Chapter 10: Virtual Memory

Lesson 08: Demand Paging and Page Swapping
Objective

• Learn demand paging, pages of data are only brought into the main memory when a program accesses them

• Learn swapping technique that uses magnetic or other media to store the state of programs that are not currently running on the processor
Objective

- Understand the use of swapping by the operating system to treat all of a program’s data as an atomic unit and moves all of the data into or out of the main memory at one time
Demand paging
Demand paging

• Pages of data are only brought into the main memory when a program accesses them.
• When a context switch occurs, the operating system does not copy any of the old program’s pages out to the disk or any of the new program’s pages into the main memory.
• Instead, it just begins executing the new program and fetches that program’s pages as they are referenced.
Demand paging

- When a context switch occurs, the operating system does not copy any of the old program’s pages out to the disk or any of the new program’s pages into the main memory.
- Instead, it just begins executing the new program and fetches that program’s pages as they are referenced.
Demand paging advantages
Demand-paging systems advantage

- Only fetch the pages of data that a program actually uses from the disk
- If a program only needs to reference a fraction of its data during each timeslice of execution, this can significantly reduce the amount of time spent copying data to and from the disk
Demand-paging systems advantage

- Individual pages of a program’s data can be brought into the memory as needed, making the limit on the maximum amount of data a program can reference the amount of space available on the disk, not the amount of main memory.
Advantages of demand paging

- Outweigh the disadvantages for most applications
- Demand paging—the choice for most current workstation/PC operating systems
Swapping of pages
Swapping

• A related technique that uses magnetic or other media to store the state of programs that are not currently running on the processor.

• In a system that uses swapping, the operating system treats all of a program’s data as an atomic unit and moves all of the data into or out of the main memory at one time.
Swapping

• When the operating system on a computer that uses swapping selects a program to run on the processor, it loads all of the program’s data into the main memory, evicting other programs from the main memory if necessary.
If all of the (counting both their instructions and data) fit into the main, both demand paging and swapping allow the computer to operate in a multiprogrammed mode without having to fetch data from disk.
Swapping systems advantage

- Once a program has been fetched from disk, all of the program’s data is mapped in the main memory.
- This makes the execution time of the program more predictable, since page faults never occur during a program’s use of the CPU.
Swapping disadvantage over demand paging

- Systems that use swapping typically cannot use their magnetic storage to allow a single program to reference more data than fits in the main memory.
- All of a program’s data must be swapped into or out of the main memory as a unit.
Summary
We learnt

- Demand paging requires only the fetch of pages of data that a program actually uses from the magnetic disk or other media.
- Swapping system requires that the operating system treats all of a program’s data as an atomic unit and moves all of the data into or out of the main memory at one time.
- Swapping advantage is that once a program has been fetched from disk, all of the program’s data is mapped in the main memory.
We learnt

- Swapping makes the execution time of the program more predictable, since page faults never occur during a program’s use of the CPU
- Demand paging advantages outweigh the disadvantages for most applications
End of Lesson 08 on
Demand Paging and Page Swapping