CSC 470F

Computer System Modelling and Analysis

Using CSIM at CDF

At CDF, a CSIM program can be compiled with the command:

```
csim  file.c
```

The executable module will be placed in a.out. The first executable procedure in a CSIM program must be named sim, and the sim procedure must contain a create statement. Also, the header file "csim.h" must be included in your program, with the statement:

```
#include "/local/include/csim/c/csim.h"
```

at the beginning of your program.

The following documentation is available online at CDF:

/local/lib/libcsim.a - CSIM library file
/local/doc/csim/rev16-docs/csim.doc - reference manual
/local/doc/csim/rev16-docs/c++_csim.doc - C++ version of CSIM
/local/doc/csim/rev16-docs/users.doc - users' guide
/local/doc/csim/rev16-docs/short.doc - brief description of CSIM
/local/doc/csim/rev16-docs/reserved.wrds - reserved words in CSIM

A Sample CSIM Program

```
/* simulate an M/M/1 queue
  (an open queue with exponential service times and interarrival intervals)
*/

#include "/local/include/csim/c/csim.h"

#define  SVTM 1.0  /*mean of service time distribution */
#define  IATM 2.0  /*mean of inter-arrival time distribution */
#define  NARS 5000 /*number of arrivals to be simulated*/

FACILITY f;        /*pointer for facility */
EVENT done;        /*pointer for counter */
TABLE tbl;             /*pointer for table */
QTABLE qtbl;       /*pointer for qhistogram */
int cnt;           /*number of active tasks*/

sim()                  /*1st process - named sim */
{
     int i;

     set_model_name("M/M/1 Queue");
     create("sim");                   /*required create statement*/

     f = facility("facility");             /*declare facility*/
     done = event("done");            /*declare event*/
     tbl = table("resp tms");              /*declare table */
     qtbl = qhistogram("num in sys", 10); /*declare qhistogram*/

     cnt = NARS;                 /*initialize cnt*/
     for(i = 1; i <= NARS; i++) {
          hold(expntl(IATM));         /* hold interarrival*/
          cust();                /*initiate process cust*/
          }
     wait(done);                      /*wait until all done*/
     report();                   /*print report*/
     theory();                   /*print theoretical res*/
     mdlstat();
}
```

```
cust()                /*process customer*/
{
     float t1;

     create("cust");                /*required create statement*/

     t1 = clock;                    /*time of request */
     note_entry(qtbl);              /*note arrival */
     reserve(f);                    /*reserve facility f*/
          hold(expntl(SVTM));       /*hold service time*/
     release(f);                    /*release facility f*/
     record(clock-t1, tbl);         /*record response time*/
     note_exit(qtbl);               /*note departure */
     cnt--;                         /*decrement cnt*/
     if(cnt == 0)
          set(done);                /*if last arrival, signal*/
}

theory()          /*print theoretical results*/
{
     float rho, nbar, rtime, tput;

     printf("0M/M/1 Theoretical Results0);

     tput = 1.0/IATM;
     rho = tput*SVTM;
     nbar = rho/(1.0 - rho);
     rtime = SVTM/(1.0 - rho);

     printf("0);
     printf("Inter-arrival time = %10.3f0,IATM);
     printf("Service time       = %10.3f0,SVTM);
     printf("Utilization        = %10.3f0,rho);
     printf("Throughput rate    = %10.3f0,tput);
     printf("Mn nbr at queue    = %10.3f0,nbar);
     printf("Mn queue length    = %10.3f0,nbar-rho);
     printf("Response time      = %10.3f0,rtime);
     printf("Time in queue      = %10.3f0,rtime - SVTM);
}
```

Output of the Sample Program

```
            CSIM Simulation Report (Version 18 for SPARC Solaris)

                              M/M/1 Queue

                          Fri Aug  6 14:55:46 1999


                    Ending simulation time:     10041.661
                    Elapsed simulation time:    10041.661
                    CPU time used (seconds):        0.680


FACILITY SUMMARY

facility     service    service          through-    queue     response   compl
name           disc      time    util.     put       length      time     count
-------------------------------------------------------------------------------
facility     fcfs       0.99206  0.494    0.49793    0.99059    1.98943     5000

TABLE 1:  resp tms

      minimum         0.000174          mean                    1.989433
      maximum        14.273082          variance                3.813339
      range          14.272908          standard deviation      1.952777
      observations        5000          coefficient of var      0.981575

QTABLE 1:  num in sys

      initial       0      minimum       0      mean                    0.990590
      final         0      maximum      13      variance                1.937727
      entries    5000      range        13      standard deviation      1.392022
      exits      5000                           coeff of variation      1.405246

                                                cumulative
        number    total time    proportion     proportion

             0    5081.38161     0.506030      0.506030   ********************
             1    2426.95194     0.241688      0.747718   **********
             2    1238.22169     0.123308      0.871027   *****
             3     667.95025     0.066518      0.937545   ***
             4     350.00001     0.034855      0.972399   *
             5     152.62571     0.015199      0.987599   *
             6      69.33696     0.006905      0.994504   .
             7      25.09331     0.002499      0.997003   .
             8       9.84005     0.000980      0.997982   .
             9      10.69388     0.001065      0.999047   .
 >=         10       9.56521     0.000953      1.000000   .


              M/M/1 Theoretical Results


          Inter-arrival time =      2.000
          Service time       =      1.000
          Utilization        =      0.500
          Throughput rate    =      0.500
          Mn nbr at queue    =      1.000
          Mn queue length    =      0.500
          Response time      =      2.000
          Time in queue      =      1.000
```

CSIM MODEL STATISTICS

CPU time used (sec):	0.680	
Events processed:	17485	
Memory allocated:	12756	bytes
Calls to malloc:	51	
Processes		
Started:	5001	
Saved:	0	
Terminated:	5000	
High water mark:	14	
Stacks		
Allocated:	5015	
High water mark:	1584	words
Average:	113	words
Maximum:	115	words
Current:	113	words