

How To Compile A Kernel - The Mandriva Way

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Each distribution has some specific tools to build a custom kernel from the sources. This article is about compiling a kernel on Mandriva systems. It describes how to build a custom kernel using the latest unmodified kernel sources from www.kernel.org ([vanilla kernel](#)) so that you are independent from the kernels supplied by your distribution. It also shows how to patch the kernel sources if you need features that are not in there.

I have tested this on Mandriva Free 2007.

I want to say first that this is not the only way of setting up such a system. There are many ways of achieving this goal but this is the way I take. I do not issue any guarantee that this will work for you!

1 Preliminary Note

The goal of this tutorial is to build a kernel rpm package that can be installed on the system, and that you can share with others and install on other Mandriva systems which is a big advantage compared to the "traditional" way where you don't end up with an rpm package.

2 Download The Kernel Sources

First we download our desired kernel to `/usr/src`. Go to www.kernel.org and select the kernel you want to install, e.g. `linux-2.6.18.3.tar.bz2` (you can find all 2.6 kernels here: <http://www.kernel.org/pub/linux/kernel/v2.6/>). Then you can download it to `/usr/src` like this:

```
cd /usr/src
wget http://www.kernel.org/pub/linux/kernel/v2.6/linux-2.6.18.3.tar.bz2
```

Then we unpack the kernel sources and create a symlink `linux` to the kernel sources directory:

```
tar xjf linux-2.6.18.3.tar.bz2

ln -s linux-2.6.18.3 linux

cd /usr/src/linux
```

3 Apply Patches To The Kernel Sources (Optional)

Sometimes you need drivers for hardware that isn't supported by the new kernel by default, or you need support for virtualization techniques or some other bleeding-edge technology that hasn't made it to the kernel yet. In all these cases you have to patch the kernel sources (provided there is a patch available...).

Now let's assume you have downloaded the needed patch (I call it `patch.bz2` in this example) to `/usr/src`. This is how you apply it to your kernel sources (you must still be in the `/usr/src/linux` directory):

```
bzip2 -dc /usr/src/patch.bz2 | patch -p1 --dry-run

bzip2 -dc /usr/src/patch.bz2 | patch -p1
```

The first command is just a test, it does nothing to your sources. If it doesn't show errors, you can run the second command which actually applies the patch. Don't do it if the first command shows errors!

If your patches are compressed with `gzip` (`.gz`) instead of `bzip2` (`.bz2`), then you patch your kernel as follows:

```
gunzip -c /usr/src/patch.gz | patch -p1 --dry-run

gunzip -c /usr/src/patch.gz | patch -p1
```

You can also apply kernel prepatches to your kernel sources. For example, if you need a feature that is available only in kernel 2.6.19-rc6, but the full

sources haven't been released yet for this kernel. Instead, a `patch-2.6.19-rc6.bz2` is available. You can apply that patch to the 2.6.18 kernel sources, but not to kernel 2.6.18.1 or 2.6.18.2 or 2.6.18.3, etc. This is explained on <http://kernel.org/patchtypes/pre.html>:

Prepatches are the equivalent to alpha releases for Linux; they live in the testing directories in the archives. They should be applied using the patch(1) utility to the source code of the previous full release with a 3-part version number (for example, the 2.6.12-rc4 prepatch should be applied to the 2.6.11 kernel sources, not, for example, 2.6.11.10.)

So if you want to compile a 2.6.19-rc6 kernel, you must download the 2.6.18 kernel sources (<http://www.kernel.org/pub/linux/kernel/v2.6/linux-2.6.18.tar.bz2>) in step 3 instead of kernel 2.6.18.3!

