

# **Advanced Programming in the UNIX Environment**

## **Week 07, Segment 1: Login Process**

**Department of Computer Science  
Stevens Institute of Technology**

**Jan Schaumann**

`jschauma@stevens.edu`

`https://stevens.netmeister.org/631/`

```
wd1: 51200 KB, 101 cyl, 16 head, 63 sec, 512 bytes/sect x 102400 sectors
uhub0 at usb0: NetBSD (0000) OHCI root hub (0000), class 9/0, rev 1.00/1.00, add
r 1
uhub0: 12 ports with 12 removable, self powered
wd1: 32-bit data port
wd1: drive supports PIO mode 4, DMA mode 2, Ultra-DMA mode 6 (Ultra/133)
wd0(piixide0:0:0): using PIO mode 4, Ultra-DMA mode 2 (Ultra/33) (using DMA)
wd1(piixide0:0:1): using PIO mode 4, Ultra-DMA mode 2 (Ultra/33) (using DMA)
atapibus0 at atabus1: 2 targets
cd0 at atapibus0 drive 0: <VBOX CD-ROM, VB2-01700376, 1.0> cdrom removable
cd0: 32-bit data port
cd0: drive supports PIO mode 4, DMA mode 2, Ultra-DMA mode 6 (Ultra/133)
cd0(piixide0:1:0): using PIO mode 4, Ultra-DMA mode 2 (Ultra/33) (using DMA)
boot device: wd0
root on wd0a dumps on wd0b
root file system type: ffs
kern.module.path=/stand/amd64/9.0/modules
wsdisplay0: screen 1 added (80x25, vt100 emulation)
wsdisplay0: screen 2 added (80x25, vt100 emulation)
wsdisplay0: screen 3 added (80x25, vt100 emulation)
wsdisplay0: screen 4 added (80x25, vt100 emulation)
[apue$ ls -l /var/run/dmesg.boot
-rw-r--r--  1 root  wheel  6731  Oct 10 20:43 /var/run/dmesg.boot
apue$
```

```
[...]  
total memory = 1023 MB  
avail memory = 970 MB  
mainbus0 (root)  
[...]  
boot device: wd0  
root on wd0a dumps on wd0b  
root file system type: ffs  
init: copying out path `/sbin/init' 11  
[...]  
Starting local daemons..  
Starting sshd.  
Starting cron.
```

NetBSD/amd64 (apue) (console)

login:

```
[...]  
total memory = 1023 MB  
avail memory = 970 MB  
mainbus0 (root)  
[...]  
boot device: wd0  
root on wd0a dumps on wd0b  
root file system type: ffs  
init: copying out path `/sbin/init' 11  
[...]  
Starting local daemons:.  
Starting sshd.  
Starting cron.
```

NetBSD/amd64 (apue) (console)

```
login: jschauma  
Password:
```

```
[...]  
total memory = 1023 MB  
avail memory = 970 MB  
mainbus0 (root)  
[...]  
boot device: wd0  
root on wd0a dumps on wd0b  
root file system type: ffs  
init: copying out path `/sbin/init' 11  
[...]  
Starting local daemons..  
Starting sshd.  
Starting cron.
```

NetBSD/amd64 (apue) (console)

