

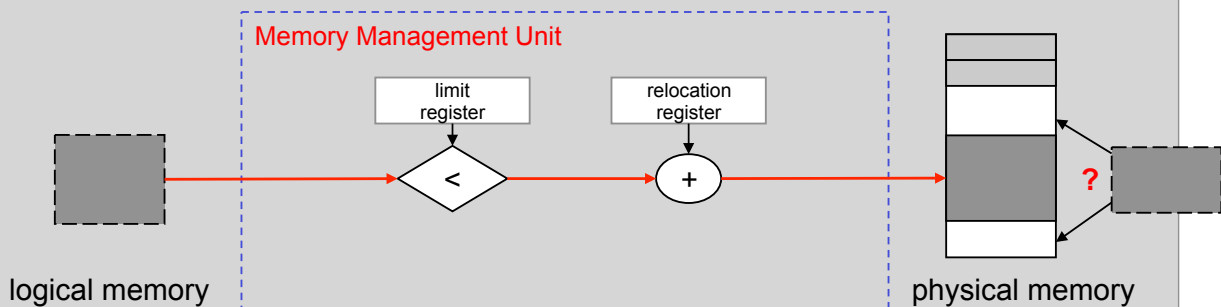
Paging

- Memory Relocation and Fragmentation
- Paging
- The Memory-Lookup process in hardware
- Paging and Internal Fragmentation

Paging

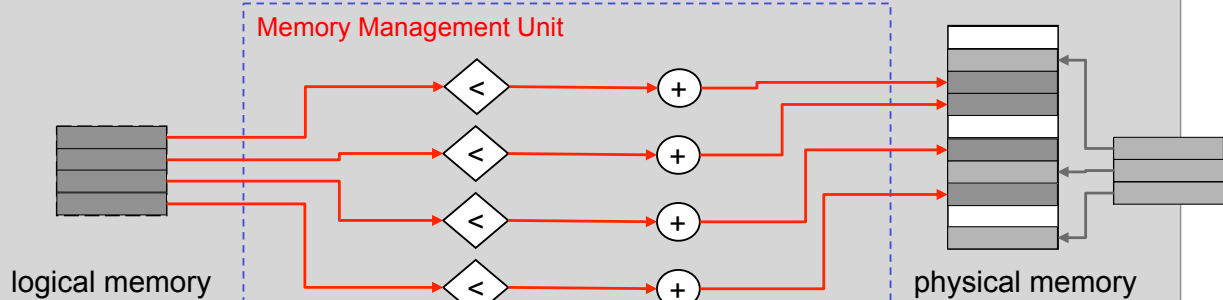
Observation: Naïve relocation causes (external) fragmentation.

simple relocation

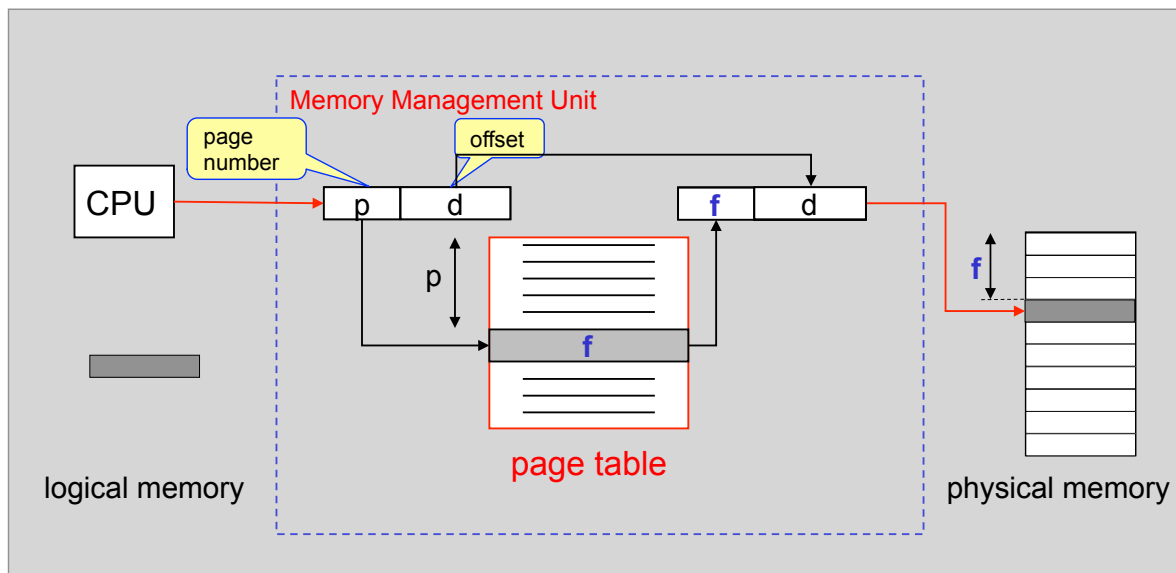


Paging

Solution: Partition memory into equal-size portions.

