Group D

Chapter 3: Processes

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Structure

1. Process Concept
2. Process Scheduling
3. Operations on Processes
4. Interprocess Communication
5. Communication in Client–Server Systems

Process Concept

- Program to Process.
- Processes in memory

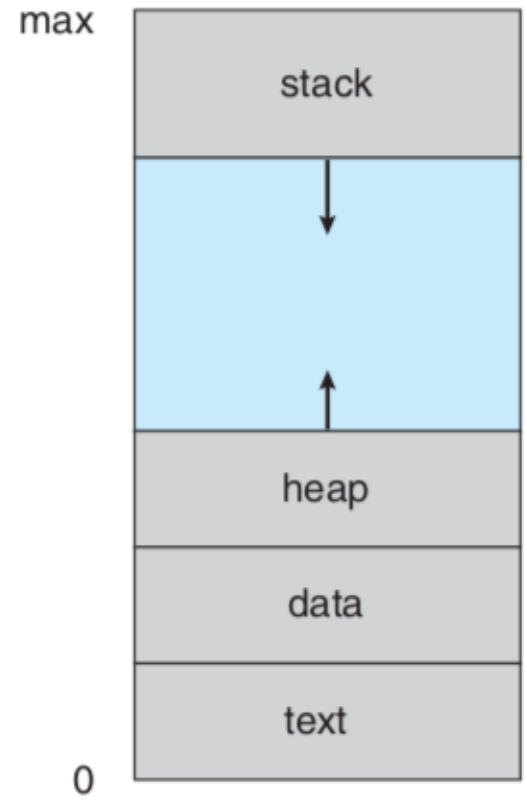


Figure 3.1 Process in memory.

Silberschatz, Abraham, et al. *Operating System Concepts*. 9th ed., Wiley, 2012,p.106

