Linux Memory Management

An Overview

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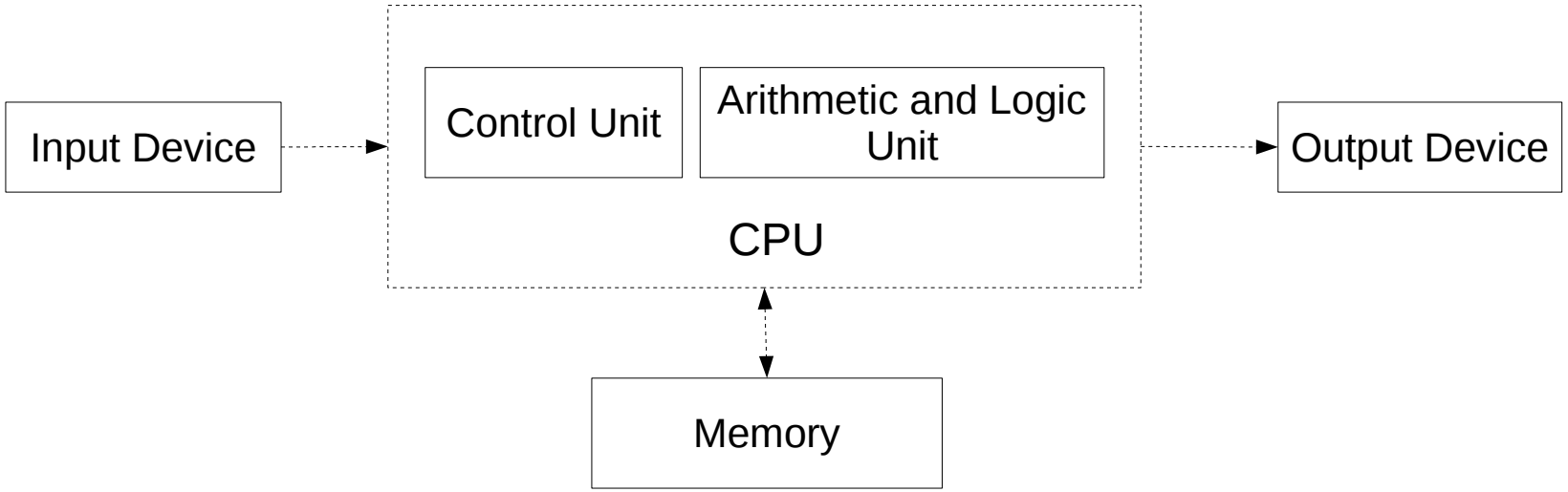
Introduction

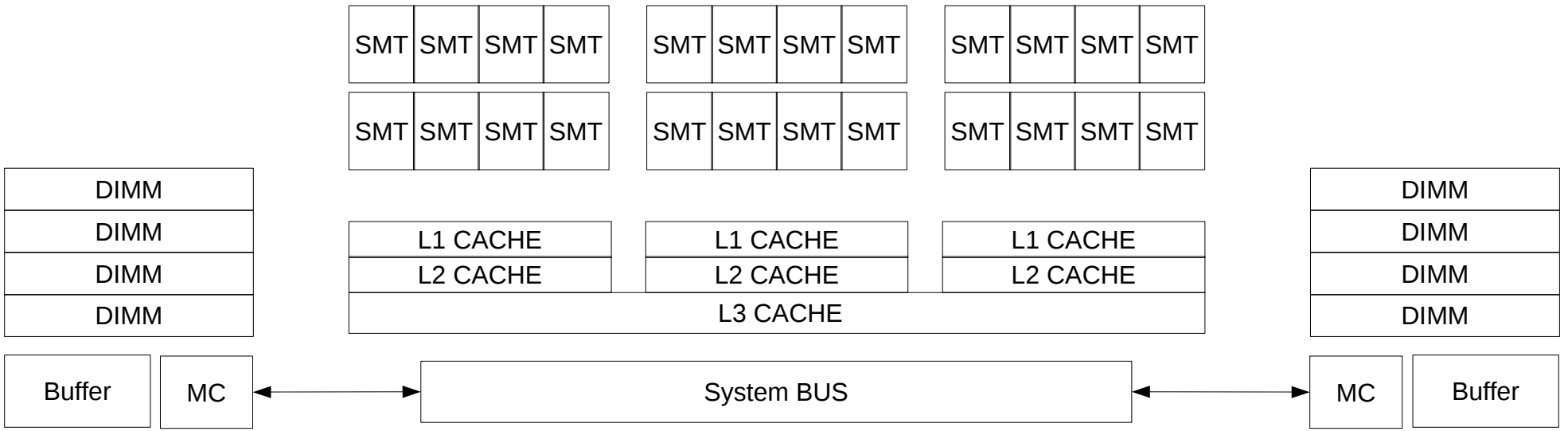
- Main Memory - A non persistent storage of memory which requires electricity
- *Joint Electron Device Engineering Council* (JEDEC) specifies standards for memory
- *Double Data Rate* (DDR) is the prevalent *Dynamic Random Access Memory* (DRAM)
- DDR standards
  - DDR3 (Released in 2007)
  - DDR4 (Released in 2014)
  - DDR5 (Will be released around 2020)
- DRAM chips are placed on *Dual In Line Memory Module* (DIMM) cards
- Memory DIMM Types
  - Non ECC DIMM (Laptop, Desktop etc)
  - ECC (Workstations, Server)
    - Industry standard DIMM (Compatible with most systems, cheaper)
    - Proprietary DIMM (Buffered, faster, more RAS features, expensive)

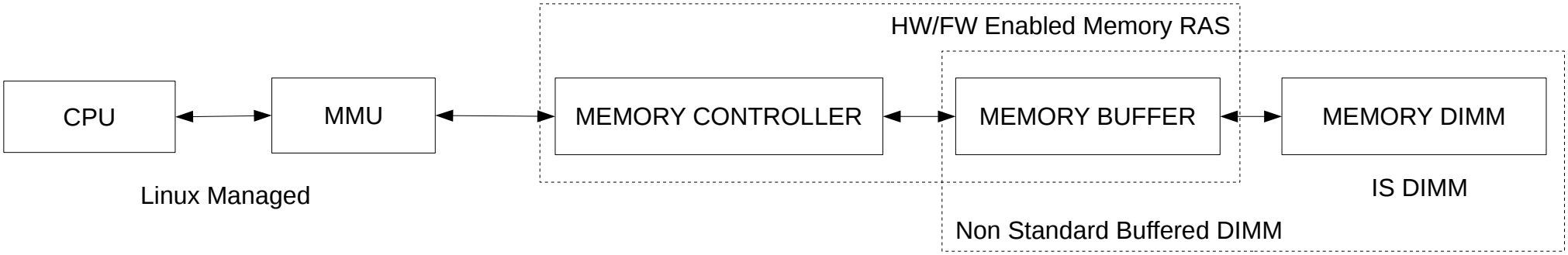
Why Memory is Required

- Working set is fundamental to Jon Von Neuman computer architecture
- Similar to the concept of stack in push down automation
- There is a need to have working memory to solve a problem
- In matrix multiplication, the matrices need to be stored some where
- In image transformation, the image (it's pixels) needs to be stored some where
- Main memory (RAM) provides the infrastructure of a working set of problem data

