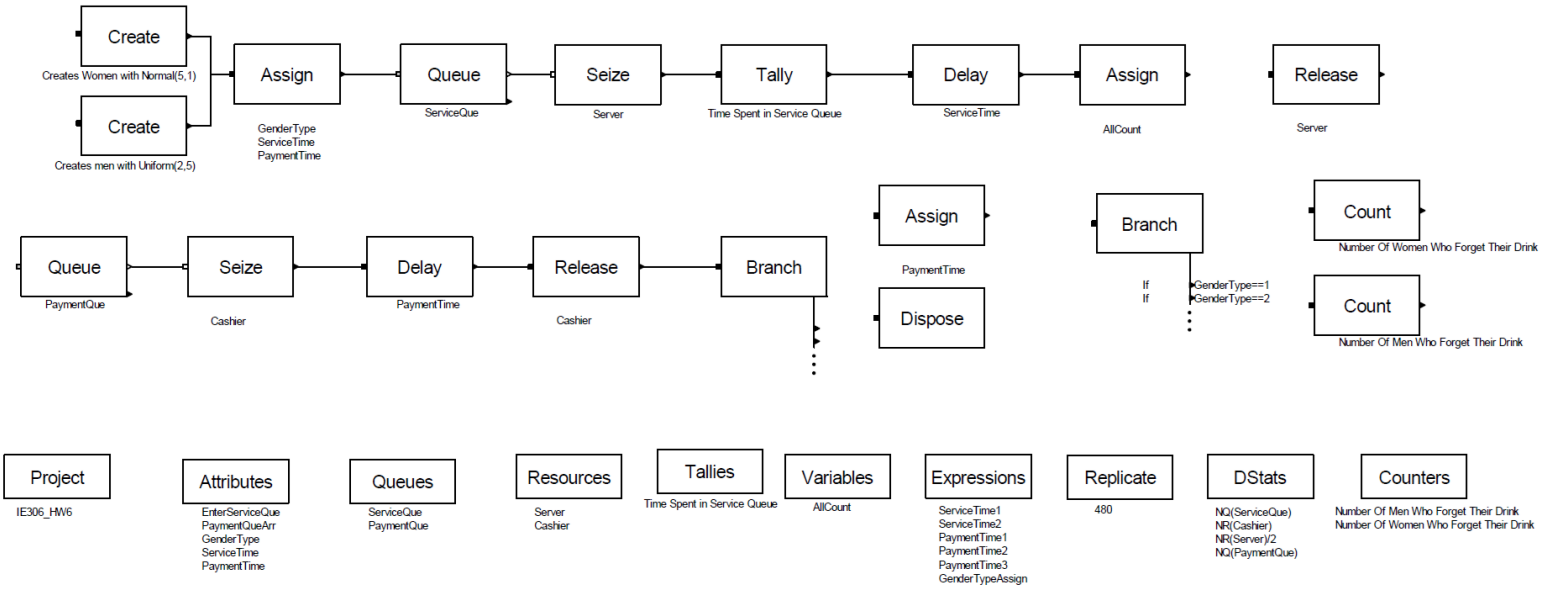
IE 306 – HW6 – Murat Tutar

Model Block Diagram



Model Listing

```
0$              CREATE,         1:NORM(5,1):NEXT(8$);                                   Creates Women with Normal(5,1)

8$              ASSIGN:         GenderType=ED(6):
                                ServiceTime=ED(GenderType):
                                PaymentTime=ED(GenderType + 2 );                        Assigns the gender type with respected service and payment times.
service         QUEUE,          ServiceQue:MARK(EnterServiceQue);
1$              SEIZE,          1,Other:
                                Server,1:NEXT(10$);

10$             TALLY:          Time Spent in Service Queue,INTERVAL(EnterServiceQue),1;
2$              DELAY:          ServiceTime,,Other:NEXT(3$);

3$              ASSIGN:         AllCount=AllCount+1:NEXT(resume);

resume          RELEASE:        Server,1:NEXT(payment);

payment         QUEUE,          PaymentQue:MARK(PaymentQueArr);
4$              SEIZE,          1,Other:
                                Cashier,1:NEXT(5$);

5$              DELAY:          PaymentTime,,Other:NEXT(6$);

6$              RELEASE:        Cashier,1;
7$              BRANCH:         Else,success,Yes:
                                With,0.1,fail,Yes;                                      there is a 0.1 probability of forgetting the drink
success         DISPOSE:        No;

fail            ASSIGN:         PaymentTime=ED(5):NEXT(forget);

forget          BRANCH:         If,GenderType==1,women,Yes:
                                If,GenderType==2,men,Yes;                               checks if the person who forget the drink is woman or man
women           COUNT:          Number Of Women Who Forget Their Drink,1:NEXT(payment); counts the women who forget their drinks

men             COUNT:          Number Of Men Who Forget Their Drink,1:NEXT(payment); counts the men who forget their drinks


9$              CREATE,         1:EXPO(4):NEXT(8$);                                     Creates men with Exponential(4)
```

