CG2271 Real Time Operating Systems

Tutorial 11

1. Are the tasks you create in your term assignment more similar to processes on general operating systems or more similar to threads? Explain your answer. In addition, explain why real-time tasks are not considered to be threads.

2. Explain, with an example, how temporal and spatial localities ensure that in a short term only small portion of memory is accessed at any time. Explain why this is relevant memory hierarchies.

3. Suppose we had two memory technologies T1 and T2 with the following characteristics:

Technology	Cost/MB	Access Speed
T1	$2	10ns
T2	$0.08	80ns

Suppose we were building a computer system with 1GB of memory. Complete the following table:

Configuration	Amount of T1 memory	Amount of T2 memory	Cost	Average access time.
1	-	1GB		
2	1GB	-		
3*	256KB	1GB		

* Configuration 3 is arranged as a cache-main memory hierarchy, and 98% of all memory accesses would be handled by the T1 memory.

Given your answers, explain why memory hierarchies make sense.

4. Explain what address translation in virtual memories is, and why it is necessary.

5. In this question we will consider a virtual memory system with 64 bytes per page, 10 bit virtual addresses and 9 bit physical addresses.

    a. What is the maximum size in bytes of the virtual memory? Physical memory?
    b. What is the maximum number of virtual and physical pages?
    c. Using the page table below, translate the following virtual addresses to physical addresses:

        0, 15, 576, 987, 1020

	V	PPN
0	1	2
1	1	3
2	0	(13,5,17)
3	0	(12,5,6)
4	1	4
5	1	7
6	0	(10,3,1)
7	0	(3,4,1)
8	0	(7,5,5)
9	1	6
10	0	(6,3,13)
11	0	(7,1,16)
12	1	5
13	0	(6,4,1)
14	0	(6,8,3)
15	1	1