

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/`

```
$ dmesg -t | more
NetBSD 10.0 (GENERIC64) #0: Thu Mar 28 08:33:33 UTC 2024
      mkrepro@mkrepro.NetBSD.org:/usr/src/sys/arch/evbarm/compile/GENERIC64
total memory = 2025 MB
avail memory = 1951 MB
timecounter: Timecounters tick every 10.000 msec
Kernelized RAIDframe activated
armfdt0 (root)
armfdt0: using EFI runtime services for RTC
simplebus0 at armfdt0: QEMU QEMU Virtual Machine
simplebus1 at simplebus0
acpifdt0 at simplebus0
acpifdt0: SMBIOS rev. 3.0.0 @ 0xbf800000
ACPI: RSDP 0x00000000BC150018 000024 (v02 BOCHS )
ACPI: 1 ACPI AML tables successfully acquired and loaded
acpi0 at acpifdt0: Intel ACPICA 20221020
acpi0: X/RSDT: OemId <BOCHS ,BXPC      ,00000001>, AslId <      ,01000013>
acpi0: MCFG: segment 0, bus 0-15, address 0x000000003f000000
cpu0 at acpi0: unknown CPU (ID = 0x610f0000), id 0x0
cpu0: package 0, core 0, smt 0
cpu0: IC enabled, DC enabled, EL0/EL1 stack Alignment check enabled
[...]
ld4: 10240 MB, 16383 cyl, 16 head, 63 sec, 512 bytes/sect x 20971520 sectors
ld5: GPT GUID: 0a6eb92a-fe83-46f9-923c-971c06167a03
dk0 at ld5: "16fe60e5-87e5-4673-b57a-813373152518", 32768 blocks at 64, type: ntfs
dk1 at ld5: "f3a31727-321b-481d-8738-8aab3858d25d", 25190336 blocks at 32832, type: ffs
dk2 at ld5: "3f94291b-4cb7-4063-9263-764d9ce92419", 8331249 blocks at 25223168, type: swap
IPsec: Initialized Security Association Processing.
swdog0: software watchdog initialized
boot device: dk1
root on dk1 dumps on dk2
root file system type: ffs
kern.module.path=/stand/evbarm/10.0/modules
$ ls -l /var/run/dmesg.boot
-rw-r--r--  1 root  wheel  10481 Oct 21 01:45 /var/run/dmesg.boot
```

```
[...]  
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.
```

