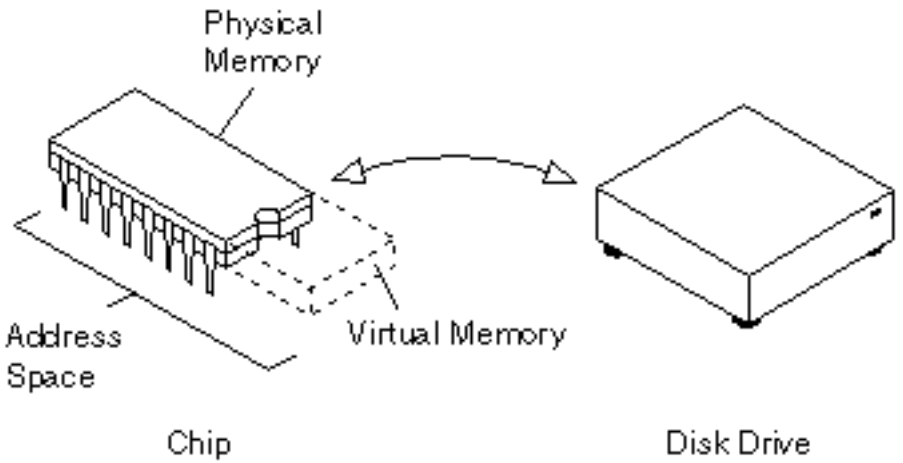
Memory Management

Week 07 – Lab 7

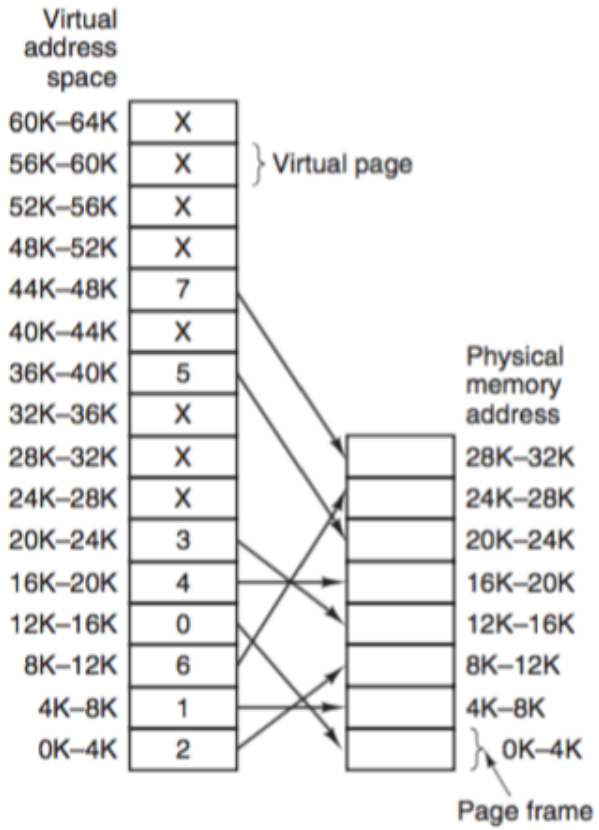
Virtual Memory



- Processor operates with Virtual Memory addresses
- Actual data (source code + data) is stored in Physical Memory
- Page tables : Virtual Memory -> Physical Memory

Purpose of Virtual Memory

- To enlarge address space, the set of memory addresses the system can use



Exercise 1

- Run *$free -t -h* in the shell

- Mem represents physical memory size
- Swap represents size of memory available for swapping
- Total represents virtual memory size

Vmstat

- Reports information about processes, memory, paging, block IO, traps, and cpu activity
- The first report produced gives averages since the last reboot. Additional reports give information on a sampling period of length delay.The process and memory reports are instantaneous in either case

Exercise 2

- Write a C program that runs for 10 seconds. Every second it allocates 10 MB of memory, fills it with zeros and sleeps for 1 second. Compile and run the program in the background (./ex2 &) and run *&vmstat 1* at the same time. Observe what happens to the memory. Pay attention to si and so fields. Hint: use memset(ptr, value, size) to fill the allocated memory

Top

- provides an ongoing look at processor activity in real time. It displays a listing of the most CPU-intensive tasks on the system, and can provide an interactive interface for manipulating processes

Exercise 3

- Run *$top -d 1*
- Run ex2 program in the background and then run *top*

getrusage()

- C function from <sys/resource.h> library to monitor application's memory usage

  int getrusage(int who, struct rusage *usage);

Exercise 4

- Write a C program that runs for 10 seconds. Every second it allocates 10 MB of memory, fills it with zeros, prints memory usage with getrusage() function and sleeps for 1 second.

Exercise 5

- What is the difference between a physical and a virtual address? Describe using your own words. Save your answer to week7/ex5.txt

Exercise 6

- A machine has 16-bit virtual addresses. Pages are 8 KB. How many entries are needed for a single-level linear page table? Explain your computations. Save your answer to week7/ex6.txt

  (Hint: Modern Operating Systems, 3.3.2)

Extra exercise

- Download and run Memory Management Simulator
- Installation:

  http://www.ontko.com/moss/memory/install_unix.html
- Download:

  http://www.ontko.com/moss/memory/memory.tgz
- User guide:

  http://www.ontko.com/moss/memory/user_guide.html

Extra exercise

- Modify *commands* file so that the last instruction would write to the 32nd virtual page in memory. Notice the swapping of virtual page to a physical memory