

Kompiling the Kernel

A presentation by
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Who am I?

- UN*X Admin
- Began using Linux in 98
- Primary OS ever since

Agenda

- Kernel basics
- Configuring and Compiling
- Installation

Kernel Basics

- Kernel (n) : a central or essential part
- Interface between user programs and computer hardware
- Its like the force – it holds the universe together inside your machine

Architecture

- monolithic vs. microkernel
 - The Tanenbaum-Torvalds debate
 - Linus decided on monolithic kernel
 - It is/was the 'Old' way
 - Simpler – Less IPC overhead – Just Works(TM)
 - contrast Mach/HURD, Windows
- POSIX compliant for portability
- All bits built at once

Modules

- Drivers implemented as removable bits of code
- Can (usually) remove driver, recompile, reinsert
- Mix & match between kernels
- Doesn't have to be for hardware
 - crypto support
 - ipv6

Things that aren't modules

- Core bits such as processor type, memory layout (<1gig, 4gig, 64gig), etc
- Configuration bits within modules

To module or not to module?

- Pros
 - Kernel Size
 - Memory
- Cons
 - Modules cause problems
 - Some drivers work better compiled in (3c509)
- Booting - if you don't use initrd's you need fs, block devices (hard drive) compiled in

Configuring and Compiling

make config|menuconfig|xconfig|gconfig|oldconfig

make dep (only for ≤ 2.4)

make

The Configers

- xconfig/gconfig – qt/gtk widgets
- menuconfig – ncurses interface
- config – original text/console interface
- oldconfig – like config but only asks about new kernel options

.config

- Example of the Tao of Linux
- Contains all configuration of the kernel
- Can be edited by hand, options are either included, not included or selected to be modules:

```
CONFIG_EFI=y
```

```
# CONFIG_MATH_EMULATION is not set
```

```
CONFIG_ACPI_BATTERY=m
```

- Kernel option exists to make the running kernels' config available via `/proc/config.gz`

Configure new kernel

```
tar -xjvf linux-new.tar.bz2
```

```
cd linux-new
```

```
copy /old/config/file .config
```

```
make oldconfig
```

```
-- or --
```

```
zcat /proc/config.gz > .config
```

```
make oldconfig
```

Patching

- Normally:

```
cd linux-<ver>
```

```
patch -p1 < /path/to/patch
```

--or--

```
zcat /path/to/patch.gz | patch -p1
```

- -mm tree

- tons of patches not yet accepted into main tree
- <ftp://ftp.kernel.org/pub/linux/kernel/people/akpm/patches/2.6>

Compiling

- Since ~2.6

make

- ≤ 2.4

make dep

make bzImage

make modules

Help and Clean

- make help
 - Lists lots of useful options.
- make clean
 - Removes .o files, leaves .config.
- make mrproper
 - Like some source packages distclean/realclean options. This will delete .config.
- Doing a make clean or mrproper sometimes fixes compile bugs.

Installing

- two steps:
 - make modules_install
 - make install
- Installs to:
 - /lib/modules/<version>
 - /boot/vmlinuz-version
 - /boot/initrd-vmlinuz-version

If you love the pain

- If make install doesn't work, this covers all distros:

```
cp arch/i386/boot/bzImage /boot/vmlinuz-<ver>
```

```
vi /etc/lilo.conf || vi /boot/grub/menu.lst
```

```
lilo # only if you use lilo
```

```
mkinitramfs || mkinitrd # only if you use initrds
```

Packages?

- make deb-pkg
- make rpm-pkg
- make targz-pkg

- 3rd party:
 - debian: make-kpkg

module-init-tools

- Transition from 2.4 to 2.6 (usually) requires the package module-init-tools:

<http://ftp.kernel.org/pub/linux/kernel/people/rusty/modules/>

How to be bleeding edge

- Patch from the -mm tree.
- Or pull from Linus's git tree.
<http://linux.yyz.us/git-howto.html>

Review

- Kernel basics
- Configuring and Compiling
- Installation

links

<ftp://ftp.us.kernel.org/pub/linux/kernel/v2.6>

<http://www.oreilly.com/catalog/opensources/book/appa.html>

<ftp://ftp.kernel.org/pub/linux/kernel/people/akpm/patches/2.6>

<http://ftp.kernel.org/pub/linux/kernel/people/rusty/modules/>

<http://linux.yyz.us/git-howto.html>

<http://en.wikipedia.org/wiki/Wildebeest>

