TDDB68/TDDE47
Concurrent Programming and Operating Systems

Lecture 1, part 5:
Dual mode and system calls

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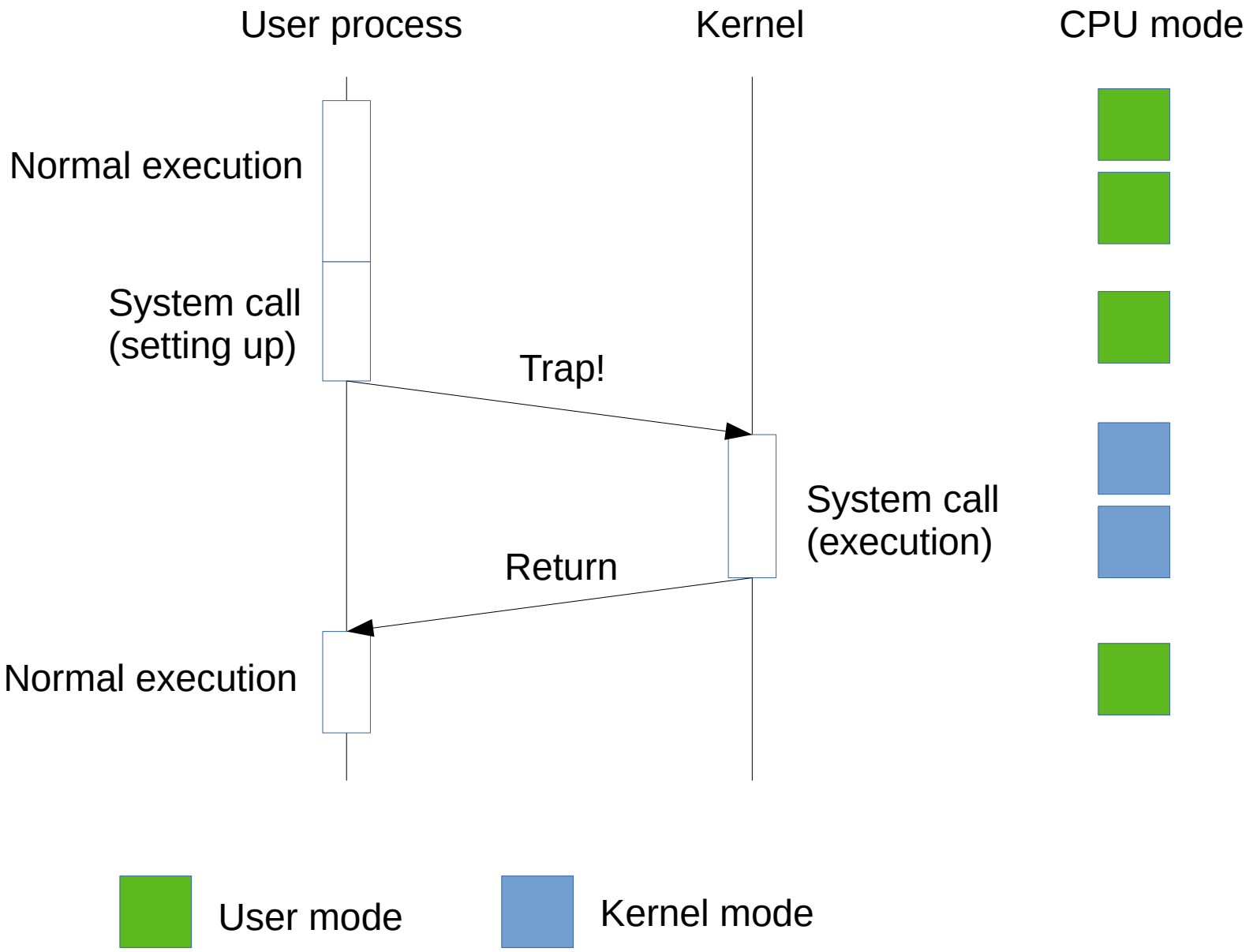
Dual mode


User process
Kernel
CPU mode
Normal execution
System call
(setting up)
Trap!
System call
(execution)
Return
Normal execution
User mode
Kernel mode

Types of System Calls

- **Process control**
  load, execute, end, abort, create, terminate, wait ...
  memory allocation and deallocation
- **File management**
  open, close, create, delete, read, write, get/set attributes...
- **Device management**
  request / release device, read, write, ...
- **Information maintenance**
  get / set time, date, system data, process / file attributes
- **Communications**
  create / delete connection, send, receive, ...

