

CSE 451: Operating Systems

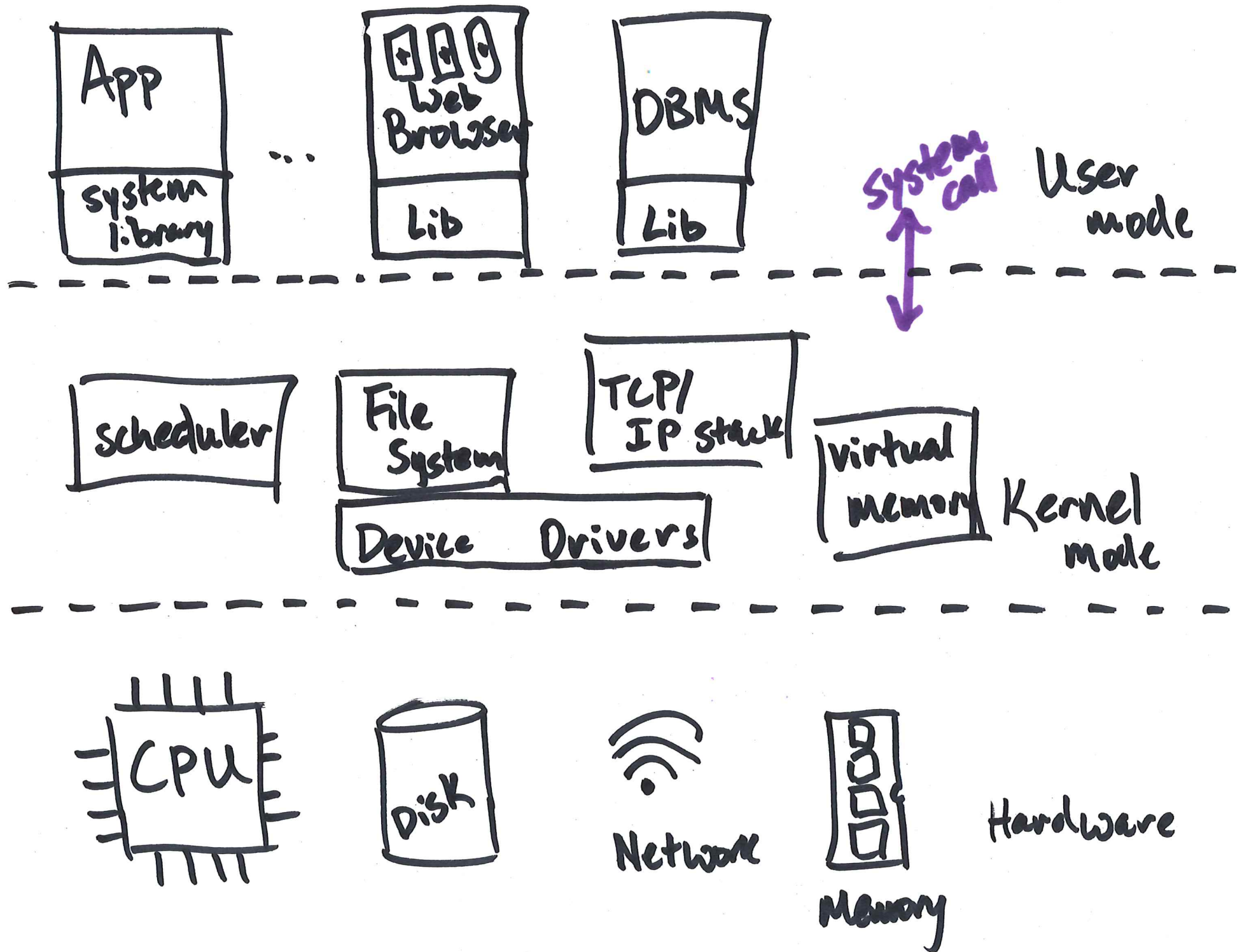
lec 1.1

What is an OS? (You tell me!)

Software to manage a computer's resources for users + applications.

Three roles of an OS:

- **Referee**: enforce "the rules"; isolation; communication
- **Illusionist**: give appearance of unlimited resources
virtualization
- **Glue**: provide library functions for common tasks
IO, UI, ...



OS Challenges

- Reliability / Availability
- Portability (of Apps, of OS)
- Security
- Performance
- Adoption

OS code must be ~ perfect
even w/ buggy or malicious Apps

Server	performance 1981	over 1997	time 2014	2025
10 ⁶ inst/s (MIPS)/core	1	200	2500	5000
CPUs	1	1	10+	100+
MIPS/\$	\$100K	\$25	\$0.20	\$0.02
DRAM/\$ MiB	0.002	2	1K	2K
Disk/\$ GiB	0.003	7	25K	100K
Network (server)	10 Mbps shared	100 Mbps switched	10 Gbps switched	400 Gbps switched

Brief History of OS

50s: I/O libraries

60s: batch processing
multi tasking

70s: time sharing

80s: personal computers

90s: the Internet/Web
takes off

2000s / 2010s: servers, clusters, cloud
smart phones

1969: Unix

1981: MS-DOS

1991: Linux

1993: Windows NT

1997: Mac OS X

An OS is expected to live
for decades

Why take this class?

- Improve your mental model of how software works
- Lots of transferable skills:
 - debugging
 - design
 - concurrent programming
- Many other systems "look like" an OS
 - Browser
 - Cloud managers
 - DBMS
 - distributed systems
 - Kubernetes

Course Organization

disorganized

- 4 labs ~ every 2 weeks
- w/ partner
- + design doc
- ~8 problem sets ~ weekly
- Final Exam
 - open note, closed book

grading scale
- additive points

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- Textbook: OSPP by Tom Anderson + Mike Dahlin
 - Labs based on xK "experimental Kernel"
xv6

Warning: Many pieces of an OS
depend on each other

- we have to start somewhere
- first couple weeks will feel lost;
that's normal 😊

How to make an OS?

Let's start simple: hello world "app"

What does this "app" need from OS?

- I/O

- call main()

What happens if app has a bug?

- infinite loop?

- out of memory?

If it's malicious?