Week 5
CS4973/CS6640
02/03 2025
https://naizhengtan.github.io/25spring/

- [x] 1. OS implementation: the first three steps
- [x] 2. OS organization
- [x] 3. egos desgin
- [x] 4. egos-2k+ (sifive_e) implementation

WHY NOW?

Lab3:

- bug/typo, ASSERT X
- too many printf ⇒ compilation error

Modern Operating Systems: Principles and Implementation

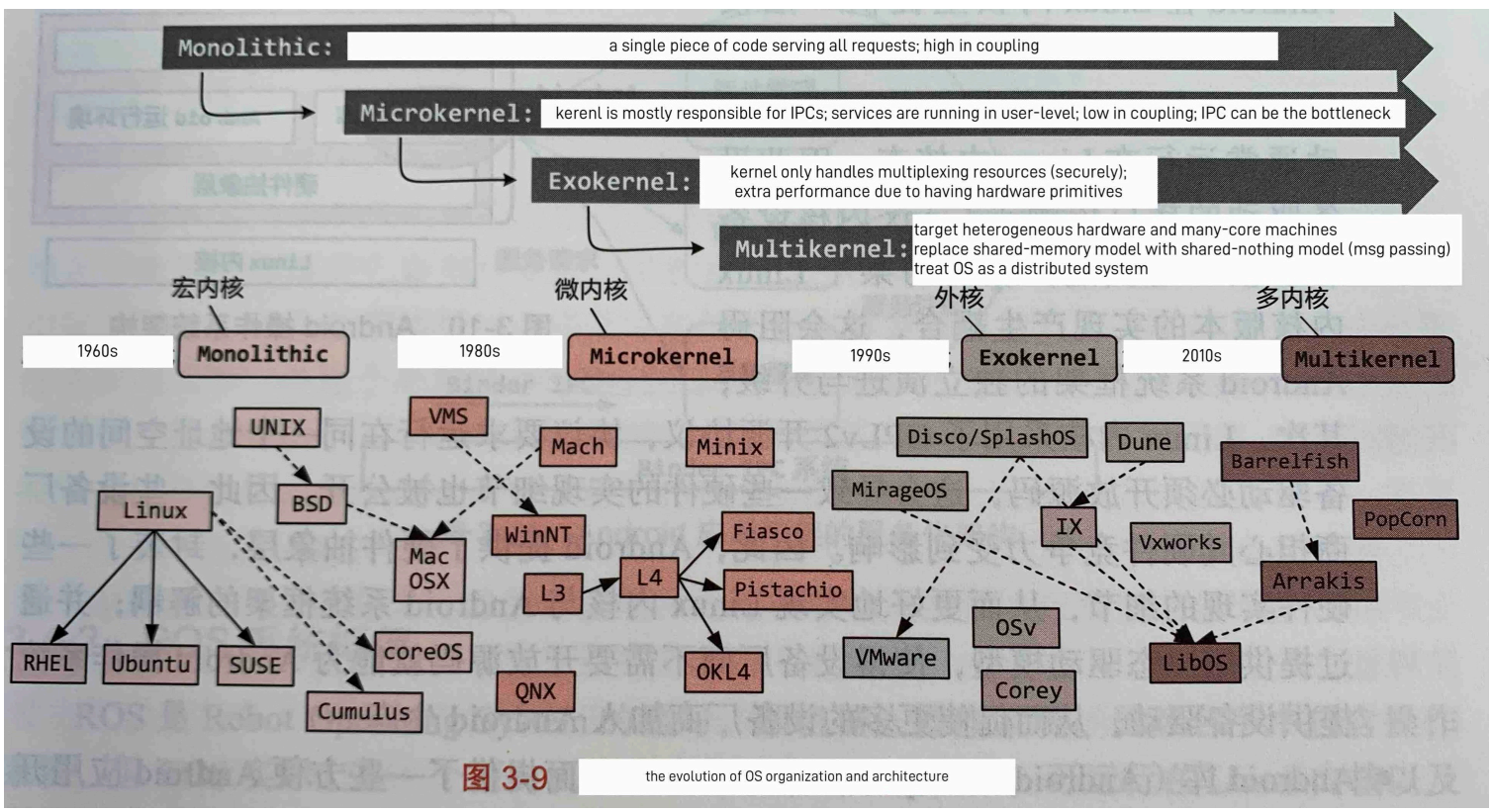
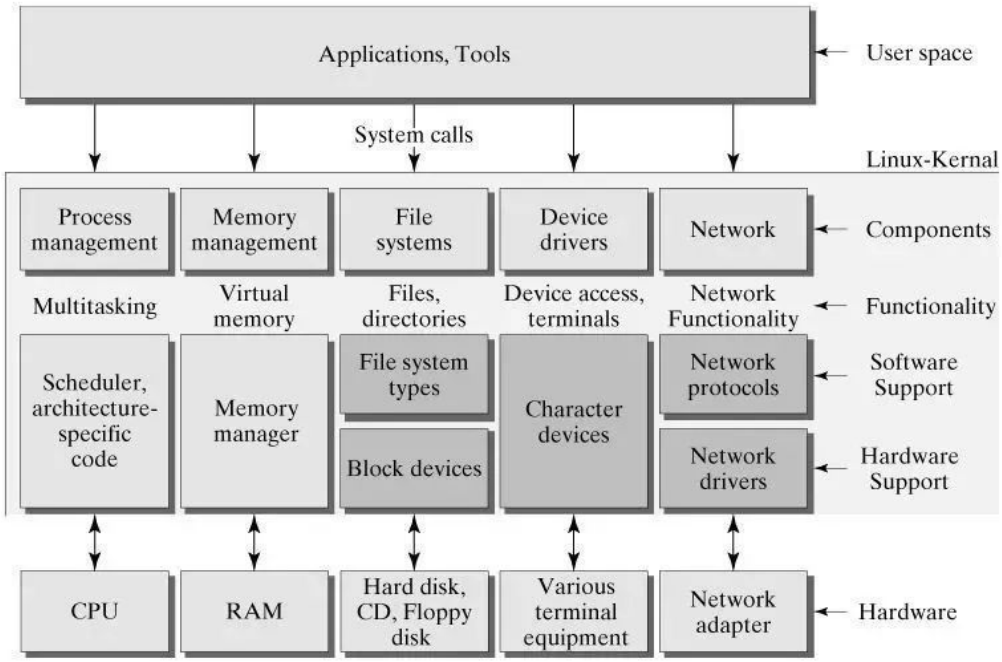


