CIS 452 - Operating Systems Concepts
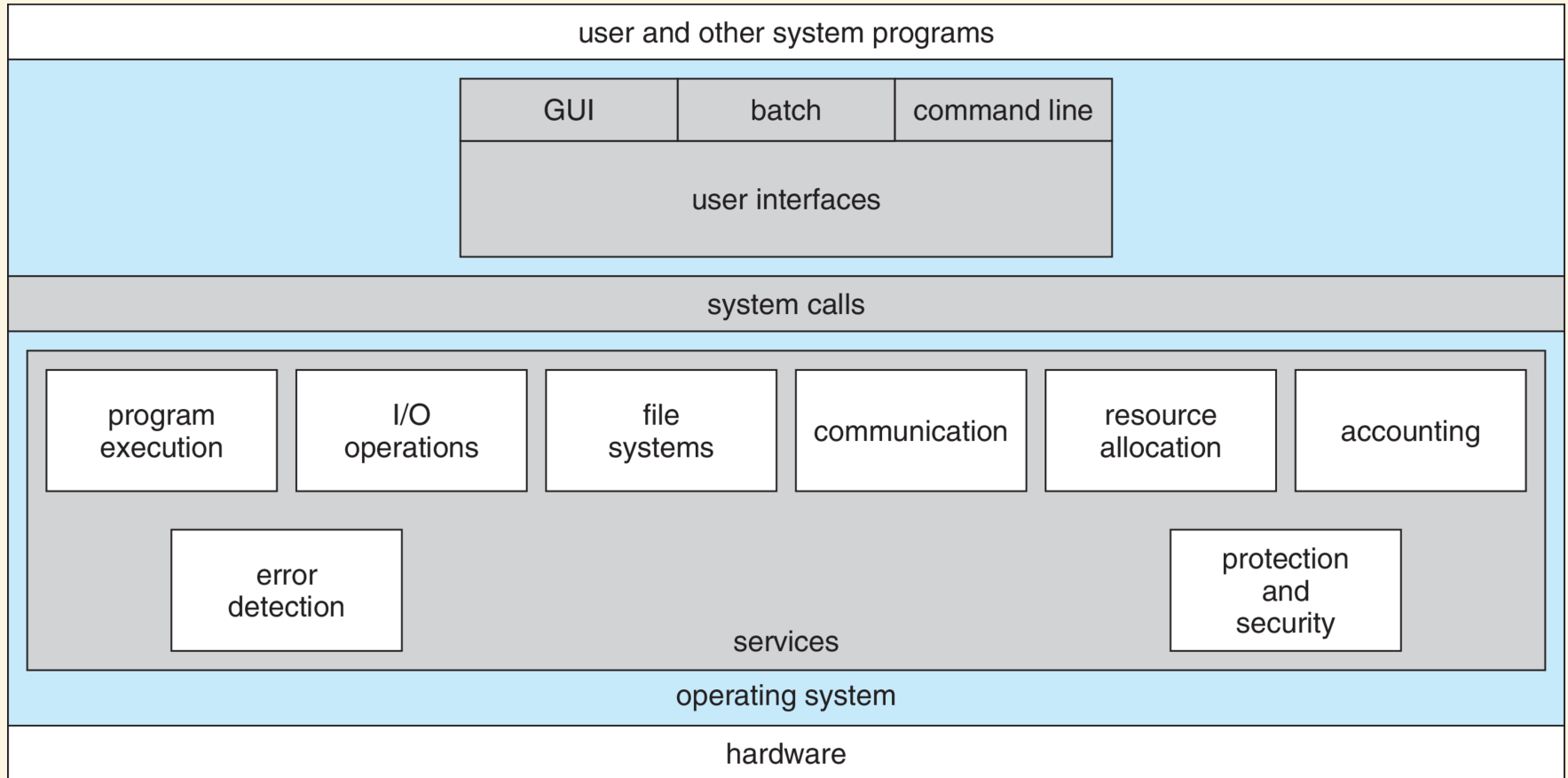
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Images taken from Silberschatz book

System Calls

Recall second purpose of OS: provide convenient environment

user and other system programs

	GUI	batch	command line	
	user interfaces			

system calls

program execution	I/O operations	file systems	communication	resource allocation	accounting

error detection		protection and security

services

operating system

hardware

OS has functions for all these wonderful features, but user-mode processes cannot access them directly

User-mode process issues **system call** to request that OS provide particular service

"System call" often used interchangeably to refer to the service provided, the function for providing it, or the act of requesting the service. These are closely related and meaning should be clear from context

How often does user program require system calls?

Here's an example of what it takes to perform a file copy

source file → destination file

Example System Call Sequence

Acquire input file name
  Write prompt to screen
  Accept input
Acquire output file name
  Write prompt to screen
  Accept input
Open the input file
  if file doesn't exist, abort
Create output file
  if file exists, abort
Loop
  Read from input file
  Write to output file
Until read fails
Close output file
Write completion message to screen
Terminate normally

The system services are written in assembly or C and presented to the user as system calls (like a low-level API)

However, programs almost never use system calls directly. Libraries are provided (often `libc`) that

- take care of some of the lower-level details
- make code more portable

Writing against `libc` instead of directly using system calls ensures your code can run on any machine with a `libc` implementation

Example `libc` function

```c
char *getcwd(char *buf, size_t size);
```

You can find these library calls with

`man 3 [function]`

From a Linux system, you can read

`man 2 intro`

and

`man 2 syscalls`

for a brief overview and a list of available system calls

Implementing system calls

Special instruction in CPU to pass control to OS

Parameters can be passed directly in registers if there are few

Often, parameters stored in a table in memory and address of that table passed to OS in a register

Stack can also be used