Experiment Listing

```
PROJECT,       "IE306_HW6","Murat Tutar",,Yes,No,Yes,No,No,No,No,No,No,No,No;

ATTRIBUTES:    GenderType,DATATYPE(Real):
               ServiceTime,DATATYPE(Real):
               EnterServiceQue,DATATYPE(Real):
               PaymentTime,DATATYPE(Real):
               PaymentQueArr,DATATYPE(Real);

VARIABLES:     AllCount,CLEAR(System),CATEGORY("None-None"),DATATYPE(Real);

QUEUES:        PaymentQue,FirstInFirstOut,,AUTOSTATS(Yes,,):
               ServiceQue,FirstInFirstOut,,AUTOSTATS(Yes,,);

RESOURCES:     Server,Capacity(2),,Stationary,COST(0.0,0.0,0.0),,AUTOSTATS(Yes,,),EFFICIENCY(1,):
               Cashier,Capacity(1),,Stationary,COST(0.0,0.0,0.0),,AUTOSTATS(Yes,,),EFFICIENCY(1,);

COUNTERS:      1,Number Of Women Who Forget Their Drink,,Replicate:
               2,Number Of Men Who Forget Their Drink,,Replicate;

TALLIES:       Time Spent in Service Queue;

DSTATS:        1,NQ(ServiceQue),Average Length of Food Service Queue:
               2,NQ(PaymentQue),Average Length of Payment to Cashier Queue:
               3,NR(Server)/2,Average Utilization of each Food Server:
               4,NR(Cashier),Average Utilization of Cashier;

REPLICATE,     4,0.0,480,Yes,Yes,0,,,24.0,Minutes,No,No,,,Yes;

EXPRESSIONS:   1,ServiceTime1,UNIFORM(2,5):
               2,ServiceTime2,EXPONENTIAL(4):
               3,PaymentTime1,UNIFORM(1,2):
               4,PaymentTime2,UNIFORM(1,2):
               5,PaymentTime3,UNIFORM(0.5,0.5):
               6,GenderTypeAssign,DISC(0.44,1,1,2);
```

Outputs (There is also the output file inside the zip folder)

ARENA Simulation Results

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Summary for Replication 1 of 4

Project: IE306_HW6 Run execution date :12/30/2021

Analyst: Murat Tutar Model revision date:12/30/2021

Replication ended at time : 480.0 Minutes

Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum	Maximum	Observations

Time Spent in Service Queue	7.3481	(Insuf)	.00000	22.059	238

DISCRETE-CHANGE VARIABLES

Identifier	Average	Half Width	Minimum	Maximum	Final Value
Average Length of Food Service Queue	3.6961	(Corr)	.00000	11.000	4.0000
Average Length of Payment to Cashier Queue	.85875	(Corr)	.00000	6.0000	4.0000
Average Utilization of each Food Server	.89702	(Insuf)	.00000	1.0000	1.0000
Average Utilization of Cashier	.75057	.07966	.00000	1.0000	1.0000

COUNTERS

Identifier	Count	Limit
Number Of Women Who Forget Their Drink	14	Infinite
Number Of Men Who Forget Their Drink	11	Infinite

OUTPUTS

Identifier	Value
System.NumberOut	.00000

Beginning replication 2 of 4

ARENA Simulation Results

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Summary for Replication 2 of 4

Project: IE306_HW6 Run execution date :12/30/2021

Analyst: Murat Tutar Model revision date:12/30/2021

Replication ended at time : 480.0 Minutes

Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum	Maximum	Observations
Time Spent in Service Queue	4.6610	(Insuf)	.00000	26.372	206