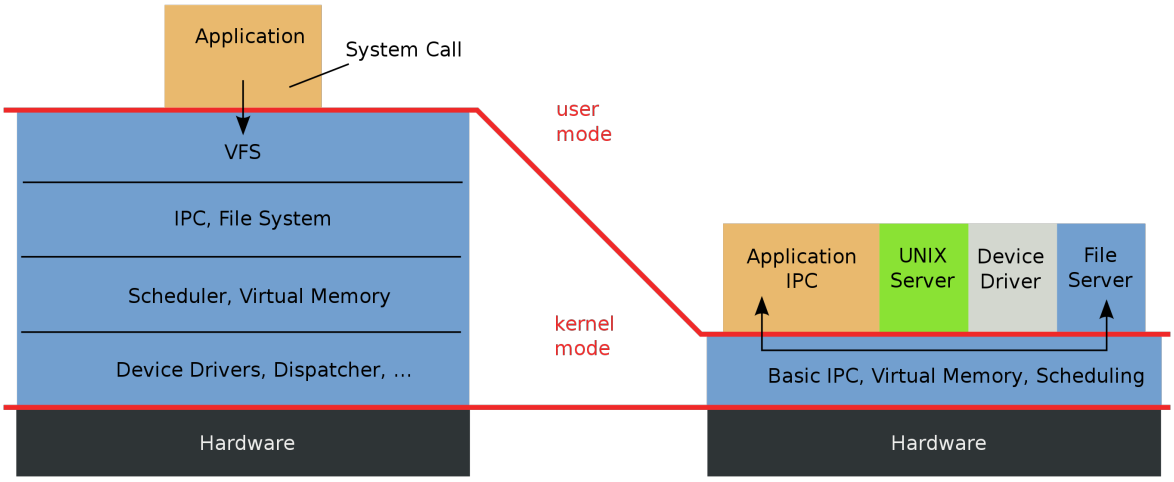
图 3-9 the evolution of OS organization and architecture