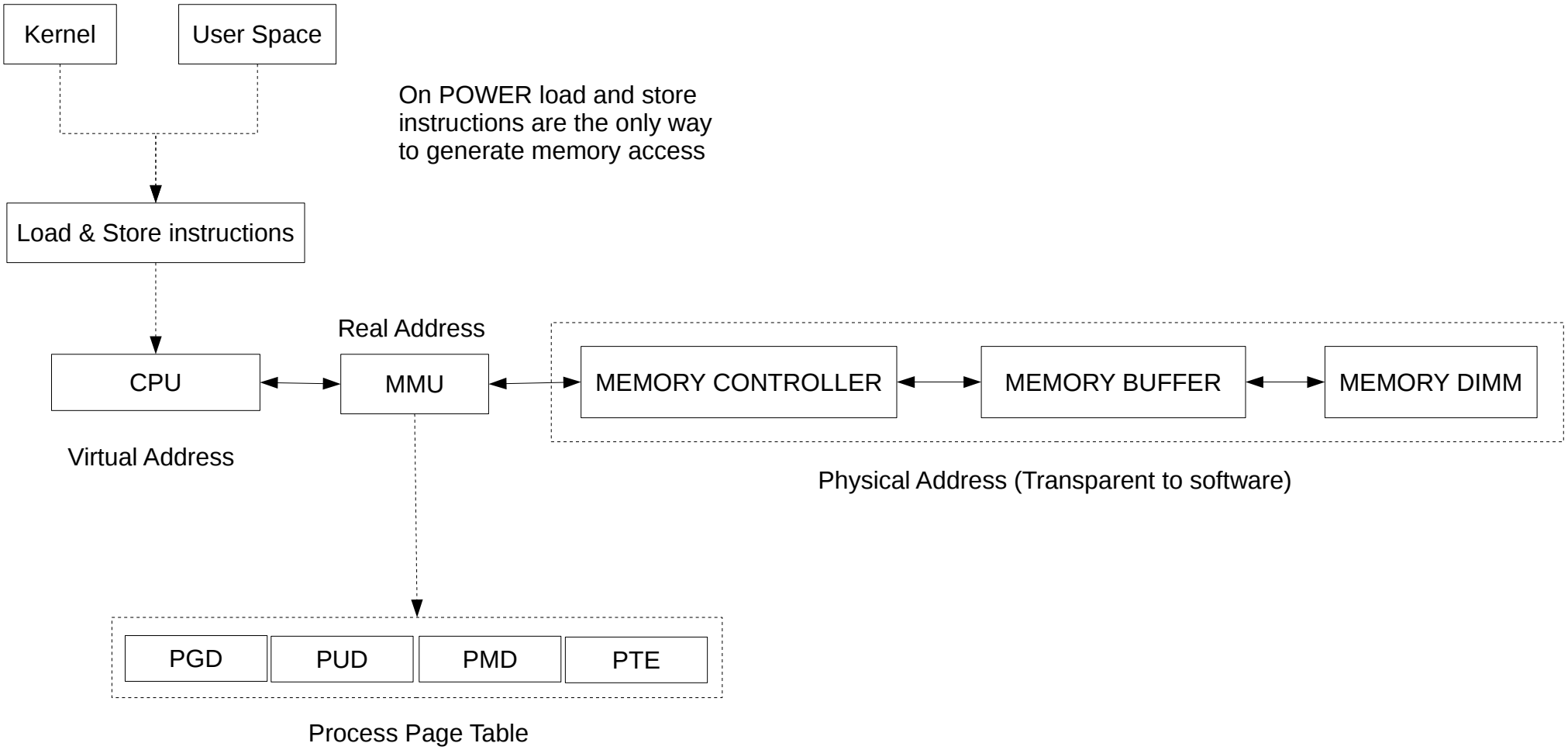


Platform Memory

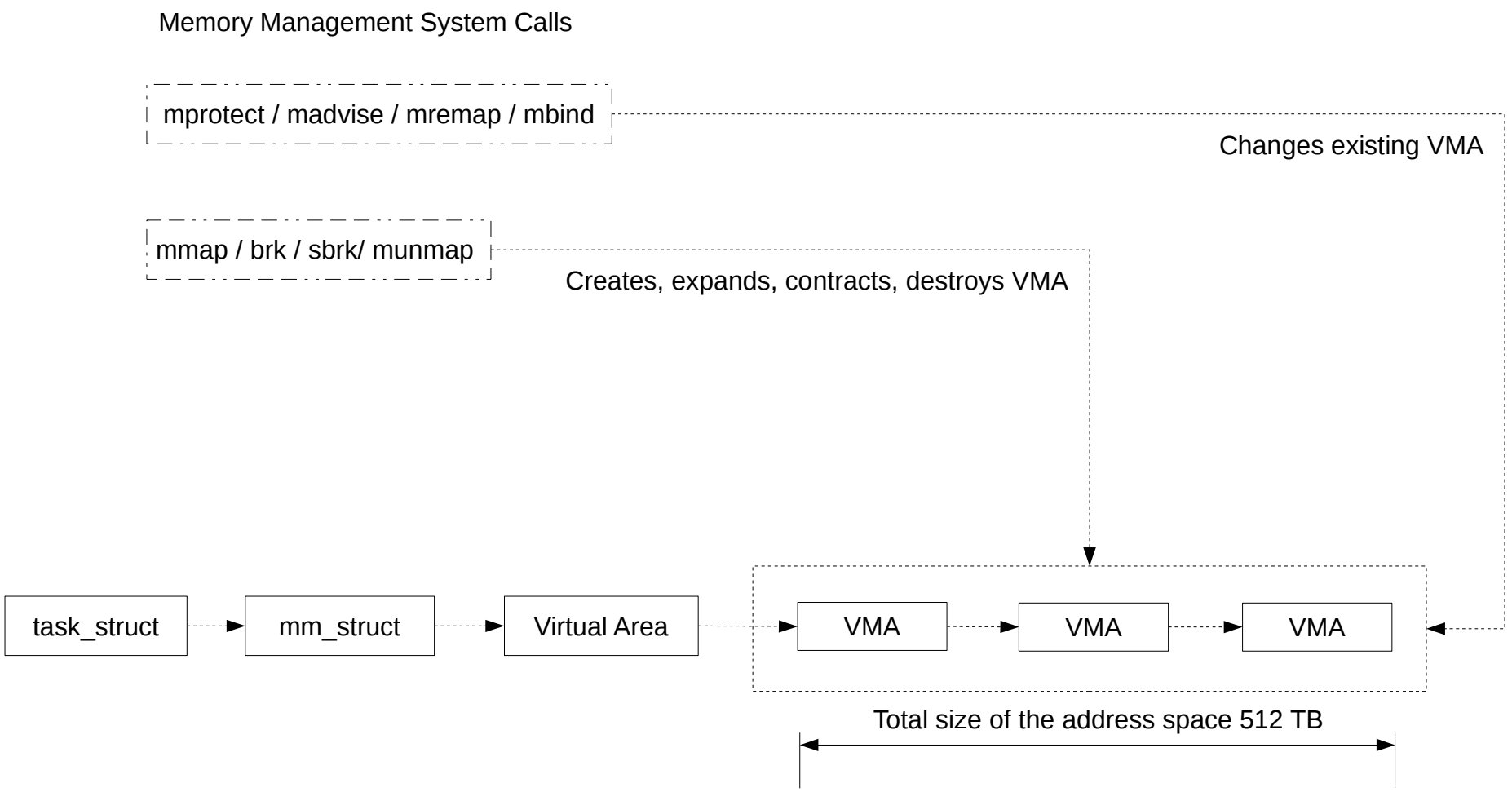




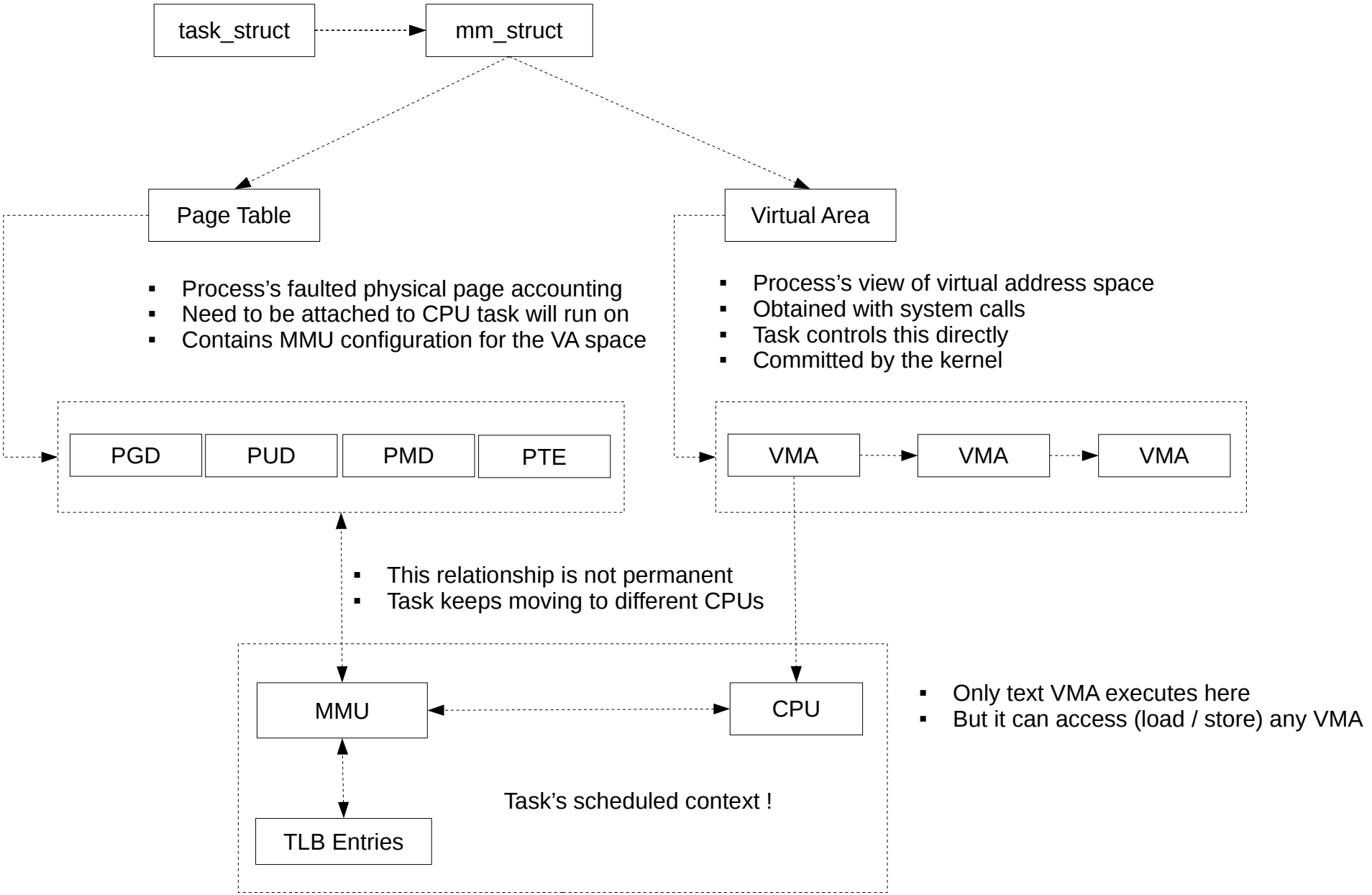
