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CST-221

Memory Management

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GitHub: https://github.com/tjames222/CST-221

MEMORY MANAGEMENT

MMU (Memory Management Unit)

The Memory Management Unit (MMU) is a piece of hardware usually located within the Central Processing Unit (CPU) that maps virtual addresses onto the physical Memory addresses. Virtual Memory addresses have fixed size pieces called pages and physical memory has the same thing, only they are referred to as page frames. The MMU translates a virtual address to a physical address by gathering the virtual address and mapping it out to a table (the Translation Lookaside Buffer) and then transforming it to the physical address. By doing this a much larger program can be run than is possible with only the RAM because only the most demanding instructions get sent to the physical memory and the rest is stored on disk space. One of the plus sides to using virtual memory is for security purposes. A program using virtual memory cannot read or write to other programs data. This would prevent programs from crashing one another since each program has its own distinct virtual memory address.

Separation of Policy & Mechanism

The separation of policy and mechanism in a system is a key way to manage complexities. Some things are managed within the Kernel space and the other tasks are run at the user level. The page fault handler is at the kernel level in addition to the Memory Management Unit. On the user level you have the external pager and Disk tasks. The external pager is like a receptionist at a hotel in the fact that it has initial contact with a customer (process) and sets up the customer with a room (Page map/ disk space). Page fault is like a hotel manager. If the customer is put in the wrong room or can’t find the right room the hotel manager comes in and corrects the room problem. The Disk and Memory can be likened to the rooms that a customer can stay in.

Page Fault Handling

A page fault is caused by a program’s failed attempt to access data located in its address space, but not in the RAM. When a page fault occurs, the OS summons a page fault handler that takes care of the problem. The page fault handler will search for where the virtual address is stored on the hard drive and then pick a page in the physical RAM and write it into the RAM. Then the handler will correct the virtual address with a valid entry so that the problem does not occur again. Once everything is fixed the program will retry the original attempt with success.

