CSE3241: Operating System and System Programming

Class-27

Sangeeta Biswas, Ph.D.
Assistant Professor
Dept. of Computer Science and Engineering (CSE)
Faculty of Engineering
University of Rajshahi (RU)
Rajshahi-6205, Bangladesh
E-mail: sangeeta.cse@ru.ac.bd / sangeeta.cse.ru@gmail.com

January 23, 2018

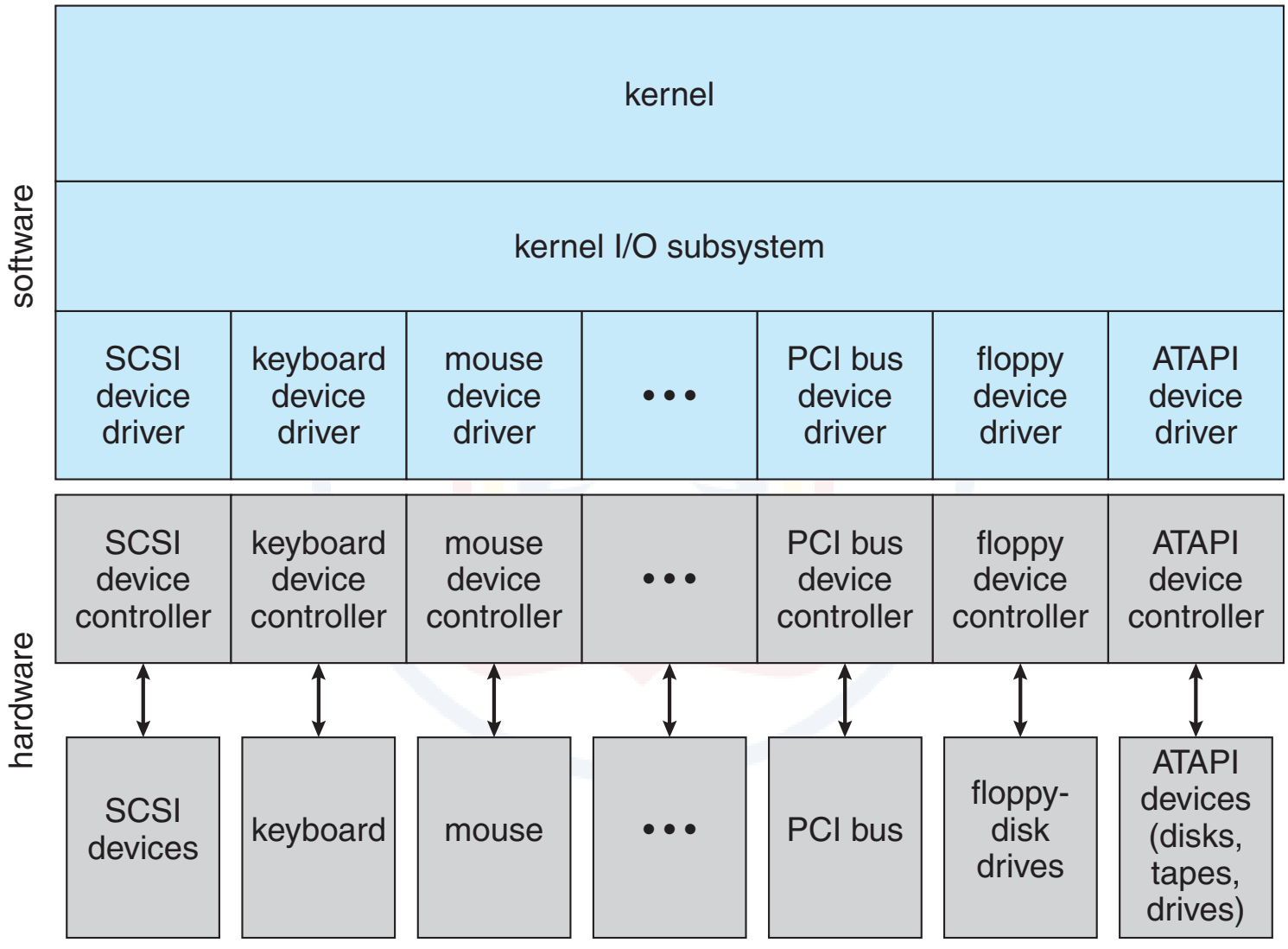
I/O Systems

- Many kinds of I/O devices are connected to our **beloved computer**.
  1. **Storage Device**: Hard Disk, Tape, Floppy Disk, Flash Memory.
  2. **Transmission Device**: Network Card, Modem
  3. **Human-Interface Device**: Screen, Keyboard, Monitor.
  4. **Specialized I/O Device**: Joy stick, Foot Padal.
- I/O devices are incredibly different from each other.
- Therefore, one headache of OS is how to manage I/O devices.
- OS has a special part called **kernel I/O subsystem**

