Data Communication & Networks
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Session 7 – Sub-Topic 1
Discrete Event Simulation in PNSimulator

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Events

- Events are unique and represent an arrival of some new information into the system. For example:
  - Packet arrives from the link layer
  - Timer expires
  - Application generates a message
  - User closes an application
Event Relationships

- Events have a defined position in time in relation to other events
  - Causal Relationship
    - One event cannot occur unless another event has already occurred
    - If Event A causes Event B, then A must precede B in time
    - If B, then A
  - Random
    - An event depends on nothing other than a probability distribution
      - A customer walks into a store
      - An application generates a request

Delivery of Events

- All events are created as “future” events
- Based on event and perhaps current state, calculate a time at which the event will occur
- Insert event into a time-ordered queue
- Remove events from the head of the queue and deliver event:
  - Advance clock to event time
  - Call event handler method
  - Repeat until no more events on queue
Event Generation

- After delivery of an event, call all random event generator:
  - If any random event is to happen, its generator will return an event and future time
- Event handlers can generate events. These are typically causal events
  - Example
    - your send() method is an event handler for the Event SendApplicationMessage
    - Your send method starts a timer which causes a TimerEvent to be put on queue with future time = now + timeout value

PNSimulator Events are Atomic

- In PNSimulator, each event is fully handled before any new event handler is called
- This means that all of your handlers are Threadsafe
- This does not insure that your code can be shared however! That’s your job
- What does this mean?
Share Code / Separate Context

- All context dependent variables must be allocated such that any invocation of a handler $L$ for user $N$ can retrieve context($L,N$)
- Usually in communications systems $L$ is layer-specific
- For example, sequence numbers in TCP are distinct for each socket
- So you must keep your Node A variables distinct from your Node B variables