Virtual Memory Organization

On this Lesson

- Organization of virtual memory systems
- Paging – virtual to physical address translation
- Organization of page tables
- Page faults
- Translation Lookaside Buffer
- Multi-level page tables
- Segmentation
- Caches on virtual memory systems

Virtual Memory

- Allows the operating system to administer the transfer of data between main memory and secondary memory.
- Provides a mechanism for the operating system to protect data between users.
- Allows the execution of programs that are larger than the installed physical memory
- Facilitates multiprocessing

## Memory Terms

Virtual Memory (Primary Memory)

- *Is the architectural memory, the memory space that can be accessed by fetch/load/store operations of a machine code program.*
- *It has 2^n memory locations, where n is the number of bits needed to specify a memory address.*

Physical Memory

- *Is the RAM memory physically installed in a computer.*
- *It has 2^m memory locations, where m could be less than n.*

Secondary Memory

- *Is the memory where programs are permanently stored.*
- *It has 2^z memory locations, where z is significantly larger than n or m.*
- *It is non-volatile*

Memory Spaces

Virtual and Physical Spaces
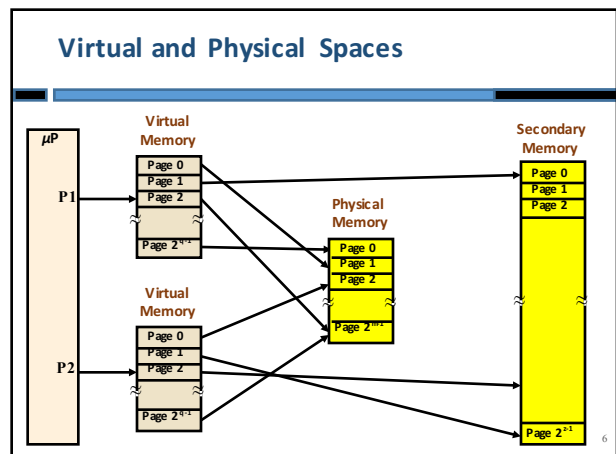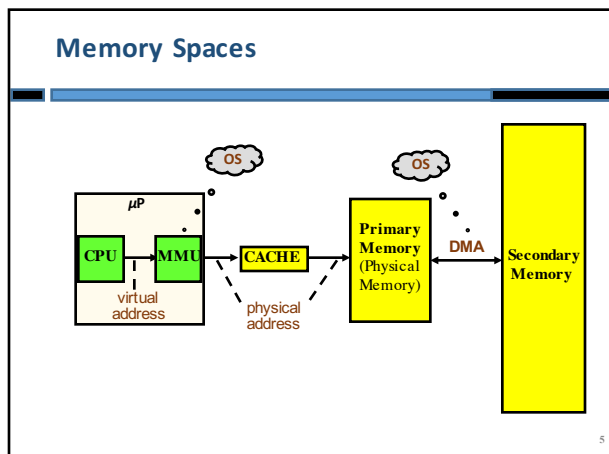
Paging

- Is the mechanism that facilitates the mapping of virtual addresses to physical addresses and the transfer of pages between physical memory and secondary memory.

- Mapping of virtual addresses to physical addresses is accomplished by mean of a page table that is **resident in primary memory**.

- Each fetch/load/store access involves two memory accesses, one to the page table and one to access the physical address of the fetch/load/store operation.

- Transfer of pages between secondary memory and physical memory is made on demand (when the pages are needed by a program).

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