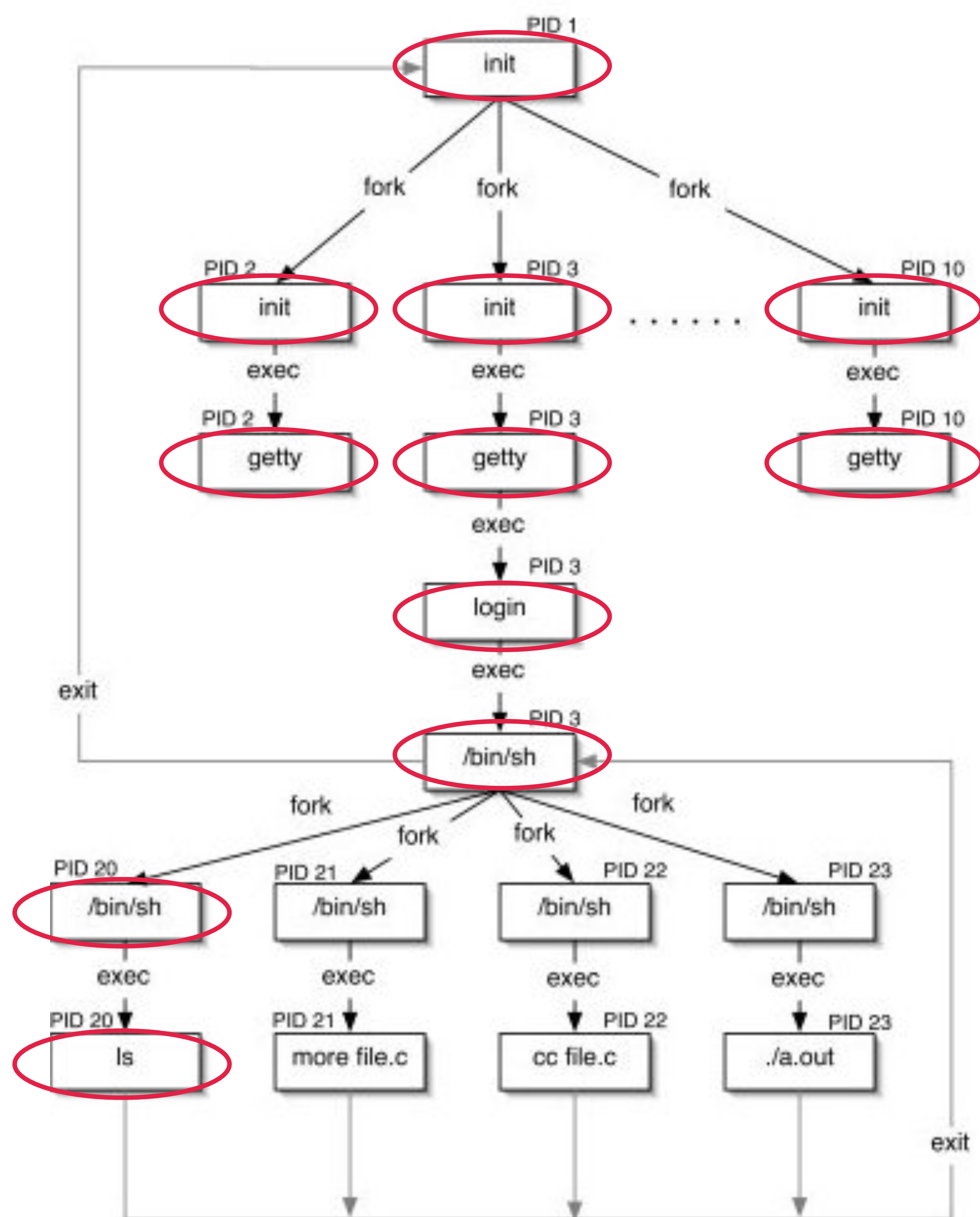
```
login: jschauma  
Password:  
Last login: Sat Sep 10 14:27:56 2011 on console  
Copyright (c) 1982, 1986, 1989, 1991, 1993  
The Regents of the University of California. All rights reserved.
```

NetBSD 9.0 (GENERIC) #0: Fri Feb 14 00:06:28 UTC 2020

Welcome to NetBSD!

\$





## Login Process

---

- `init(8)`: reads `/etc/ttys`
- `getty(8)`: opens terminal, prints “login: ”, reads username
- `login(1)`:
  - `getpass(3)`, hash, compare to `getpwnam(3)`
  - register login in system databases
  - read/display various files
  - `initgroups(3)/setgid(2)`, initialize environment
  - `chdir(2)` to new home directory
  - `chown(2)` terminal device
  - `setuid(2)` to user's uid, `exec(3)` shell

## Login Process

---

Let's revisit the process relationships for a login:

kernel  $\Rightarrow$  init(8)      # explicit creation

init(8)  $\Rightarrow$  getty(8)    # fork(2) + exec(3)

getty(8)  $\Rightarrow$  login(1)   # exec(3)

login(1)  $\Rightarrow$  \$SHELL    # exec(3)

\$SHELL  $\Rightarrow$  ls(1)        # fork(2) + exec(3)



## Login Process

---

Let's revisit the process relationships for a login:

`init(8)` # PID 1, PPID 0, EUID 0

`getty(8)` # PID *N*, PPID 1, EUID 0

`login(1)` # PID *N*, PPID 1, EUID 0

`$SHELL` # PID *N*, PPID 1, EUID *U*

`ls(1)` # PID *M*, PPID *N*, EUID *U*

Configuring network interfaces: wm0.  
Adding interface aliases:.  
Waiting for DAD to complete for statically configured addresses...  
Starting dhcpd.  
Building databases: dev, utmp, utmpx.  
Starting syslogd.  
Mounting all file systems...  
Clearing temporary files.  
Checking quotas: done.  
swapctl: setting dump device to /dev/wd0b  
Starting virecover.  
Checking for core dump...  
savecore: no core dump  
Starting local daemons:.  
Updating motd.  
Starting ntpd.  
Starting powerd.  
Starting sshd.  
Starting inetd.  
Starting cron.  
Sat Oct 10 02:18:50 UTC 2020  
NetBSD/amd64 (apue) (constty)  
login: █

## Login Process

---

The boot and login process illustrates:

- process creation sequence
- process ownership
- process groups and sessions
- things are generally more complex than we initially think