This is how you apply the 2.6.19-rc6 patch to kernel 2.6.18:

```
cd /usr/src

wget http://www.kernel.org/pub/linux/kernel/v2.6/testing/patch-2.6.19-rc6.bz2

cd /usr/src/linux

bzip2 -dc /usr/src/patch-2.6.19-rc6.bz2 | patch -p1 --dry-run

bzip2 -dc /usr/src/patch-2.6.19-rc6.bz2 | patch -p1
```

4 Configure The Kernel

It's a good idea to use the configuration of your current working kernel as a basis for your new kernel. Therefore we copy the existing configuration to `/usr/src/linux`:

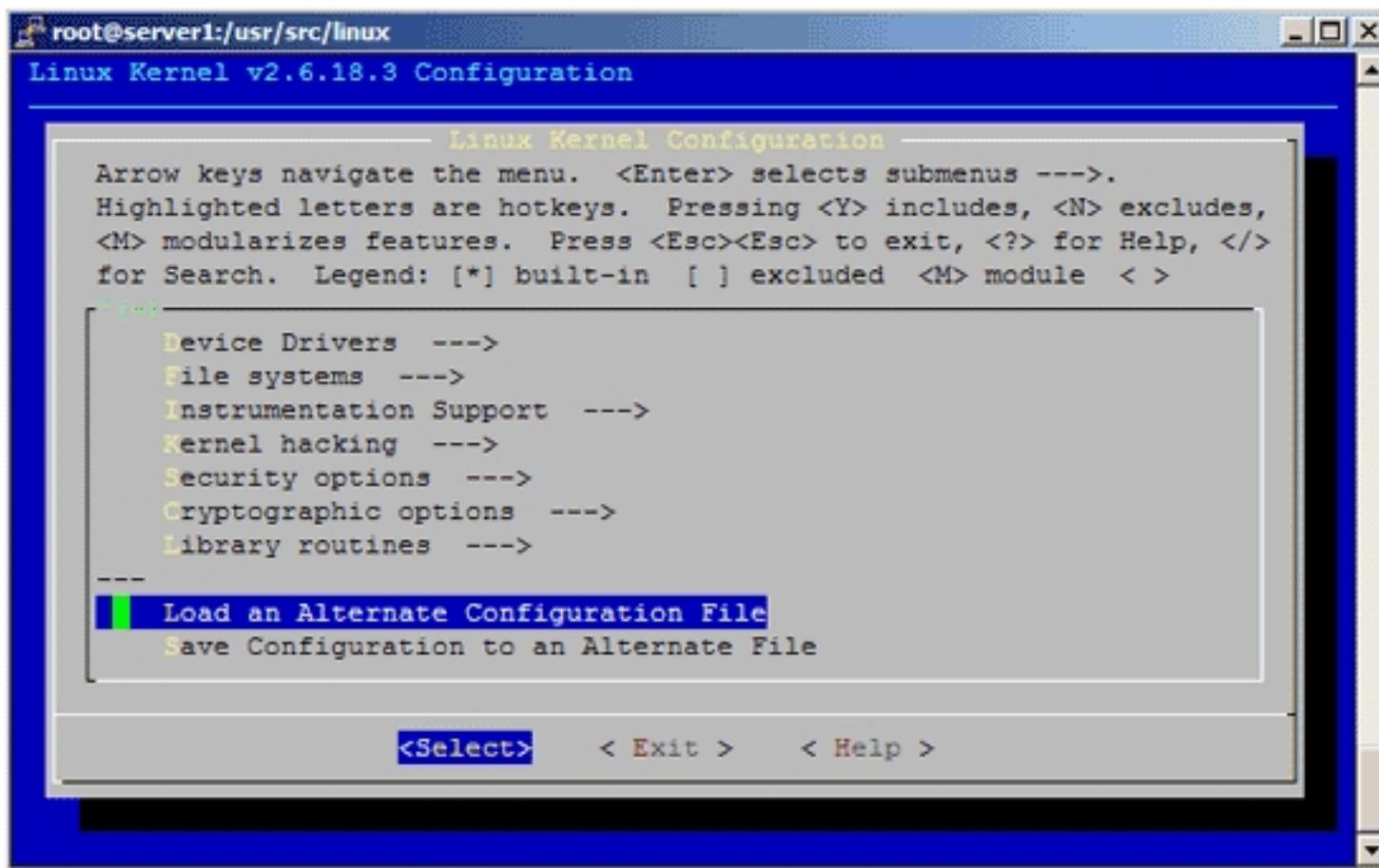
```
make clean && make mrproper

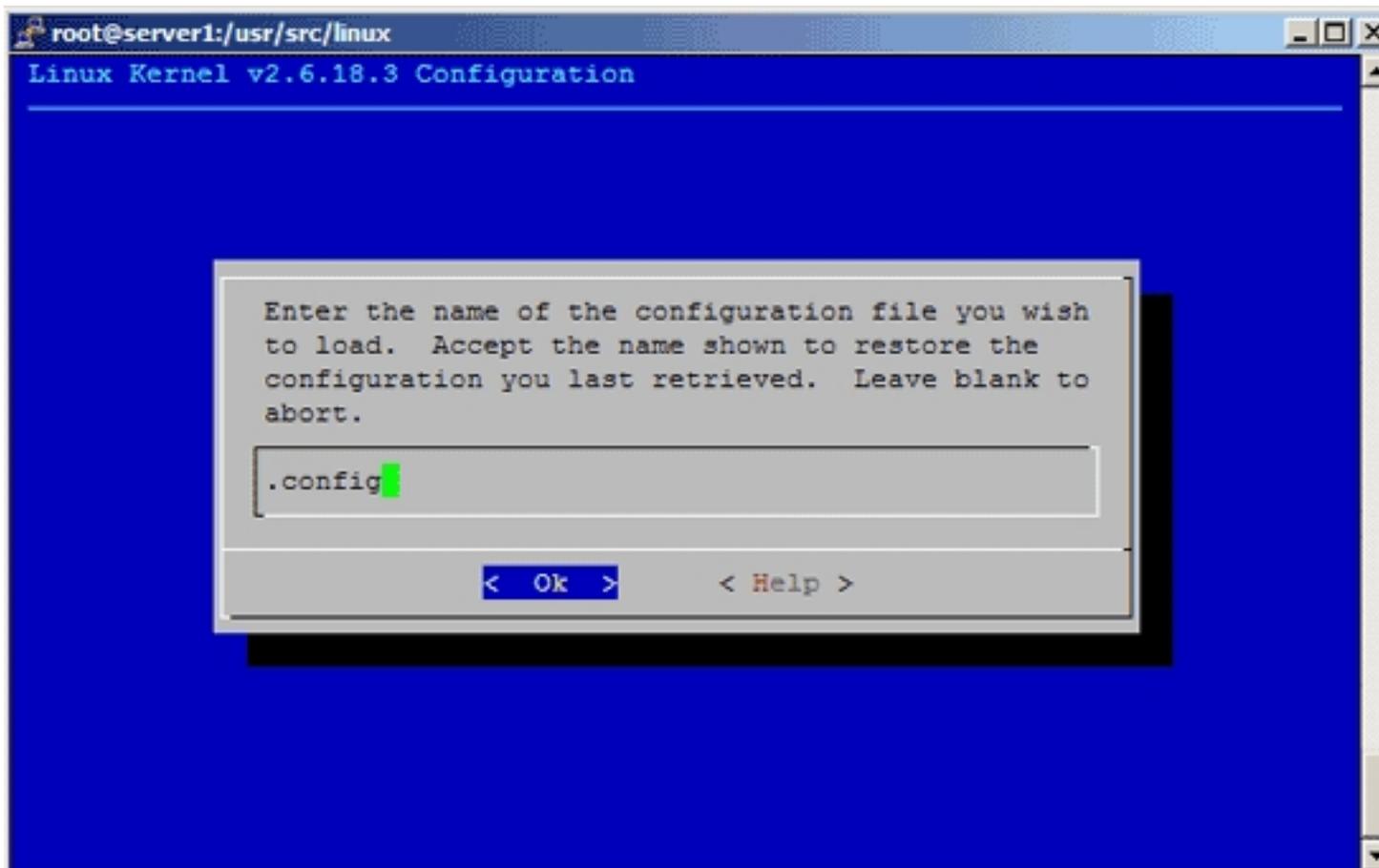
cp /boot/config-`uname -r` ./config
```

