

Part 1: Build the Linux kernel

```
LD [M] net/netfilter/nf_log_syslog.ko
LD [M] net/netfilter/xt_mark.ko
LD [M] net/netfilter/xt_LOG.ko
LD [M] net/netfilter/xt_nat.ko
LD [M] net/netfilter/xt_MASQUERADE.ko
LD [M] net/netfilter/xt_addrtype.ko
LD [M] net/netfilter/xt_nat.ko
NM .tmp_vmlinux.kallsyms1.syms
KSYMS .tmp_vmlinux.kallsyms1.s
AS .tmp_vmlinux.kallsyms1.s
LD .tmp_vmlinux.kallsyms2
NM .tmp_vmlinux.kallsyms2.syms
KSYMS .tmp_vmlinux.kallsyms2.s
AS .tmp_vmlinux.kallsyms2.s
LD vmlinux
NM System.map
SORTTAB vmlinux
RELOCS arch/x86/boot/compressed/vmlinux.relocs
RSTRIP vmlinux
CC arch/x86/boot/a20.o
AS arch/x86/boot/bioscall.o
CC arch/x86/boot/cmdline.o
AS arch/x86/boot/copy.o
HOSTCC arch/x86/boot/mkcpustr
CC arch/x86/boot/cpuflags.o
CC arch/x86/boot/cpucheck.o
CC arch/x86/boot/early_serial_console.o
CC arch/x86/boot/edd.o
CC arch/x86/boot/main.o
CC arch/x86/boot/memory.o
CC arch/x86/boot/pm.o
AS arch/x86/boot/pmjump.o
CC arch/x86/boot/printk.o
CC arch/x86/boot/regs.o
LDS arch/x86/boot/compressed/vmlinux.lds
CC arch/x86/boot/string.o
AS arch/x86/boot/compressed/kernel_info.o
AS arch/x86/boot/compressed/head_64.o
VOFFSET arch/x86/boot/compressed/.../voffset.h
CC arch/x86/boot/tty.o
CC arch/x86/boot/compressed/string.o
CC arch/x86/boot/compressed/cmdline.o
CC arch/x86/boot/compressed/error.o
CC arch/x86/boot/video.o
CC arch/x86/boot/video-mode.o
CC arch/x86/boot/version.o
CC arch/x86/boot/video-vga.o
CC arch/x86/boot/video-vesa.o
OBJCOPY arch/x86/boot/compressed/vmlinux.bin
HOSTCC arch/x86/boot/compressed/mkpiggy
CC arch/x86/boot/compressed/cpuflags.o
CC arch/x86/boot/compressed/early_serial_console.o
CC arch/x86/boot/video-bios.o
HOSTCC arch/x86/boot/tools/build
CC arch/x86/boot/compressed/kaslr.o
CC arch/x86/boot/compressed/ident_map_64.o
CC arch/x86/boot/compressed/idt_64.o
AS arch/x86/boot/compressed/idt_handlers_64.o
CPUSTR arch/x86/boot/cpustr.h
CC arch/x86/boot/compressed/pgtable_64.o
CC arch/x86/boot/compressed/acpi.o
CC arch/x86/boot/cpu.o
CC arch/x86/boot/compressed/efi.o
AS arch/x86/boot/compressed/efi_mixed.o
CC arch/x86/boot/compressed/misc.o
GZIP arch/x86/boot/compressed/vmlinux.bin.gz
MKPIGGY arch/x86/boot/compressed/piggy.S
AS arch/x86/boot/compressed/piggy.o
LD arch/x86/boot/compressed/vmlinux
ZOFFSET arch/x86/boot/zoffset.h
OBJCOPY arch/x86/boot/vmlinux.bin
AS arch/x86/boot/header.o
LD arch/x86/boot/setup.elf
OBJCOPY arch/x86/boot/setup.bin
BUILD arch/x86/boot/bzImage
Kernel: arch/x86/boot/bzImage is ready (#1)
ssing214@ssing214-vm:~/linux$ ls arch/x86/boot/bzImage
arch/x86/boot/bzImage
ssing214@ssing214-vm:~/linux$
```

Try out the kernel with QEMU

```
2.800580] usbcore: registered new interface driver usb_lp
2.800887] usbcore: registered new interface driver usb-storage
2.801842] i8042: PNP: PS/2 Controller [PNP0303:KBD,PNP0f13:MOU] at 0x60,0x64 irq 1,12
2.805383] serio: i8042 KBD port at 0x60,0x64 irq 1
2.805658] serio: i8042 AUX port at 0x60,0x64 irq 12
2.809171] rtc_cmos 00:05: RTC can wake from S4
2.811686] input: AT Translated Set 2 keyboard as /devices/platform/i8042/serio0/input/input1
2.815321] rtc_cmos 00:05: registered as rtc0
2.816343] rtc_cmos 00:05: alarms up to one day, y3k, 242 bytes nvram, hpet irqs
2.818806] fail to initialize ptp_kvm
2.821060] device-mapper: ioctl: 4.48.0-ioctl (2023-03-01) initialised: dm-devel@redhat.com
