

Computer Science CSCI 251

Systems and Networks

Dr. Peter Walsh

Department of Computer Science

Vancouver Island University

peter.walsh@viu.ca

How Linux Boots (Abstraction)

- Step 1
 - firmware performs POST (power-on self test) and initiates loading the bootloader
 - choices: BIOS and UEFI
- Step 2
 - the bootloader completes loading itself into memory, (if necessary) then loads the kernel into memory and starts kernel execution
 - choices: LILO, GRUB1 and GRUB2
- Step 3
 - kernel initializes devices and memory and starts the `init` process
 - choices: SysV, Upstart and SystemD

Which init Process?

- Xubuntu 20.04

```
peter@cobra:~$ ls -l /sbin/init
lrwxrwxrwx 1 root root 20 Jan  6 12:47
/sbin/init -> /lib/systemd/systemd
peter@cobra:~$
```

- antiX 19.3

```
$ ls -l /sbin/init
-rwxr-xr-x 1 root root 53016 Feb 14 2019 /sbin/init
peter@antix:~
```

SysV Runlevels

- Runlevel 0
 - **mode:** Halt **action:** system shutdown
- Runlevel 1
 - **mode:** Single-User-Mode
 - **action:** CLI (command line interface), no networking, root login only
- Runlevel 2
 - **mode:** Multi-User-Mode **action:** CLI, no networking
- Runlevel 3
 - **mode:** Multi-User-Mode **action:** CLI with networking
- Runlevel 4
 - **mode:** Undefined **action:**
- Runlevel 5
 - **mode:** X11 Multi-User-Mode **action:** GUI with networking
- Runlevel 6
 - **mode:** Reboot **action:** reboot the system

antiX Runlevels

○ Start-Up Configuration

- /etc/inittab

...

The default runlevel.

id:5:initdefault:

Boot-time system configuration/initialization script.

This is run first except when booting in emergency (-b) mode.

si::sysinit:/etc/init.d/rcS

What to do in single-user mode.

~~:S:wait:/sbin/sulogin

/etc/init.d executes the S and K scripts upon change

of runlevel.

#

Runlevel 0 is halt.

Runlevel 1 is single-user.

Runlevels 2-5 are multi-user.

Runlevel 6 is reboot.

.....

Runlevel 2 GUI

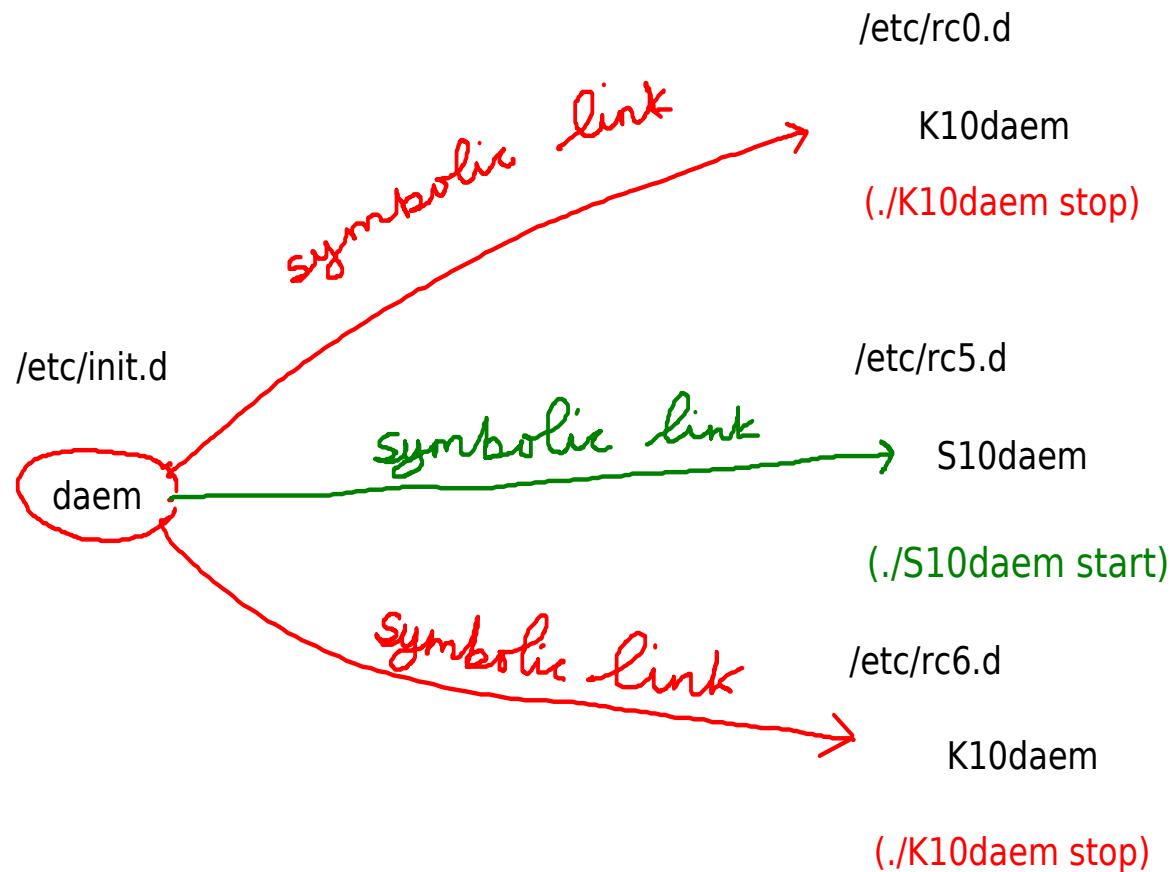
Daemon Start-Up/Tear-Down Scripts

Each daemon associated with runlevel n has a script in `rcn.d` whose file name starts with either a K or S. Executing a K script kills a daemon. Executing a S script starts a daemon. Script names have the general format (Perl RE `/[S|K][0-9][0-9][a-z|A-Z].*/`) e.g., `S10daem`.

Changing to runlevel n results in the execution of K and S scripts in `rcn.d`. Scripts are executed in ASCII sort order. K scripts are executed first followed by S scripts. *

*`antiX` optimizes a runlevel change by not starting a daemon that has already been started and not stopping a daemon that has already been stopped.

File Organization



Daemon Template

- must at least respond to start, stop and restart as command line arguments

```
.....  
if ($ARGV[0] eq "start") {  
    print($fh "Starting pwinit\n");  
} elsif ($ARGV[0] eq "stop") {  
    print($fh "Stopping pwinit\n");  
} elsif ($ARGV[0] eq "restart") {  
    print($fh "Restarting pwinit\n");  
}  
.....
```


Install/Remove Script Links

- LSB (Linux Standard Base) Compliant
 - `update-rc.d -f script remove`
 - `update-rc.d script defaults`

```
### BEGIN INIT INFO
# Provides:                pwinit
# Required-Start:          $remote_fs $syslog
# Required-Stop:           $remote_fs $syslog
# Should-Start:            virtualbox
# Should-Stop:             virtualbox
# Default-Start:           2 3 4 5
# Default-Stop:            0 1 6
# Short-Description:       Example initscript
# Description:             constructed for csci 251
### END INIT INFO
```