MMU Address Translation



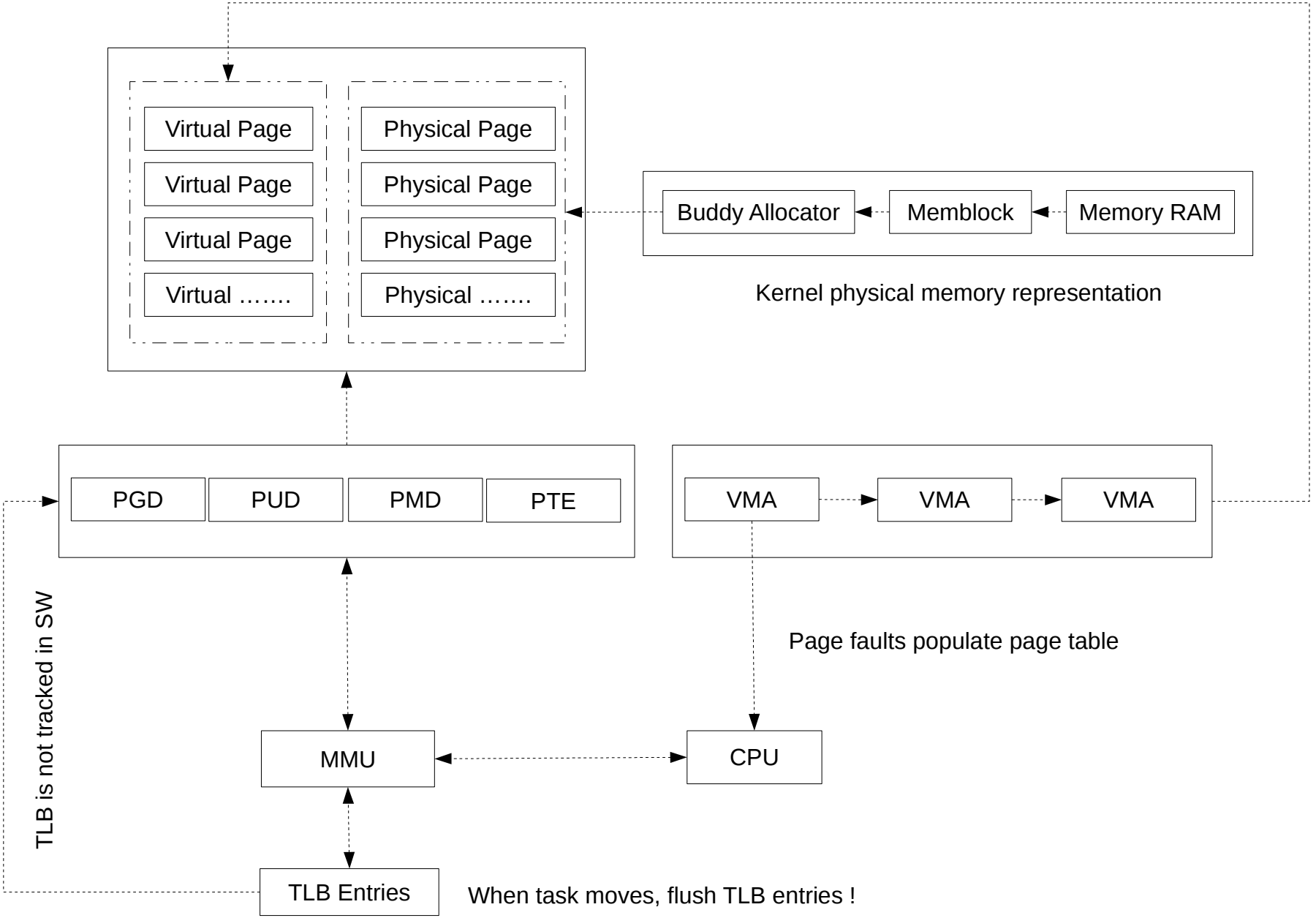
Virtual Memory Area



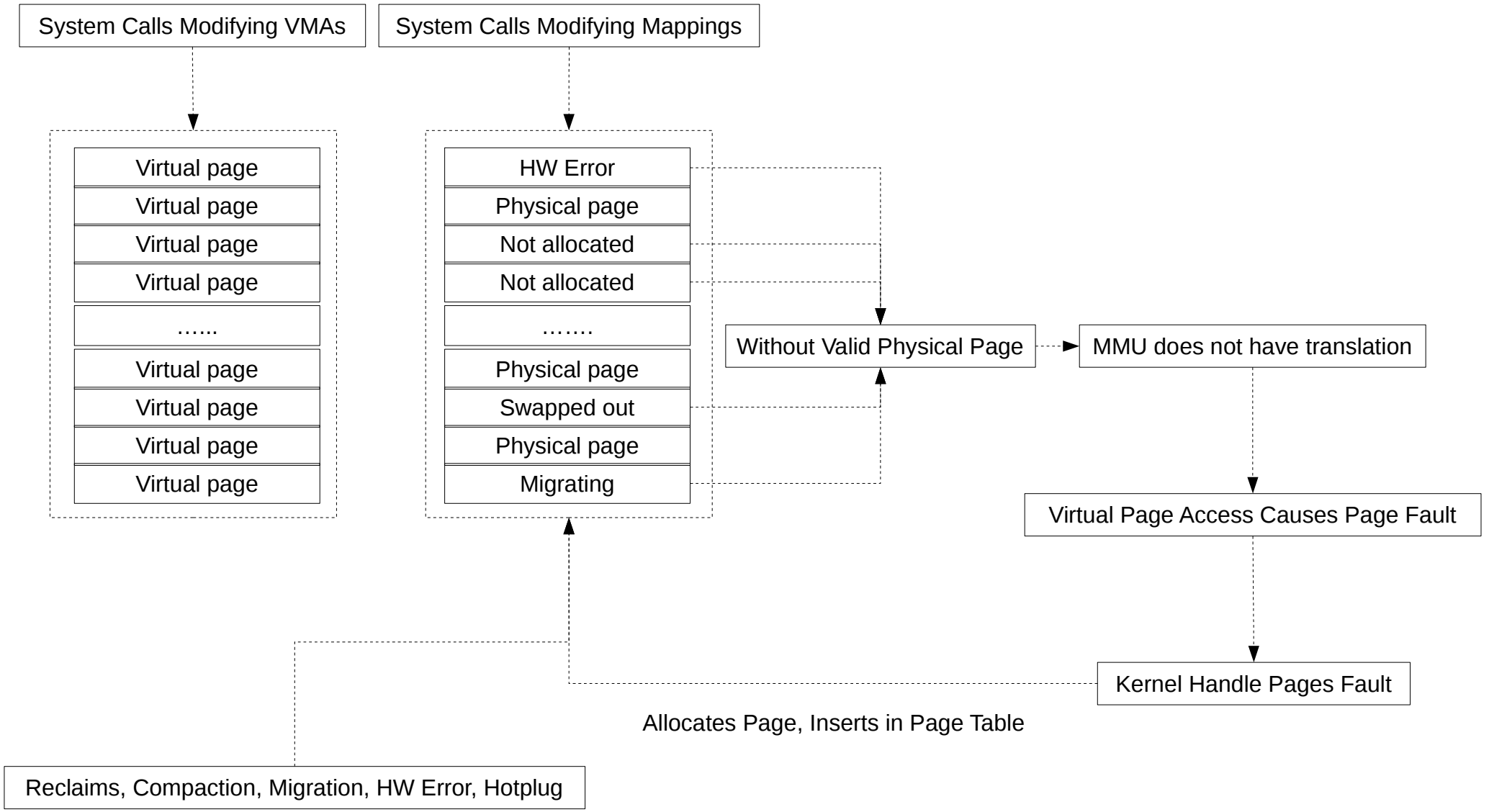
Linux Address Translation