Dimensions of Varieties of I/O Systems

- **Character-stream / Block**: Terminal / Hard Disk.
- **Sequential / Random Access**: Modem / CD-ROM.
- **Synchronous / Asynchronous**: Tape / Keyboard.
- **Sharable / Dedicated**: Keyboard / Terminal.
- **Speed of Operation**: Keyboard / Hard Disk.
- **Read-Write / Read-Only / Write-Only**: Hard Disk / CD-ROM / Graphics Controller.

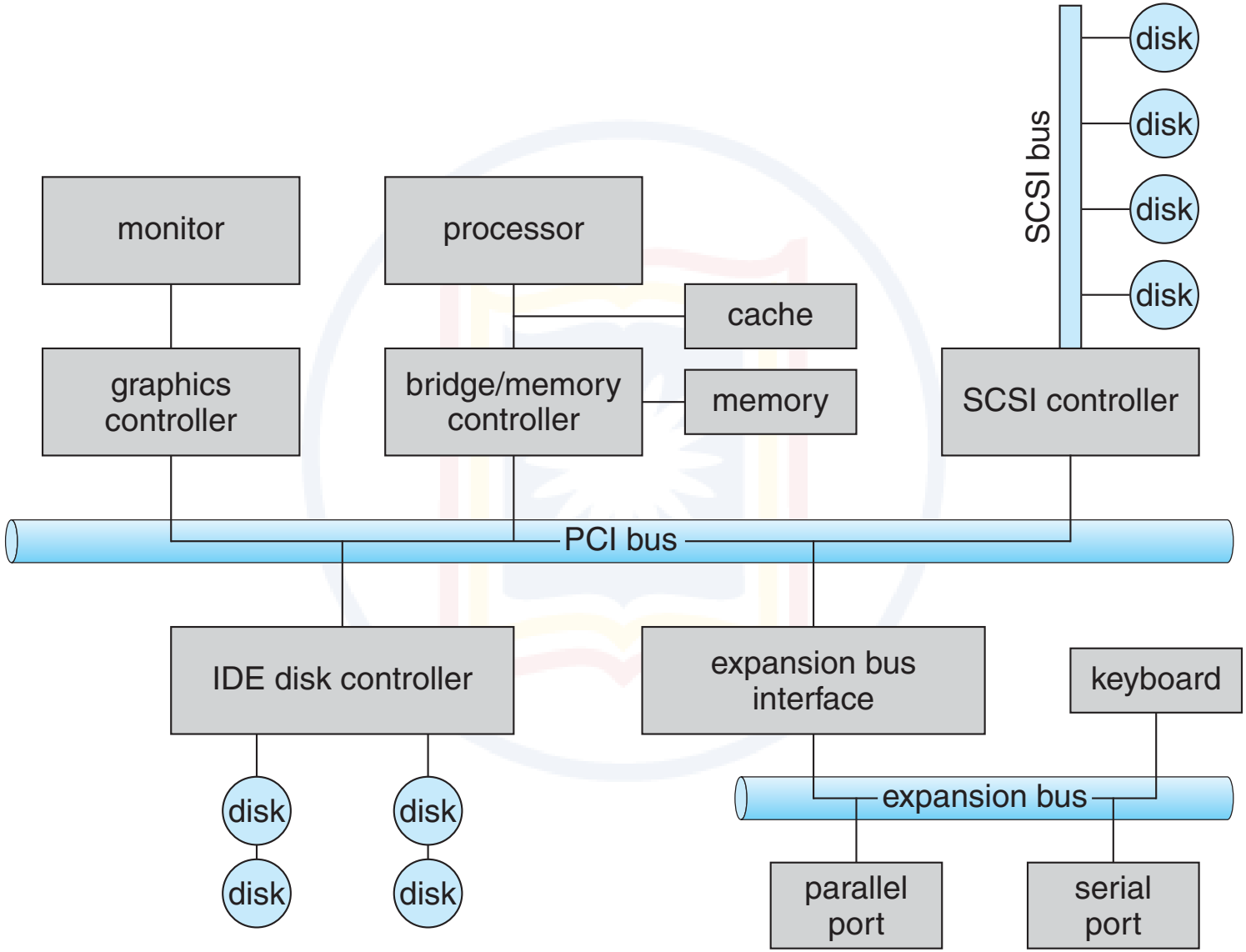
A Kernel I/O Structure [1]