Process State

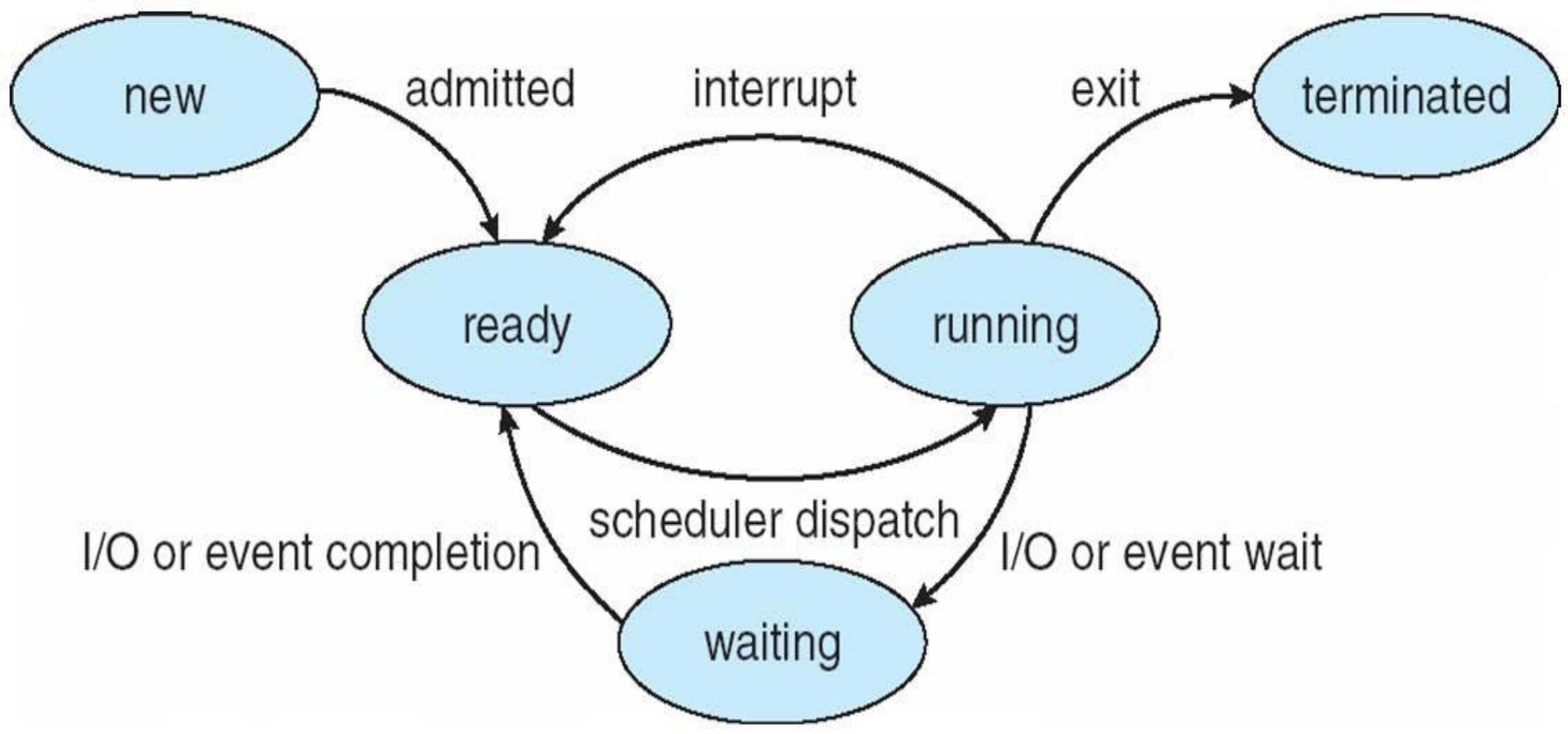


Figure 3.2 Diagram of a process state.

Silberschatz, Abraham, et al. *Operating System Concepts*. 9th ed., Wiley, 2012,p.108

Process Control Block (PCB)

- Process state
- Program counter
- CPU registers
- CPU-scheduling information
- Memory-management information
- Accounting information
- I/O status information

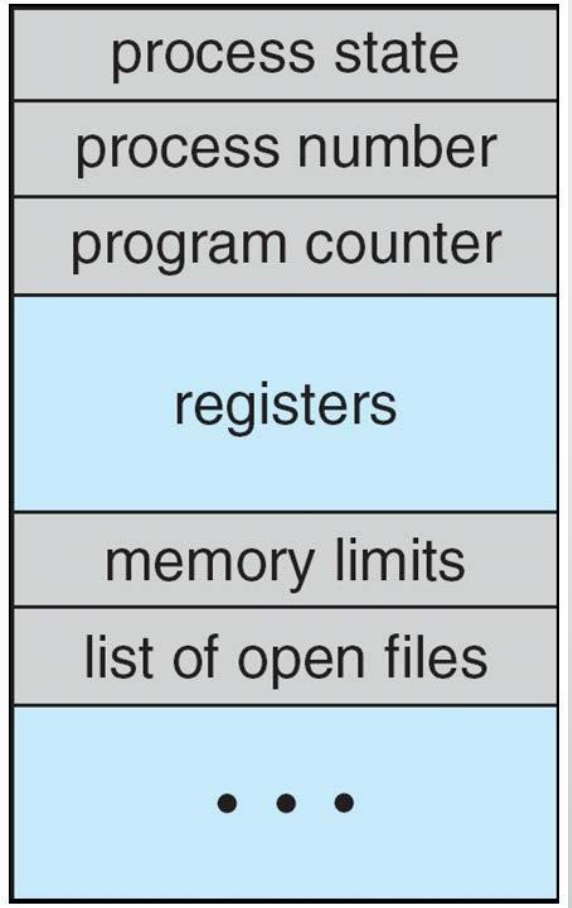


Figure 3.3 Process control block (PCB).

