#!/usr/bin/env python

# Mach1.py

# Introductory SimPy example: Two machines, which sometimes break down.
# Up time is exponentially distributed with mean 1.0, and repair time is
# exponentially distributed with mean 0.5. There are two repairpersons,
# so the two machines can be repaired simultaneously if they are down
# at the same time.

# Output is long-run proportion of up time. Should get value of about
# 0.66.

# SimPy constructs used:

# Overview of operation:

# Main program (see "'main' program starts here" near end of this file)
# sets up two objects of class Machine and calls activate() to start
# them. Then main program calls simulate() to run the simulation, and
# then prints out the results.

# Objects of the Machine class represent machines. The function
# Machine.Run() simulates the action of a machine. It does this by
# calling "yield hold" to simulate an up time, then calling "yield hold"
# to simulate a repair time, repeating that cycle indefinitely. It also
# of course does bookkeeping, e.g. to add to the total up time.

# required imports
from __future__ import generators  # delete if use Python >= 2.3
from SimPy.Simulation import *
from random import Random, expovariate, uniform

# set rates for this model
UpRate = 1/1.0
RepairRate = 1/0.5

# create an object of type Random, so can generate random numbers
Rnd = Random(12345)

initialize()  # required SimPy statement

# create a Machine object
M = Machine()

# get the process M started, executing M's Run() method,
# right away (i.e. no delay)
activate(M, M.Run(), delay=0.0)

# run until simulated time 10000
MaxSimtime = 10000.0
simulate(until=MaxSimtime)

# print results
print "the percentage of up time was", Machine.TotalUpTime/(2*MaxSimtime)

# "main" program starts here

# set up the two machine processes
for I in range(2):
    # create a Machine object
    M = Machine()
    # get the process M started, executing M's Run() method,
    # right away (i.e. no delay)
    activate(M, M.Run(), delay=0.0)

# run until simulated time 10000
MaxSimtime = 10000.0
simulate(until=MaxSimtime)

# print results
print "the percentage of up time was", Machine.TotalUpTime/(2*MaxSimtime)

# "main" program starts here