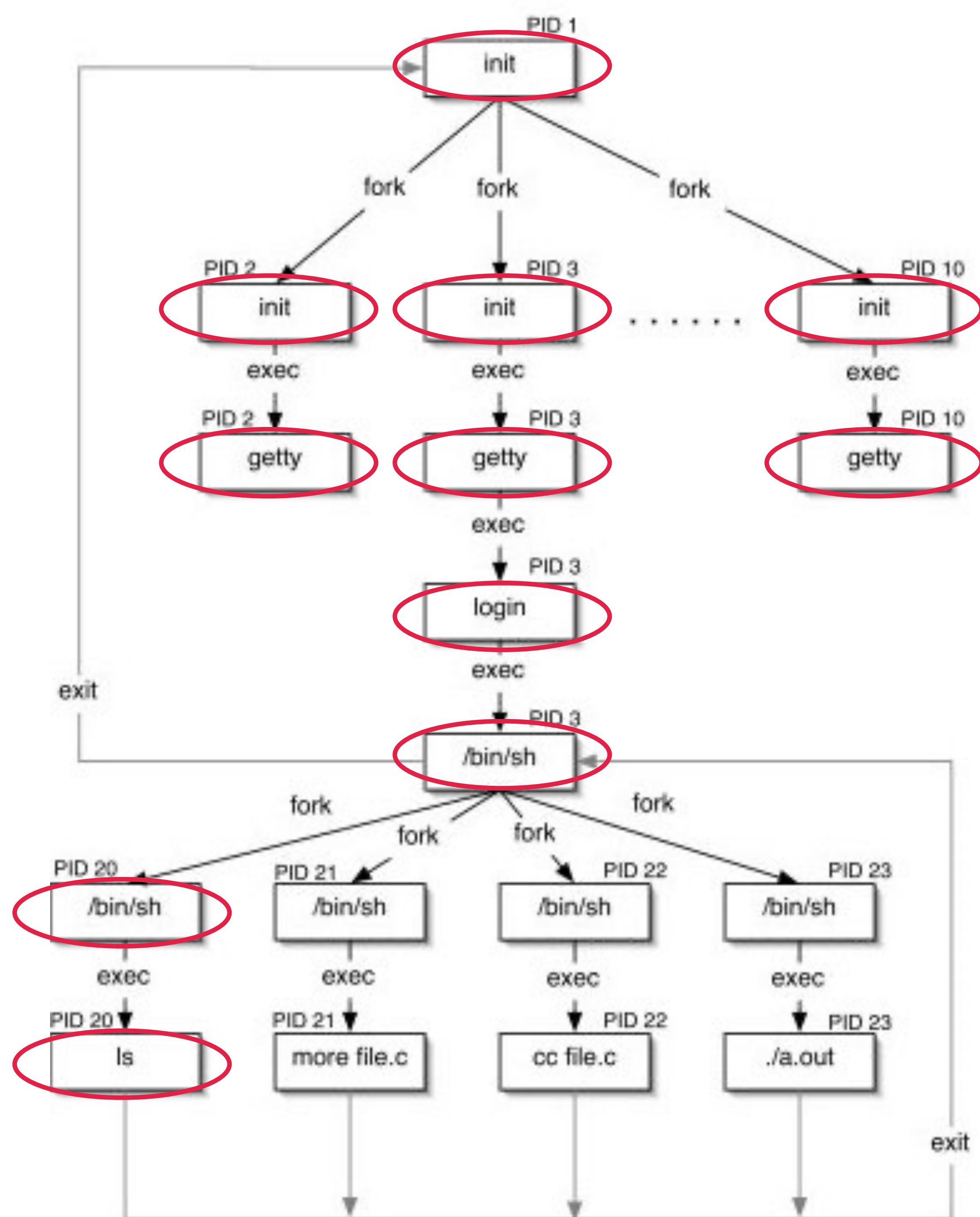
NetBSD/amd64 (apue) (console)

```
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*

```
$ telnet localhost 4444
```

```
NetBSD/evbarm (apue) (constty)
```

```
login: jschauma
```

```
Password:
```

```
NetBSD 10.0 (GENERIC64) #0: Thu Mar 28 08:33:33 UTC 2024
```

```
Welcome to NetBSD!
```

```
You have new mail.
```

```
apue$ proctree
```

```
-+= 00001 root init
| -+- 00470 _dhcpcd dhcpcd: [manager] [ip4]
| | --- 00474 _dhcpcd dhcpcd: [network proxy]
| | --- 00475 _root dhcpcd: [privileged proxy]
| \ --- 00477 _dhcpcd dhcpcd: [control proxy]
| --= 00672 root /usr/sbin/syslogd -s
| --= 01109 root sshd: /usr/sbin/sshd [listener] 0 of 10-100 startups (sshd)
| -+= 01135 root /usr/sbin/ntpd -p /var/run/ntpd.pid
| \ --- 01535 root ntpd: asynchronous dns resolver
| --= 01340 root /usr/sbin/cron
| --= 01342 root /usr/sbin/inetd -l
| -+= 01364 root /usr/libexec/postfix/master -w
| | --- 01189 postfix pickup -l -t unix -u
| \ --- 01393 postfix qmgr -l -t unix -u
\ -+= 01450 root login
    \ -+= 01369 jschauma -ksh
        \ -+= 00338 jschauma proctree
            \ --- 00604 jschauma ps -axww user,pid,ppid,pgid,command
```

```
$
```

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