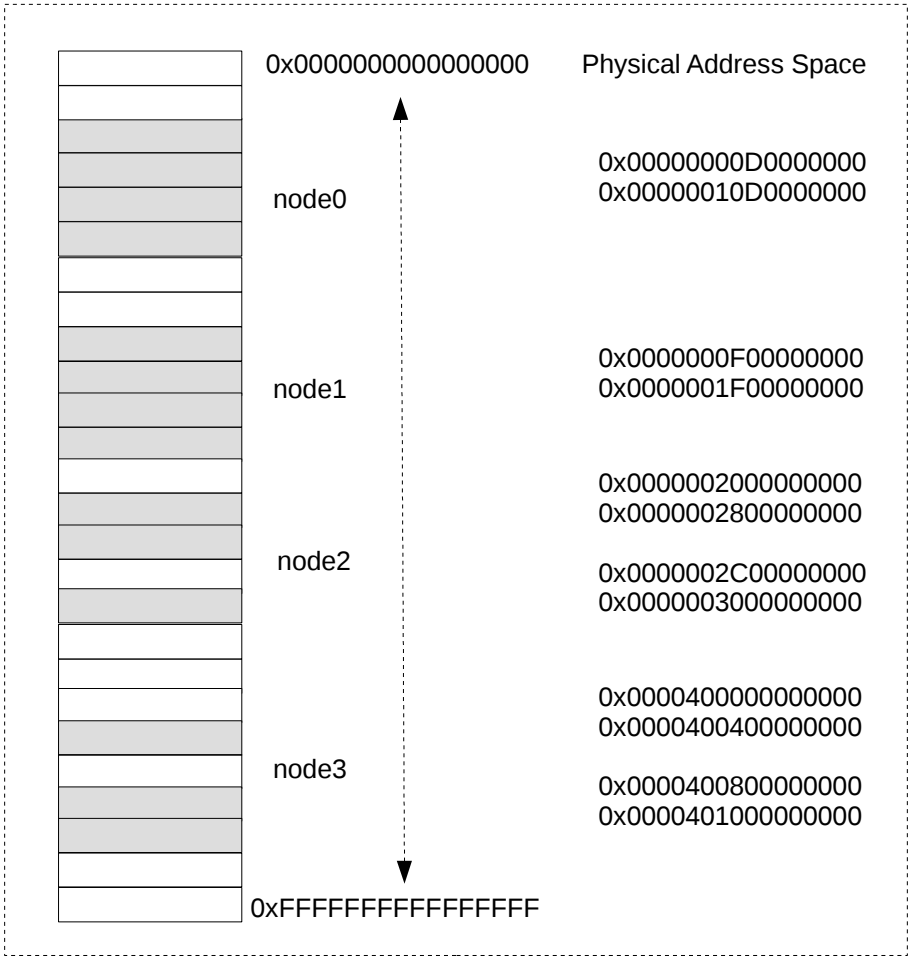
Linux Address Translation



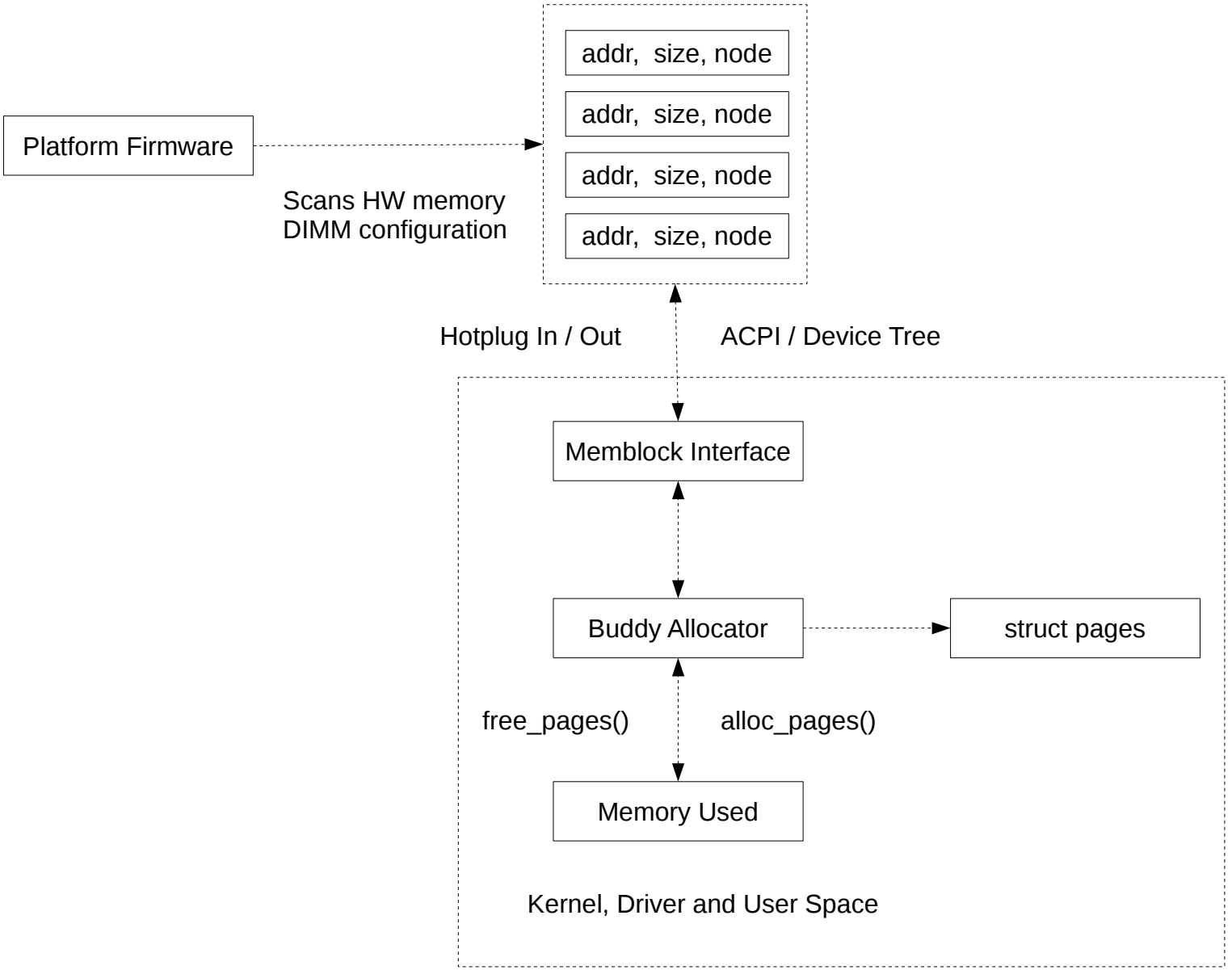
Process Page Table