Then we run

```
make menuconfig
```

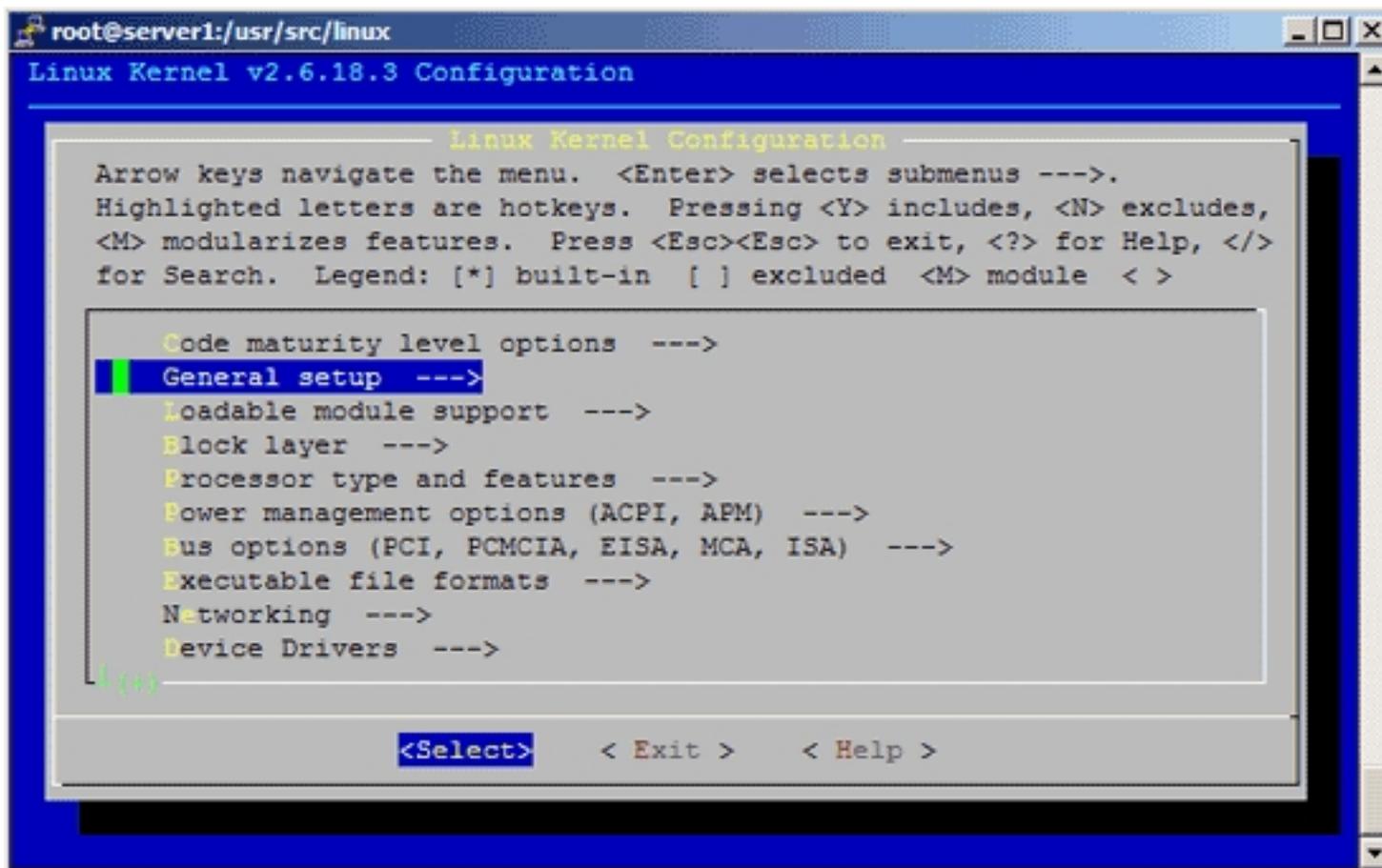
which brings up the kernel configuration menu. Go to *Load an Alternate Configuration File* and choose *.config* (which contains the configuration of your current working kernel) as the configuration file:





Then browse through the kernel configuration menu and make your choices. Make sure you specify a kernel version identification string under *General Setup* ---> *() Local version - append to kernel release*. I use *-default* so our kernel rpm package will be named *kernel-2.6.18.3default-1.i386.rpm*. You can leave the string empty or specify a different one which helps you identify the kernel (e.g. *-custom* or whatever you like).

After you have installed *kernel-2.6.18.3default-1.i386.rpm* and decide to compile another 2.6.18.3 kernel rpm package, it is important to use a different version string, e.g. *-default1*, *-default2*, etc., because otherwise you can't install your new kernel because rpm complains that *kernel-2.6.18.3default-1.i386.rpm* is already installed!



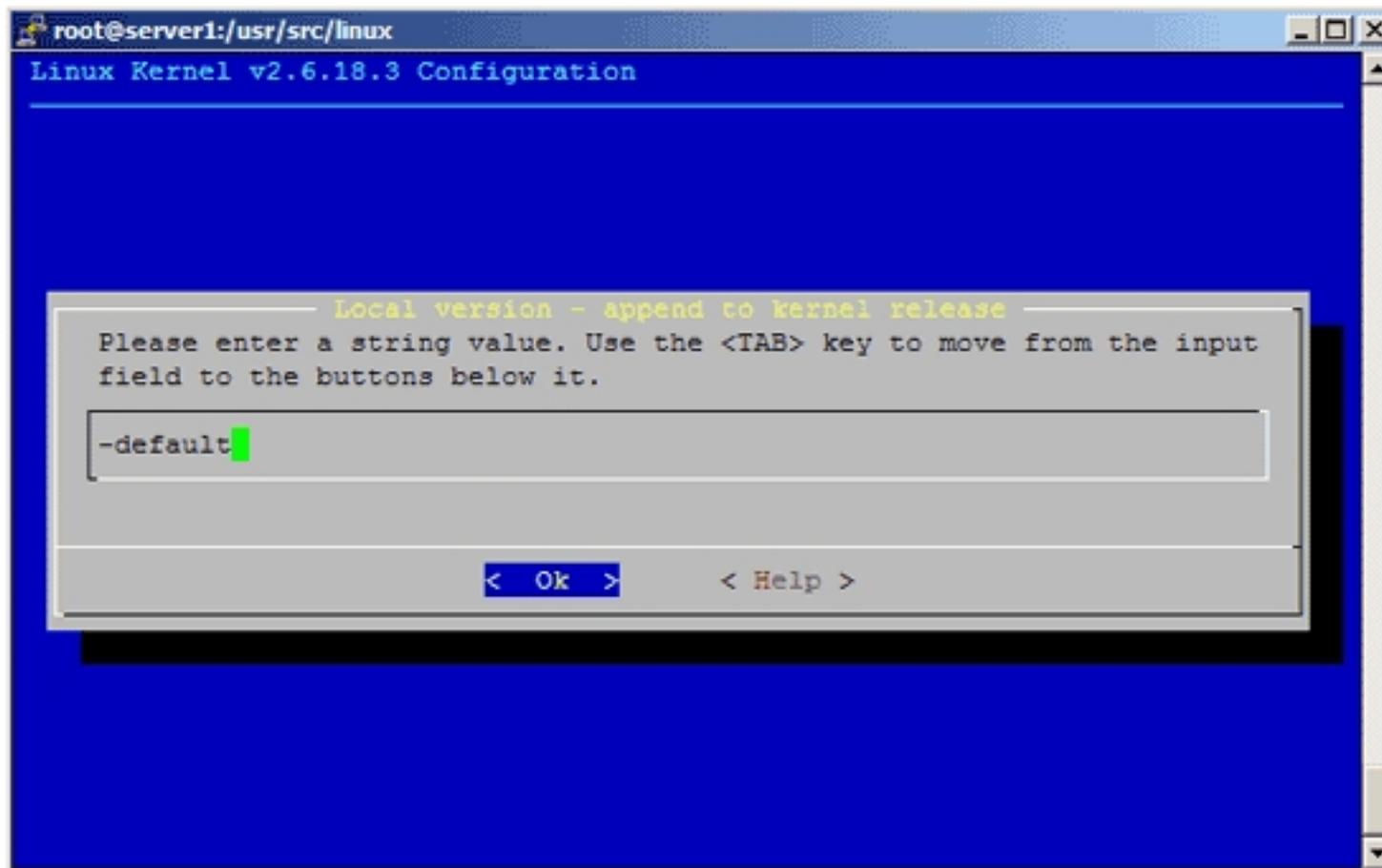
```
root@server1:/usr/src/linux
Linux Kernel v2.6.18.3 Configuration

          General setup

Arrow keys navigate the menu.  <Enter> selects submenus --->.
Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
<M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
for Search.  Legend: [*] built-in [ ] excluded <M> module < >

[|] Local version - append to kernel release