Silberschatz, Abraham, et al. *Operating System Concepts*. 9th ed., Wiley, 2012,p.108

CPU Switch From Process to Process

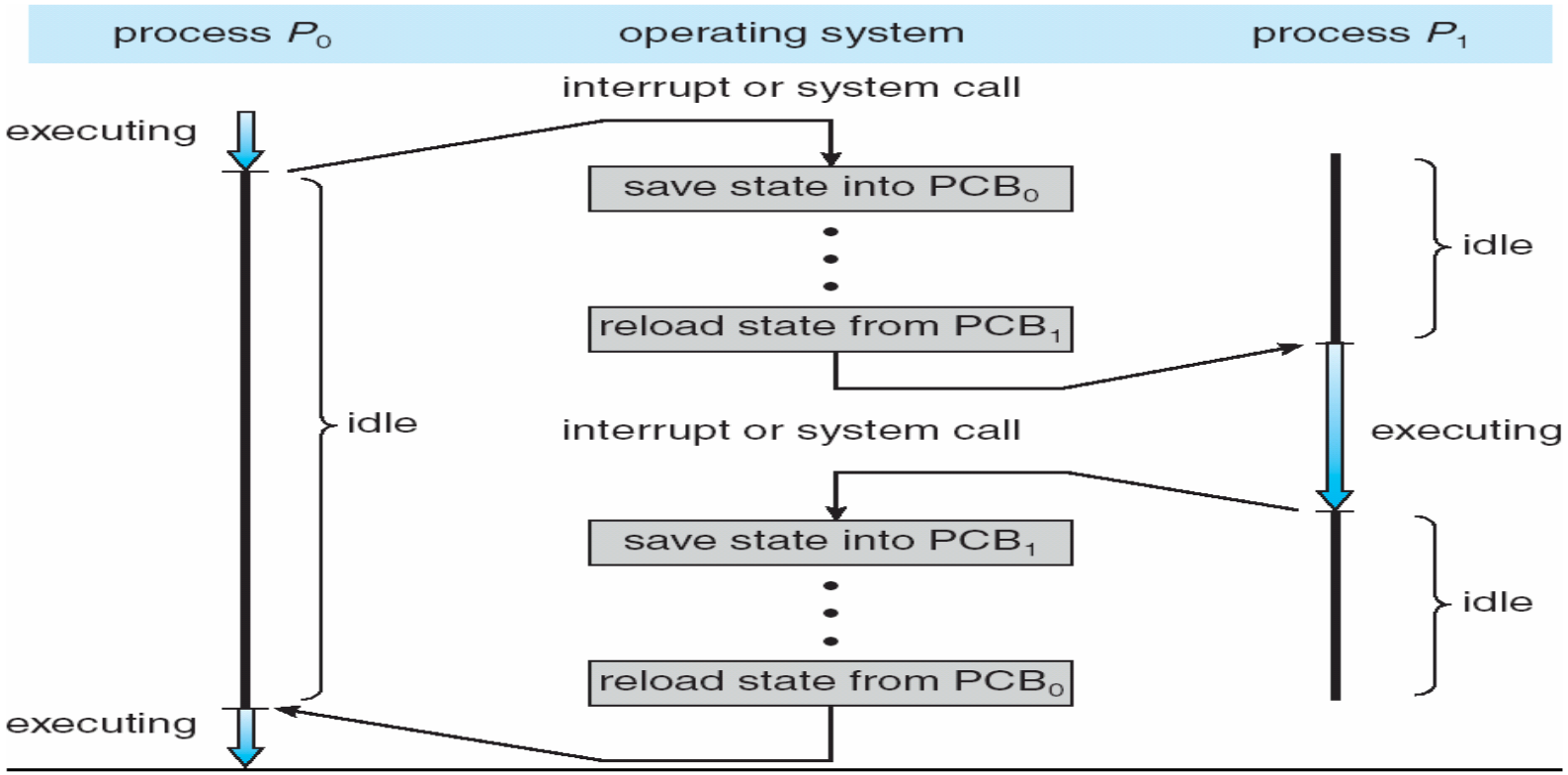


Figure 3.4 Diagram showing CPU switch from process to process.

Silberschatz, Abraham, et al. *Operating System Concepts*. 9th ed., Wiley, 2012,p.109

Process Scheduling

- **Process scheduler**
  - What is the objective of multiprogramming?
  - What is the objective of time sharing?
  - Only one process at a time.

