mx53 内核编译步骤

这篇文章祥解了如何针对 mx53 CPU 编译内核，其中包含了一些针对 mx53 的必要的驱动。

1、 解压内核源码包，该内核版本为 Linux2.6.35.3。

```
tar zxvf kernel_imx.tar.gz
```

2、 配置内核

由于 2.6.35 标准内核已经包括对 Freescale i.MX 平台的支持，所以我们要官方提供的配置文件基础之上进行适当的裁减。去除不需要的模块，仅下我们需要的模块。

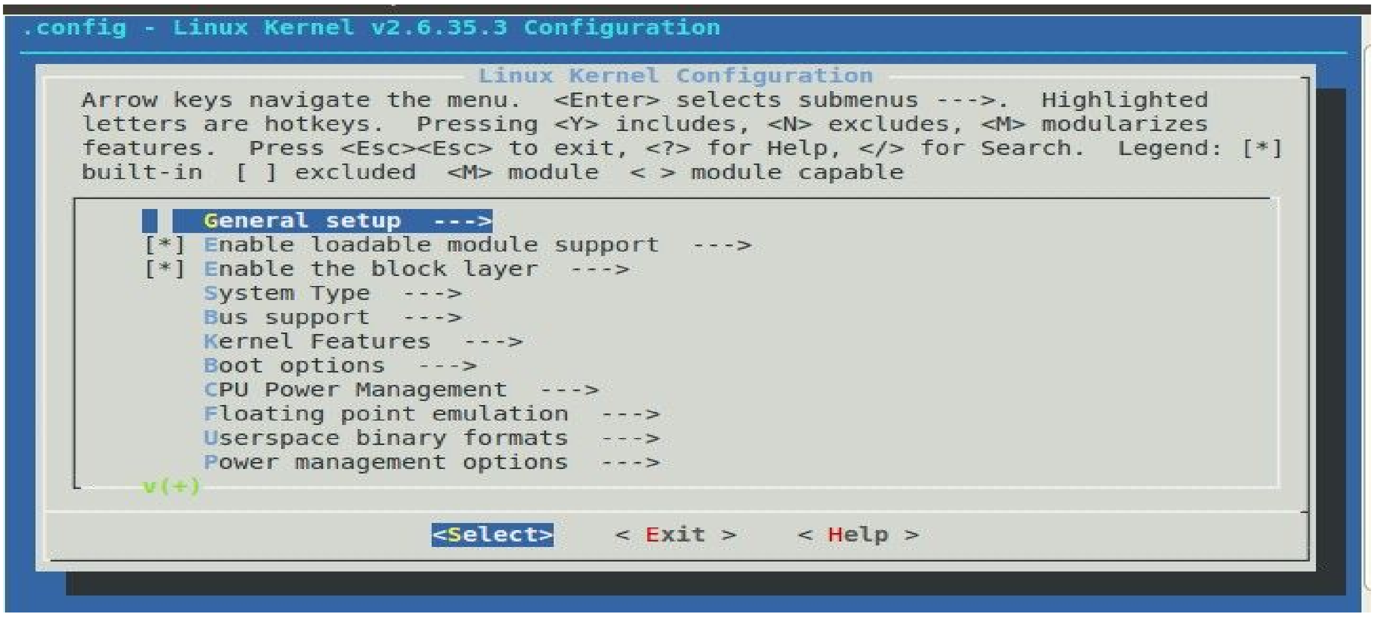
在 arch/arm/configs 目录下有 imx5_defconfig，这个文件是官方提供的基于 i.mx5 系列 CPU 的默认配置文件。我们要在这个基础上进行修改。

```
cp arch/arm/configs/imx5_defconfig .
```

拷贝预配置文件到内核根目录下

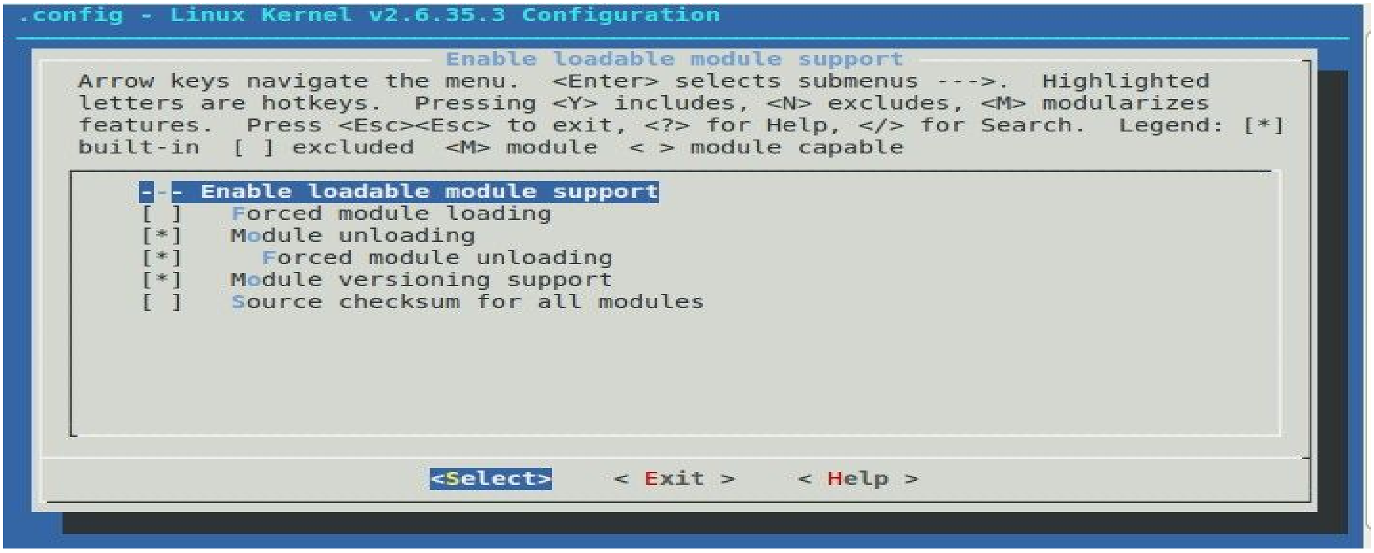
```
make imx5_defconfig menuconfig
```

执行配置程序



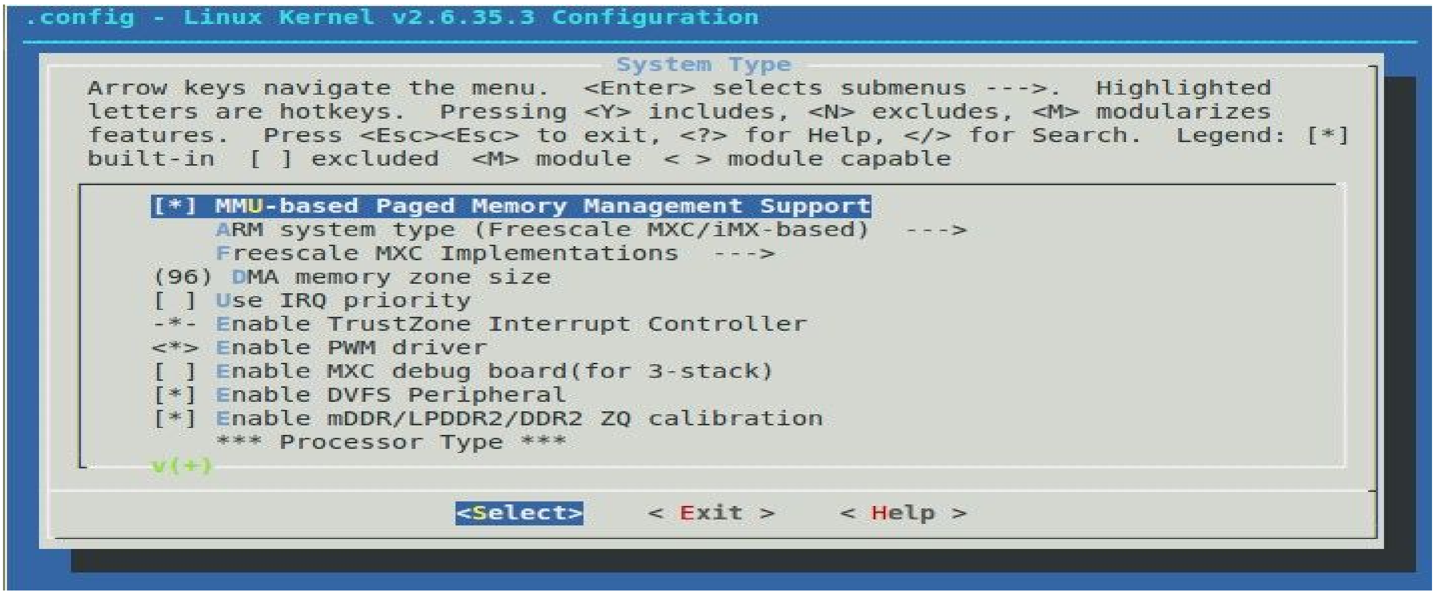
```
.config - Linux Kernel v2.6.35.3 Configuration
                          Linux Kernel Configuration
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*]
  built-in  [ ] excluded  <M> module  < > module capable

          General setup  --->
      [*] Enable loadable module support  --->
      [*] Enable the block layer  --->
          System Type  --->
          Bus support  --->
          Kernel Features  --->
          Boot options  --->
          CPU Power Management  --->
          Floating point emulation  --->
          Userspace binary formats  --->
          Power management options  --->
      v(+)

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

配置内核允许动态加载模块，[*] Enable loadable module support，这样我们就能通过 insmod、rmmod 动态地向内核中添加、移除驱动程序了。在调试期间是非常方便的。



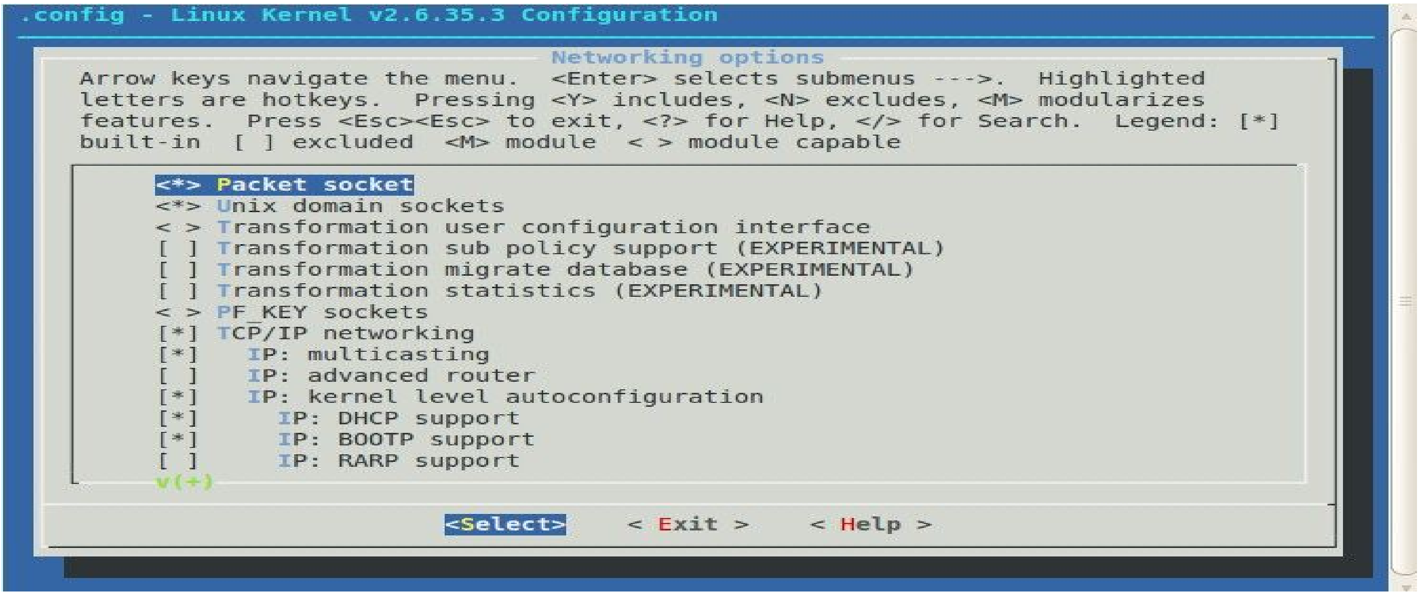
```
.config - Linux Kernel v2.6.35.3 Configuration
                       Enable loadable module support
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*]
  built-in  [ ] excluded  <M> module  < > module capable

      --- Enable loadable module support
      [ ]   Forced module loading
      [*]   Module unloading
      [*]     Forced module unloading
      [*]   Module versioning support
      [ ]   Source checksum for all modules

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

选择处理器类型，内核中已经有 Freescale iMX 平台的支持了，我们直接选择就行了。在这里选择 MMU 模块，支持内存管理单元。



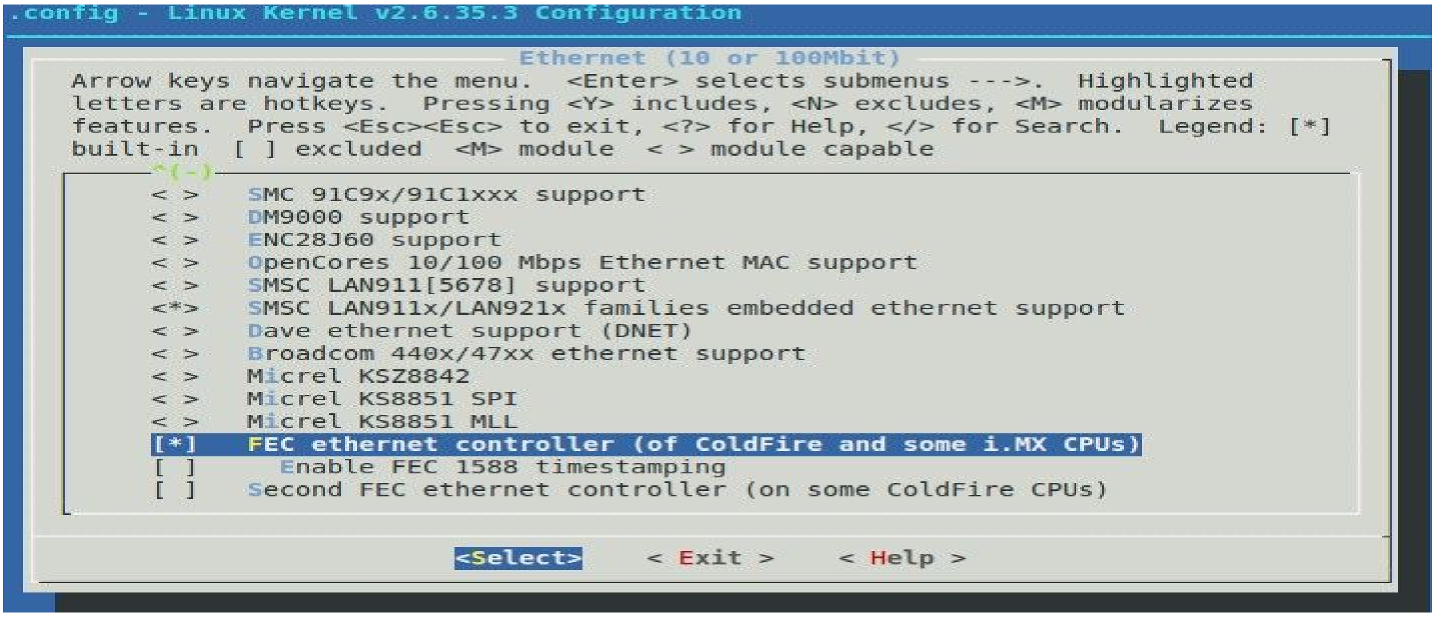
```
.config - Linux Kernel v2.6.35.3 Configuration
                              System Type
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*]
  built-in  [ ] excluded  <M> module  < > module capable

      [*] MMU-based Paged Memory Management Support
          ARM system type (Freescale MXC/iMX-based)  --->
          Freescale MXC Implementations  --->
      (96) DMA memory zone size
      [ ] Use IRQ priority
      -*- Enable TrustZone Interrupt Controller
      <*> Enable PWM driver
      [ ] Enable MXC debug board(for 3-stack)
      [*] Enable DVFS Peripheral
      [*] Enable mDDR/LPDDR2/DDR2 ZQ calibration
          *** Processor Type ***
      v(+)

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

