Operating Systems - Review Questions 3

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Group A&H
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1. Name two differences between logical and physical addresses.

One difference between logical and physical addresses is that a logical address is generated by the CPU whereas a physical address is a location in the main memory. Another difference is that the physical address cannot be used directly whereas the logical address can be used directly.

2. Consider a logical address space of 64 pages of 1024 words each, mapped onto a physical memory of 32 frames.
a. How many bits are there in the logical address?

log(64)=6 and log(1024)=10 so one will need 6 +10=16 bits

b. How many bits are there in the physical address?

log(32)=5 and log(1024)=10 so one will need 5 +10=15 bits

3. Assuming a 1-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers)?
Page number = Address reference / page size
Offset = Address reference mod page size
Using these formulas:

a. 3085
Page Number= 3.01 Offset=13

b. 42095
Page Number= 41.1 Offset=111

c. 215201
Page Number= 210.2 Offset=161

d. 650000
Page Number= 634.7 Offset=784

4. Consider a logical address space of 256 pages with a 4-KB page size mapped onto a physical memory of 64 frames.

a. How many bits are required in the logical address?
2^x = page size * pages
x = log(page size *pages)
x=log(4096*256)
x=log(1048576)= 20 bits

b. How many bits are required in the physical address?
2^x = number of frames * page size
x= log(number of frames * page size)
x= log(64 *4096))
x= log(262144)=18 bits

5. Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs.

Page faults happen when you request memory that is not in the RAM. If a page fault happens the operating system needs to do a number of things first it checks if the reference it got is valid or invalid in the internal table. If it is invalid it can discard it and stop the process otherwise it needs to try to get the page. It needs to use a new frame where it will read the page in.The reference in the internal table will now point to this frame and one can redo the request.