[*] Automatically append version information to the version string (N)
[*] Support for paging of anonymous memory (swap)
[*] System V IPC
[*] POSIX Message Queues
[*] BSD Process Accounting
[ ]   BSD Process Accounting version 3 file format
[ ]   Export task/process statistics through netlink (EXPERIMENTAL) (NE)
[*] Auditing support
[*]   Enable system-call auditing support

<Select>  < Exit >  < Help >
```



```
root@server1:/usr/src/linux
Linux Kernel v2.6.18.3 Configuration

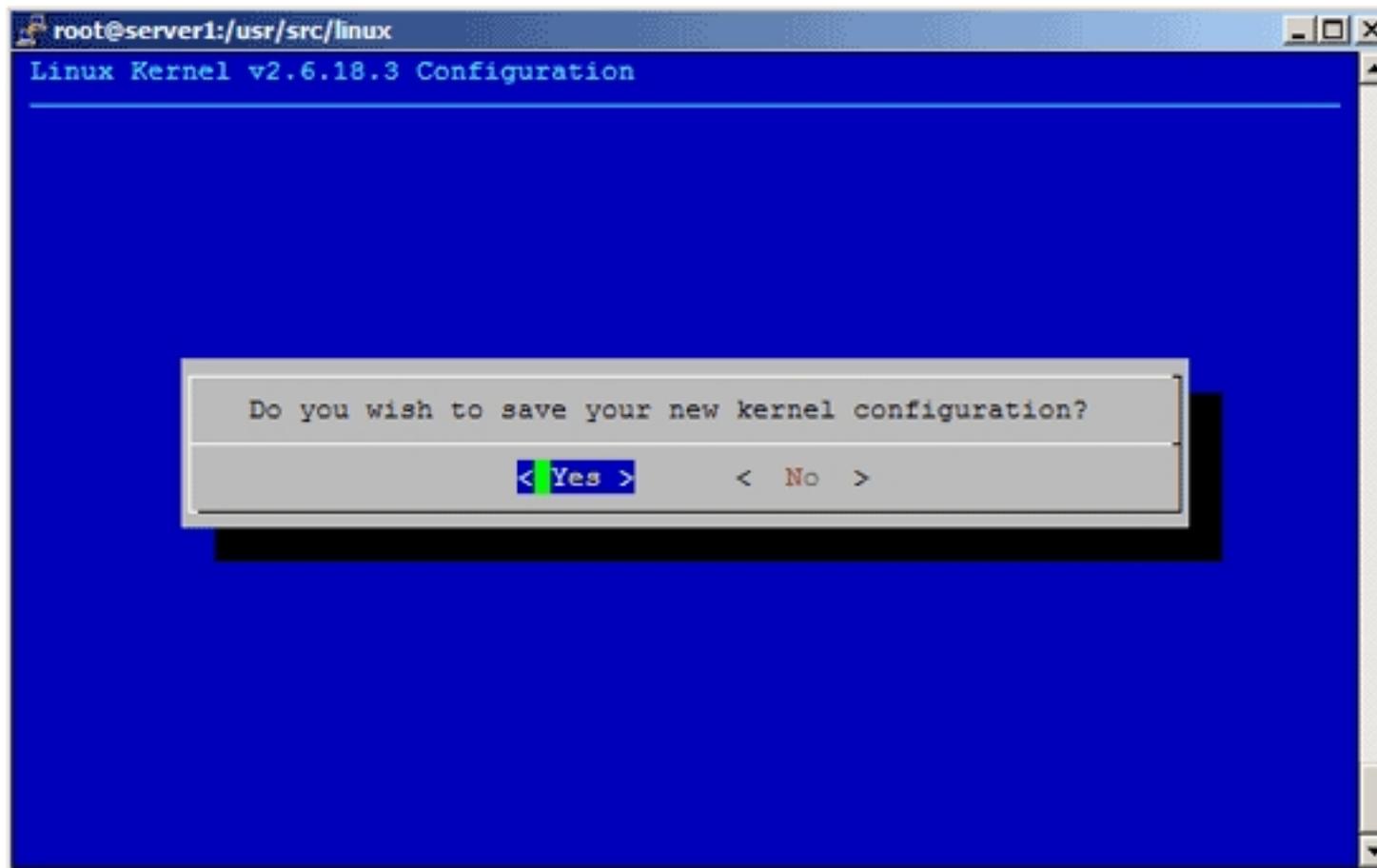
          General setup

Arrow keys navigate the menu.  <Enter> selects submenus --->.
Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
<M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
for Search.  Legend: [*] built-in [ ] excluded <M> module < >

(-default) Local version - append to kernel release
[*] Automatically append version information to the version string (N)
[*] Support for paging of anonymous memory (swap)
[*] System V IPC
[*] POSIX Message Queues
[*] BSD Process Accounting
[ ]   BSD Process Accounting version 3 file format
[ ]   Export task/process statistics through netlink (EXPERIMENTAL) (NE)
[*] Auditing support
[*]   Enable system-call auditing support

<Select>  < Exit >  < Help >
```

