

Fragmentation

- Poor memory utilization caused by *fragmentation*
 - *internal* fragmentation
 - *external* fragmentation

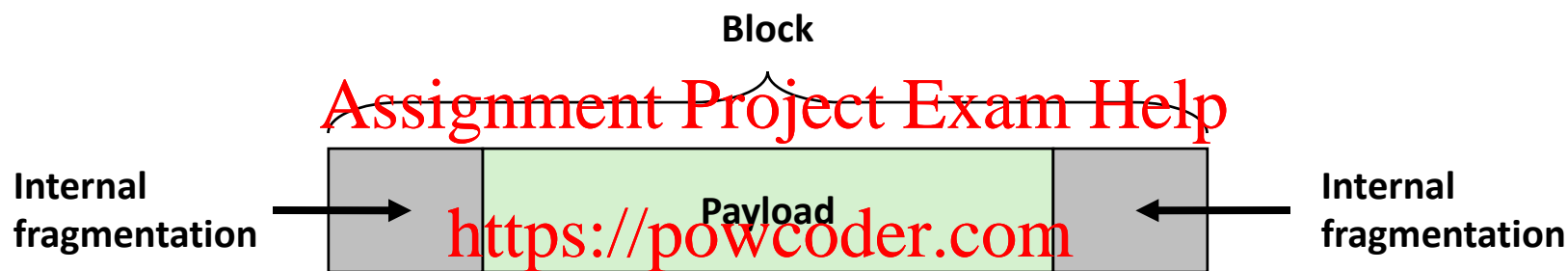
Assignment Project Exam Help

<https://powcoder.com>

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Internal Fragmentation

- For a given block, *internal fragmentation* occurs if payload is smaller than block size



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- **Caused by**
 - Overhead of maintaining heap data structures
 - Padding for alignment purposes
 - Explicit policy decisions
(e.g., to return a big block to satisfy a small request)
- **Depends only on the pattern of *previous* requests**
 - Thus, easy to measure

External Fragmentation

- Occurs when there is enough aggregate heap memory, but no single free block is large enough

```
p1 = malloc(4)
```



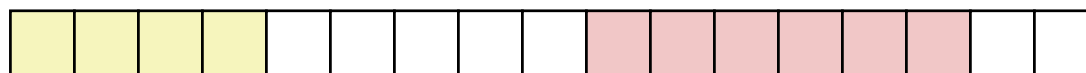
```
p2 = malloc(5)
```



```
p3 = malloc(6)
```



```
free(p2)
```



```
p4 = malloc(6)
```

Oops! (what would happen now?)

- Depends on the pattern of future requests
 - Thus, difficult to measure