COL 331 HomeWork -3

Harshith Chandra Danam - 2016CS10364

_____

1. The virtual address '0x80100000' in binary form is '1000000000 0100000000 000000000000'. The first ten digits give us the offset in page directory, the next ten digits give us offset in the page table and next 12 digits, the offset in the page.
   a. In the page directory, the first 20 digits at 1000000000(512) offset, needs to be modified to the physical address of the base of the page table. The next 12 digits provide us the flags. Since read-only , last four digits of flags can be set as 0101.
   b. In page table, the first 20 digits at 0100000000(256) offset, needs to be modified to be physical address of the base of the page. The next 12 digits provide us the flags. Since read only , last four digits of flags can be set as 0101.
   Since 000000000000 is (0) we will have to modify the value at the base to required physical address 0x00100000.

2.
   A. Why is kpgdir[0] zero?
      a. It is convention that the base of the pagedirectory is set to 0,null or no value. Hence it is showing us the value zero.
   B. how would we translate 0x80107beb to a physical address?
      a. The next command was used till switchkvm(). Which hasnt been executed yet.
   C. what is this 0x114007?
      a. 0x80107beb >> 22 gives us the first ten bits of this address, which is also the offset required - 0x200.
      b. Kpgdir[0x200] looks up the value at offset 0x200 is page table and returns us the value 0x114007
   D. What is the PPN and what does 7 mean?
      a. Looking at kpgdir[0x200] gives us the physical address of the PageTable and also the flags set.
      b. First 20 digits i.e 0x00114 gives the page table PPN and last 12 digits 0x007 gives us the flags set.
      c. 7 is 0111. The last 1 digit signifies page is in memory . It also means it is in read-write mode.
   E. what is this 0x107001?
      a. Similar in the case of page directory, 0x107 is the next ten digits of 0x80107beb obtained using >> 12) & 0xfff
      b. Using the address obtained in page directory, we more to 0x114000 and use the offset of 0x107. To get the value present in the page table 0x107001.
   F. why 1 in the low bits?

       a.   The 0x001 signifies the flags set in the address as mentioned before. The '0001' in the last 1 signifies page is present in the memory.

    G. Here ,switchkvm() is not yet executed . All the physical address are still mapped to same physical address and hence they give us the value.

    H. Since switchkvm() is executed, PageDirectory is present a new pagetable and there the physical address aren't mapped unlike the previous case, resulting in error.

5.

    A. sched(): This is executed on process stack which is present in the process space.

    B. scheduler(): This is executed on scheduler stack.

    C. swtch() returns after scheduler() calls the swtch() again. Therefore, yes.

    D. It is possible to reduce size by excluding the caller save registers.

    E. We can observe the pattern 'badc'.

    F. In the very first main calls the scheduler() and prints 'a'. The context switch happens here, and scheduled process calls the sched(). The sched() first prints 'c'. And later due to context switches we observe the pattern.