Hello Dolly

ID1206 OPERATING SYSTEMS

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Intro - processes

• A process is a running program, an execution of instructions and a set of resources
• Can be represented by a unique number called process id (pid)
fork()

- Function that creates a new process
- Creates a copy (child process) of the current process (parent process)
- Returns twice
  - child’s pid to the parent
  - 0 to the child
- Child process has its own address space
Example – fork()

```c
int pid = fork();
if (pid == 0) {
    printf("I’m the child");
}
else {
    printf("I’m the parent");
}
```
Zombie

- Child process that has finished executing but still exists in the process table
- Happens if parent does not call wait()

```c
else {
    //parent process
    printf("I’m the parent");
    wait(NULL);  //wait for child process to terminate, prevent zombie
}
```
Orphan

• Child process that is still running but the parent process has finished executing or terminated
• Will be "adopted" by another process, get a new parent process
• In UNIX the new parent process is the *init* or *systemd* process
  - parent of all processes
  - process id 1
Daemon

- Process that runs automatically in the background instead of under direct control of a user
- Performs operations at predefined times or in response to events
- Runs most of the tasks in a system
exec()

- Runs an executable file in the context of an existing process, replacing the previous execution context
- `execvp("ls", "ls", NULL);
  - check if ‘ls’ exists
  - run it with the rest of the arguments
- `exec` functions do not return when successful
exec() family of functions

- `execl`, `execlp`, `execle`, `execv`, `execvp`, `execvpe`
  - `e`: pass an array of pointers to environment variables
  - `l`: arguments are passed individually to the function
  - `v`: arguments are passed as an array of strings
  - `p`: uses PATH environment variable to find the file that is to be executed
Pipes

• Sends the output of one program to another program's input
• Denoted by symbol ’|’
• Piping in the shell: combine several commands
  - Ex: `cat countries.txt | grep a | sort`
  - Displays all countries that start with an ’a’ and sorts them in alphabetic order