Services Provided by Kernel I/O Subsystem

- I/O Scheduling.
- Buffering.
- Caching.
- Spooling and Device Reservation.
- Error Handling.
- Data Structure Handling

A Typical PC Bus Structure [1]



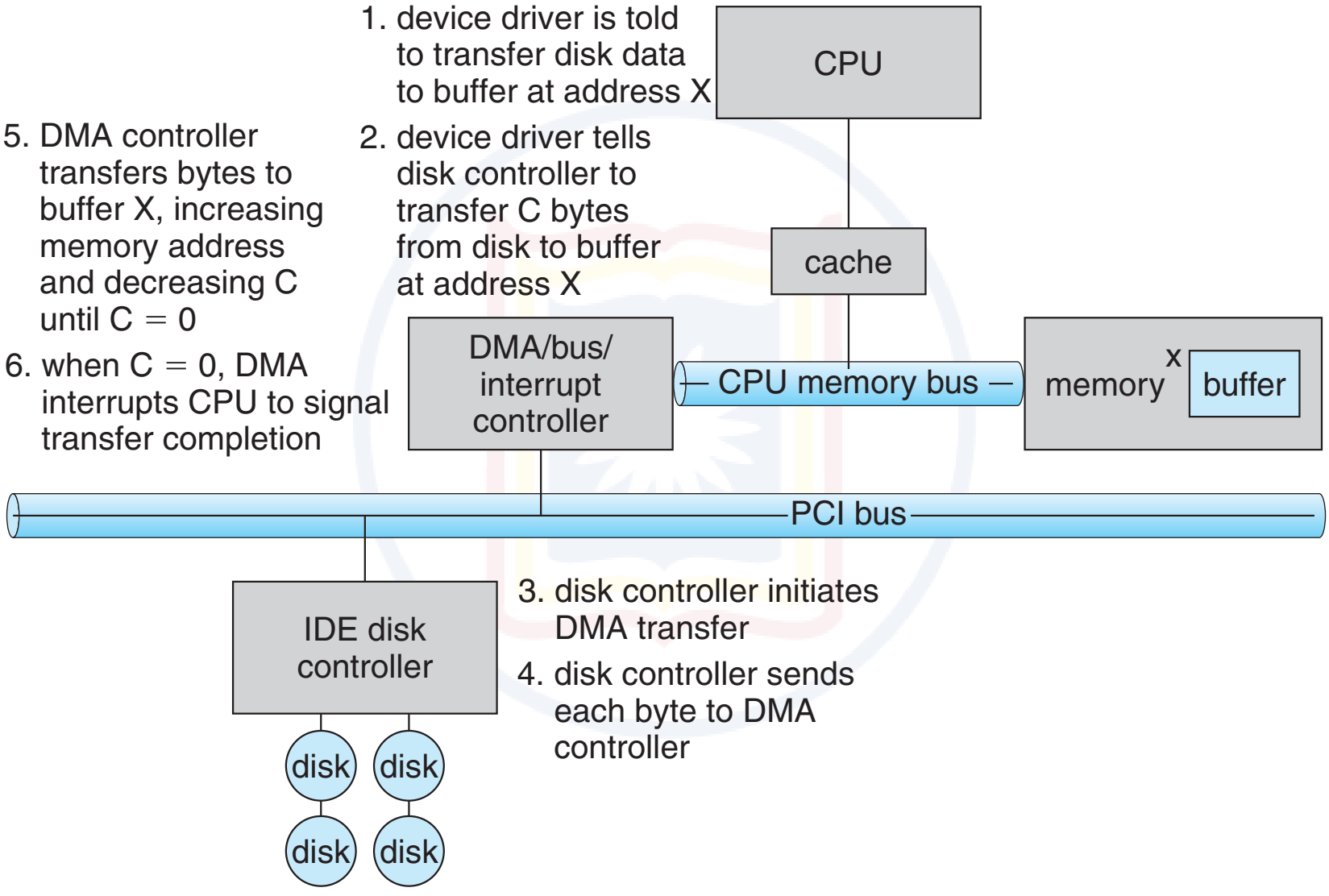
How to Communicate(Polling, Interrupts, DMA)

- Polling.
  - CPU needs to talk to the controller of I/O system continuously.
- Interrupt.
  - CPU needs to talk to the controller when interrupts happen.
- DMA.
  - CPU needs to talk to the controller Via DMA.