Linux kernel architecture



Monolithic Kernel
based Operating System

Microkernel
based Operating System



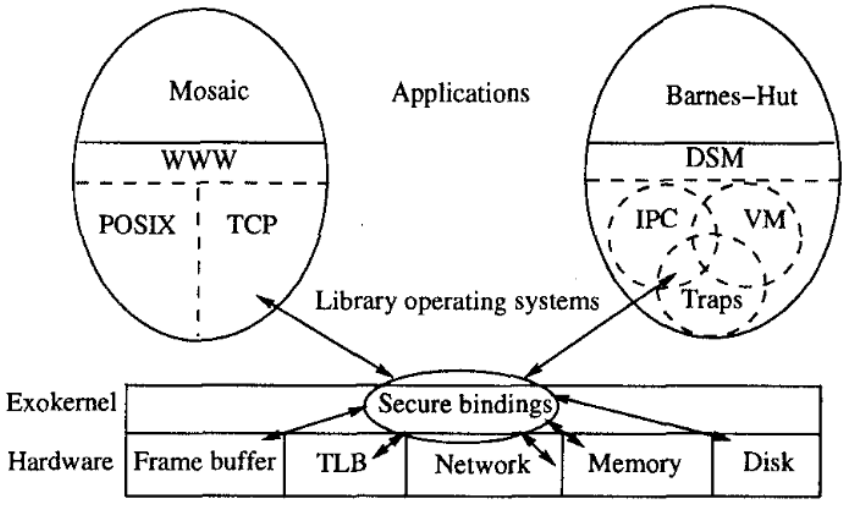


Figure 1: An example exokernel-based system consisting of a thin exokernel veneer that exports resources to library operating systems through secure bindings. Each library operating system implements its own system objects and policies. Applications link against standard libraries (*e.g.*, WWW, POSIX, and TCP libraries for Web applications) or against specialized libraries (*e.g.*, a distributed shared memory library for parallel applications).

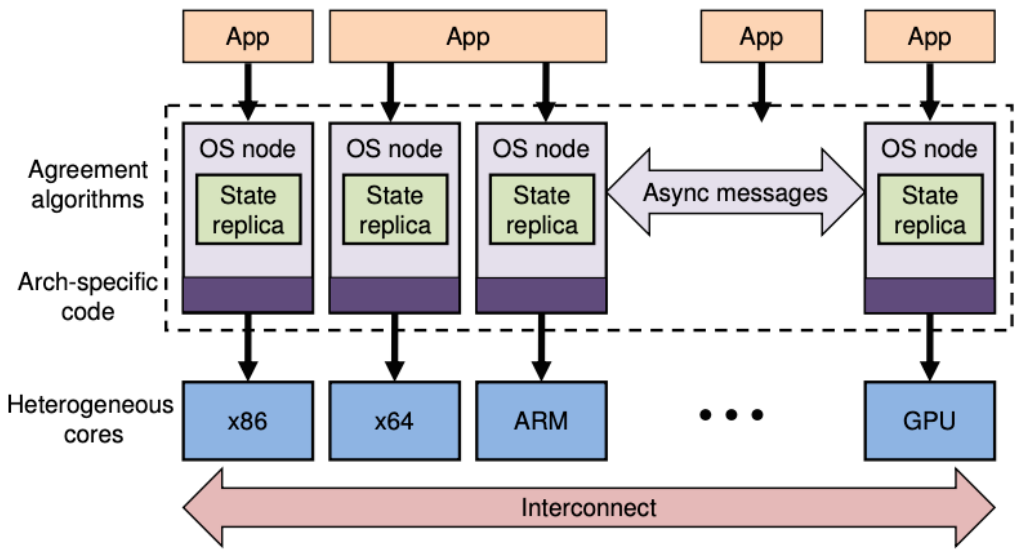
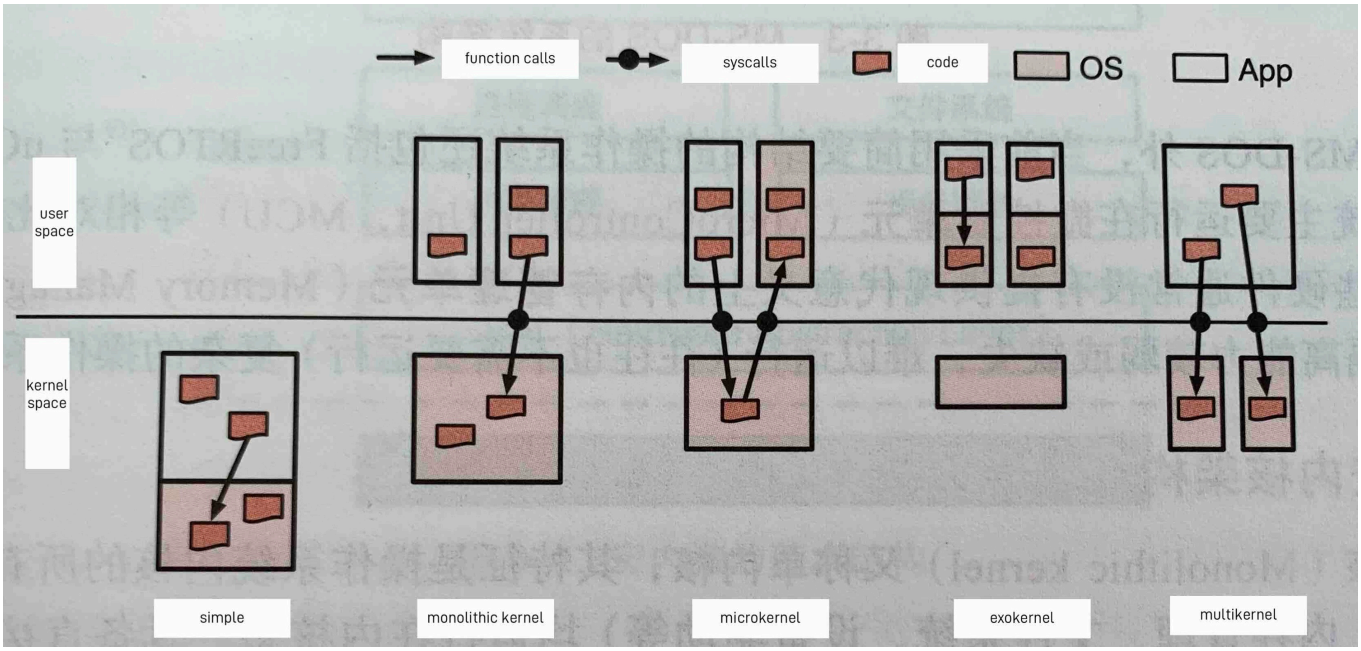
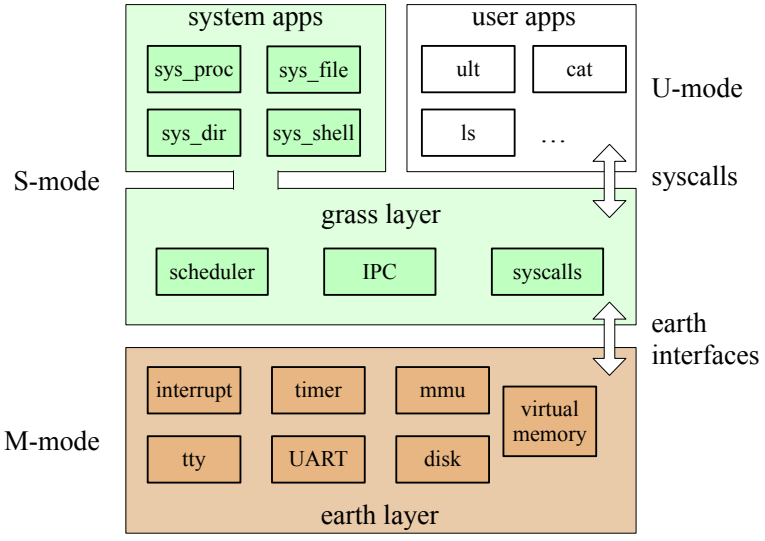


