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Operating System

AI-602

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THRASHING

Thrashing 1/4

- If a process does not have "*enough*" pages, the page-fault rate is very high.

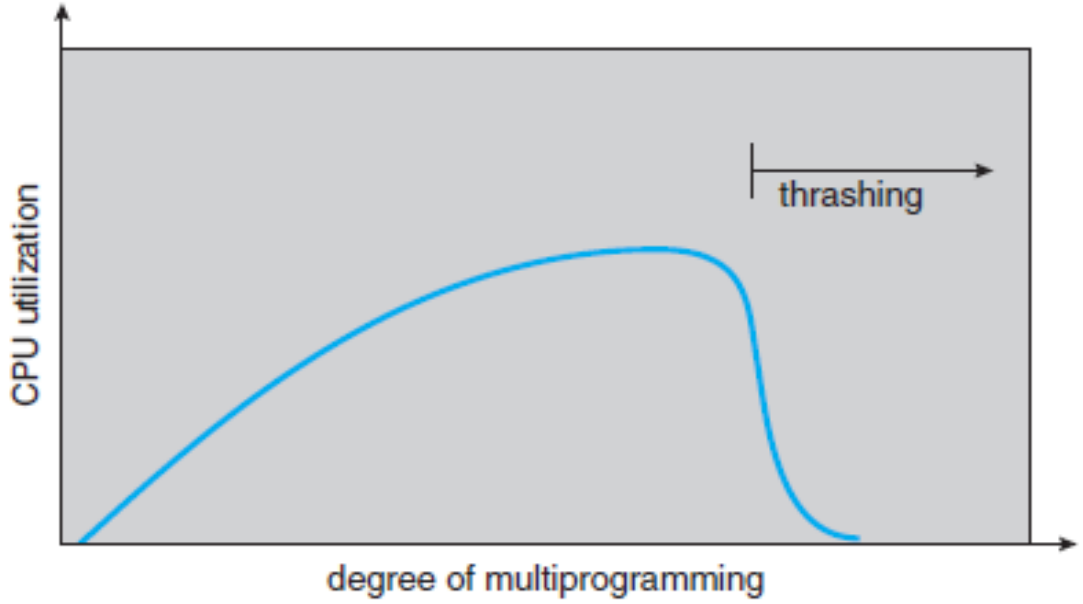
- This leads to:
  - *Low* CPU utilization
  - Operating system thinks that it needs to increase the ***degree of multiprogramming***.
  - Again number of frames per process decrease so *page fault* rather increase more.

Thrashing 2/4

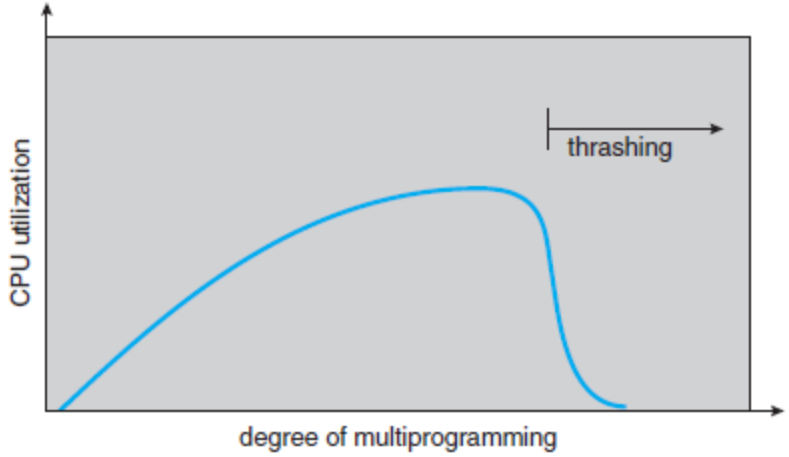
- *This high paging activity is called thrashing.*

- A process is thrashing if it is spending more time *paging* than executing.

- Thrashing results in severe *performance problems*.

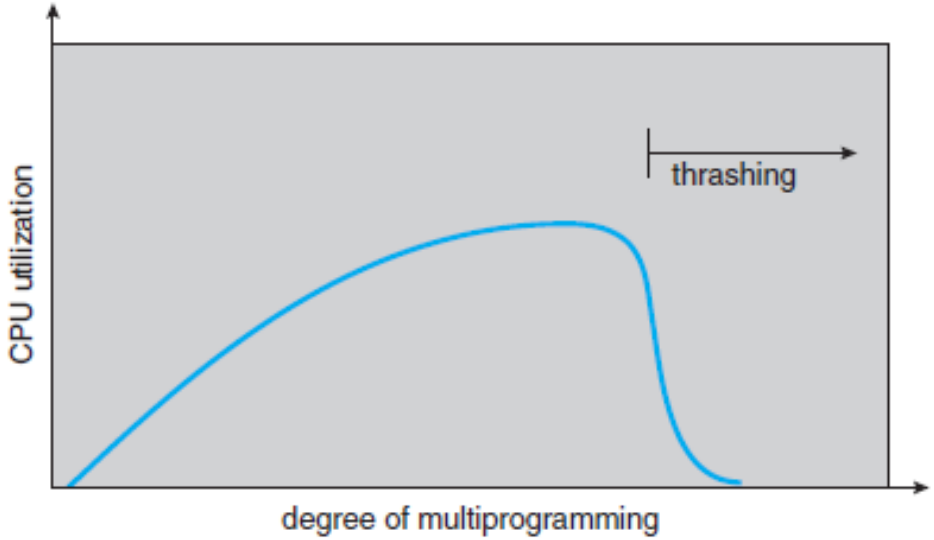


Thrashing 3/4



- **Explanation**:
  - As the degree of multiprogramming increases, CPU utilization also increases until a *maximum* is reached.
  - If the degree of multiprogramming is increased even further, *thrashing* sets in, and CPU utilization drops sharply.
  - At this point, to increase CPU utilization and stop thrashing, we must decrease the *degree of multiprogramming*.

Thrashing 4/4



- **Solution**:
  - The *locality model* states that, as a process executes, it moves from locality to locality.
  - A locality is a *set of pages* that are actively used together.
  - A *program* is generally composed of several different localities, which may overlap.

Other Considerations

- **Prepaging**:
  - Prepaging is an attempt to prevent this high level of initial paging.
  - The strategy is to bring into memory at one time all the pages that will be needed.

Other Considerations

- **Page Size**:
  - The problem has *no best answer*.
  - Some factors (***internal fragmentation, locality***) argue for a small page size, whereas others (*table size, I/O time*) argue for a large page size.
  - However, the historical trend is toward larger page sizes, even for mobile systems.

References

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley.

2. William Stallings, “Operating Systems: Internals and Design Principles”, 6th Edition, Pearson Education.

3. D M Dhamdhere, “Operating Systems: A Concept based Approach”, 2nd Edition, TMH.

Thank You.