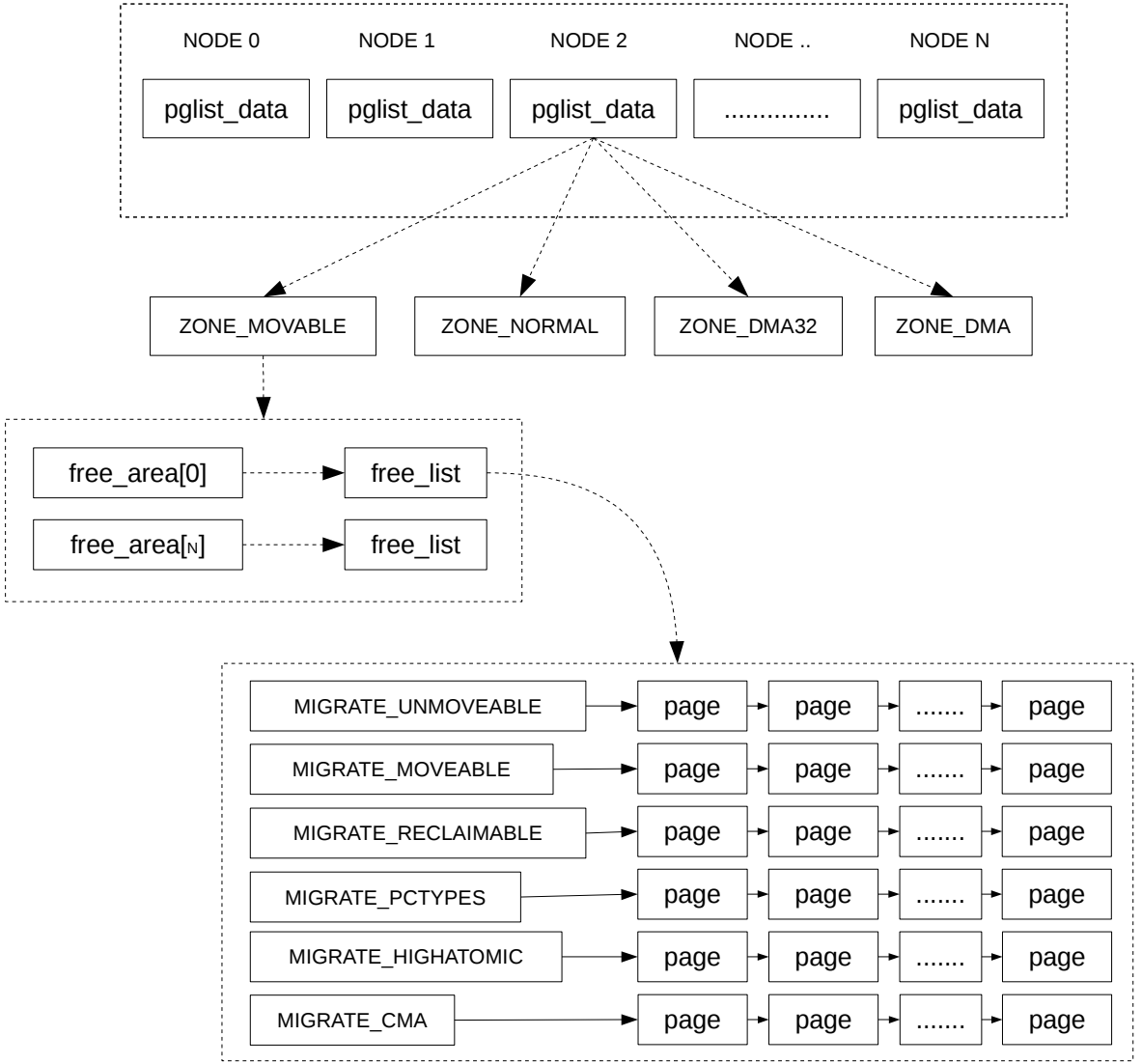
Physical Memory



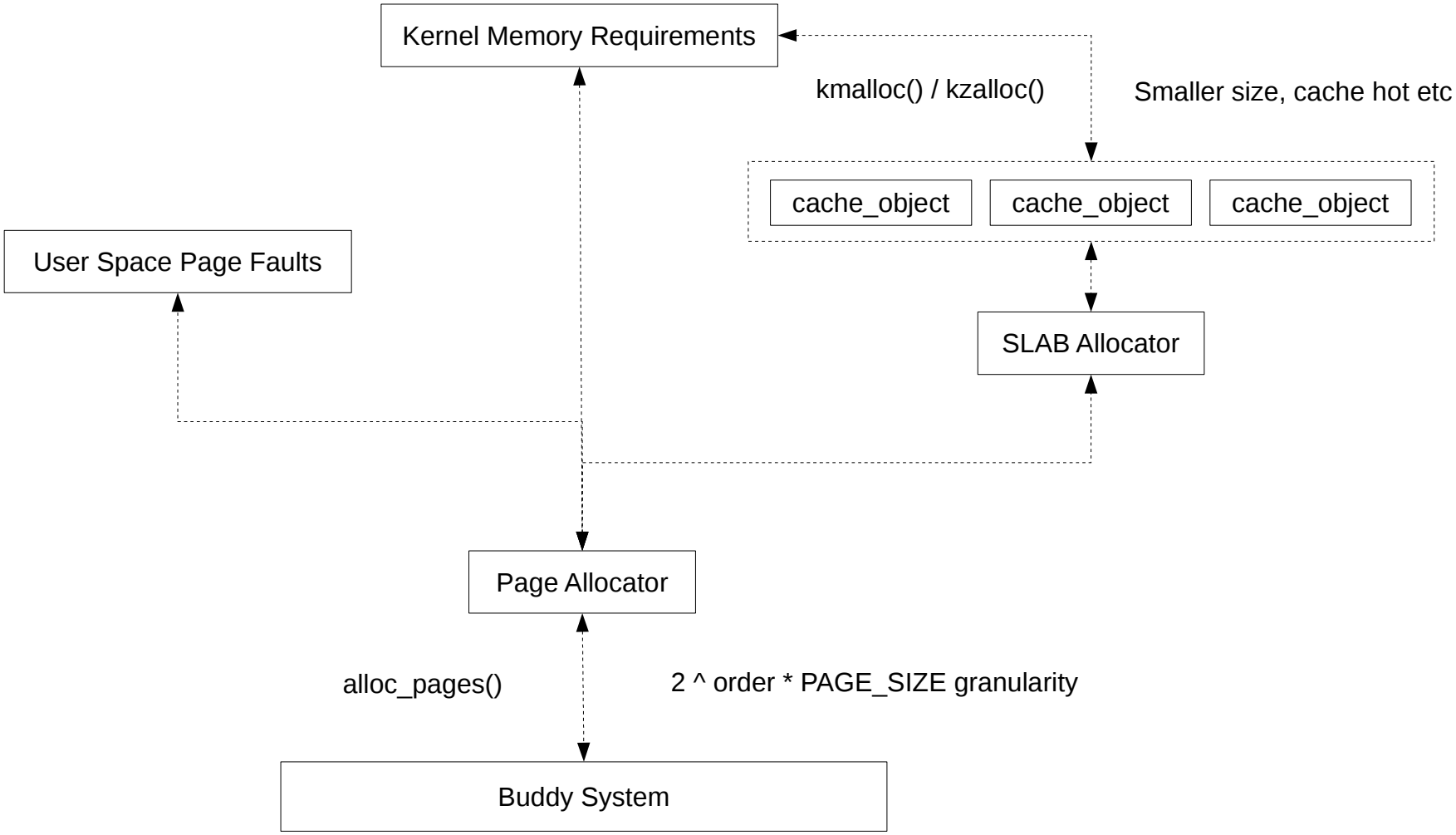
Physical Memory



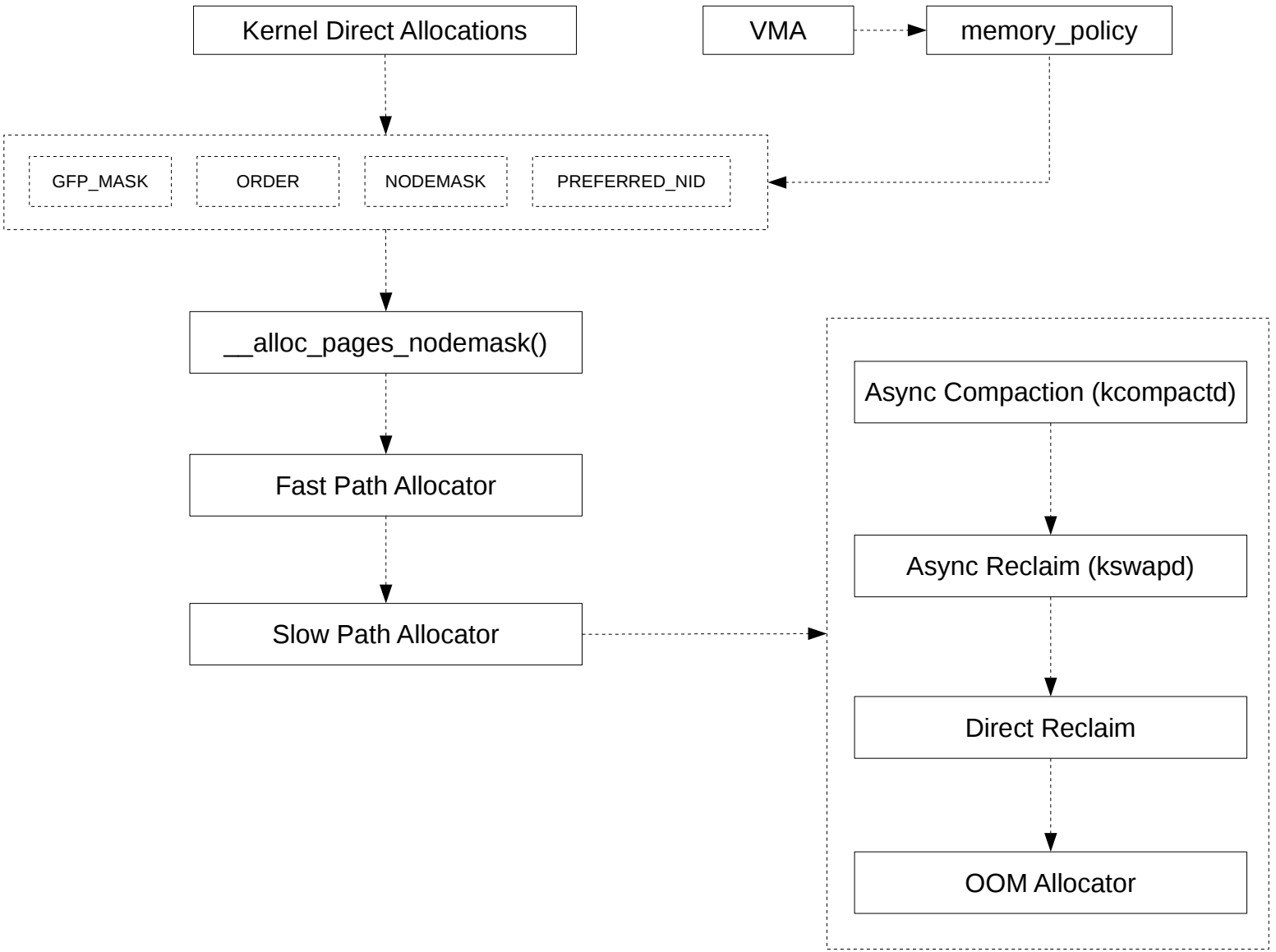