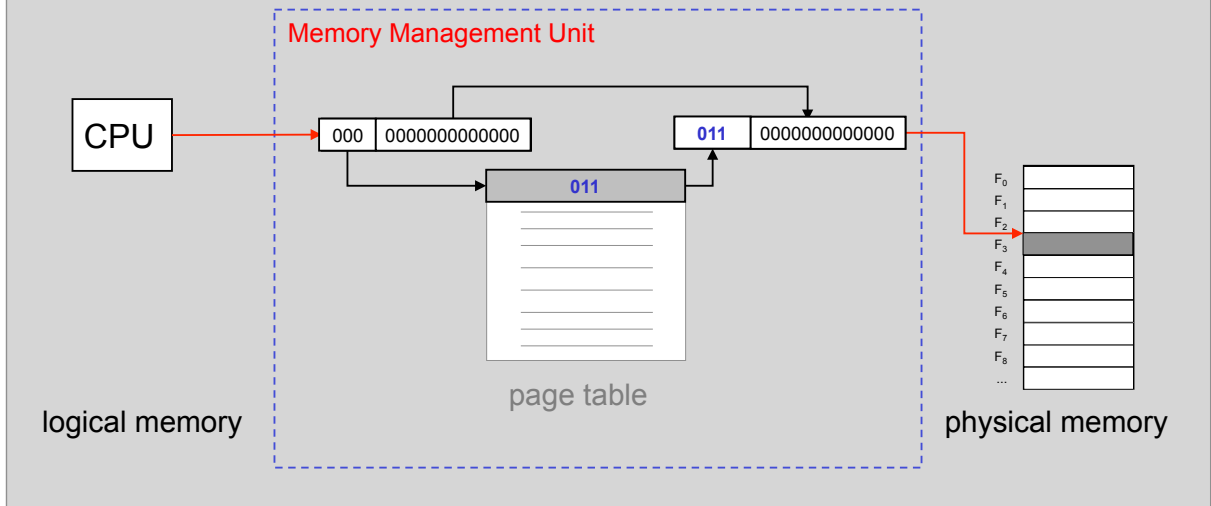


Paging in Hardware



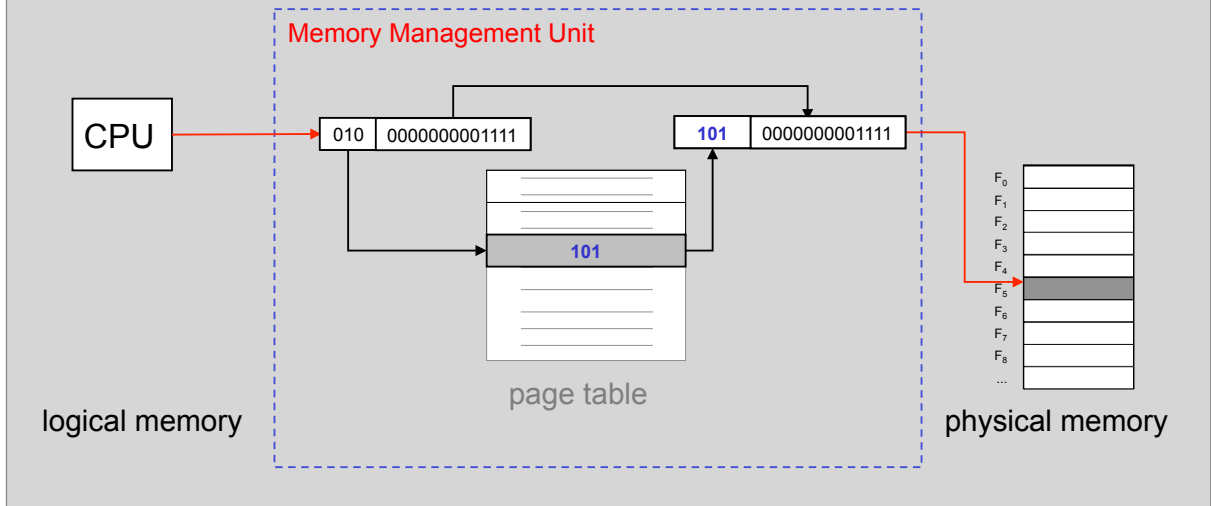
Paging Address Resolution: Example

Example: PDP-11 (16-bit addresses, page size 8kB => 64kB address space, with 8 pages)

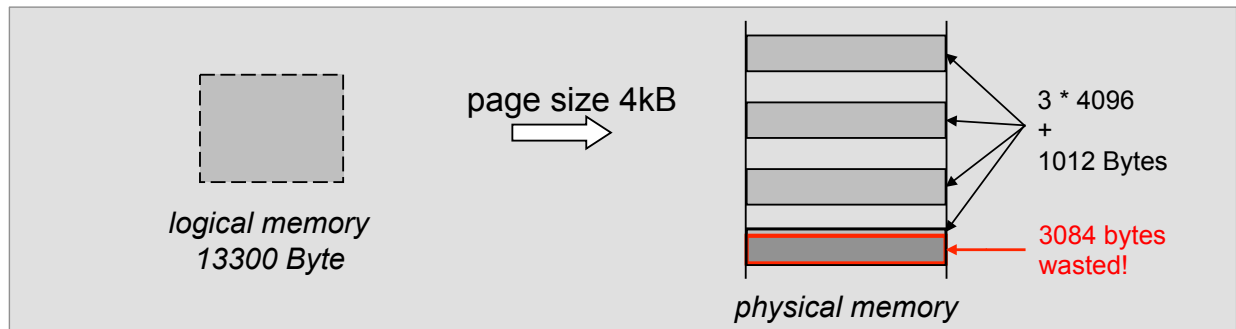


Paging Address Resolution: Example 2

Example: PDP-11 (16-bit addresses, page size 8kB => 64kB address space, with 8 pages)



Internal Fragmentation in Paging



- **Observation:** Last frame may not be completely full.
- **General Rule:** Average internal fragmentation per block is typically half frame size.
- **Q:** Frames: large or small?!
 - Large frames cause more fragmentation.
 - Small frames cause more overhead (page table size, disk I/O)

Paging: Summary

- Paging eliminates External Fragmentation
- The Memory-Lookup process in the MMU
- Paging allows for large address spaces
- Paging does not completely eliminate Internal Fragmentation