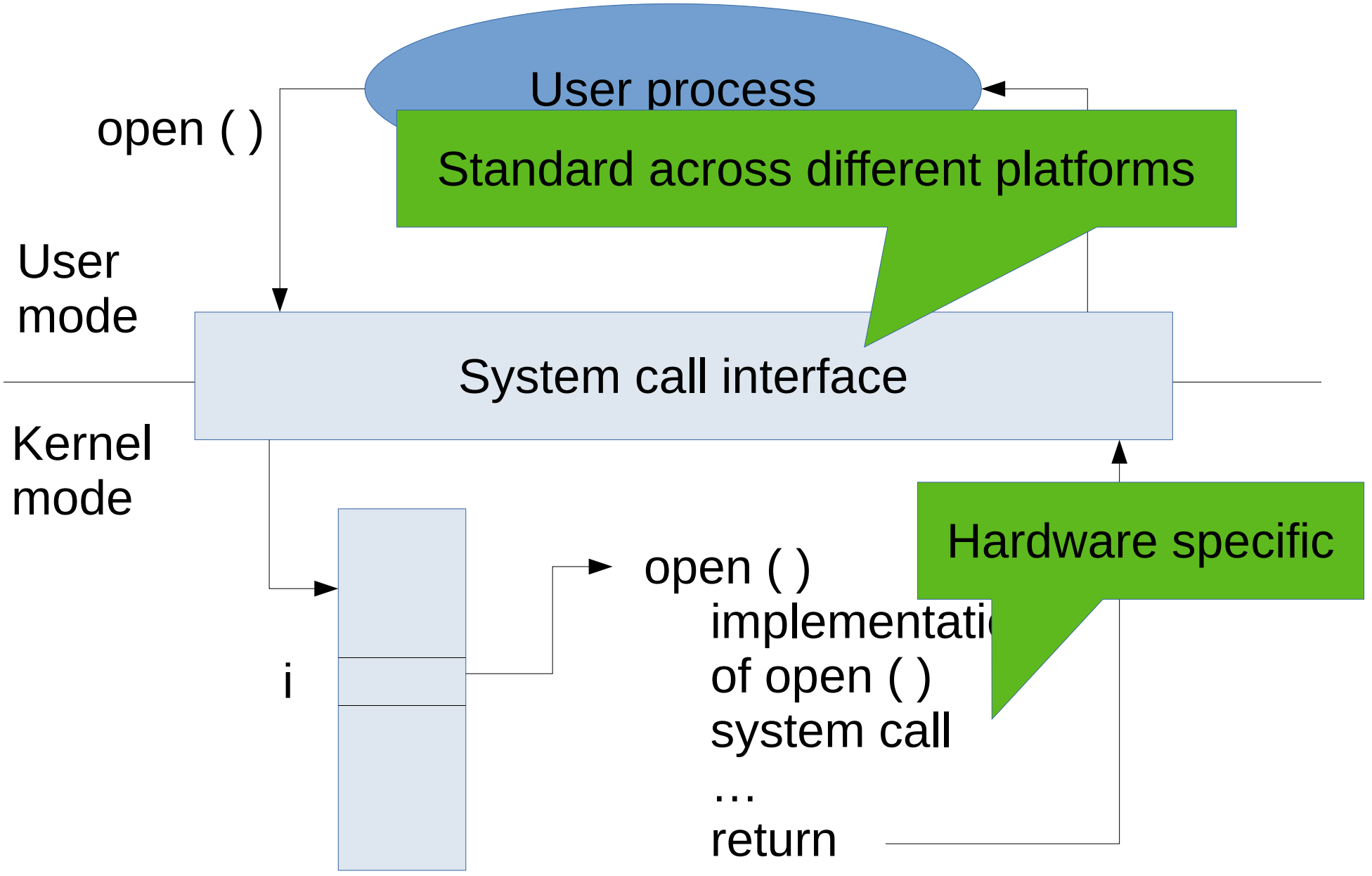
Syscalls In Linux

(man syscalls)