Scheduling queues

- Job Queue
- Ready queue
- Device queues

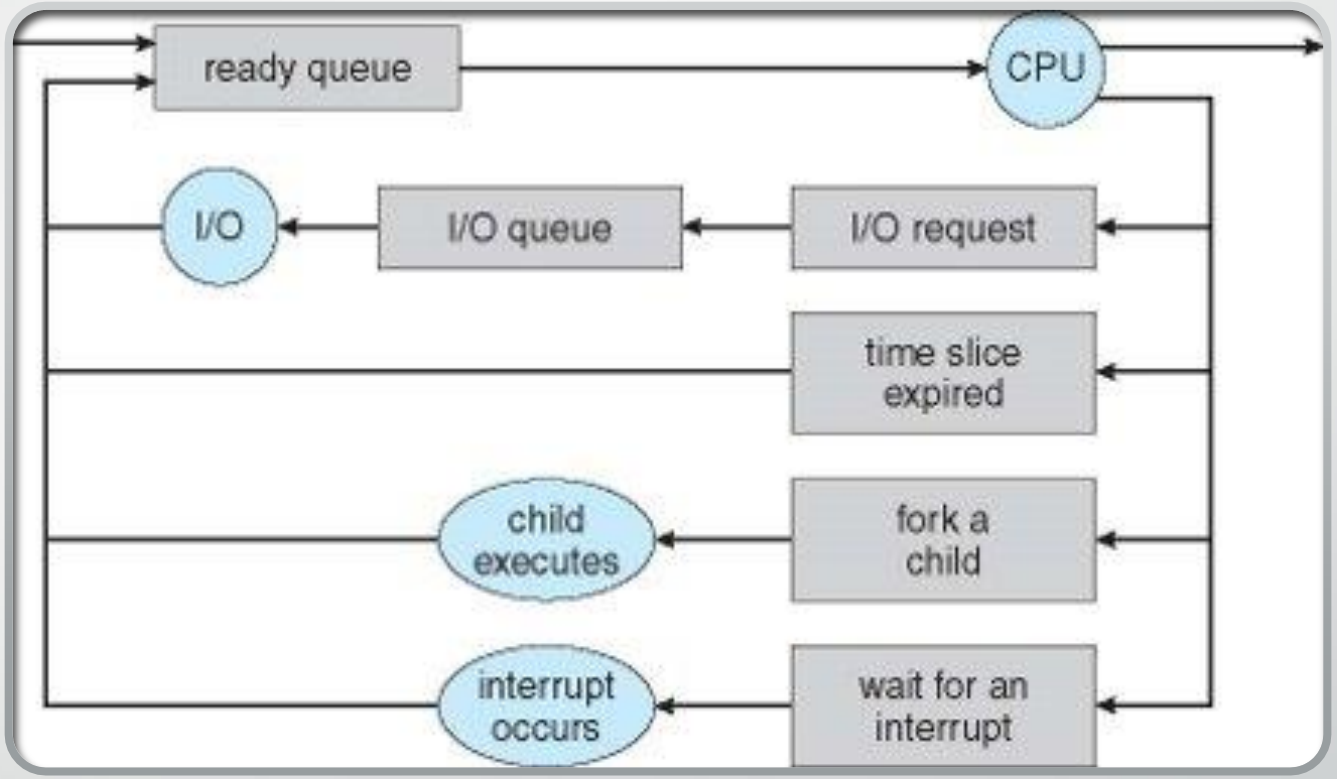


Figure 3.6 Queueing-diagram representation of process scheduling.

Silberschatz, Abraham, et al. *Operating System Concepts*. 9th ed., Wiley, 2012,p.112

Schedulers

- **Short-term scheduler** (or **CPU scheduler**)
- **Long-term scheduler** (or **job scheduler**)
- **Medium-term scheduler**

Context Switch

Saving the state of old process and switching the CPU to another process

Context-Switch time is pure overhead, because the system does no useful work while switching

Operations on Processes

- Process Creation
- Process Termination

Process Creation

A process is a running program

=>Resource sharing

Figure:
A tree of processes on a typical Solaris system.

- When a process creates a new process, two possibilities exists in terms of execution:

- 1. The parent continues to execute concurrently with its children.
- 2. The parent waits until some or all its children have terminated.

- There are also two possibilities in terms of address space of the new process

- 1. The child process is a duplicate of the parent process.
- 2. The child process has a new program loaded into it.

