Computer Modeling
- Spring 2008 -

Homework

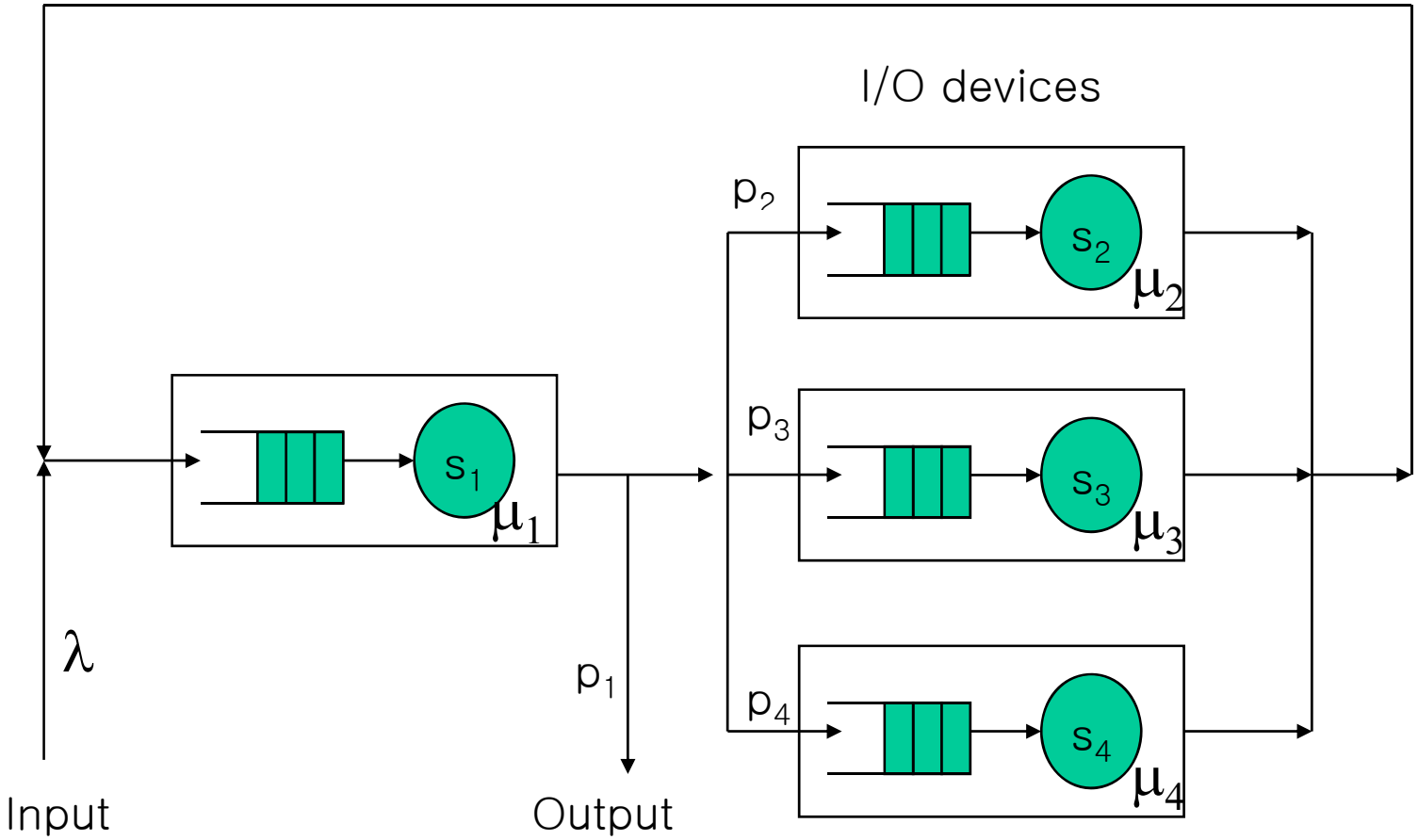
Homework 1

- Draw the following three graphs by simulation
  - traffic load (0-0.95) vs. average # of jobs in the system
  - traffic load (0-0.95) vs. average queue length
  - traffic load (0-0.95) vs. average queueing delay for each job
- Draw the same three graphs by M/M/1 queueing analysis results
- When simulating the system with a traffic load 1.0 and 1.5,
  - Observe what happens in your simulation
  - Discuss how to handle such situation

Homework 2

- Draw the following three graphs by SMPL simulation
  - traffic load (0-0.95) vs. average # of jobs in the system
  - traffic load (0-0.95) vs. average queue length
  - traffic load (0-0.95) vs. average queueing delay for each job
- Compare the three graphs with the graphs of Homework 1
- When simulating the system with a traffic load 1.0 and 1.5,
  - Observe what happens in your simulation
  - Discuss how to handle such situation

