  STORAGES
      0.000000              250.000000    46         4          0


          NAME                      VALUE
       ARRIVAL_1               10008.000000
       ARRIVAL_2               10009.000000
       ARRIVAL_3               10010.000000
       ARRIVAL_4               10011.000000
       BEKLE_1                    11.000000
       BEKLE_2                    22.000000
       BEKLE_3                    33.000000
       BEKLE_4                    44.000000
       BUS_FULL_1              10004.000000
       BUS_FULL_2              10005.000000
       BUS_FULL_3              10006.000000
       BUS_FULL_4              10007.000000
       COUNTER_1               10000.000000
       COUNTER_2               10001.000000
       COUNTER_3               10002.000000
       COUNTER_4               10003.000000
       DRIVER_1                10016.000000
       DRIVER_2                10017.000000
       DRIVER_3                10019.000000
       DRIVER_4                10018.000000
       WALKING_1               10012.000000
       WALKING_2               10013.000000
       WALKING_3               10014.000000
       WALKING_4               10015.000000


  LABEL               LOC  BLOCK TYPE    ENTRY COUNT  CURRENT COUNT  RETRY
                       1   GENERATE          25           0           0
                       2   QUEUE             25           0           0
                       3   ADVANCE           25           0           0
                       4   SAVEVALUE         25           0           0
                       5   SAVEVALUE         25           0           0
                       6   DEPART            25           0           0
                       7   PREEMPT           25           0           0
                       8   ADVANCE           25           0           0
                       9   RELEASE            1           0           0
```

	10	SAVEVALUE	1	0	0
BEKLE_1	11	TERMINATE	25	0	0
	12	GENERATE	25	0	0
	13	QUEUE	25	0	0
	14	ADVANCE	25	0	0
	15	SAVEVALUE	25	0	0
	16	SAVEVALUE	25	0	0
	17	DEPART	25	0	0
	18	PREEMPT	25	0	0
	19	ADVANCE	25	0	0
	20	RELEASE	1	0	0
	21	SAVEVALUE	1	0	0
BEKLE_2	22	TERMINATE	73	0	0
	23	GENERATE	25	0	0
	24	QUEUE	25	0	0
	25	ADVANCE	25	0	0
	26	SAVEVALUE	25	0	0
	27	SAVEVALUE	25	0	0
	28	DEPART	25	0	0
	29	PREEMPT	25	0	0
	30	ADVANCE	25	0	0
	31	RELEASE	1	0	0
	32	SAVEVALUE	1	0	0
BEKLE_3	33	TERMINATE	1	0	0
	34	GENERATE	25	0	0
	35	QUEUE	25	0	0
	36	ADVANCE	25	0	0
	37	SAVEVALUE	25	0	0
	38	SAVEVALUE	25	0	0
	39	DEPART	25	0	0
	40	PREEMPT	25	0	0
	41	ADVANCE	25	0	0
	42	RELEASE	1	0	0
	43	SAVEVALUE	1	0	0
BEKLE_4	44	TERMINATE	1	0	0
	45	GENERATE	1	0	0
	46	TERMINATE	1	0	0

FACILITY	ENTRIES	UTIL.	AVE. TIME	AVAIL.	OWNER	PEND	INTER	RETRY	DELAY
DRIVER_1	25	0.354232	3.542318	1	0	0	0	0	0
DRIVER_2	25	0.351322	3.513224	1	0	0	0	0	0
DRIVER_4	25	0.449003	4.490032	1	0	0	0	0	0
DRIVER_3	25	0.415819	4.158186	1	0	0	0	0	0

QUEUE **(3)**	MAX	CONT.	ENTRY	ENTRY(0)	AVE.CONT.	AVE.TIME	AVE.(-0)	RETRY
WALKING_1	25	0	25	0	0.939518	9.395179	9.395179	0
WALKING_2	25	0	25	0	1.126110	11.261098	11.261098	0
WALKING_3	25	0	25	0	2.504582	25.045819	25.045819	0
WALKING_4	25	0	25	0	2.843581	28.435805	28.435805	0

SAVEVALUE **(4)**	RETRY	VALUE
COUNTER_1	0	25.000000
COUNTER_2	0	25.000000
COUNTER_3	0	25.000000
COUNTER_4	0	25.000000
BUS_FULL_1	0	16.010234
BUS_FULL_2	0	18.916599

```
 BUS_FULL_3                  0       30.997683
 BUS_FULL_4                  0       40.374865
 ARRIVAL_1                   0       88.770680
 ARRIVAL_2                   0       93.215154
 ARRIVAL_3                   0      118.840395
 ARRIVAL_4                   0      125.994555


FEC XN   PRI        BDT      ASSEM  CURRENT  NEXT  PARAMETER    VALUE
   102    0   500.000000      102       0     45
```

9.3. Simulation Report for Experiment #2:

