

Simulation Software

- Typically, a set of libraries to aid developing discrete event simulation models.
- At the minimum must implement an FEL, schedule() and dequeue() functions.
- Typically, also implements various modeling elements to facilitate model development.
 - Generic modeling element – e.g., queue, customer.
 - Domain specific modeling element – e.g., network link, network interface etc. Could be a complete protocol.

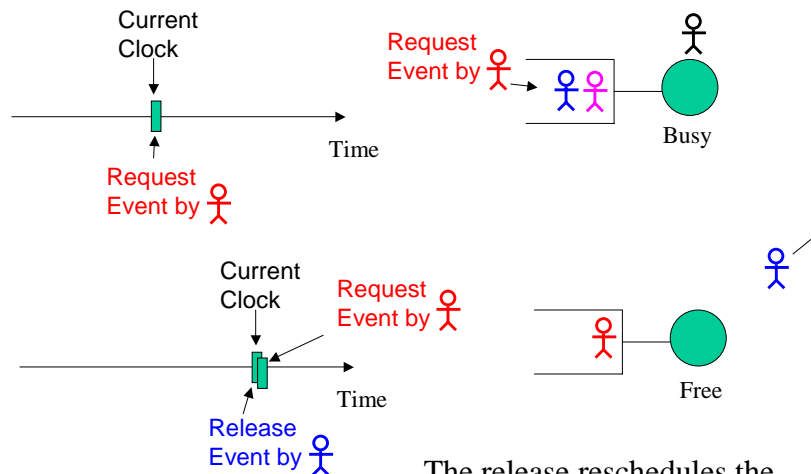
SMPL: A DES Tool

- Modeling elements
 - Facility (server plus queue)
 - Token (integer serving as customer id)
 - Event
- System calls
 - Schedule
 - Cause (same as dequeue)
 - Various random number generators
 - Creating, requesting and releasing facility.

Important System Calls

- **Request** (facility, token, priority)
 - Requests the server.
 - If free, makes it busy.
 - If busy, enqueues the request in the facility queue. (Actually enqueues the current event).
 - Returns status (busy/free).
- **Release** (facility, token)
 - Makes server free.
 - If the facility queue is non-empty, dequeues the head entry from the queue and schedules that event at the current time.

Request and Release Details

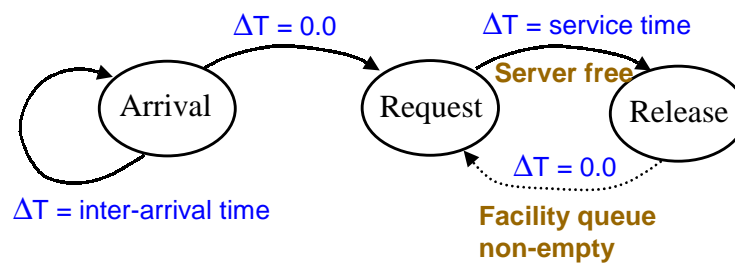


The release reschedules the request that was blocked at the current time.

Single Server Queue Simulation on SMPL

- Three types of event
 - Arrival
 - Schedules next arrival after *inter-arrival time*.
 - Schedules Request at current time.
 - Request
 - Schedules Release after *service time*, if facility free.
 - Implicitly queues the event (i.e., the request) at facility queue, if server busy.
 - Always makes server busy.
 - Release
 - Schedules the event at the head of facility queue, if any, at current time. (This event will be the request event of the following customer.)
 - Always makes facility free.

Event Scheduling Graph

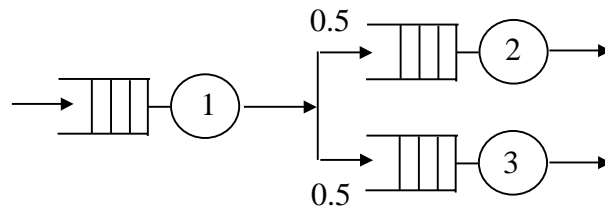


$\Delta T = \text{inter-arrival time}$

$\Delta T = \text{Timestamp increment.}$

- Note that the request event is executed twice for a typical customer.
 - First when he arrives and finds server busy.
 - Again when the previous customer leaves.

Queueing Network Simulation



- Release event from 1 will schedule a request event at 2 or 3 with probability 0.5.
- The new event should be at the same time (zero timestamp increment).

Readings

- Chapters 1 and 2 in MD.
- Pay close attention to the program in Figure 1.7.
- Then program in Figure 2.2.
- Expect to solve some programming exercises using SMPL as homework exercises.