Memory Protection:

Memory Management Unit

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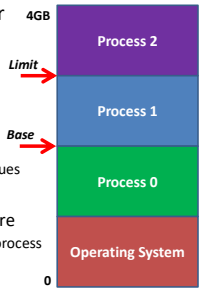
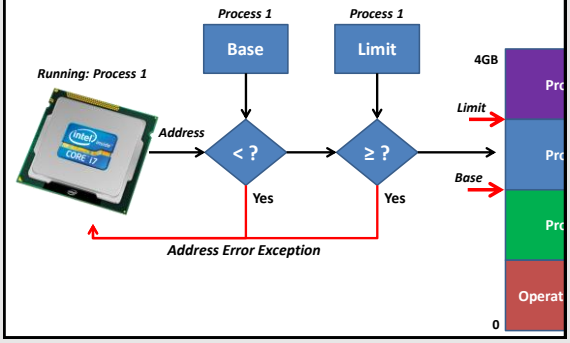
Simple Protection: *Base and Limit*

- Protect processes from each other
- For every memory access, can enforce a *Base* and *Limit*
  - Easy to handle in hardware
    - Test requested address between set values
  - Simple to set two registers in software
    - OS sets *base* and *limit* when switching process



2

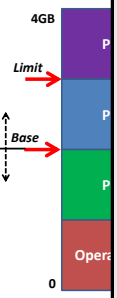
Base and Limit Handling



3

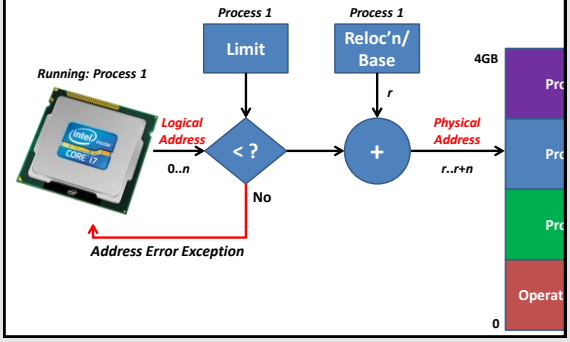
Separate Address Spaces

- Processes expect zero-based addresses, 0..*n*
  - Addresses change between runs
    - Process can be loaded in different places each time
  - Base and Limit leaves location of process visible
- Ideally we'd dynamically re-map addresses
  - **Logical Address** used in code
    - Process always sees addresses in range 0…*n*
  - **Physical Address**, where data actually stored
    - Varies depending on where process loaded in memory



4

Relocation Registers



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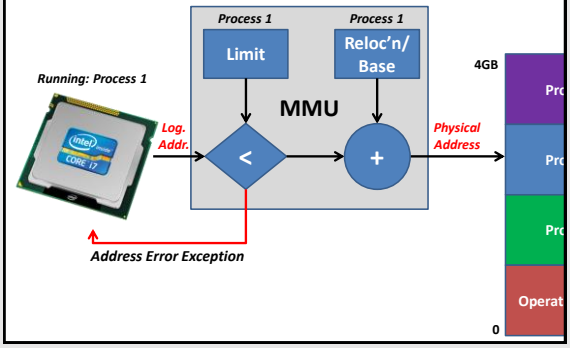
Memory Management Unit (MMU)



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