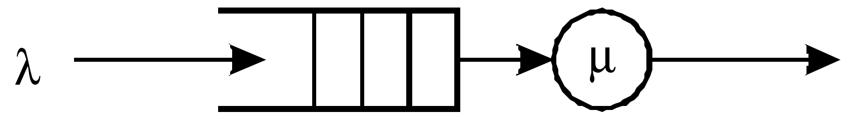


**Figure 1.** *M*/*M*/1 queue

$$F(x) = \begin{cases} 1 - e^{-lx}, if\ 0 \le x < \infty \\ 0, otherwise \end{cases}$$

**Figure 2.** Exponential Distribution Function

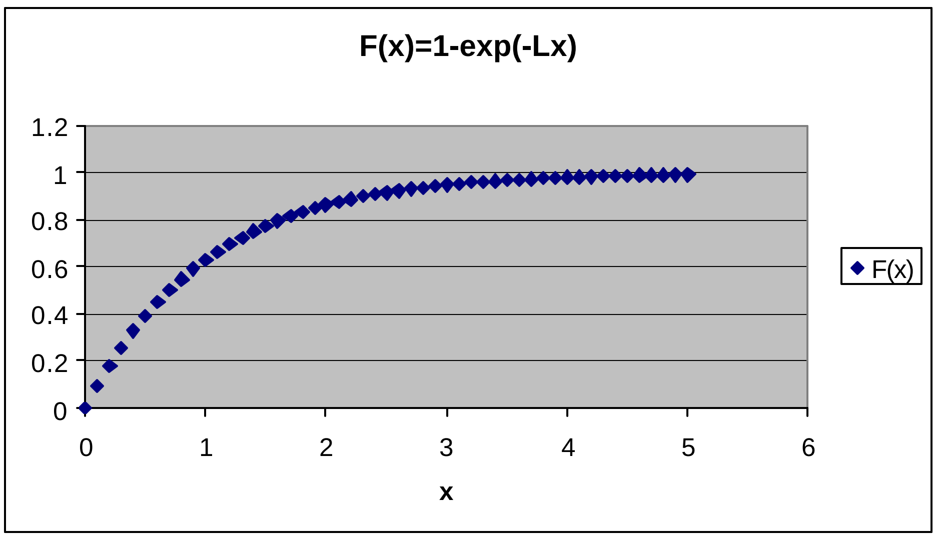


**Figure 3.** The CDF of an exponentially distributed random variable with parameter $l = 1$

*u* is a random variable drawn from the uniform distribution. We find x, a random variable drawn from the exponential distribution by setting $u = F(t) = 1 - e^{-lt}$ and solving for *x*.

$$u = 1 - e^{-lt} \quad (1)$$

$$t = -\frac{\ln(1-u)}{l} \quad (2)$$

*t* is a random variable drawn from the exponential distribution. *t* represents a time between events. For example, *t* could be the time between arrivals or the time between departures.

Simulation mechanics require an *elapsed* time rather than the time between events. For example, instead of receiving the following sequence of inter-arrival times 1 3 2 4, the simulation requires the time of the event relative to the start of the simulation. The foregoing sequence of times is transformed to 1 4 6 10.

Finally, the simulation must manage two such sequences of timed events. The first sequence lists the time of arrivals and the second marks the time of departures. Both sequences are merged and sorted by time in ascending order.

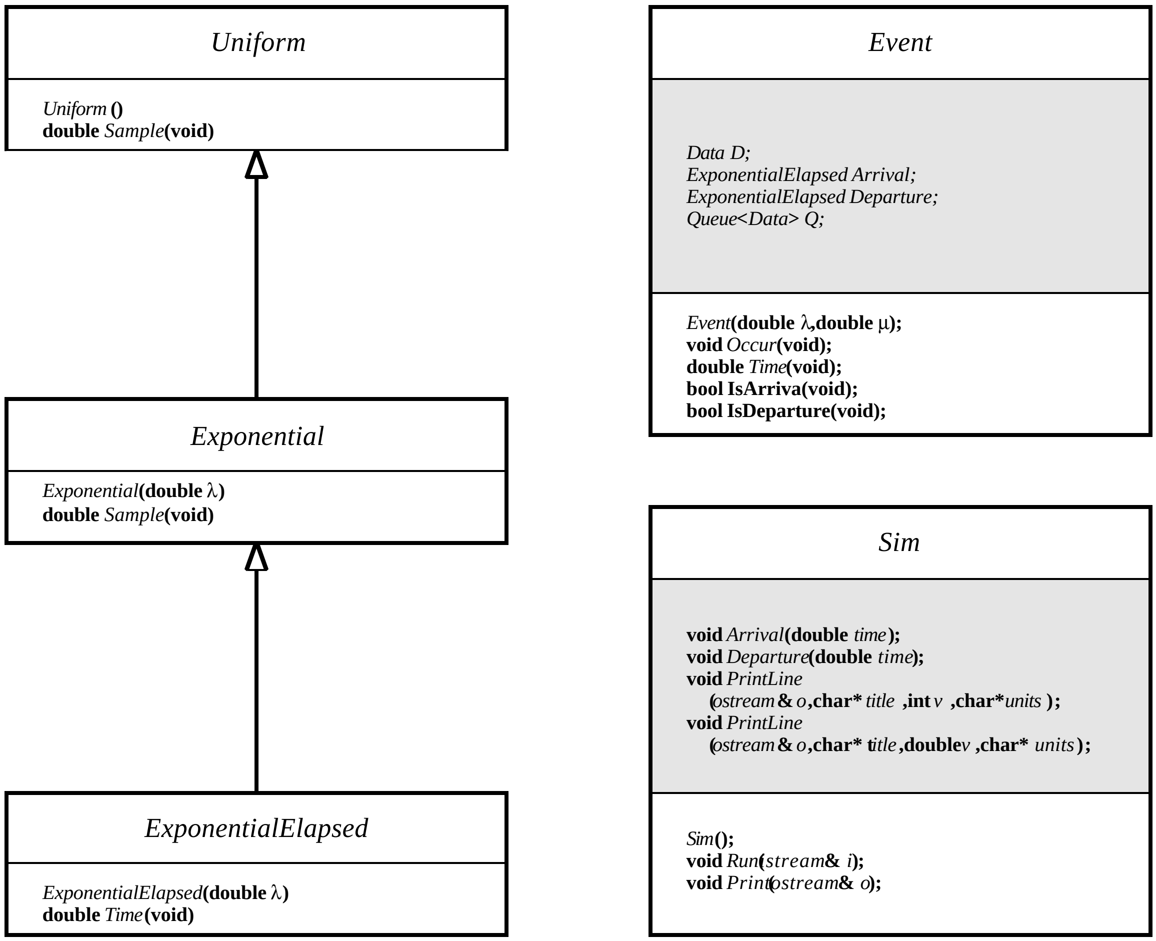


**Figure 2.** Project **p05** class hierarchy