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

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- 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

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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

Programs being executed on a computer fitting into the main memory

- 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