Process Termination

- A process terminates when it finishes executing its final statement and asks the operating system to delete it by using the exit() system call.
- Termination can occur in other circumstances as well.

Interprocess Communication

- Processes within a system may be independent or cooperating
  - Cooperating process can affect or be affected by other processes, including sharing data
- Reasons for cooperating processes:
  - Information sharing
  - Computation speedup
  - Modularity
  - Convenience

Shared memory

- Process shared commen buffer pool
- The code written by applictaion programmer
- Producer and consumer paradigm

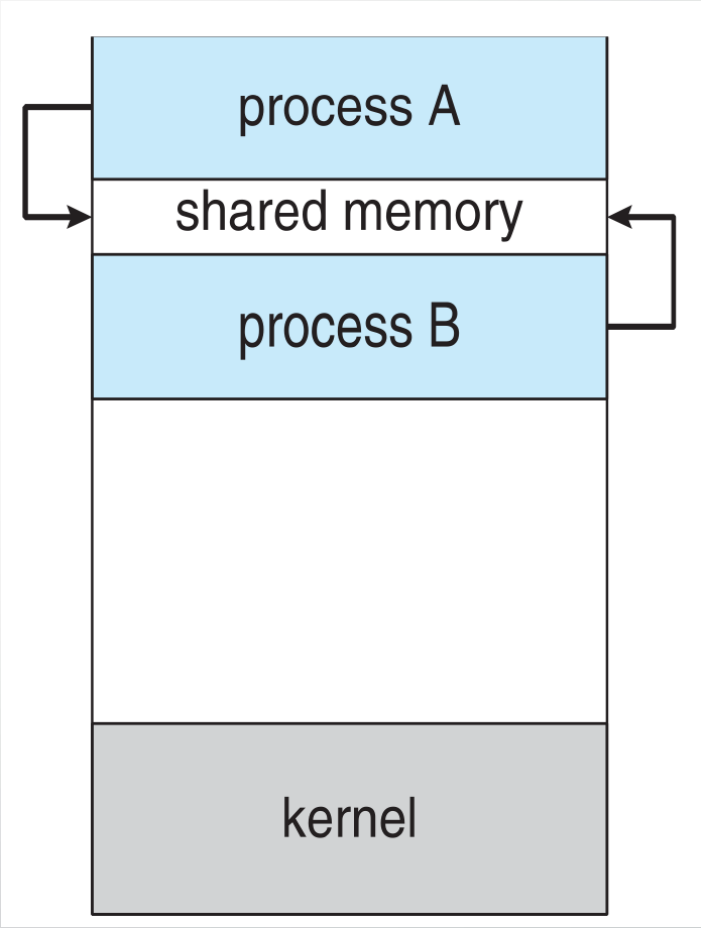


Figure 3.12 Communications models. Shared memory.

Silberschatz, Abraham, et al. *Operating System Concepts*. 9th ed., Wiley, 2012,p.124

Message passing

- Processes communicate without sharing data
- Processes can be fixed / variable size
- Communication links must exist
- There are methods for logically implementing this
  - Direct or indirect communication
  - Symmetric or asymmetric communication
  - Automatic orexplicit buffering

Message passing

- **Direct Communication**
  - Processes must name each other explicitly
  - Properties of communication link
- **Indirect Communication**
  - Messages are directed and received from mailboxes (also referred to as ports)
  - Properties of communication link

Synchronization

- **Blocking** is considered **synchronous**
  - **Blocking send** -- the sender is blocked until the message is received
  - **Blocking receive** -- the receiver is blocked until a message is available
- **Non-blocking** is considered **asynchronous**
  - **Non-blocking send** -- the sender sends the message and continue
  - **Non-blocking receive** -- the receiver receives:
    - A valid message
    - Null message

Buffering

- Queue of messages attached to the link.
- implemented in one of three ways
  - Zero capacity – no messages are queued on a link. Sender must wait for receiver (rendezvous)
  - Bounded capacity – finite length of *n* messages Sender must wait if link full
  - Unbounded capacity – infinite length Sender never waits

Local Procedure Calls (OS example) (LPCs)