Homework 3



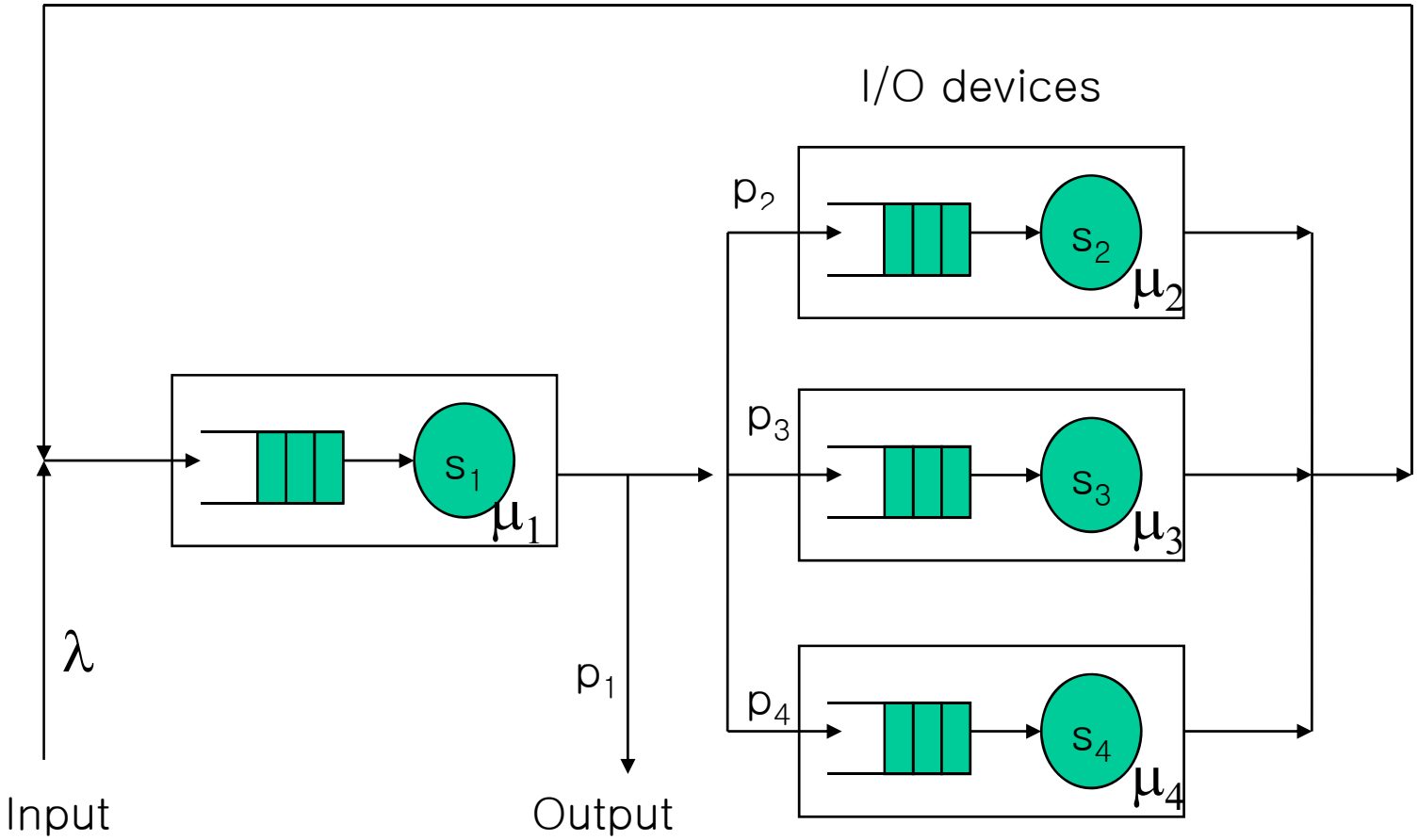
Homework 3 (Cont.)

- Let
  - Service rates: μ_1=1.333, μ_2=1/1, μ_3 = 1/2, μ_4 =1/4
  - Job transferring probs: p_1=p_2=p_3=p_4=0.25
- As increasing λ (x-axis) from 1/20 to 1/1, draw the followings by “SMPL” Simulation
  - L1, L2, L3, L4, W1, W2, W3, W4, L, W
  - Utilization of each server
- Draw the same curves by analysis
- Answer the followings
  - Which server is the bottleneck that first makes the system unstable
  - How to reassign server rates so that λ can be maximized while keeping the system stable

Homework 4

- Draw the following three graphs by OMNet++ simulation
  - traffic load (0-0.95) vs. average # of jobs in the system
  - traffic load (0-0.95) vs. average queue length
  - traffic load (0-0.95) vs. average queueing delay for each job
- Compare the three graphs with the graphs of Homework 1
- When simulating the system with a traffic load 1.0 and 1.5,
  - Observe what happens in your simulation
  - Discuss how to handle such situation

Homework 5



Homework 5 (Cont.)