When you are finished and select *Exit*, answer the following question (*Do you wish to save your new kernel configuration?*) with *Yes*:



5 Build The Kernel

To build the kernel, simply execute this command:

```
make rpm
```

Now be patient, the kernel compilation can take some hours, depending on your kernel configuration and your processor speed.

6 Install The New Kernel

After the successful kernel build, a *src.rpm* and an *rpm* package have been created. The *src.rpm* package can be found in the `/usr/src/rpm/SRPMS/` directory, you can find out about its name by running

```
ls -l /usr/src/rpm/SRPMS/
```

On my system it was called `kernel-2.6.18.3default-1.src.rpm`.

The rpm package can be found in `/usr/src/rpm/RPMS/i386/`, `/usr/src/rpm/RPMS/i586/`, `/usr/src/rpm/RPMS/i686/`, `/usr/src/rpm/RPMS/x86_64/`, etc., depending on your architecture. On my system it was located in `/usr/src/rpm/RPMS/i386/`, and by running

```
ls -l /usr/src/rpm/RPMS/i386/
```

I found out that its name was `kernel-2.6.18.3default-1.i386.rpm`.

Now we can install our kernel rpm package like this:

```
cd /usr/src/rpm/RPMS/i386/  
  
rpm -ivh kernel-2.6.18.3default-1.i386.rpm
```

You can now even transfer the kernel rpm package to other Mandriva systems and install it there exactly the same way, which means you don't have to compile the kernel there again.

