HW4
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1. To run simulator, run the Controller.java file (has Main method to generate results)

    a. lambda --------> **CPU** ------------------P(0.5)-->

    ```
              ^                    |
              |---------Net <----P(0.4)
              |          ^         |
              |        P(0.5)      |
              |          |         |
           P(0.5)----Disk <----P(0.1)
    ```
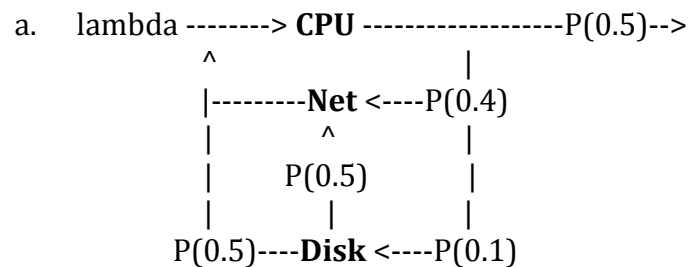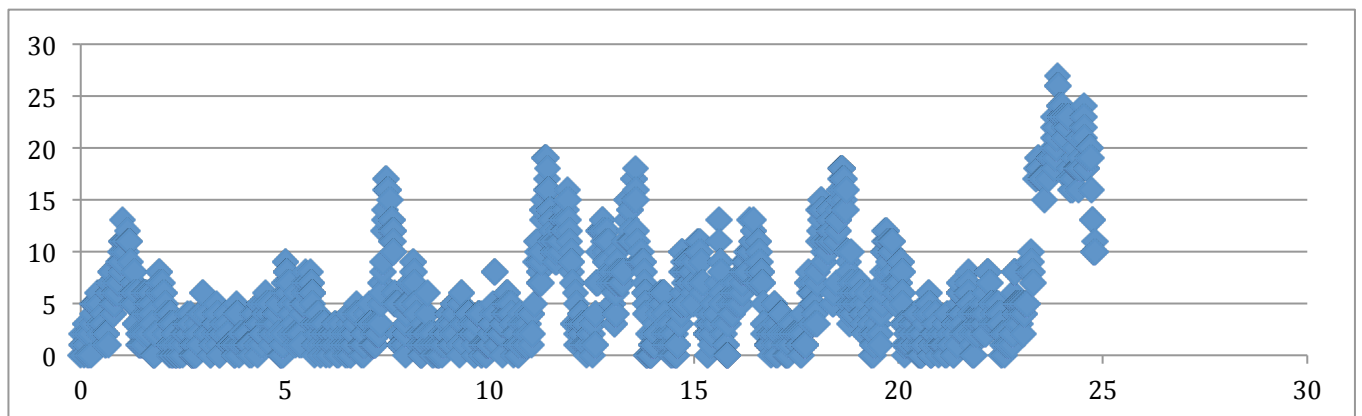
    b. $Q_{CPU} = 4.444$

    $$Q_{Disk} = 4$$

    $$T_{Q\ total} = \frac{4.444 + 4 + 9}{40} = 0.436$$

    c. Network, it has the highest utilization (p = 0.9)

2.

    a. The System reaches a steady state at around 11-12 seconds: there

    is a consistent pattern of spikes and drops in CPU queue size that continues after that point, which suggests CPU Q is entering a steady pattern
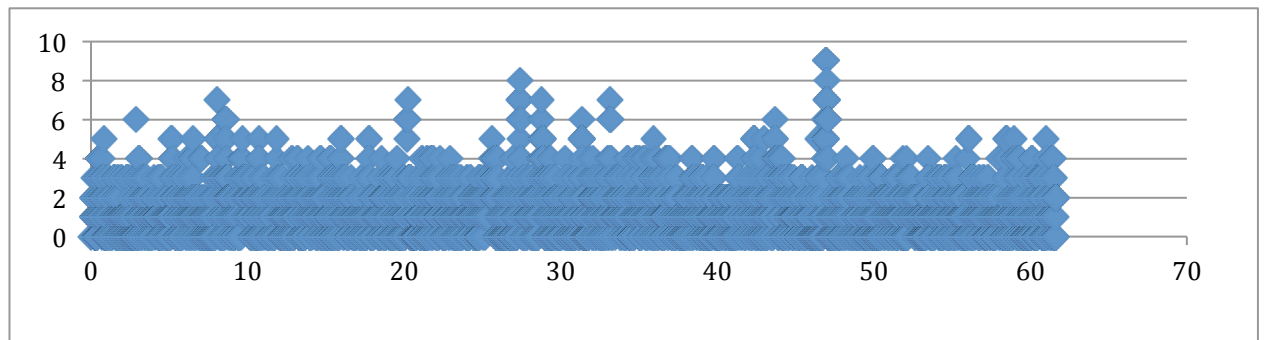
b.

```
Results:
 CPU Utilization (P): 0.801349
 Disk Utilization (P): 0.819697
 Network Utilization (P): 0.894793
 95th CI for CPU Q: 4.325130 +- 0.029910
 98th CI for CPU Q: 4.325130 +- 0.031284
 95th CI for System TQ: 0.417631 +- 0.006829
 98th CI for System TQ: 0.417631 +- 0.007142
```

c. The analytical and simulation results are pretty close to each other

3.

a.

b. In this system, it reaches steady state around the 30-second mark. After that point, apart from a few spikes it consistently stays around a queue size of 2 to 3

c.

```
Results:
 CPU Utilization (P): 0.515638
 Disk Utilization (P): 0.128913
 Network Utilization (P): 0.999775
 95th CI for CPU Q: 1.261193 +- 0.008559
 98th CI for CPU Q: 1.261193 +- 0.008952
 95th CI for System TQ: 63.428654 +- 1.845916
 98th CI for System TQ: 63.428654 +- 1.930678
```

4.

a. Analytical Capacity = 44.44

b. Simulator Capacity = 44~45

```
Results:
 CPU Utilization (P): 0.895377
 Disk Utilization (P): 0.909977
 Network Utilization (P): 0.997456
 95th CI for CPU Q: 8.993763 +- 0.056564
 98th CI for CPU Q: 8.993763 +- 0.059161
 95th CI for System TQ: 4.840311 +- 0.069529
 98th CI for System TQ: 4.840311 +- 0.072722
```