Tracing system calls

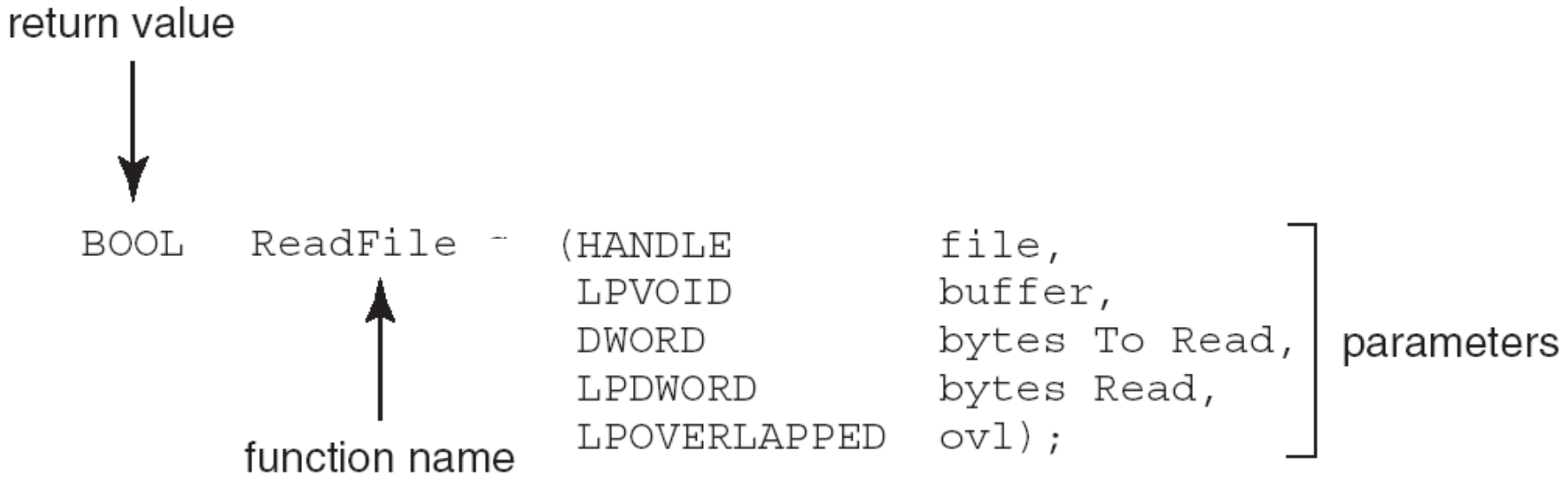
Linux – ltrace
Mac OSX - dtrace

System Call API – OS Relationship



Example of a System Call API

- ReadFile() function in Win32 API (function for reading from a file)