- System call sequence to copy the contents of one file to another file

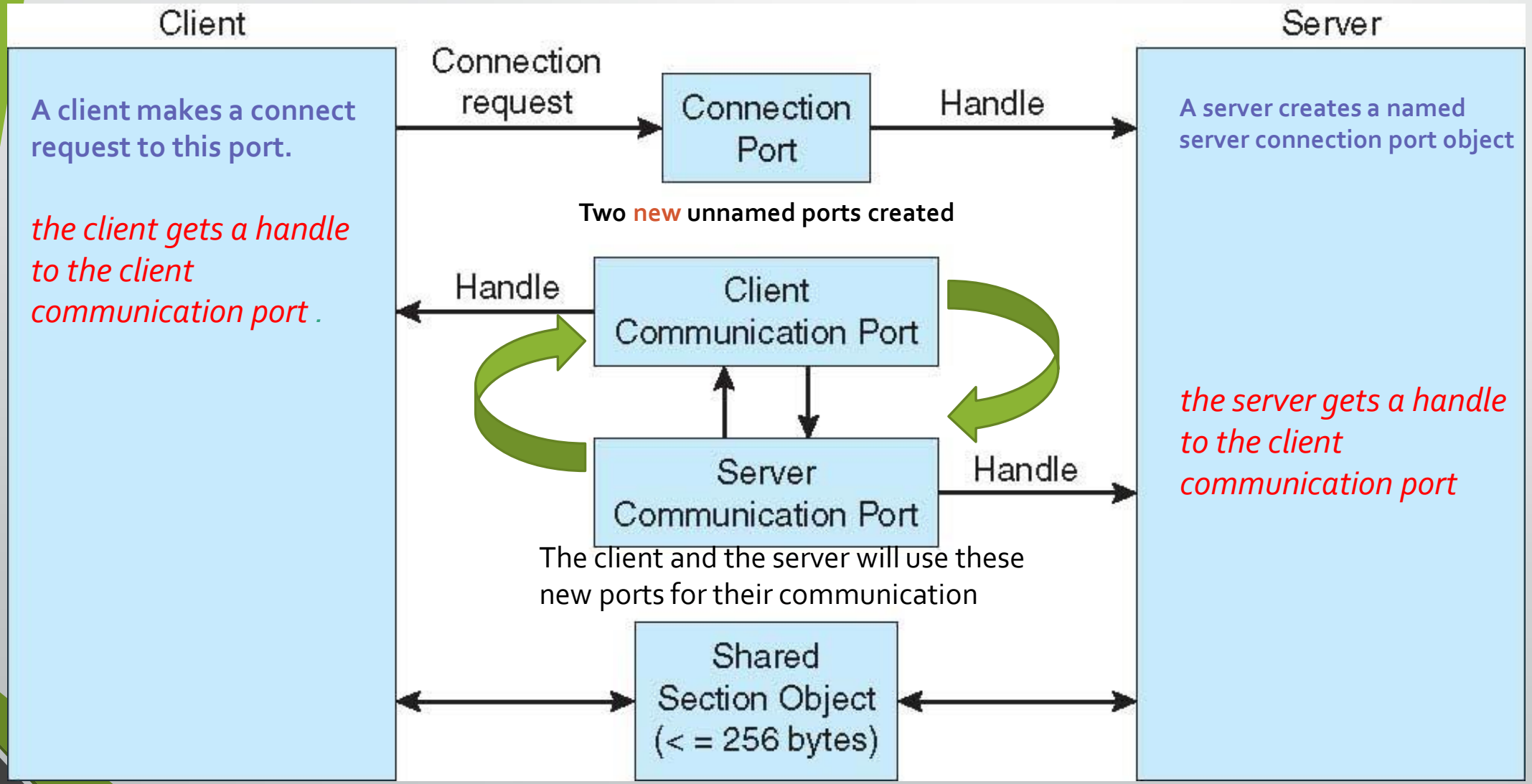


Figure 3.19 Advanced local procedure calls in Windows.

