UECS2103/2403/2423 Operating Systems

Tutorial 5

1. There are 3 resources and 3 processes, each process requires 2 resources for its operation. Briefly describe a scenario where deadlock may occur and draw a Resource Allocation Graphs to illustrate the scenario.

2. List the conditions that cause a deadlock occurs.

3. The state of a system at a particular time is shown in the Table 2. Total resource unit of R1, R2, R3 and R4 is 5, 6, 6 and 6 respectively. Determine whether the current state of the system is safe or unsafe by using banker's algorithm.

	Max. requirement				Current allocation			
Process	R1	R2	R3	R4	R1	R2	R3	R4
P1	3	2	2	1	1	1	1	1
P2	3	1	1	6	1	0	0	1
P3	2	5	1	3	0	0	1	1
P4	4	5	2	4	1	2	1	1

4. Consider the system state below.

	Maximum demand				Current allocation			
	R1	R2	R3	R4	R1	R2	R3	R4
P1	2	0	1	0	1	0	0	0
P2	4	3	6	0	1	0	2	0
P3	3	2	4	1	0	0	1	1
P4	3	4	5	6	2	0	1	4
P5	6	6	9	8	0	3	3	3

Total unit of resources: R1: 6, R2: 6, R3: 10, R4: 10

a) Is the state of system safe?

b) If one unit of R2 allocated to P5 is forcibly released and allocated to P4, will it affect the system state? Show your calculation to support your answer.

5. Consider a system with 150 units of memory, allocated the three processes as below:

Process	Maximum demand	Allocated
A	70	45
B	60	40
C	60	15

Process D arrives later, requires maximum demand of 60 and initial need of 35; apply the banker's algorithm to determine whether it would be safe to grant the request.

6. Table below show the request and current allocation of resources for 5 processes. The initial total unit of resources are: R1: 5, R2: 4, R3: 2, R4: 5

	Request				Current allocation			
Process	R1	R2	R3	R4	R1	R2	R3	R4
P1	2	1	0	1	1	0	0	1
P2	1	1	0	1	0	1	1	1
P3	2	0	1	1	1	2	1	0
P4	3	1	2	1	0	0	0	0
P5	2	0	2	1	2	0	0	2

a) Apply deadlock detection algorithm to determine whether deadlock occurs.

b) Recover the deadlock by successively abort deadlock processes based on the least total resources allocated so far.

7. What are the possible approaches that can be used when a deadlock is detected?

8. Table below shows the current allocation of resources to each process, the resources that are needed by each process to proceed with their execution and the priority of each process (bigger number means lower priority).
Currently, the resources available are R1 = 0, R2 = 0, R3 = 1 and R4 = 2. Obviously the processes are deadlocked. Resolve the deadlock by successively aborting deadlocked processes with the lowest priority until the deadlock no longer exists. Show the resources available after each abortion in your workings.

	Allocated				Needed				Process
Process	R1	R2	R3	R4	R1	R2	R3	R4	Priority
P1	1	1	2	0	1	3	0	5	3
P2	1	1	0	1	2	1	3	1	4
P3	1	0	0	2	4	1	2	6	2
P4	1	1	1	1	2	3	5	4	5
P5	1	0	2	2	0	3	2	2	1