

**Fragmentation when it occurs**

## What is Fragmentation?

Fragmentation in the context of computer systems refers to the division of memory or storage into smaller, non-contiguous blocks that are too small to accommodate certain programs or data structures efficiently. Fragmentation can occur in both memory (RAM) and storage (disk) and is generally categorized into two types:

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- **Internal Fragmentation:**

Internal fragmentation occurs when allocated memory or storage space is larger than the actual data or process it holds. This wasted space exists within the allocated block due to alignment requirements or fixed block sizes. Internal fragmentation is more common in memory management and file systems where fixed-size blocks are used.

- **External Fragmentation:**

External fragmentation occurs when there is enough total free memory or storage space to satisfy a memory allocation request, but the available space is fragmented into smaller non-contiguous blocks. As a result, it becomes challenging to find a single contiguous block large enough to accommodate larger programs or data structures, even though the total free space is sufficient.

External fragmentation is more common in memory management, where a series of small allocated and deallocated memory blocks can lead to gaps between them that are too small to be useful for larger memory requests.

## When Fragmentation Occurs?

Fragmentation occurs over time as memory or storage is allocated and deallocated.

The process of allocating and releasing memory or storage can lead to fragmentation:

**Memory Allocation:** When processes are loaded into memory, they occupy specific memory blocks. If processes of varying sizes are loaded and deallocated, it can lead to internal and external fragmentation.

**Disk Storage:** As files are created, modified, and deleted on a disk, the available space becomes fragmented due to the uneven allocation and deallocation of blocks.