2.822812] hid: raw HID events driver (C) Jiri Kosina
2.823597] usbcore: registered new interface driver usbhid
2.823824] usbhid: USB HID core driver
2.832401] Initializing XFRM netlink socket
2.832905] NET: Registered PF_INET6 protocol family
2.839800] Segment Routing with IPv6
2.840052] In-situ OAM (IOAM) with IPv6
2.841097] sit: IPv6, IPv4 and MPLS over IPv4 tunneling driver
2.844711] NET: Registered PF_PACKET protocol family
2.846395] 9pnet: Installing 9P2000 support
2.846840] Key type dns_resolver registered
2.849101] IPI shorthand broadcast: enabled
2.870224] sched_clock: Marking stable (2885093311, -14841257)->(2882444098, -12192044)
2.872698] registered taskstats version 1
2.872894] Loading compiled-in X.509 certificates
2.886060] PM: Magic number: 0:659:536
2.887091] printk: legacy console [netcon0] enabled
2.887405] netconsole: network logging started
2.888513] cfg80211: Loading compiled-in X.509 certificates for regulatory database
2.897426] kworker/u2:0 (46) used greatest stack depth: 14488 bytes left
2.908824] Loaded X.509 cert 'sforshee: 00b28ddf47aef9cea7'
2.909840] Loaded X.509 cert 'wens: 61c038651aabdcf94bd8ac7ff06c7248db18c600'
2.912368] ALSA device list:
2.912920] platform regulatory.0: Direct firmware load for regulatory.db failed with error -2
2.913609] No soundcards found.
2.914910] cfg80211: failed to load regulatory.db
3.443438] input: ImExPS/2 Generic Explorer Mouse as /devices/platform/i8042/serio1/input/input3
3.444815] md: Waiting for all devices to be available before autodetect
3.444978] md: If you don't use raid, use raid=noautodetect
3.445213] md: Autodetecting RAID arrays.
3.445603] md: autorun ...
3.445818] md: ... autorun DONE.
3.447798] kworker/u2:0 (49) used greatest stack depth: 14072 bytes left
3.448148] /dev/root: Can't open blockdev
3.448863] VFS: Cannot open root device "" or unknown-block(0,0): error -6
3.449025] Please append a correct "root=" boot option; here are the available partitions:
3.449545] 0000 1048575 sr0
3.449636] driver: sr
3.449945] List of all bdev filesystems:
3.450020] ext3
3.450040] ext2
3.450115] ext4
3.450176] vfat
3.450205] msdos
3.450246] iso9660
3.450448]
3.450825] Kernel panic - not syncing: VFS: Unable to mount root fs on unknown-block(0,0)
3.451294] CPU: 0 PID: 1 Comm: swapper/0 Not tainted 6.8.0 #1
3.451466] Hardware name: QEMU Ubuntu 24.04 PC (i440FX + PIIX, 1996), BIOS 1.16.3-debian-1.16.3-2 04/01/2014
3.451873] Call Trace:
3.452543] <TASK>
3.452920] dump_stack_lvl+0x36/0x50
3.453298] panic+0x312/0x340
3.453398] mount_root_generic+0x2a9/0x310
3.453577] prepare_namespace+0x64/0x280
3.453866] kernel_init_freeable+0x28a/0x2d0
3.453956] ? __pfx_kernel_init+0x10/0x10
3.454100] kernel_init+0x15/0x1b0
3.454272] ret_from_fork+0x2f/0x50
3.454446] ? __pfx_kernel_init+0x10/0x10
3.454692] ret_from_fork_asm+0x1b/0x30
3.454913] </TASK>
3.455337] Kernel Offset: 0x1a00000 from 0xfffffff81000000 (relocation range: 0xfffffff800000000-0xfffffff8bfffffff)
3.455908] ---[ end Kernel panic - not syncing: VFS: Unable to mount root fs on unknown-block(0,0) ]---
QEMU: Terminated
ssing214@ssing214-vm: ~/linux$
ssing214@ssing214-vm: ~/linux$
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```

TODO: [FAILED] Failed to start multipathd.service...Mapper Multipath Device Controller.

[illegible]