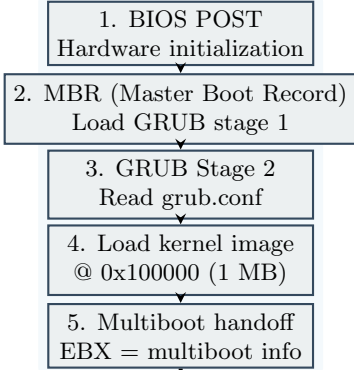# MINIX 3.4.0 Complete Boot Sequence

From GRUB Bootloader to Userspace Execution

Source files:
kernel/main.c:115-328 (kmain), pm/main.c:50 (PM), rs/main.c:38 (RS)
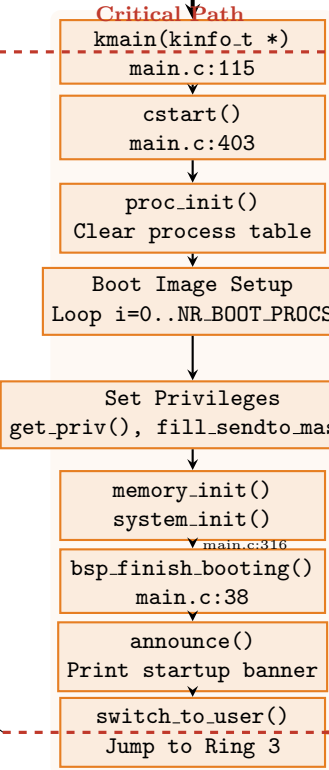
PHASE 1: Bootloader

1. BIOS POST
Hardware initialization

2. MBR (Master Boot Record)
Load GRUB stage 1

3. GRUB Stage 2
Read grub.conf

4. Load kernel image
@ 0x100000 (1 MB)

5. Multiboot handoff
EBX = multiboot info

Multiboot info contains:
- *Boot modules (servers)*
- *Memory map*
- *Kernel command line*

PHASE 2: kmain()

Critical Path

kmain(kinfo_t *)
main.c:115

cstart()
main.c:403

proc_init()
Clear process table

Boot Image Setup
Loop i=0..NR_BOOT_PROCS

Set Privileges
get_priv(), fill_sendto_mask()

memory_init()
system_init()
main.c:316

bsp_finish_booting()
main.c:38

announce()
Print startup banner

switch_to_user()
Jump to Ring 3

Ring 0
(Kernel)

prot_init() - segments
init_clock() - timers
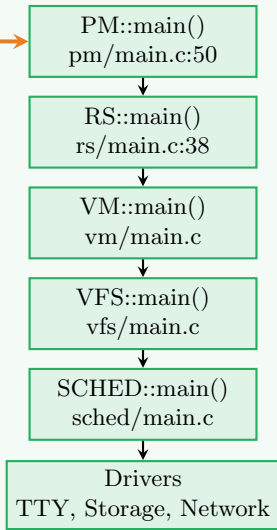*env_get() - boot params*

Set up processes:
- *Kernel tasks (i ¡ NR_TASKS)*
- *VM (Virtual Memory)*
- *PM, RS, VFS, SCHED*
- *Drivers, servers*

Assign capabilities:
- *Ring 0 for kernel tasks*
- *IPC targets*
- *Kernel call masks*

cpu_identify()
Unset RTS_PROC_STOP
boot_cpu_init_timer()
fpu_init()

Process scheduler activates servers

PHASE 3: Servers (Ring 3)

PM::main()
pm/main.c:50

RS::main()
rs/main.c:38

VM::main()
vm/main.c

VFS::main()
vfs/main.c

SCHED::main()
sched/main.c

Drivers
TTY, Storage, Network

SEF Framework
All servers use SEF
(Self-healing Framework)

Process Manager:
fork(), exec(), exit()
Signal handling

Reincarnation Server:
Service monitoring
Restart crashed servers

Virtual Memory:
Page fault handling
Memory allocation

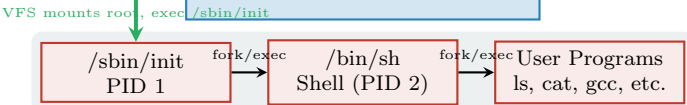*Virtual File System:*
File operations
Mount points

Scheduler:
CPU time allocation
Priority management

SEF initialization:
- *sef_local_startup()*
- *sef_cb_init_fresh()*
- *Register callbacks*
- *sef_startup() - blocks until ready*

Boot Time: 1-3 seconds

PHASE 4: Userspace

VFS mounts root, exec /sbin/init

/sbin/init
PID 1

fork/exec

/bin/sh
Shell (PID 2)

fork/exec

User Programs
ls, cat, gcc, etc.

Ring 3
(User)