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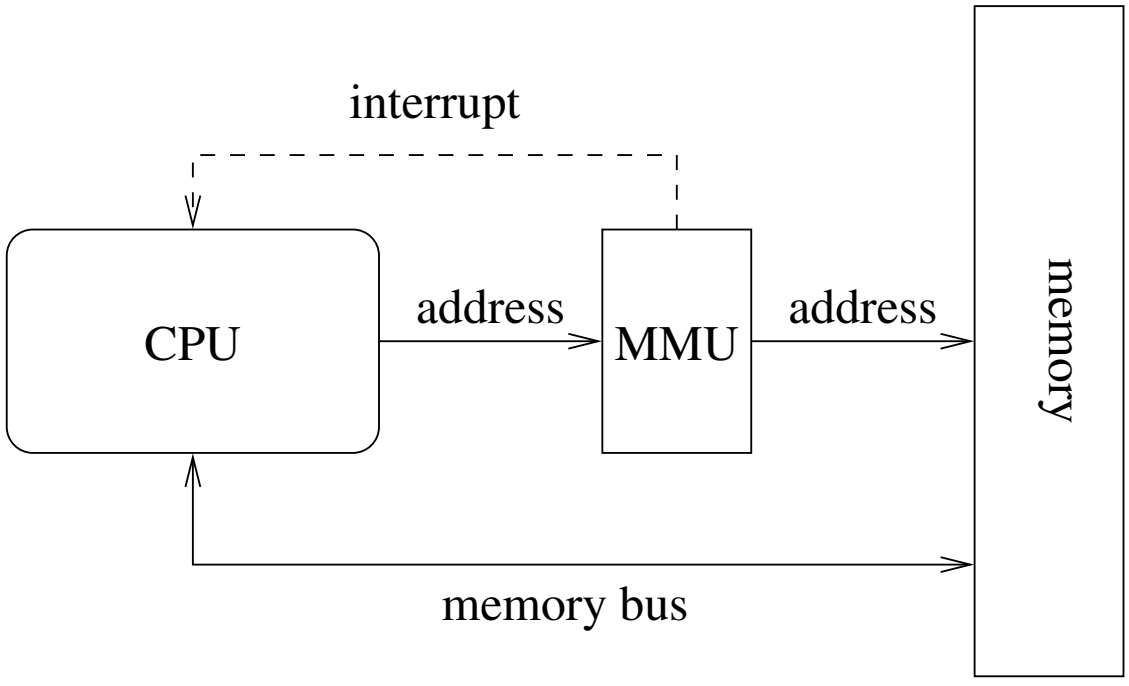
There is a table of flags in a special piece of hardware: the *memory management unit* (MMU). These flags say whether the *currently running* (user mode) program can read or write a given area of memory

History



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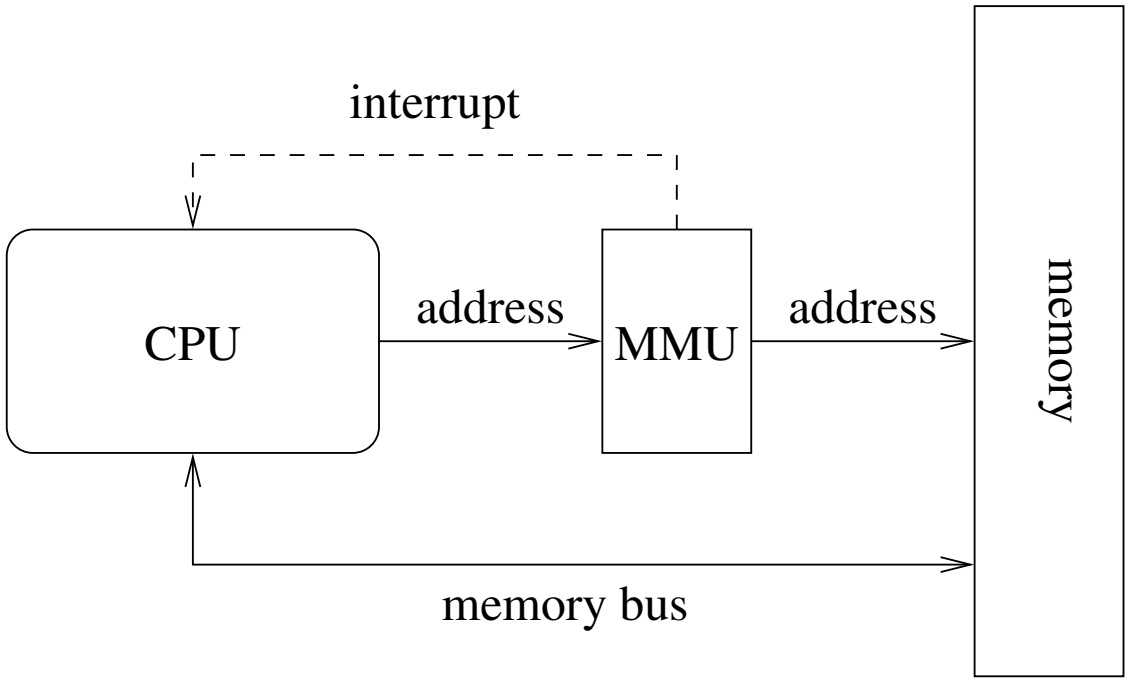