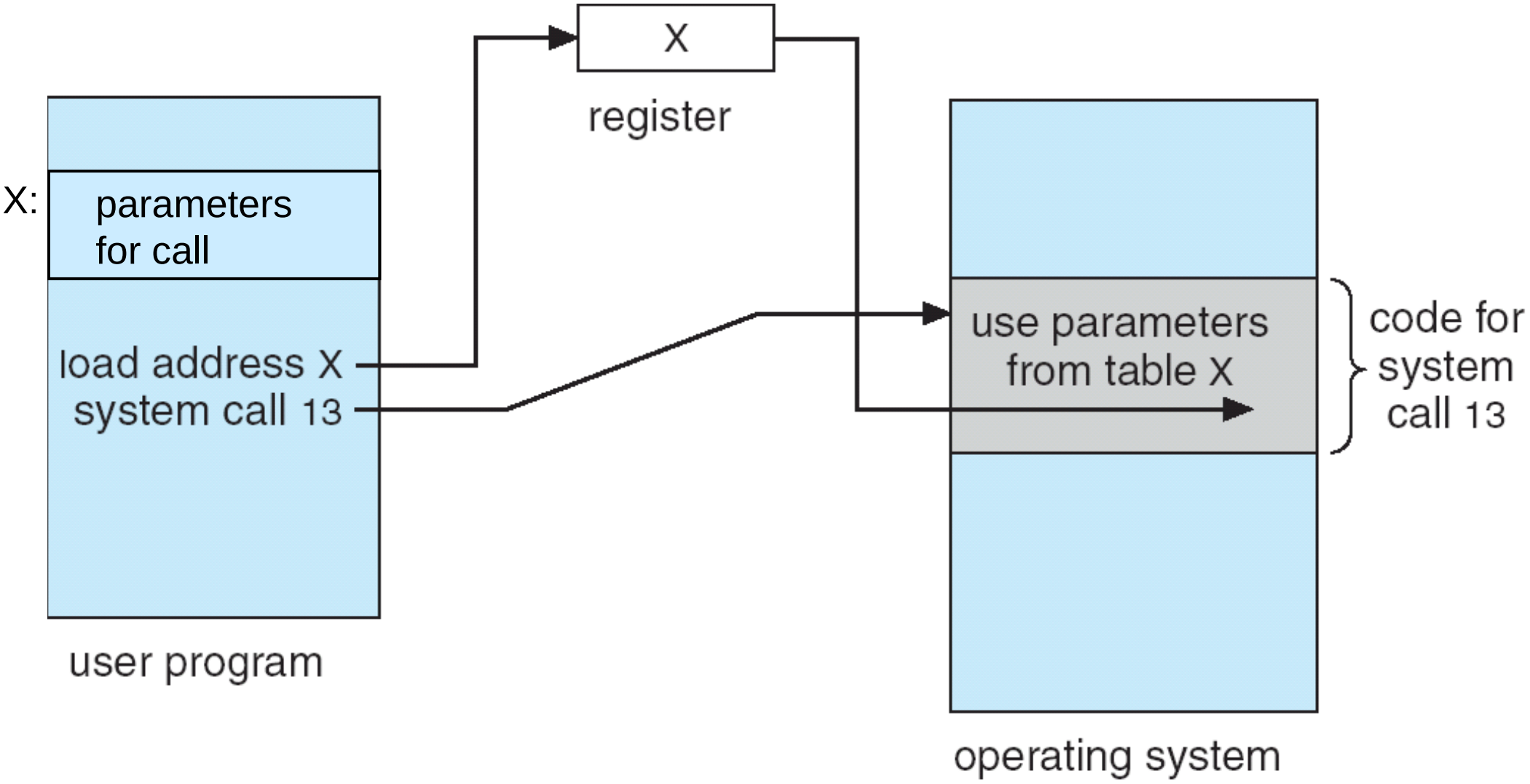
- Parameters passed to ReadFile():
  - file — the file to be read
  - buffer — a buffer where the data will be read into and written from
  - bytesToRead — the number of bytes to be read into the buffer
  - bytesRead — the number of bytes read during the last read
  - ovl — indicates if overlapped I/O is being used

System Call Parameter Passing

- Three general methods used to pass parameters to syscalls:
  - Parameters **in *registers***
  - Parameters **in a *block in memory***, and address to block in a register
    - This approach taken by Linux
  - Parameters ***pushed onto the stack***

- What are the advantages/disadvantages?

System Call Parameter Passing via Block



Summary

- **Operating System** = OS Kernel + System Programs
  - Mediates all accesses to system resources
  - **Interrupt**-driven
    - Error handling
    - Controlled access to system resources, e.g.
      - I/O devices, DMA
      - CPU time sharing
    - …
- **Dual-Mode** (user mode, kernel mode)
  - **System Call** API for portability

Reading guidelines

- 9th edition
  - Chapter 1: Sections 1.1-1.7
  - Chapter 2: 2.3-2.5
- 10th edition
  - Chapter 1: 1.1-1.5
  - Chapter 2: 2.3-2.4

What's next?

- **Monday**
  - Sign up in Webreg!
  - Get the book
- **Tuesday**
  - 13-17 Introductory C lecture
  - Try some C programming
- **Thursday**
  - 8-10 lesson to introduce the labs
- **Friday**
  - First lab (lab0)