```
         GPSS World Simulation Report - 476-Project - Exp2.369.1


           Wednesday, December 12, 2012 01:25:03

      START TIME              END TIME  BLOCKS  FACILITIES  STORAGES
       0.000000             250.000000    46        4          0


            NAME                     VALUE
         ARRIVAL_1               10008.000000
         ARRIVAL_2               10009.000000
         ARRIVAL_3               10010.000000
         ARRIVAL_4               10011.000000
         BEKLE_1                    11.000000
         BEKLE_2                    22.000000
         BEKLE_3                    33.000000
         BEKLE_4                    44.000000
         BUS_FULL_1              10004.000000
         BUS_FULL_2              10005.000000
         BUS_FULL_3              10006.000000
         BUS_FULL_4              10007.000000
         COUNTER_1               10000.000000
         COUNTER_2               10001.000000
         COUNTER_3               10002.000000
         COUNTER_4               10003.000000
         DRIVER_1                10016.000000
         DRIVER_2                10019.000000
         DRIVER_3                10018.000000
         DRIVER_4                10017.000000
         WALKING_1               10012.000000
         WALKING_2               10013.000000
         WALKING_3               10014.000000
         WALKING_4               10015.000000


 LABEL              LOC  BLOCK TYPE     ENTRY COUNT CURRENT COUNT RETRY
                     1   GENERATE           25            0         0
                     2   QUEUE              25            0         0
```

	3	ADVANCE	25	0	0
	4	SAVEVALUE	25	0	0
	5	SAVEVALUE	25	0	0
	6	DEPART	25	0	0
	7	PREEMPT	25	0	0
	8	ADVANCE	25	0	0
	9	RELEASE	1	0	0
	10	SAVEVALUE	1	0	0
BEKLE_1	11	TERMINATE	25	0	0
	12	GENERATE	25	0	0
	13	QUEUE	25	0	0
	14	ADVANCE	25	0	0
	15	SAVEVALUE	25	0	0
	16	SAVEVALUE	25	0	0
	17	DEPART	25	0	0
	18	PREEMPT	25	0	0
	19	ADVANCE	25	0	0
	20	RELEASE	1	0	0
	21	SAVEVALUE	1	0	0
BEKLE_2	22	TERMINATE	73	0	0
	23	GENERATE	25	0	0
	24	QUEUE	25	0	0
	25	ADVANCE	25	0	0
	26	SAVEVALUE	25	0	0
	27	SAVEVALUE	25	0	0
	28	DEPART	25	0	0
	29	PREEMPT	25	0	0
	30	ADVANCE	25	0	0
	31	RELEASE	1	0	0
	32	SAVEVALUE	1	0	0
BEKLE_3	33	TERMINATE	1	0	0
	34	GENERATE	25	0	0
	35	QUEUE	25	0	0
	36	ADVANCE	25	0	0
	37	SAVEVALUE	25	0	0
	38	SAVEVALUE	25	0	0
	39	DEPART	25	0	0
	40	PREEMPT	25	0	0
	41	ADVANCE	25	0	0
	42	RELEASE	1	0	0
	43	SAVEVALUE	1	0	0
BEKLE_4	44	TERMINATE	1	0	0
	45	GENERATE	1	0	0
	46	TERMINATE	1	0	0

FACILITY	ENTRIES	UTIL.	AVE. TIME	AVAIL.	OWNER	PEND	INTER	RETRY	DELAY
DRIVER_1	25	0.322847	3.228471	1	0	0	0	0	0
DRIVER_4	25	0.372667	3.726666	1	0	0	0	0	0
DRIVER_3	25	0.327298	3.272979	1	0	0	0	0	0
DRIVER_2	25	0.265170	2.651700	1	0	0	0	0	0

QUEUE (5)	MAX	CONT.	ENTRY	ENTRY(0)	AVE.CONT.	AVE.TIME	AVE.(-0)	RETRY
WALKING_1	25	0	25	0	0.939518	9.395179	9.395179	0
WALKING_2	25	0	25	0	1.126110	11.261098	11.261098	0
WALKING_3	25	0	25	0	1.504582	15.045819	15.045819	0
WALKING_4	25	0	25	0	1.843581	18.435805	18.435805	0

SAVEVALUE	**(6)**	RETRY	VALUE
COUNTER_1		0	25.000000
COUNTER_2		0	25.000000
COUNTER_3		0	25.000000
COUNTER_4		0	25.000000
BUS_FULL_1		0	16.010234
BUS_FULL_2		0	18.916599
BUS_FULL_3		0	20.997683
BUS_FULL_4		0	30.374865
ARRIVAL_1		0	80.924520
ARRIVAL_2		0	71.677045
ARRIVAL_3		0	86.710227
ARRIVAL_4		0	96.910411

FEC XN	PRI	BDT	ASSEM	CURRENT	NEXT	PARAMETER	VALUE
102	0	500.000000	102	0	45		