
Homework #7

M1522.000800 System Programming

Name: _____

Due Date: Tuesday, April 21, 2015, 23:59

Student-Number: _____

Submission: in paper form.
There is a drop off box in class and inside the CSAP Lab in building 301, room 419.

Question 1

Memory Mapping

Given an input file `SP.txt` that consists of the string `"I hate System Programming!\n"`, write a C program that uses `mmap` to change the contents of `SP.txt` to `"I love System Programming!\n"`. Use `fstat()` to get the file size.

```
#include <fcntl.h>
#include <unistd.h>
#include <sys/mman.h>
#include <sys/stat.h>
#include <sys/types.h>

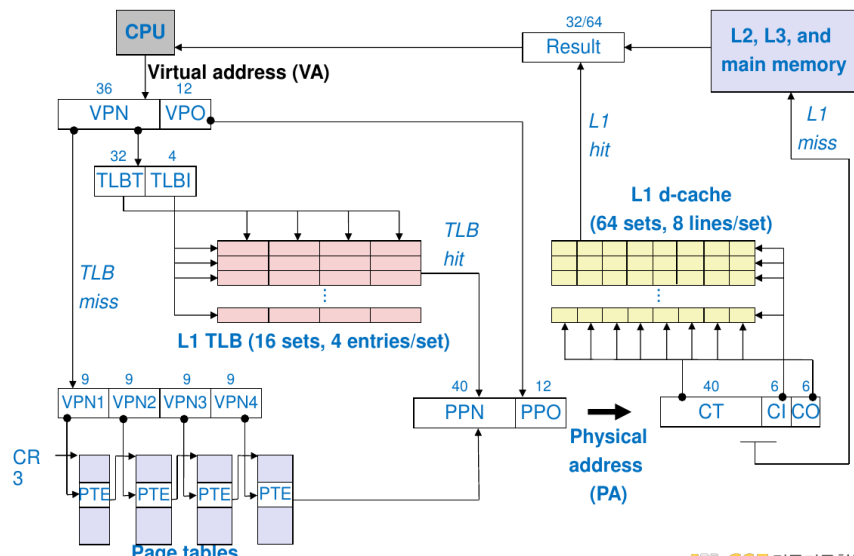
int main(void) {

    return 0;
}
```

Question 2

Address Translation

The following picture is an **end-to-end address translation** mechanism on Intel i7 core.



a) How much large is the **L1 d-cache line size** in byte?

b) How much large is the **page size** in byte?

c) If the **page entry size** for each page tables is same as **8B**, how much large is the **page table size** for each page tables in byte?

d) If a program is to access a data, draw the address translation flow of the **worst case** in accessing time on this picture.

Question 3

Dynamic Memory Allocation

Determine the block sizes and header values that would result from the following sequence of `malloc` requests. Assumptions: (1) The allocator maintains **double-word** alignment, and uses an **implicit free list** with the block format from **the following plot**. (2) Block sizes are rounded up to the nearest multiple of **eight** bytes.

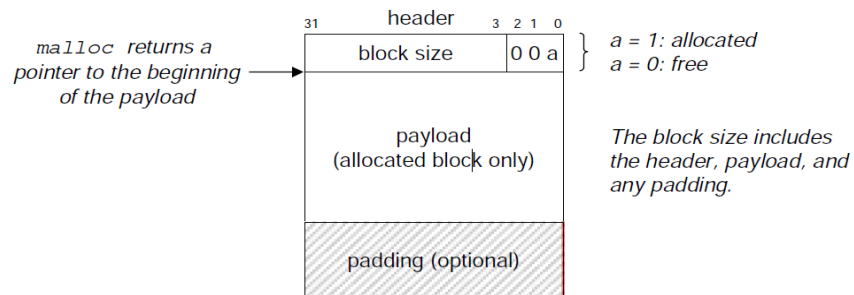


Figure 10.37: **Format of a simple heap block.**

Request	Block size (decimal bytes)	Block header (hex)
malloc(3)		
malloc(11)		
malloc(20)		
malloc(21)		