Buddy System



Physical Memory Allocator



Page Allocator



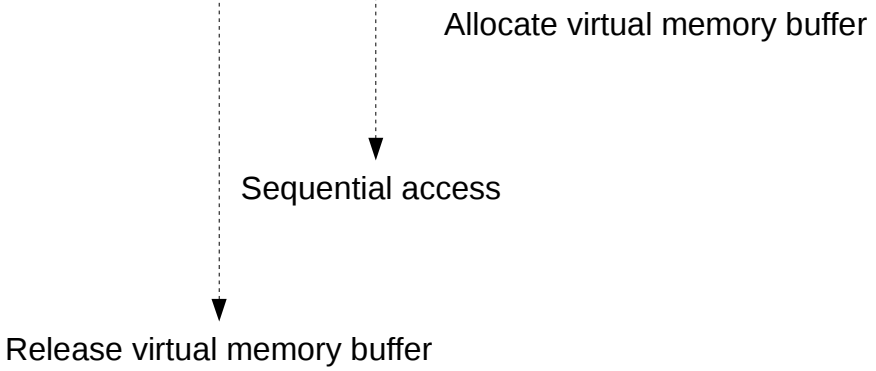
Analyze Memory Performance

```
char *ptr;

ptr = mmmap(NULL, PAGE_SIZE * NR_PAGES, PROT_READ | PROT_READ,
MAP_PRIVATE | MAP_ANON, -1, 0);
```

```
memset(ptr, 0, size);
```

```
munmap(ptr, size);
```