Silberschatz, Abraham, et al. *Operating System Concepts*. 9th ed., Wiley, 2012,p.136

Sockets

One of the strategies for communication in client–server systems

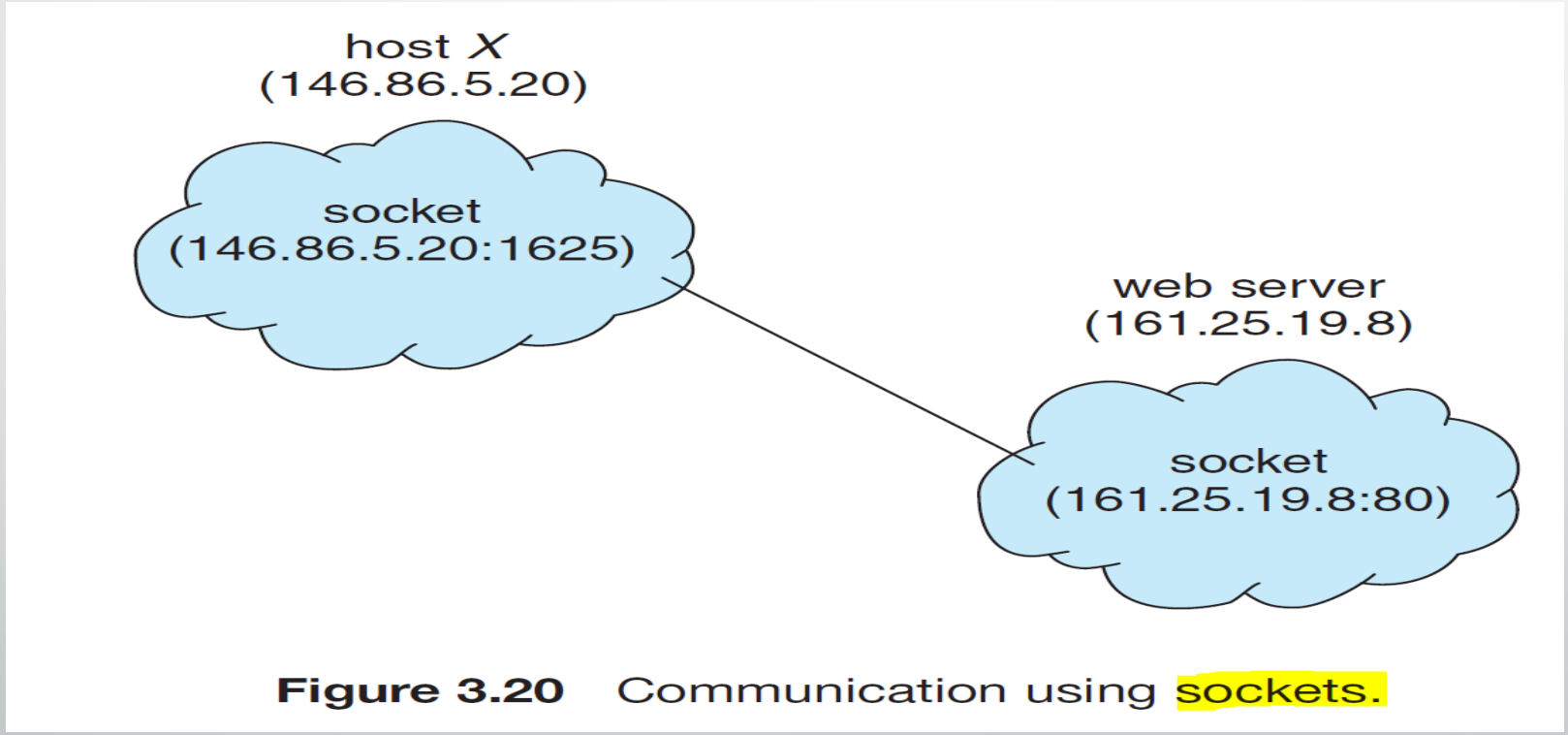
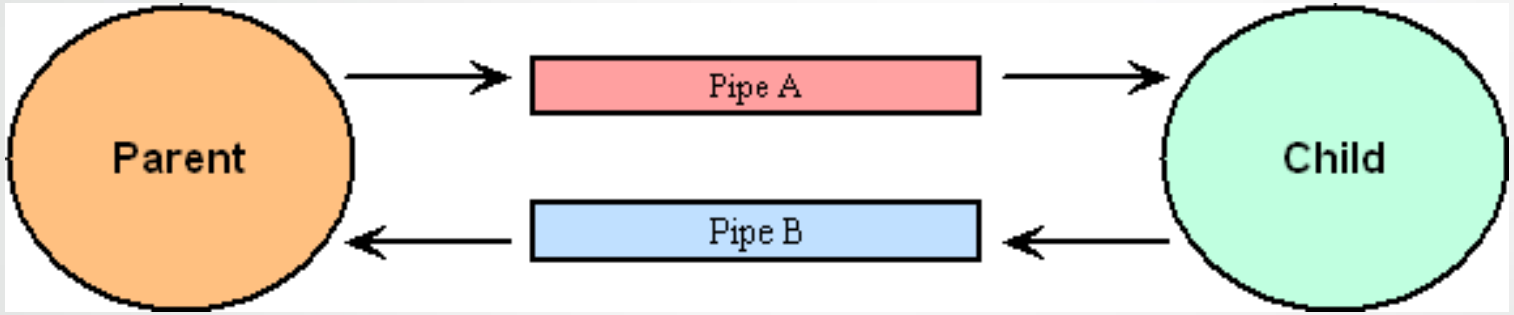


