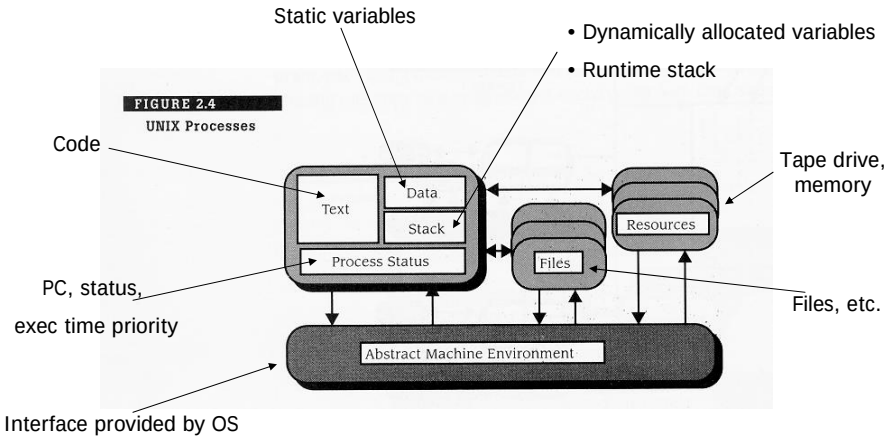
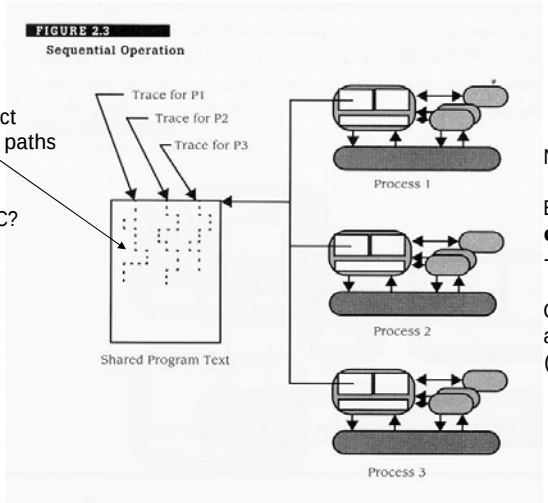
Process & Process Descriptor (PCB)

Contents of a descriptor maps directly to the Abstract Machine provided by the OS



One Program / Multiple Instantiations

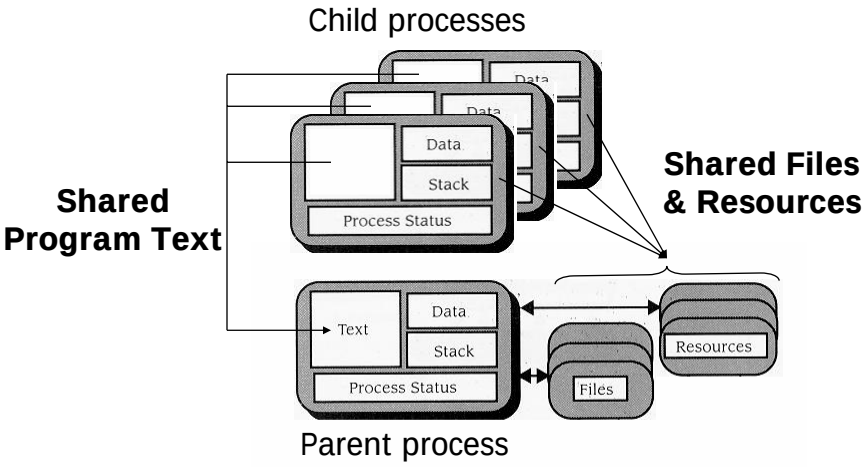


Note:

Each Process has its **own** descriptor
- text (shared), data…

Only **one** process active at a time (context switching)

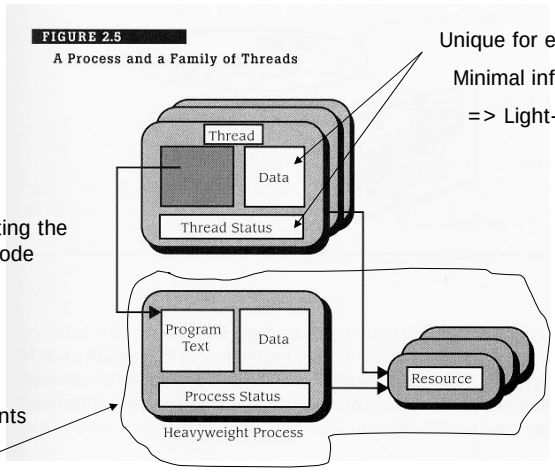
UNIX Parent and Child Processes



Thread (Child Process)

- Thread: light-weight process
  - OS maintains minimal internal state information
- Usually instantiated from a process
- Each thread has its OWN unique descriptor
  - Stack, Thread Status Word (TSW)
- SHARES with the parent process (and other threads)
  - Program text
  - Files & Resources
  - Parent process data segment

Thread ...



Unique for each thread

Minimal info

=> Light-weight

Each thread is sharing/executing the EXACT same code

Shared components

Only 1 copy of descriptor in OS

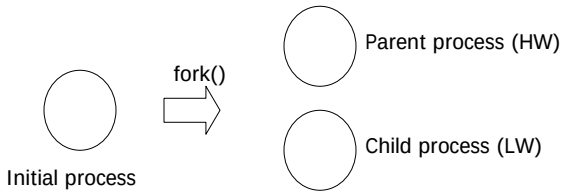
Process creation - fork()... example

```
int pidValue;
..
pidValue = fork();                /* creates a child process        */
If(pidValue == 0) {
        /* pidValue is ZERO for child, nonzero for parent           */
        /* The child executes this code concurrently with Parent    */
        childsPlay(..);           /* A locally-liked procedure      */
        exit(0);                  /* Terminate the child            */
}
/* The Parent executes this code concurrently with the child       */
..
wait(..);                /* Parent waits for Child's to terminate   */
```

UNIX process creation : fork() facility

Process creation – Unix fork()...

- Child/Parent code executed based on the pid value in "local" data space
  - For parent process, pid value returned is that of the *child* (non-zero)
  - For child process, pid value returned is 0
- pidvalue returned to parent process is non-Zero
- Therefore, fork() creates a new LW process



Process Creation – Unix exec()

- Turns LW process into autonomous HW process
- fork()
  - Creates new process
- exec()
  - Brings in new program to be executed by that process
  - New text, data, stack, resources, PSW, etc.
    BUT using same (expanded) process descriptor entries

  In effect, the "exec'ed" code overlays "exec'ing" code

Process creation – exec()... example

```
int pid;
..
        /* Setup the argv array for the child      */
..
if((pid = fork()) == 0) {         /* Create a child                */
        /* The child process executes changes to its own program    */
        execve( new_program.out , argv , 0 );
        /*Only return from an execve call if it fails               */
        printf("Error in execve");
        exit(0);                  /* Terminate the child            */
}
        /* Parent executes this code      */
..
wait(..);                /* Parent waits for Child's to terminate   */
```

UNIX process creation: exec() facility