Next we create a ramdisk for our new kernel, because otherwise the system will most likely not boot our new kernel:

```
mkinitrd /boot/initrd-2.6.18.3-default.img 2.6.18.3-default
```

7 Configure The LILO Boot Loader

Now we must configure our LILO boot loader so that our new kernels gets booted when we restart the system.

Run

```
ls -l /boot
```

to find out about your new kernel (typically begins with *vmlinuz*, e.g. *vmlinuz-2.6.18.3-default*) and ramdisk (typically begins with *initrd*, e.g. *initrd-2.6.18.3-default.img*).

Then edit */etc/lilo.conf*. Have a look at your existing (working) kernel stanzas there and take one of them as a sample for your new stanza and replace the kernel and ramdisk, then add the stanza above all other stanzas. Make sure you specify a unique name for that kernel in the *label* line (e.g. *linux-2.6.18.3-default*) and specify exactly the same name in the *default* line so that the kernel gets booted when you restart the system.

```
vi /etc/lilo.conf
```

For example, my *lilo.conf* looks like this before I add the new stanza:

```
# File generated by DrakX/drakboot
# WARNING: do not forget to run lilo after modifying this file

default="linux"
boot=/dev/sda
map=/boot/map
keytable=/boot/us.klt
menu-scheme=wb:bw:wb:bw
compact
prompt
nowarn
```

```
timeout=100
message=/boot/message
image=/boot/vmlinuz
    label="linux"
    root=/dev/sda6
    initrd=/boot/initrd.img
    append=" resume=/dev/sda5 splash=silent"
    vga=788
image=/boot/vmlinuz
    label="linux-nonfb"
    root=/dev/sda6
    initrd=/boot/initrd.img
    append=" resume=/dev/sda5"
image=/boot/vmlinuz
    label="failsafe"
    root=/dev/sda6
    initrd=/boot/initrd.img
    append=" failsafe resume=/dev/sda5"
```

and like this afterwards (keep in mind what I said about the *label* and *default* lines):

```
# File generated by DrakX/drakboot
# WARNING: do not forget to run lilo after modifying this file

default="linux-2.6.18.3-default"
boot=/dev/sda
map=/boot/map
keytable=/boot/us.klt
menu-scheme=wb:bw:wb:bw
compact
prompt
```

```
nowarn
timeout=100
message=/boot/message
image=/boot/vmlinuz-2.6.18.3-default
    label="linux-2.6.18.3-default"
    root=/dev/sda6
    initrd=/boot/initrd-2.6.18.3-default.img
    append=" resume=/dev/sda5 splash=silent"
    vga=788
image=/boot/vmlinuz
    label="linux"
    root=/dev/sda6
    initrd=/boot/initrd.img
    append=" resume=/dev/sda5 splash=silent"
    vga=788
image=/boot/vmlinuz
    label="linux-nonfb"
    root=/dev/sda6
    initrd=/boot/initrd.img
    append=" resume=/dev/sda5"
image=/boot/vmlinuz
    label="failsafe"
    root=/dev/sda6
    initrd=/boot/initrd.img
    append=" failsafe resume=/dev/sda5"
```

Then run

```
lilo
```

Now reboot the system:

```
shutdown -r now
```

If everything goes well, it should come up with the new kernel. You can check if it's really using your new kernel by running

```
uname -r
```

This should display something like

```
2.6.18.3-default
```

If the system doesn't start, restart it, and when you come to the LILO boot loader menu, select your old kernel and start the system:



You can now try again to compile a working kernel. Don't forget to remove the stanza of the not-working kernel from `/etc/lilo.conf`, and make sure you run

`lilo`

after modifying `/etc/lilo.conf`.

8 Links

- Mandriva: <http://www.mandriva.com>
- The Linux Kernel Archives: <http://www.kernel.org>