Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich
Spring Term 2014

Operating Systems and Networks
Assignment 4

Assigned on: **13th March 2014**
Due by: **21st March 2014**

1 Memory Management

What are the goals of memory managent in a modern OS?

1.1 Segmentation

Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses given as (segment, offset) tuples?

a) 0, 430

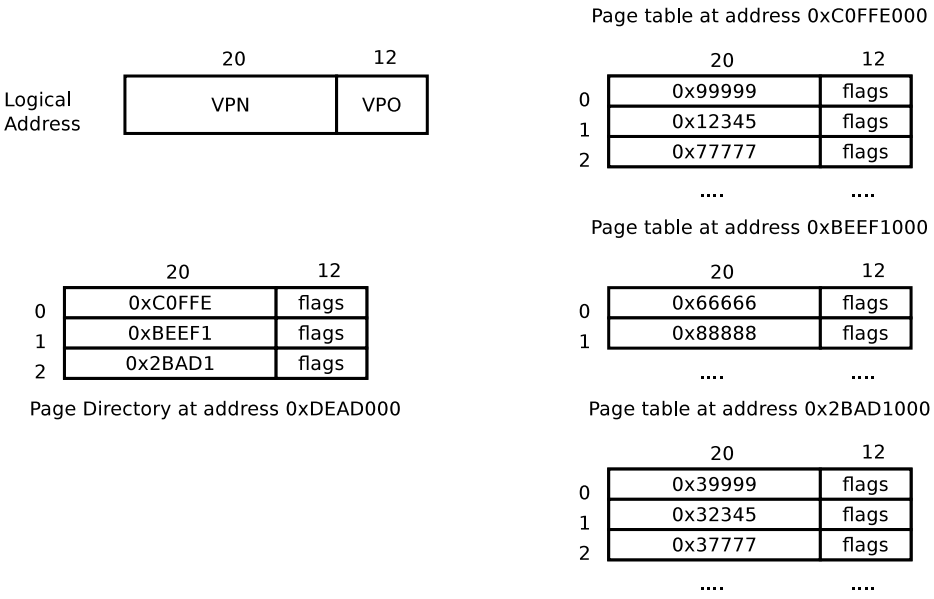
b) 1, 10

c) 2, 500

d) 3, 400

e) 4, 112

1.2 Paging



Answer the following questions concerning the given P6 page table:

a) How does paging provide isolation of processes?

b) How does paging allow multiple processes to share a memory region?

c) Which physical address is referenced by the virtual address 0x00802BAD?

d) Which virtual address references the physical address 0x77777777?

e) Only the 20 most significant bits of a page directory entry are used to reference the location of a page table, the remaining 12 bits are used for flags. What does this imply for the location of page tables?

f) What does the kernel have to do so that different processes use different page tables?

g) If a memory reference takes 100 nanoseconds, how long does a paged memory reference take if there is no TLB or cache?

1.3 Virtual Memory

Consider a paged virtual address space composed of 1024 pages of 4 KB each, which is mapped into a 1 MB physical memory space.

a) What is the format of the logical address; i.e., which bits are the offset bits and which are the page number bits? Explain.

1.4 Page Replacement

Consider the following page access pattern:

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1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6
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How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, or seven frames?

a) LRU replacement

b) FIFO replacement

c) Optimal replacement