DISCRETE-CHANGE VARIABLES

Identifier	Average	Half Width	Minimum	Maximum	Final Value
Average Length of Food Service Queue	2.1368	(Insuf)	.00000	13.000	6.0000
Average Length of Payment to Cashier Queue	.32669	(Insuf)	.00000	4.0000	2.0000
Average Utilization of each Food Server	.82498	(Insuf)	.00000	1.0000	1.0000
Average Utilization of Cashier	.66563	.06304	.00000	1.0000	1.0000

COUNTERS

Identifier	Count	Limit
Number Of Women Who Forget Their Drink	11	Infinite
Number Of Men Who Forget Their Drink	18	Infinite

OUTPUTS

Identifier	Value
System.NumberOut	.00000

Beginning replication 3 of 4

ARENA Simulation Results

ASUS - License: STUDENT

Summary for Replication 3 of 4

Project: IE306_HW6 Run execution date :12/30/2021

Analyst: Murat Tutar Model revision date:12/30/2021

Replication ended at time : 480.0 Minutes

Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum	Maximum	Observations
Time Spent in Service Queue	4.0960	(Insuf)	.00000	19.050	226

DISCRETE-CHANGE VARIABLES

Identifier	Average	Half Width	Minimum	Maximum	Final Value
Average Length of Food Service Queue	1.9600	(Insuf)	.00000	11.000	4.0000
Average Length of Payment to Cashier Queue	.56333	(Insuf)	.00000	6.0000	.00000
Average Utilization of each Food Server	.75349	(Insuf)	.00000	1.0000	1.0000
Average Utilization of Cashier	.71537	.07893	.00000	1.0000	1.0000

COUNTERS

Identifier	Count	Limit
Number Of Women Who Forget Their Drink	6	Infinite
Number Of Men Who Forget Their Drink	12	Infinite

OUTPUTS

Identifier	Value
System.NumberOut	.00000

Beginning replication 4 of 4

ARENA Simulation Results

ASUS - License: STUDENT

Summary for Replication 4 of 4

Project: IE306_HW6 Run execution date :12/30/2021

Analyst: Murat Tutar Model revision date:12/30/2021

Replication ended at time : 480.0 Minutes

Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum	Maximum	Observations
Time Spent in Service Queue	4.9521	(Insuf)	.00000	22.976	230

DISCRETE-CHANGE VARIABLES

Identifier	Average	Half Width	Minimum	Maximum	Final Value
Average Length of Food Service Queue	2.3728	(Corr)	.00000	10.000	.00000
Average Length of Payment to Cashier Queue	.64111	(Insuf)	.00000	6.0000	.00000
Average Utilization of each Food Server	.85310	(Insuf)	.00000	1.0000	.50000
Average Utilization of Cashier	.74545	.06678	.00000	1.0000	.00000

COUNTERS

Identifier	Count	Limit
Number Of Women Who Forget Their Drink	13	Infinite
Number Of Men Who Forget Their Drink	15	Infinite

OUTPUTS

```
Identifier                                    Value

_____________________________________________________________

System.NumberOut                              .00000
```

```
                                  ARENA Simulation Results
                                   ASUS - License: STUDENT

                                Output Summary for 4 Replications

Project: IE306_HW6                                          Run execution date :12/30/2021
Analyst: Murat Tutar                                        Model revision date:12/30/2021

                                          OUTPUTS

Identifier                                Average    Half-width Minimum    Maximum # Replications

_____________________________________________________________________________________________

System.NumberOut                          .00000     .00000     .00000     .00000     4

Simulation run time: 0.02 minutes.
Simulation run complete.
```

Averages of Simulated Statistics

Average Time Spent in Food Service Queue = (7.3481 + 4.661 + 4.096 + 4.9521) / 4 = 5.2643

Average Length of Food Service Queue = (3.6961 + 2.1368 + 1.96 + 2.3728) / 4 = 2.5414

Average Length of Payment to Cashier Queue = (0.85875 + 0.3267 + 0.56333 + 0.64111) / 4 = 0.5975

Average Utilization of each Food Server = (0.89702 + 0.82498 + 0.75349 + 0.85310) / 4 = 0.8321

Average Utilization of Cashier = (0.75057 + 0.66563 + 0.71537 + 0.74545) / 4 = 0.7193

Average Number of Women Who Forget Their Drink = (14 + 11 + 6 + 13) / 4 = 11

Average Number of Men Who Forget Their Drink = (11 + 18 + 12 + 15) / 4 = 14