Figure 3.20 Communication using sockets.

Another methods of communication between two processes called **Pipe**

Pipe mechanism : Information stream



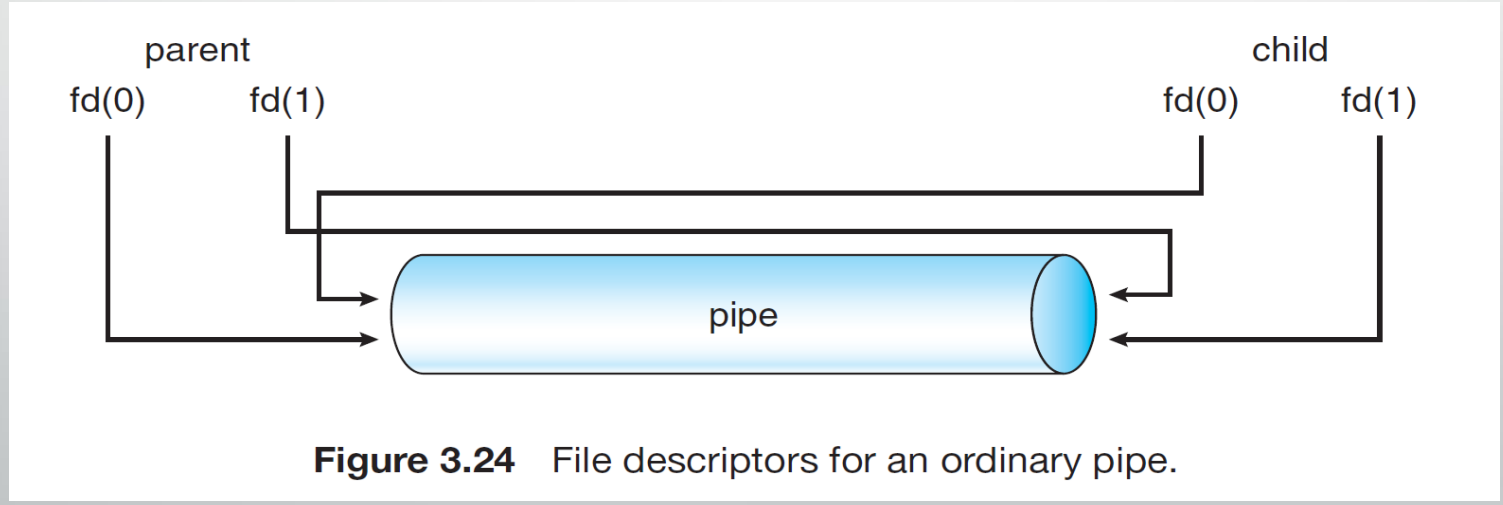


Figure 3.24 File descriptors for an ordinary pipe.

Thank you!