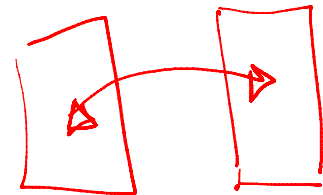


Lecture 6: Inter Process Communication (IPC)

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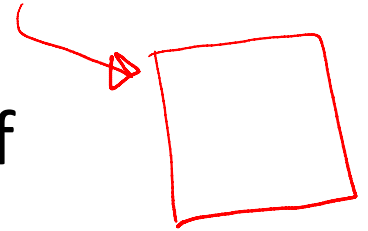
Inter Process Communication (IPC)

- Processes do not share any memory with each other
- Some processes might want to work together for a task, so need to communicate information
- IPC mechanisms to share information between processes



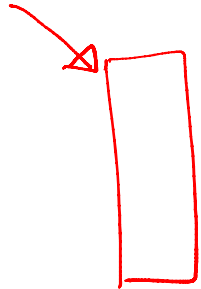
Shared Memory

- Processes can both access same region of memory via `shmget ()` system call
- `int shmget (key_t key, int size, int shmflg)`
- By providing same key, two processes can get same segment of memory
- Can read/write to memory to communicate
- Need to take care that one is not overwriting other's data: how?



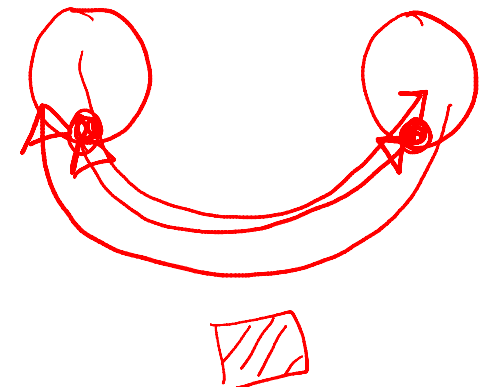
Signals

- A certain set of signals supported by OS
 - Some signals have fixed meaning (e.g., signal to terminate process)
 - Some signals can be user-defined
- Signals can be sent to a process by OS or another process (e.g., if you type Ctrl+C, OS sends SIGINT signal to running process)
- Signal handler: every process has a default code to execute for each signal
 - Exit on terminate signal
- Some signal handlers can be overridden to do other things



Sockets

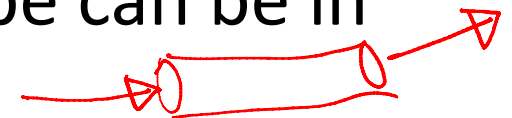
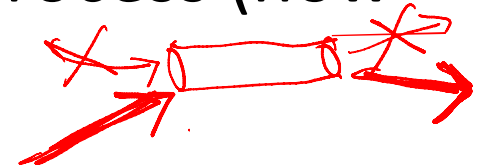
- Sockets can be used for two processes on same machine or different machines to communicate
 - TCP/UDP sockets across machines
 - Unix sockets in local machine
- Communicating with sockets
 - Processes open sockets and connect them to each other
 - Messages written into one socket can be read from another
 - OS transfers data across socket buffers



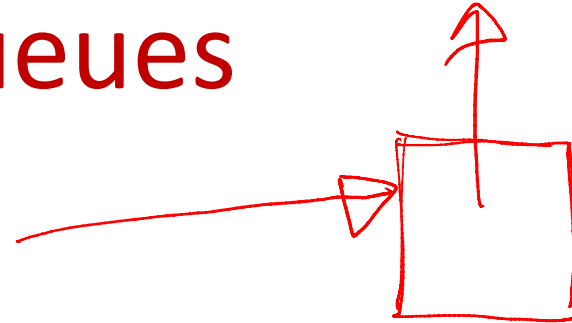
Pipes



- Pipe system call returns two file descriptors
 - Read handle and write handle
 - A pipe is a half-duplex communication
 - Data written in one file descriptor can be read through another
- Regular pipes: both fd are in same process (how it is useful?)
 - Parent and child share fd after fork
 - Parent uses one end and child uses other end
- Named pipes: two endpoints of a pipe can be in different processes
- Pipe data buffered in OS buffers between write and read



Message Queues



- Mailbox abstraction
- Process can open a mailbox at a specified location
- Processes can send/receive messages from mailbox
- OS buffers messages between send and receive

Blocking vs. non-blocking communication

- Some IPC actions can block
 - Reading from socket/pipe that has no data, or reading from empty message queue
 - Writing to a full socket/pipe/message queue
- The system calls to read/write have versions that block or can return with an error code in case of failure
 - A socket read can return error indicating no data to be read, instead of blocking