Figure 1: The multikernel model.


function calls
syscalls
code
OS
App
user space
kernel space
simple
monolithic kernel
microkernel
exokernel
multikernel

OSI Handout Week 5

1. egos architecture



2. egos-2k+ (sifive_e) booting process

```
1    -------- Simulate on QEMU-RISCV --------
2    cp build/release/earth.elf tools/qemu/qemu.elf
3    riscv64-unknown-elf-objcopy --update-section
        .image=tools/disk.img tools/qemu/qemu.elf
4    qemu-system-riscv32 -bios none -readconfig
        tools/qemu/sifive-e31.cfg -kernel tools/qemu/qemu.elf -nographic
5    [CRITICAL] ------------- Booting -------------
6    [SUCCESS] Finished initializing the tty device
7    [INFO] Use direct mode and put the address of trap_entry() to mtvec
8    [SUCCESS] Finished initializing the CPU interrupts
9    [SUCCESS] Finished initializing the timer function
10   [SUCCESS] Finished initializing the disk device
11   [SUCCESS] Finished initializing the CPU memory management unit
12   [INFO] Grass kernel file size: 0x00002708 bytes
13   [INFO] Grass kernel memory size: 0x00002c90 bytes
14   [CRITICAL] Enter the grass layer
15   [INFO] Load kernel process #1: sys_proc
16   [INFO] App file size: 0x00001330 bytes
17   [INFO] App memory size: 0x00001740 bytes
18   [SUCCESS] Enter kernel process GPID_PROCESS
19   [INFO] Load kernel process #2: sys_file
20   [INFO] App file size: 0x000027c0 bytes
21   [INFO] App memory size: 0x00002814 bytes
22   [SUCCESS] Enter kernel process GPID_FILE
23   [INFO] sys_proc receives: Finish GPID_FILE initialization
24   [INFO] Load kernel process #3: sys_dir
25   [INFO] App file size: 0x00000fb4 bytes
26   [INFO] App memory size: 0x000013bc bytes
27   [SUCCESS] Enter kernel process GPID_DIR
28   [INFO] sys_proc receives: Finish GPID_DIR initialization
29   [INFO] Load kernel process #4: sys_shell
30   [INFO] App file size: 0x000006e0 bytes
31   [INFO] App memory size: 0x000006e0 bytes
32   [CRITICAL] Welcome to the egos-2k+ shell!
33   [INFO] proc 5 finished after 0 yields, turnaround time: 0.00,
            response time: 0.00, cputime: 0.00
34   ➜ /home/cs6640 %
```

3. egos-2k+ (sifive_e) memory layout II