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In [1]: import random
import simpy

# Constants
arrival_rate = 5 # Passengers arriving rate per minute
check_rate = 0.75 # Service time rate at ID/boarding-pass check
min_scan_time = 0.5 # Scanner time (minimum)
max_scan_time = 1.0 # Scanner time (maximum)
simulation_time = 1440 # Total simulation time in minutes

# Global variables to store simulation results
wait_times = []

# Function to simulate passenger check process
def check(env, passenger):
    yield env.timeout(random.expovariate(1 / check_rate))

# Function to simulate passenger scan process
def scan(env, passenger):
    yield env.timeout(random.uniform(min_scan_time, max_scan_time))

# Function to simulate passenger arrival
def passenger_arrival(env):
    passenger_id = 0
    while True:
        passenger_id += 1
        arrival_time = env.now
        with checkers.request() as request:
            yield request
            checkin_time = env.now
            yield env.process(check(env, passenger_id))
            scan_time = env.now
            yield env.process(scan(env, passenger_id))
            exit_time = env.now
            wait_time = checkin_time - arrival_time + scan_time - checkin_time
            wait_times.append(wait_time)

# Function to run the simulation
def run_simulation(num_checkers):
    env = simpy.Environment()
    global checkers
    checkers = simpy.Resource(env, capacity=num_checkers)
    env.process(passenger_arrival(env))
    env.run(until=simulation_time)

# Perform simulations with varying numbers of checkers
for num_checkers in range(1, 11):
    wait_times = [] # Reset wait_times list for each run
    run_simulation(num_checkers)
    avg_wait_time = sum(wait_times) / len(wait_times)
    print(f"Number of Checkers: {num_checkers}, Average Wait Time: {avg_wait_time:.2f} minutes")

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Number of Checkers: 1, Average Wait Time: 0.78 minutes
Number of Checkers: 2, Average Wait Time: 0.76 minutes
Number of Checkers: 3, Average Wait Time: 0.79 minutes
Number of Checkers: 4, Average Wait Time: 0.72 minutes
Number of Checkers: 5, Average Wait Time: 0.72 minutes
Number of Checkers: 6, Average Wait Time: 0.77 minutes
Number of Checkers: 7, Average Wait Time: 0.76 minutes
Number of Checkers: 8, Average Wait Time: 0.74 minutes
Number of Checkers: 9, Average Wait Time: 0.75 minutes
Number of Checkers: 10, Average Wait Time: 0.76 minutes

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In []: