Menuconfig or how to configure kernel

Contents

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Contents

1 Linux configuration genericity

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.config is the result of configuring task which is processing platform defconfig and fragment files if any.

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- arch/arm/configs/**multi_v7_defconfig**

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.config result is located in the build folder:

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To modify the kernel options, it is not recommended to edit this file directly.

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```
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starts a character based question and answer session (Figure 1)
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Wikipedia Menuconfig[1] also explains how to "navigate" within the configuration menu,
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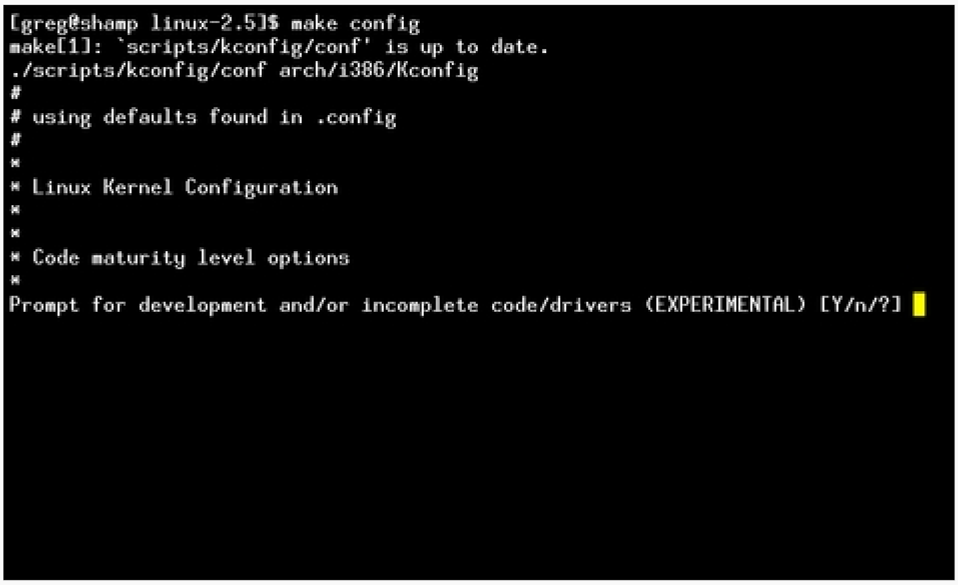

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make[1]: `scripts/kconfig/conf' is up to date.
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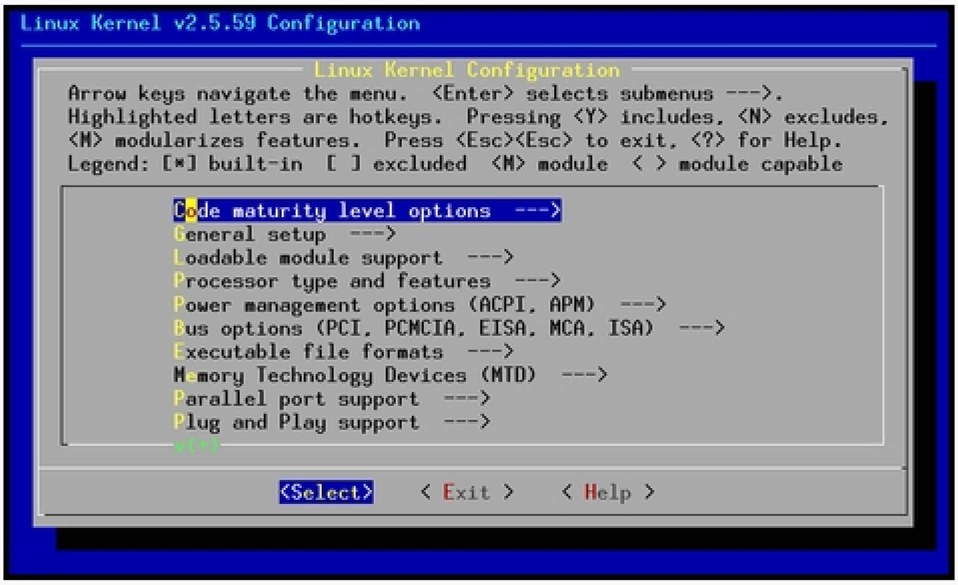
#
# using defaults found in .config
#
*
* Linux Kernel Configuration
*
*
* Code maturity level options
*
Prompt for development and/or incomplete code/drivers (EXPERIMENTAL) [Y/n/?]
```

Figure 1. Configuring the kernel with make config



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          Memory Technology Devices (MTD)  --->
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          v(+)

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

Figure 2. Make menuconfig makes it easier to back up and correct mistakes

- or a graphical kernel configurator :

```
PC $> make xconfig
starts a X based configuration tool (Figure 3)
```

Ultimately these configuration tools edit the . config file.

An option indicates either some driver is built into the kernel ("=y") or will be built as a module ("=m") or is not selected.

The unselected state can either be indicated by a line starting with "#" (e.g. "# CONFIG_SCSI is not set") or by the absence of the relevant line from the .config file.

The 3 states of the main selection option for the SCSI subsystem (which actually selects the SCSI mid level driver) follow. Only one of these should appear in an actual .config file:

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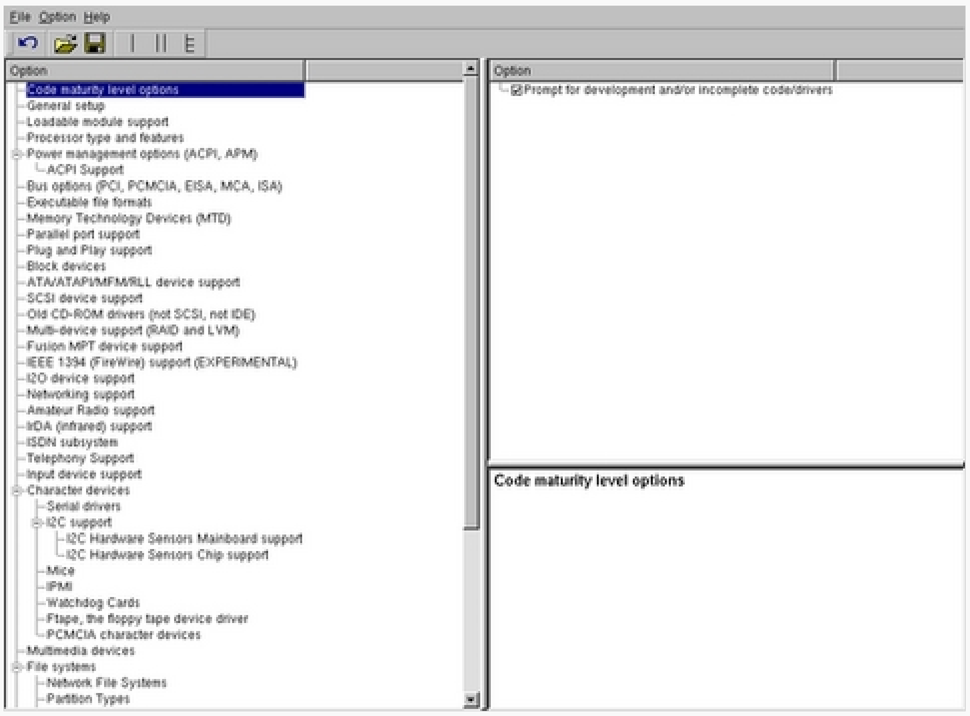
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Figure 3. The Qt-Based make xconfig

2 Menuconfig and Developer Package

For this use case, the prerequesite is that OpenSTLinux SDK has been installed and configured.

To verify if your cross-compilation environment has been put in place correctly, run the following command:

```
PC $> set | grep CROSS
CROSS_COMPILE=arm-openstlinux_weston-linux-gnueabi-
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For more details, refer to *<Linux kernel installation directory>/README.HOW_TO.txt* helper file (the latest version of this helper file is also available in this user guide: README.HOW_TO.txt).

- Go to the <Linux kernel build directory>

```
PC $> cd <Linux kernel build directory>
```

- Save initial configuration (to identify later configuration updates)

```
PC $> make arch=ARM savedefconfig
Result is stored in defconfig file
PC $> cp defconfig defconfig.old
```

- Start the Linux kernel configuration menu

```
PC $> make arch=ARM menuconfig
```

- Navigate forwards or backwards directly between feature
  - un/select, modify feature(s) you want
  - When the configuration is OK : exit and save the new configuration

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useful keys to know:
enter: enter in config subdirectory
space: hit several times to either select [*], select in module [m] or unselect [ ]
/: to search for a keyword, this is usefull to navigate in tree
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- Compare the old and new config files after operating modifications with menuconfig

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PC $> make arch=ARM savedefconfig
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Retrieve configuration updates by comparing the new defconfig and the old one

```
PC $> meld defconfig defconfig.old
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- Cross-compile the Linux kernel (please check the load address in the *README.HOW_TO.txt* helper file)

```
PC $> make arch=ARM uImage LOADADDR=<loadaddr of kernel>
PC $> cp arch/arm/boot/uImage install_artifact/boot/
```

- Update the Linux kernel image on board

```
PC $> scp install_artifact/boot/uImage root@<board ip address>:/boot/
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If the */boot* mounting point doesn't exist yet, please see how to create a mounting point

- Reboot the board

```
Board $> cd /boot; sync; systemctl reboot
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Note that this use case modifies the configuration file in the Linux kernel build directory, not in the Linux kernel source directory: this is a temporary modification useful for a prototyping.

- To make this temporary modification permanent, the delta between defconfig and defconfig.old must be saved in a configuration fragment file (fragment-*.config) based on fragment.cfg file, and the Linux kernel configuration /compilation steps must be re-executed (as explained in the README.HOW_TO.txt helper file).

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- Start the Linux kernel configuration menu

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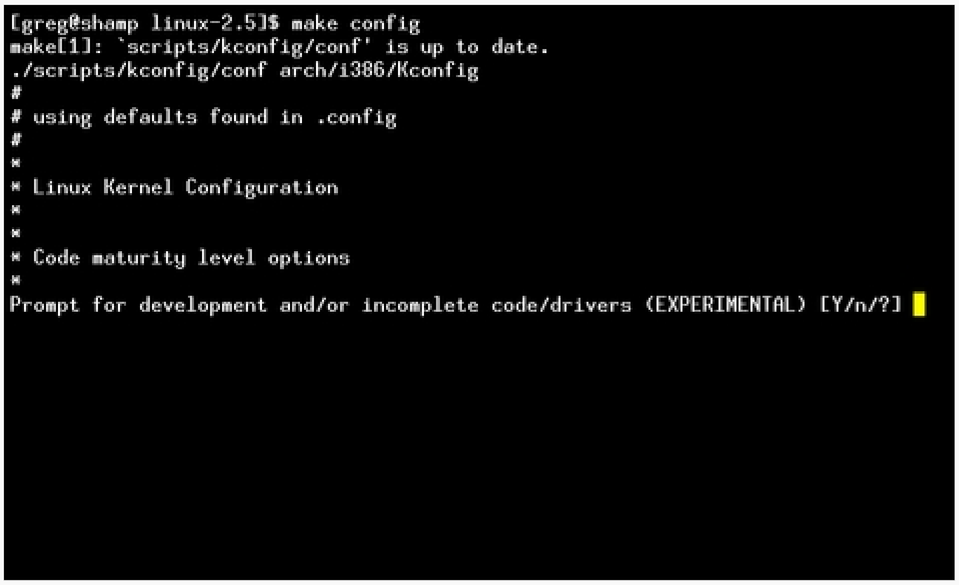

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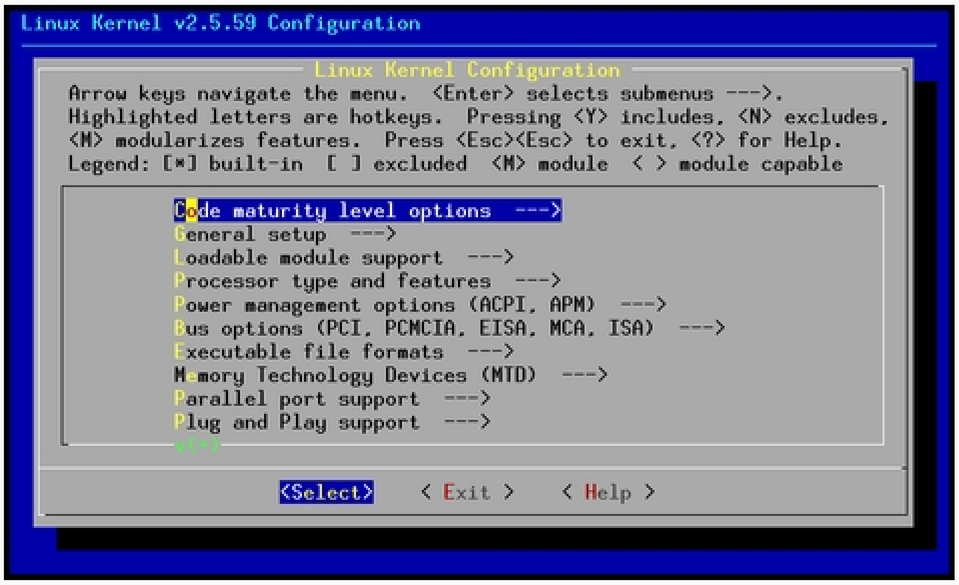

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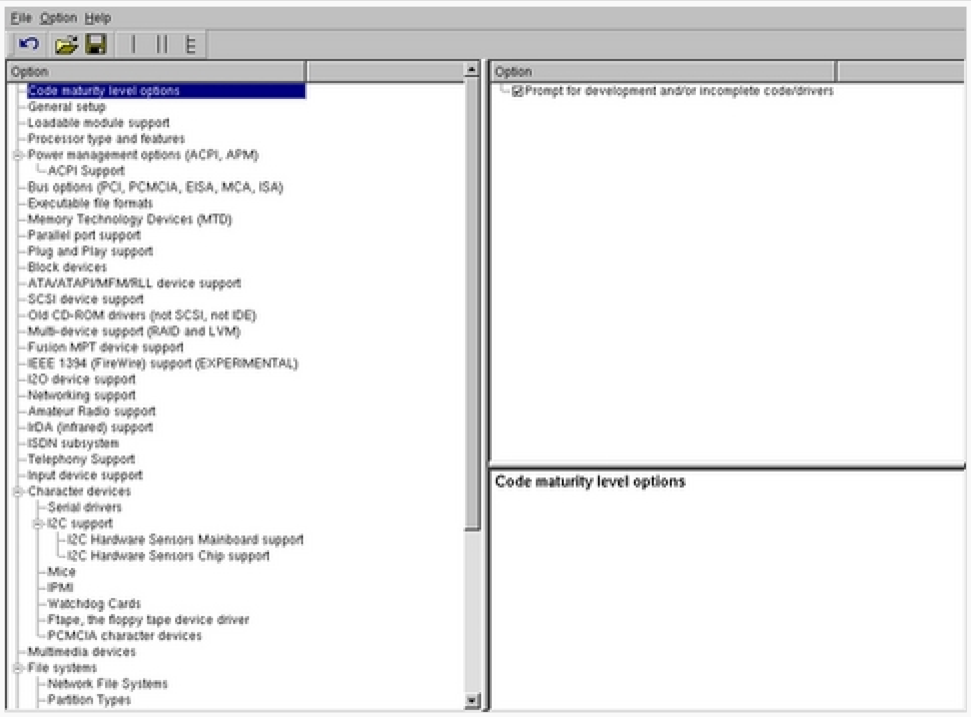
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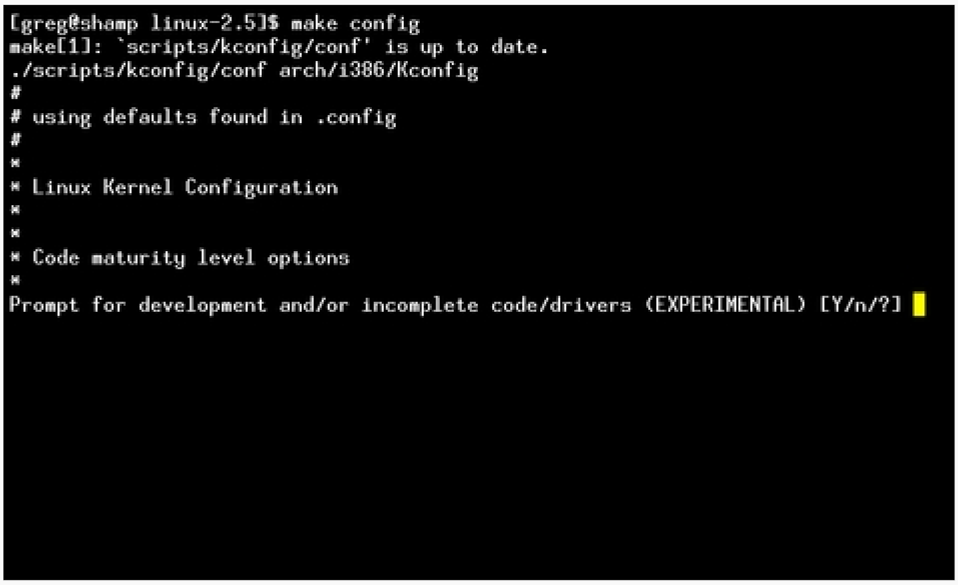

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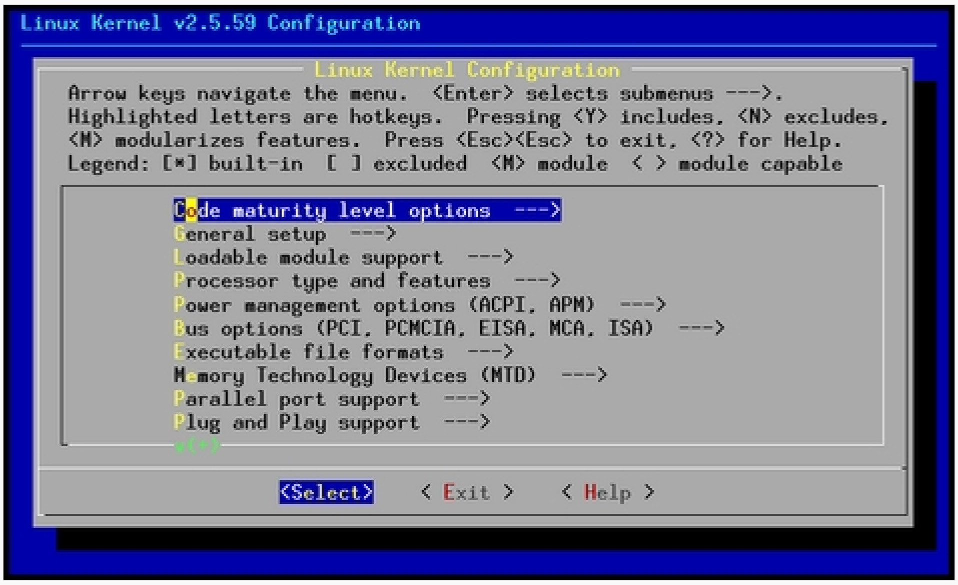

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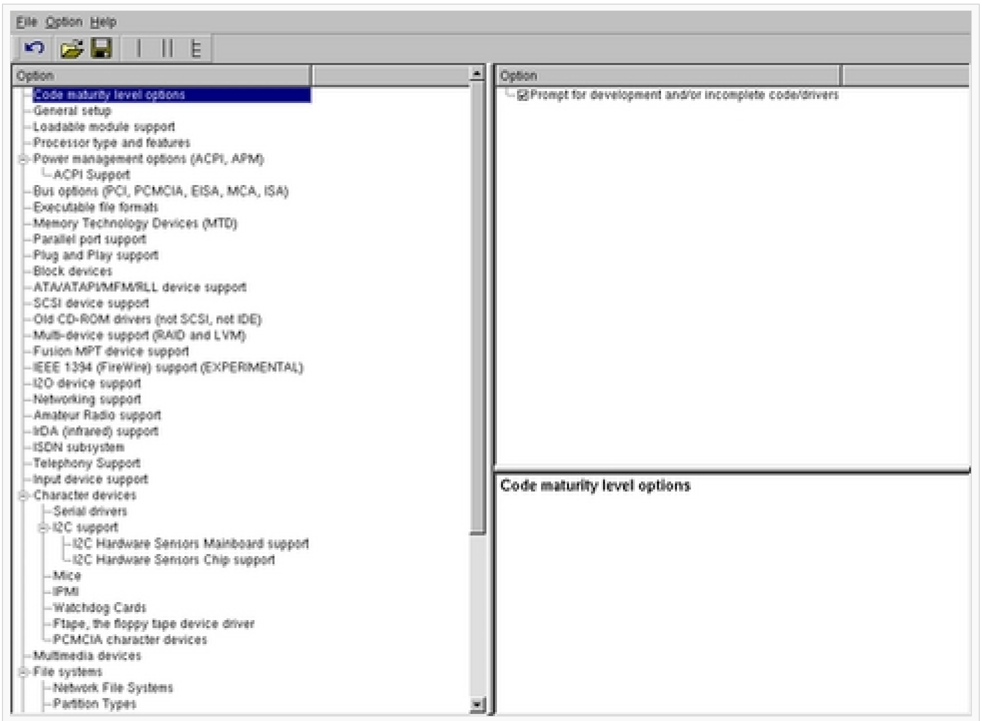

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```
PC $> bitbake virtual/kernel
```

- Update the Linux kernel image on board

```
PC $> scp <build dir>/tmp-glibc/deploy/images/<machine name>/uImage root@<board ip
address>:/boot
```

If the */boot* mounting point does not exist yet, please see how to create a mounting point

- Reboot the board

```
Board $> cd /boot; sync; systemctl reboot
```

Note that this use case modifies the configuration file in the Linux kernel build directory, not in the Linux kernel source directory: this is a temporary modification useful for a prototyping.

- To make this temporary modification permanent, it must be saved in a configuration fragment file (fragment-*.config) based on **fragment.cfg** file, and the Linux kernel configuration/compilation steps must be re-executed: **bitbake <name of kernel recipe>**.

4 References

- Wikipedia Menuconfig

Board support package

Software development kit (A programming package that enables a programmer to develop applications for a specific platform.)

Menuconfig or how to configure kernel

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Contents

1 Linux configuration genericity

The process of building a kernel has two parts: configuring the kernel options and building the source with those options.

The Linux® kernel configuration is found in the generated file: .config.

.config is the result of configuring task which is processing platform defconfig and fragment files if any.

For OpenSTLinux distribution the defconfig is located into the kernel source code and fragments into stm32mp BSP layer :

- arch/arm/configs/**multi_v7_defconfig**

Every new kernel version brings a bunch of new options, we do not want to back port them into a specific defconfig file each time the kernel releases, so we use the same defconfig file based on ARM SoC v7 architecture.
STM32MP1 specificities are managed with fragments config files.

- meta-st/meta-st-stm32mp/recipes-kernel/linux/linux-stm32mp/<kernel version>/**fragment-*.config**

.config result is located in the build folder:

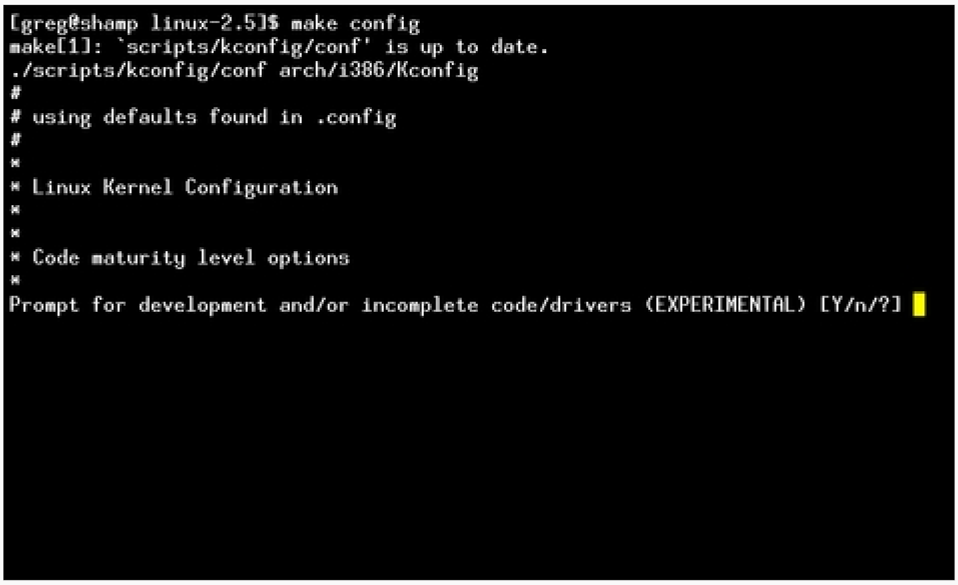
- build-openstlinuxweston-stm32mp1/tmp-glibc/work/stm32mp1-openstlinux_weston-linux-gnueabi/linux-stm32mp/4.14-48/linux-stm32mp1-standard-build/**.config**

To modify the kernel options, it is not recommended to edit this file directly.

- A user runs either a text-mode :

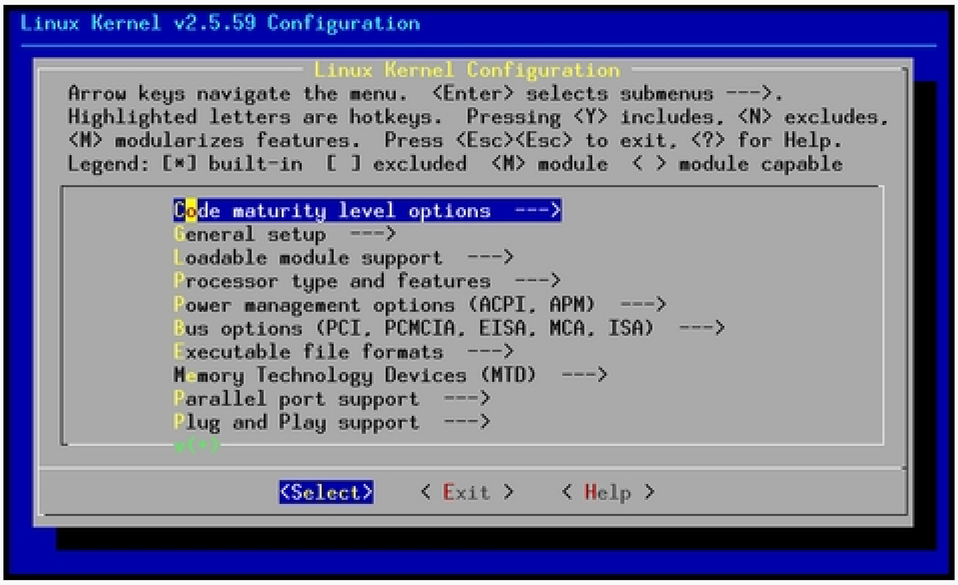
```
   PC $> make config
starts a character based question and answer session (Figure 1)
```

```
   PC $> make menuconfig
starts a terminal-oriented configuration tool (using ncurses) (Figure 2)
The ncurses text version is more popular and is run with the make menuconfig option.
```



```
[greg@shamp linux-2.5]$ make config
make[1]: `scripts/kconfig/conf' is up to date.
./scripts/kconfig/conf arch/i386/Kconfig
#
# using defaults found in .config
#
*
* Linux Kernel Configuration
*
*
* Code maturity level options
*
Prompt for development and/or incomplete code/drivers (EXPERIMENTAL) [Y/n/?]
```

Figure 1. Configuring the kernel with make config



```
Linux Kernel v2.5.59 Configuration

                    Linux Kernel Configuration
  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.
  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

          Code maturity level options  --->
          General setup  --->
          Loadable module support  --->
          Processor type and features  --->
          Power management options (ACPI, APM)  --->
          Bus options (PCI, PCMCIA, EISA, MCA, ISA)  --->
          Executable file formats  --->
          Memory Technology Devices (MTD)  --->
          Parallel port support  --->
          Plug and Play support  --->
          v(+)

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

Figure 2. Make menuconfig makes it easier to back up and correct mistakes

```
Wikipedia
Menuconfig[1] also
explains how to
"navigate" within
the configuration
menu, and
highlights main
key strokes.
```

- or a graphical kernel configurator :

```
   PC $> make
xconfig
starts a X based
configuration tool
(Figure 3)
```

Ultimately these configuration tools edit the . config file.

An option indicates either some driver is built into the kernel ("=y") or will be built as a module ("=m") or is not selected.

The unselected state can either be indicated by a line starting with "#" (e.g. "# CONFIG_SCSI is not set") or by the absence of the relevant line from the .config file.

The 3 states of the main selection option for the SCSI subsystem (which actually selects the SCSI mid level driver) follow. Only one of these should appear in an actual . config file:

```
CONFIG_SCSI=y
CONFIG_SCSI=m
# CONFIG_SCSI is not set
```

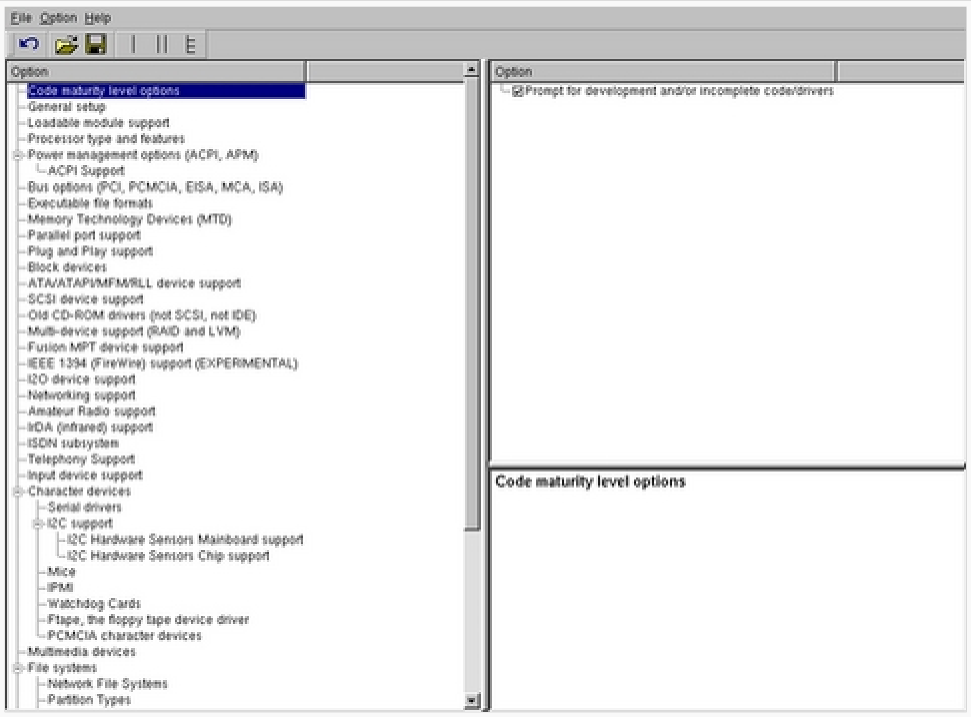

File Option Help
Option
Code maturity level options
General setup
Loadable module support
Processor type and features
Power management options (ACPI, APM)
ACPI Support
Bus options (PCI, PCMCIA, EISA, MCA, ISA)
Executable file formats
Memory Technology Devices (MTD)
Parallel port support
Plug and Play support
Block devices
ATA/ATAPI/MFM/RLL device support
SCSI device support
Old CD-ROM drivers (not SCSI, not IDE)
Multi-device support (RAID and LVM)
Fusion MPT device support
IEEE 1394 (FireWire) support (EXPERIMENTAL)
I2O device support
Networking support
Amateur Radio support
IrDA (infrared) support
ISDN subsystem
Telephony Support
Input device support
Character devices
Serial drivers
I2C support
I2C Hardware Sensors Mainboard support
I2C Hardware Sensors Chip support
Mice
IPMI
Watchdog Cards
Ftape, the floppy tape device driver
PCMCIA character devices
Multimedia devices
File systems
Network File Systems
Partition Types
Option
Prompt for development and/or incomplete code/drivers
Code maturity level options

Figure 3. The Qt-Based make xconfig

2 Menuconfig and Developer Package

For this use case, the prerequesite is that OpenSTLinux SDK has been installed and configured.

To verify if your cross-compilation environment has been put in place correctly, run the following command:

```
PC $> set | grep CROSS
CROSS_COMPILE=arm-openstlinux_weston-linux-gnueabi-
```

For more details, refer to *<Linux kernel installation directory>/README.HOW_TO.txt* helper file (the latest version of this helper file is also available in this user guide: README.HOW_TO.txt).

- Go to the <Linux kernel build directory>

```
PC $> cd <Linux kernel build directory>
```

- Save initial configuration (to identify later configuration updates)

```
PC $> make arch=ARM savedefconfig
Result is stored in defconfig file
PC $> cp defconfig defconfig.old
```

- Start the Linux kernel configuration menu

```
PC $> make arch=ARM menuconfig
```

- Navigate forwards or backwards directly between feature
  - un/select, modify feature(s) you want
  - When the configuration is OK : exit and save the new configuration

```
useful keys to know:
enter: enter in config subdirectory
space: hit several times to either select [*], select in module [m] or unselect [ ]
/: to search for a keyword, this is usefull to navigate in tree
?: to have more information on selected line
```

- Compare the old and new config files after operating modifications with menuconfig

```
PC $> make arch=ARM savedefconfig
```

Retrieve configuration updates by comparing the new defconfig and the old one

```
PC $> meld defconfig defconfig.old
```

- Cross-compile the Linux kernel (please check the load address in the *README.HOW_TO.txt* helper file)

```
PC $> make arch=ARM uImage LOADADDR=<loadaddr of kernel>
PC $> cp arch/arm/boot/uImage install_artifact/boot/
```

- Update the Linux kernel image on board

```
PC $> scp install_artifact/boot/uImage root@<board ip address>:/boot/
```

If the */boot* mounting point doesn't exist yet, please see how to create a mounting point

- Reboot the board

```
Board $> cd /boot; sync; systemctl reboot
```

Note that this use case modifies the configuration file in the Linux kernel build directory, not in the Linux kernel source directory: this is a temporary modification useful for a prototyping.

- To make this temporary modification permanent, the delta between defconfig and defconfig.old must be saved in a configuration fragment file (fragment-*.config) based on fragment.cfg file, and the Linux kernel configuration /compilation steps must be re-executed (as explained in the README.HOW_TO.txt helper file).

3 Menuconfig and Distribution Package

- Start the Linux kernel configuration menu

```
PC $> bitbake virtual/kernel -c menuconfig
```

- Navigate forwards or backwards directly between feature
  - un/select, modify feature(s) you want
  - When the configuration is OK : exit and save the new configuration

```
useful keys to know:
enter: enter in config subdirectory
space: hit several times to either select [*], select in module [m] or unselect [ ]
/: to search for a keyword, this is usefull to navigate in tree
?: to have more information on selected line
```

- Cross-compile the Linux kernel

```
PC $> bitbake virtual/kernel
```

- Update the Linux kernel image on board

```
PC $> scp <build dir>/tmp-glibc/deploy/images/<machine name>/uImage root@<board ip
address>:/boot
```

If the */boot* mounting point does not exist yet, please see how to create a mounting point

- Reboot the board

```
Board $> cd /boot; sync; systemctl reboot
```

Note that this use case modifies the configuration file in the Linux kernel build directory, not in the Linux kernel source directory: this is a temporary modification useful for a prototyping.

- To make this temporary modification permanent, it must be saved in a configuration fragment file (fragment-*.config) based on **fragment.cfg** file, and the Linux kernel configuration/compilation steps must be re-executed: **bitbake <name of kernel recipe>**.

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