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We shall start by looking at general hardware protection mechanisms

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- Unprivileged. Normal computation, called *user mode*
- Privileged. For systems operation, called *kernel mode*

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The latest Intel and AMD architectures added a Ring -1 (for OS virtualisation)

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For example, the OS may decide to disallow the operation, and kill the program (i.e., not run it any more)

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5. The program executes a special “call OS” (or *syscall*) instruction that jumps to the OS
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7. The OS decides what to do next

Of course, even if the program does not do a syscall, a timer interrupt will come along at some point, anyway

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This to-ing and fro-ing between modes ensures that the OS is running in privileged mode and the user program is running in unprivileged mode

And the user program can never manage to get into privileged mode as every transition to privileged mode is tied by the hardware to a jump to the OS

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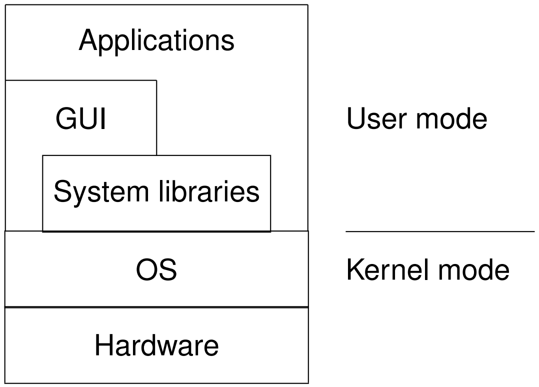

There is a strict divide between kernel (OS) code and user code, controlled by the hardware

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The `open` system library function simply hides these details from the programmer

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