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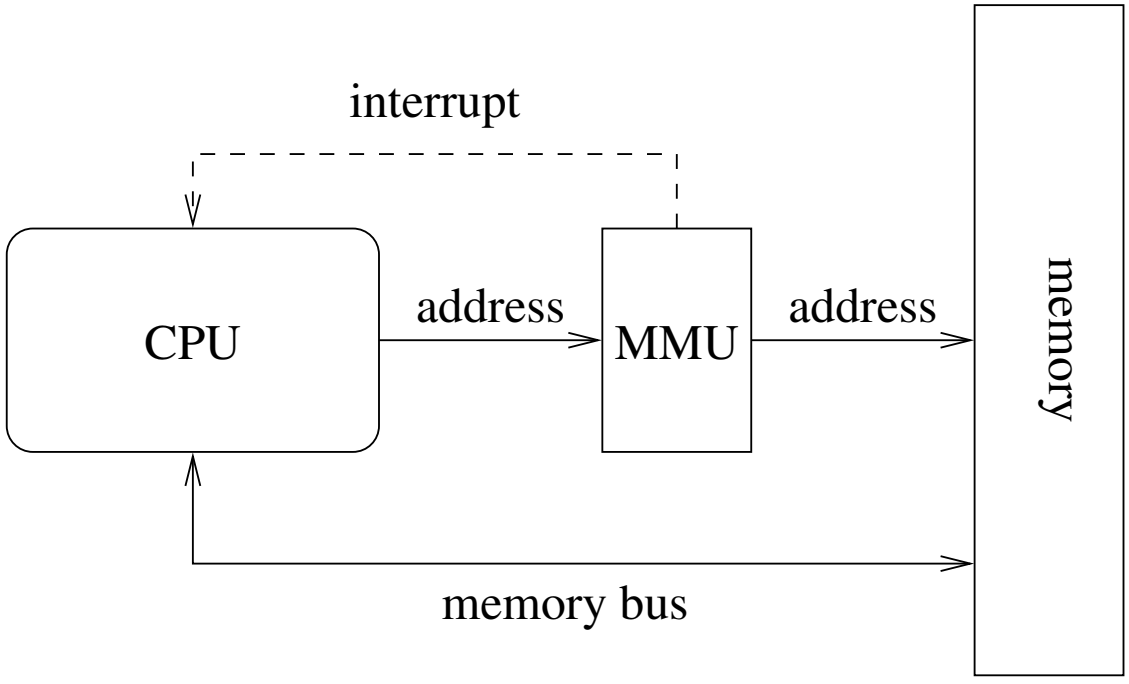

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It is often useful to separate ability to read from ability to write

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A page is just a contiguous area of memory: 4096 bytes is popular on modern machines, though current hardware can support 4MB pages

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There is usually also an *executable* flag: can you execute code from this memory address?

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This we shall cover later, but it builds on the ideas above and provides a much more flexible method of protection

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  - also files, network data, . . .
- Efficiency
  - in particular with regards to time
  - also size, energy, . . .

History

By making privileged operations *only* available to the OS, the OS can enforce policy on access and ensure fair distribution of shared resources

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- MacOS. MacOS X is a Unix derivative (BSD), from 1999 onwards. Earlier systems (MacOS 9 and earlier) were completely different, with no preemption, only cooperative

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- OS/2. Initially from Microsoft and IBM (1997), then just IBM as Microsoft went off to do its own thing. Intended to be the followup to DOS. Multitasking when the hardware could support it: OS/2 2.0 (1992) could run multiple copies of DOS/Windows simultaneously. Previously used a lot in bank ATMs (until IBM ended support in 2006). OS/2 3.0 became Windows NT

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In contrast, in the embedded market are things are much more mixed, with both purpose-built OSs and slimmed-down derivatives of the general-purpose OSs all having major representation

History

With Windows, rebooting is the first thing an admin tries to fix a problem; with Unix, it's the last

Anon.

□