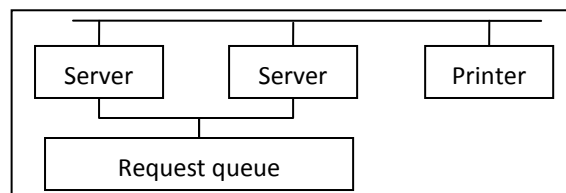


UECS2103 Operating Systems  
Tutorial 4

1. What are the hardware approaches to enforce mutual exclusion?
2. What are the disadvantages in using machine instructions to enforce mutual exclusion?
3. There are two processes, namely P and Q, and an I/O device. Each process requires the I/O device in their critical section.
  - (a) Write the pseudo code that uses semaphore to control the allocation of I/O device to the process. Assume that the function `write_data()` is called in the critical section.
  - (b) Given that process P has higher priority than process Q, Give a scenario where deadlock may occurs.
4. Consider two servers are sharing a request queue and a printer, as shown in the figure below. Each server will get a request from request queue, process it and send to printer. Printer and request queue can be accessed by only 1 server at a time. Write the pseudo code for the server process, use semaphores p and q to control the access to printer and request queue respectively. Assume that function `get_request()` gets request from the request queue and function `print()` will process the request and send it to the printer. Initialise the values of semaphores appropriately.



5. Consider the pseudo code segments of two processes below.

<pre>P() { P1    semWait(s); P2    m--; P3    semWait(t); P4    k = m * c; P5    semSignal(t); P6    semSignal(s); }</pre>	<pre>Q() { Q1    semWait(t); Q2    m++; Q3    semWait(s); Q4    c++; Q5    semSignal(s); Q6    semSignal(t); }</pre>
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Assume that both processes are assigned with the same priority level and process P executes first, is it possible that the process switching done by operating system can cause the two processes to enter a deadlock. Please explain. (You may use the line numbers as references in your explanation.)

6. How does monitor differ from semaphore?