Event Vector Table [1]

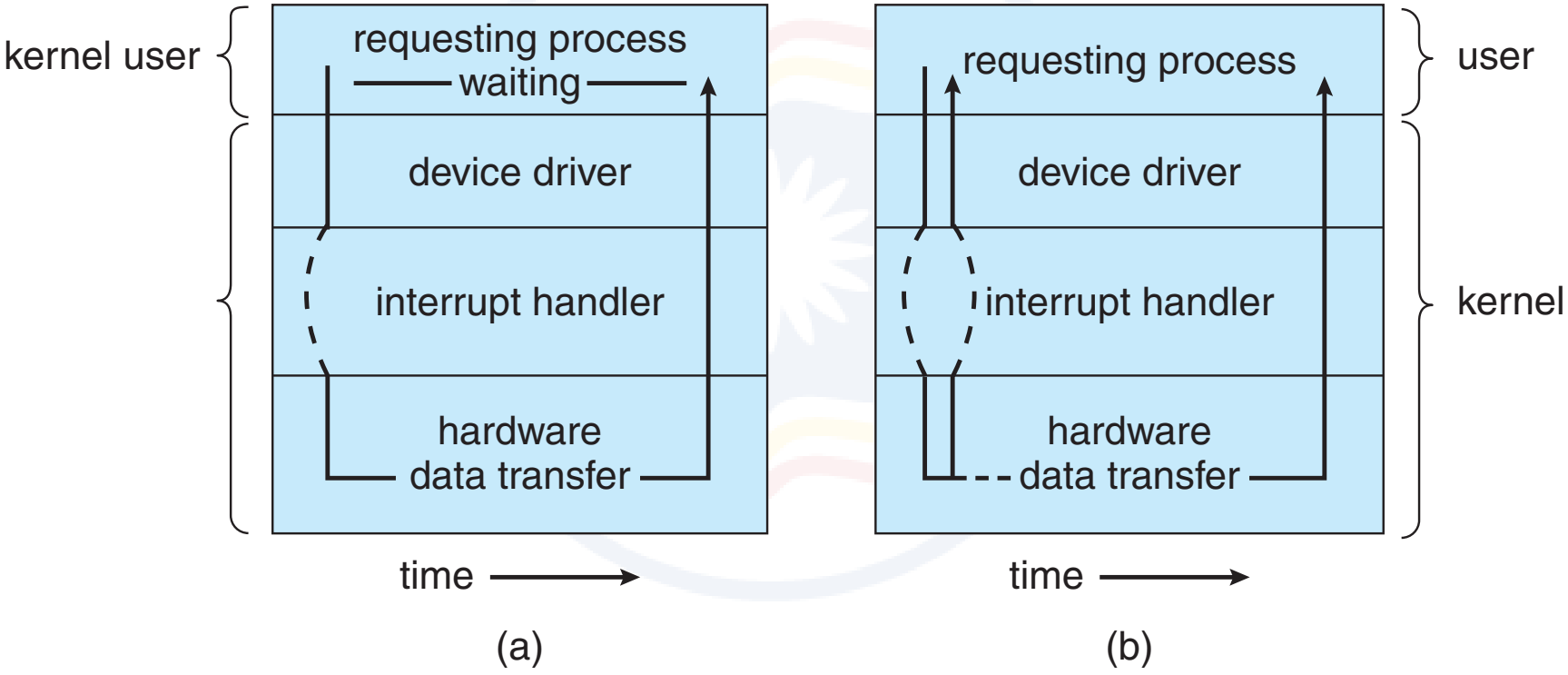
vector number	description
0	divide error
1	debug exception
2	null interrupt
3	breakpoint
4	INTO-detected overflow
5	bound range exception
6	invalid opcode
7	device not available
8	double fault
9	coprocessor segment overrun (reserved)
10	invalid task state segment
11	segment not present
12	stack fault
13	general protection
14	page fault
15	(Intel reserved, do not use)
16	floating-point error
17	alignment check
18	machine check
19–31	(Intel reserved, do not use)
32–255	maskable interrupts

Steps in a DMA Transfer [1]



Two I/O Methods [1]

- (a) Synchronous I/O and (b) Asynchronous I/O.



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