Unix Process States

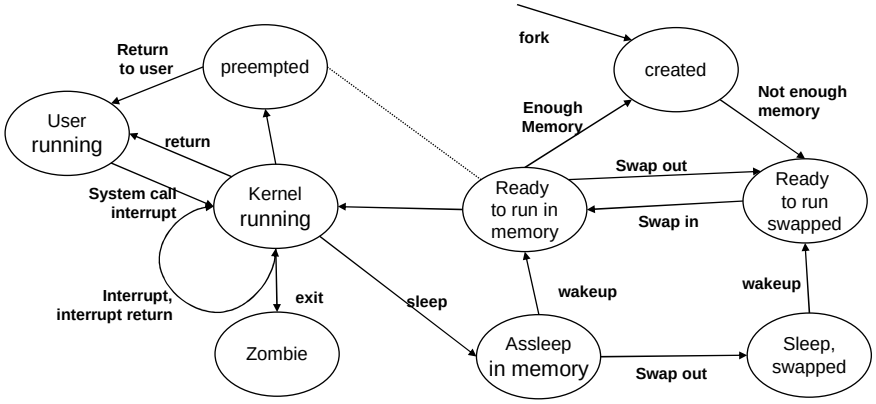


Fig: 3.15 from OS design & Principles, Stalling1998

Process Creation in Unix

- **One Process can create another process:**
  - **the original process is called the parent**
  - **the new process is called child**
  - **the child is an identical copy of the parent (same code, same data) but has a new process ID.**
  - **the parent can either wait for the child to complete or continue execution in parallel with child.**
- **Useful function calls:**
  - **Fork()**
    - » **in child process, fork() returns 0.**
    - » **in parent process, fork() returns process ID of child.**
  - **Execv()**
    - » **Child can overwrite its remaining programs with a new one and start a completely different program.**
  - **Wait(pid)**
    - » **Parent, if desired can wait until child completes.**

Example of Unix Process Creation

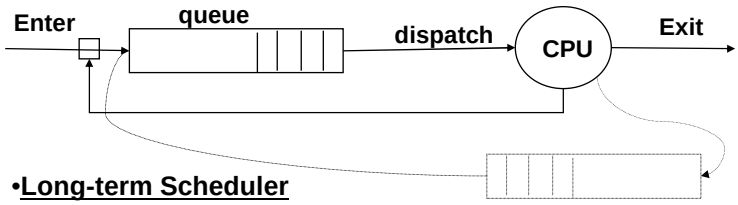
```
#include <sys/types.h>
#include <stdio.h>
int a=6;        /*global (external) variable*/

int main(void)
{
int b:                          /*local variable*/
pid_t mypid, childpid;          /*process ids*/
b=88;
prinf("Before fork..\n");

childpid=fork();
mypid=getpid();
if(childpid==0) /*chlid*/
                a++; b++;
} else /*parent*/
                wait(childpid);
printf("After fork..\n");
printf("me=%d, mychild=%d, a=%d, b=%d\n",mypid,childpid,a,b);
exit(0);
}
```

Aegis: fork
Before fork…
After fork..
mypid=101, mychild=0, a=7, b=89
After fork..
mypid=80, mychild=101,a=6,b=88

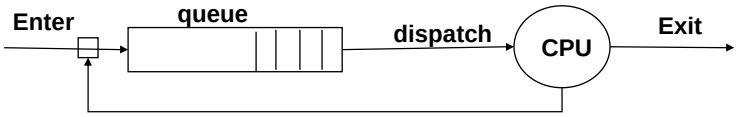
Schedulers



- **Long-term Scheduler**
  - selects jobs from spooled jobs and loads into memory.
  - Executes infrequently, mayne only when process leaves system
  - controls degree of multiprogramming:
  - Goal: good mix of CPU and IO bound processes
  - Does not really exist in modern time sharing systems.
- **Medium-term Scheduler**
  - On time sharing system does some of the task of long term scheduler.
  - May swap processes in and out of memory temporarily
  - Goal: balance load for better throughput

Short-Term Scheduler

- **Executes frequently (about 10 times per second)**
- **Runs whenever:**
  - **Process switches from running to blocked**
  - **Time slice runs out for a process (timer interrupt)**
  - **Any other interrupt occurs**
  - **Process is created or terminated**
- **Selects process from those that are ready to execute, allocates CPU to that process**
- **Goals:**
  - **minimize response time**
  - **maximize throughput**
  - **Efficient use of resources**
  - **minimize overhead (such as context switching)**
  - **Fairness**



Context Switching

Stopping one process and starting another is called context switch:

- **saving all hardware registers (PC, SP etc) or any other process state info in that the stopping process' PCB.**
- **Loading all the Hardware registers of the new process from the new process' PCB**

It is an expensive operation:

- **A time sharing system may do 100-1000 context switches per second.**

Next Class

Concurrent Process