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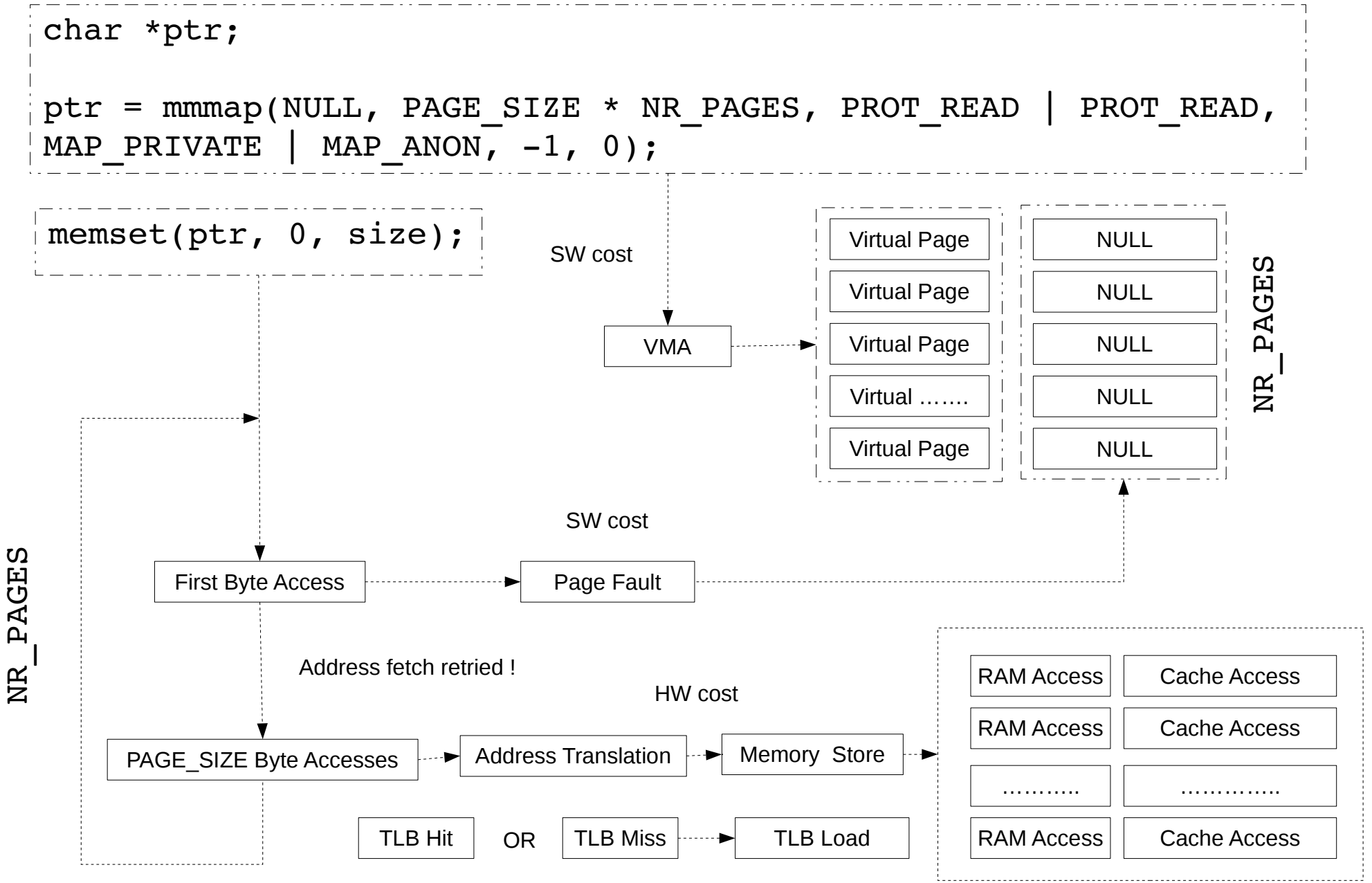

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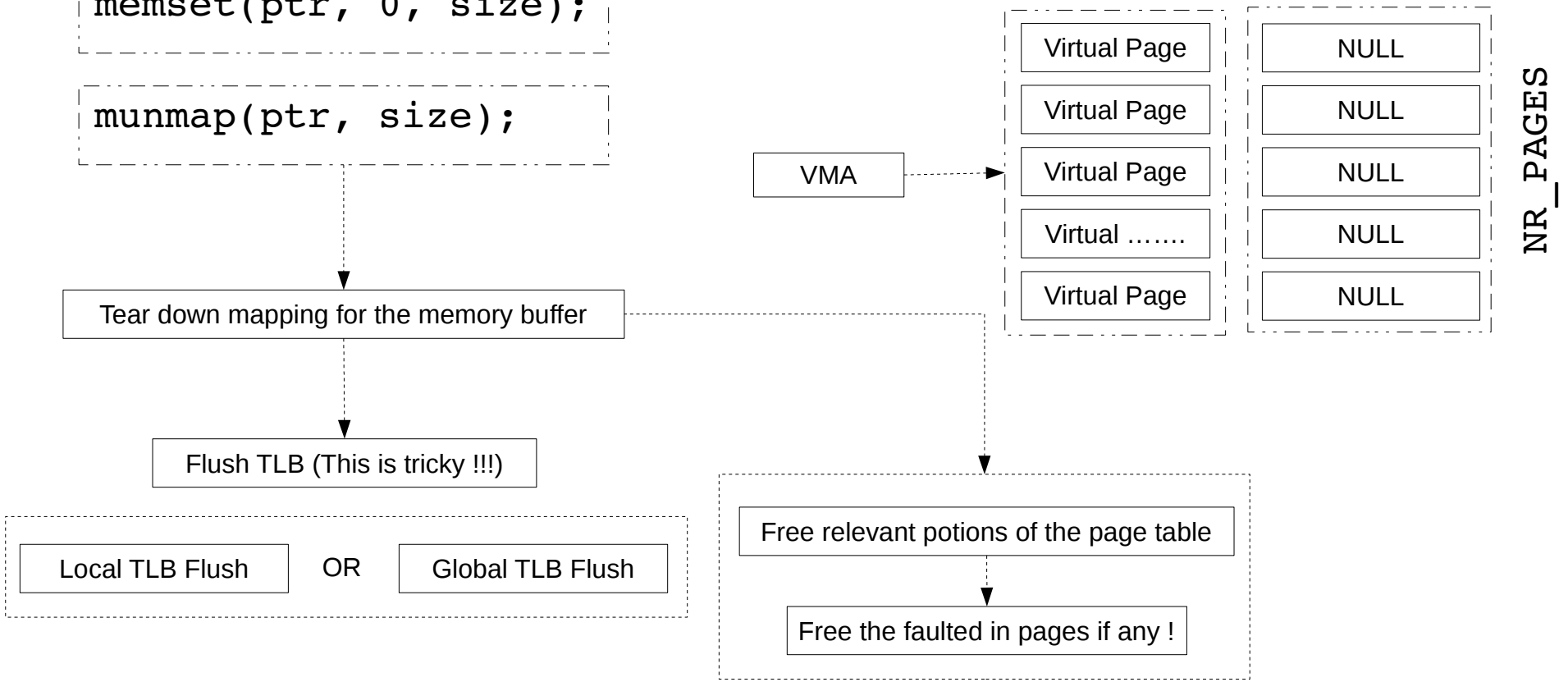

Thank You