- Let
  - Service rates: μ_1=1/3, μ_2=1/1, μ_3 = 1/2, μ_4 =1/4
  - Job transferring probs: p_1=p_2=p_3=p_4=0.25
- As increasing λ (x-axis) from 1/20 to 1/1, draw the followings by "OMNet++" Simulation
  - L1, L2, L3, L4, W1, W2, W3, W4, L, W
  - Utilization of each server
- Draw the same curves by analysis
- Answer the followings
  - Which server is the bottleneck that first makes the system unstable
  - How to reassign server rates so that λ can be maximized while keeping the system stable

Homework 6

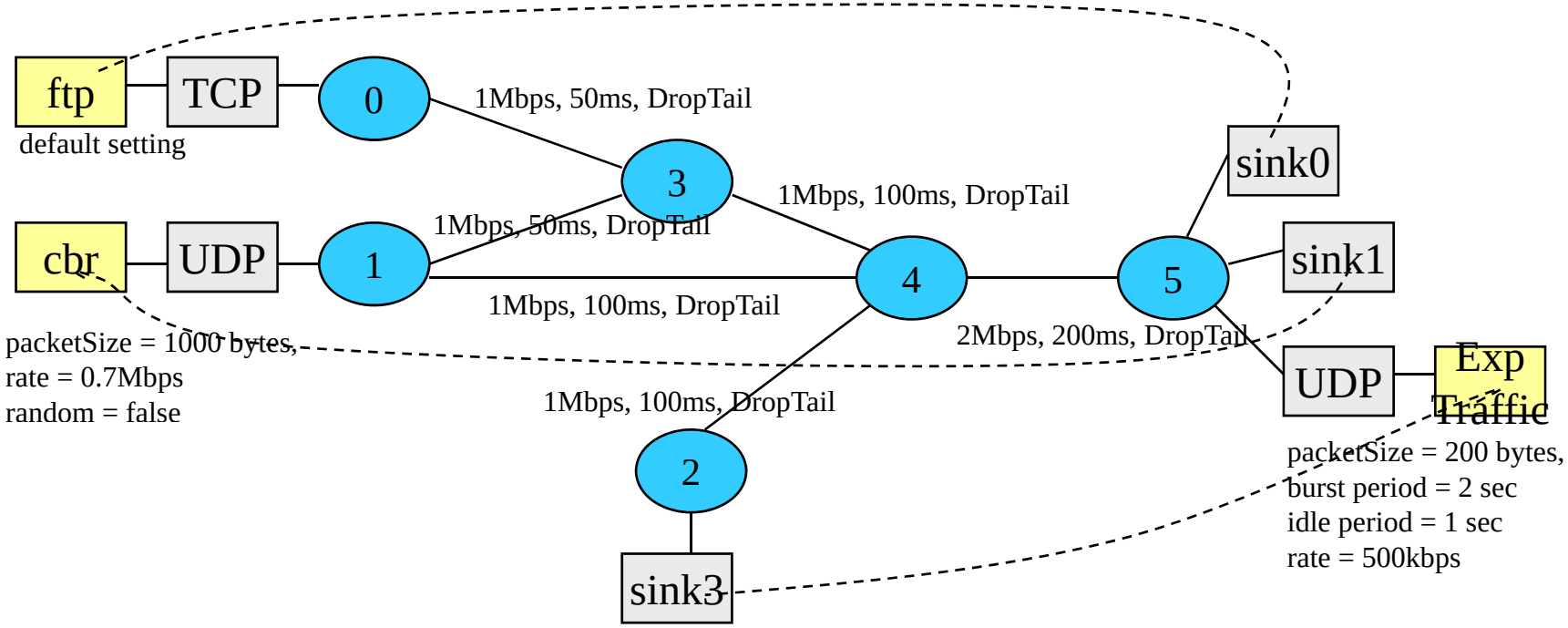
- 2 periodic tasks
  - T_1 {e_1=1, p_1= 4}
  - T_2 {e_2=2, p_2= 10}
- Four methods to process aperiodic jobs
  - background
  - polling server
    - highest priority, period = 2, server budget = 1
  - deferrable server
    - highest priority, period = 2, server budget = 5/6=0.833333
  - sporadic server
    - highest priority, period = 2, server budget = 1

Homework 6 (Cont.)

- Simulate the RM scheduler with aperiodic processing by
  - background
  - polling server (+ background if the server is idle)
  - deferrable server (+ background if the server is idle)
  - sporadic server (+ background if the server is idle)
- Compare the response time of aperiodic jobs for the above four cases as decreasing the average inter-arrival time from 10 to 0.4 while fixing the average execution time to 0.1
- Do the same as decreasing the average inter-arrival time from 1000 to 40 while fixing the average execution time to 10
- Explain your results

Homework 7

- Simulate the following network



- Each application traffic source starts at 10 sec and stops at 20 sec.
- Plot the received bytes at each sink at every 0.5 sec period.

Homework 8

- Make a newPing in NS2
  - once started, it sends probing packets 5 times periodically at every 1 sec.
- Using the same network of Homework 7, measure the round-trip delays of each way between node 1 and 5
  - first newPing start at 1.0 sec
  - second newPing start at 11.0 sec

Homework 9

- Make a newDsdv in NS2
  - Add or Modify at least one feature of DSDV
    - Clearly explain the added or modified features in your report
  - Implement newDsdv with the added or modified features
- Run the simulation to show the difference between DSDV and newDsdv