配置网络功能，使内核包含 TCP/IP 协议栈，支持 Socket 功能，在 IP 层支持 DHCP，为了实现自动获取 IP 地址。



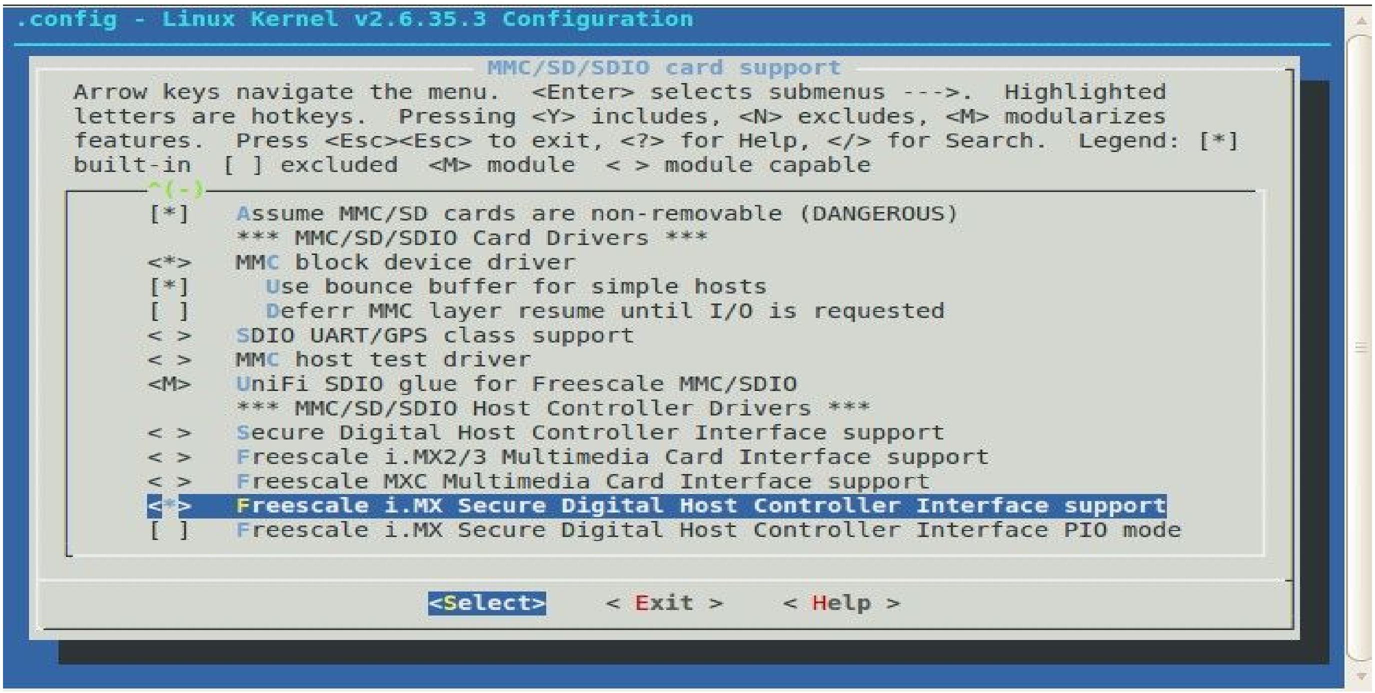
```
.config - Linux Kernel v2.6.35.3 Configuration
                           Networking options
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*]
  built-in  [ ] excluded  <M> module  < > module capable

      <*> Packet socket
      <*> Unix domain sockets
      < > Transformation user configuration interface
      [ ] Transformation sub policy support (EXPERIMENTAL)
      [ ] Transformation migrate database (EXPERIMENTAL)
      [ ] Transformation statistics (EXPERIMENTAL)
      < > PF_KEY sockets
      [*] TCP/IP networking
      [*]   IP: multicasting
      [ ]   IP: advanced router
      [*]   IP: kernel level autoconfiguration
      [*]     IP: DHCP support
      [*]     IP: BOOTP support
      [ ]     IP: RARP support
      v(+)

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

配置驱动程序，使内核支持 MTD 设备、块设备等。这里最主要的是要选择 FEC 网卡驱动。网卡驱动程序的路径在 Device drivers->Network device support->Ethernet (10 or 100Mbit)->FEC ethernet controller。



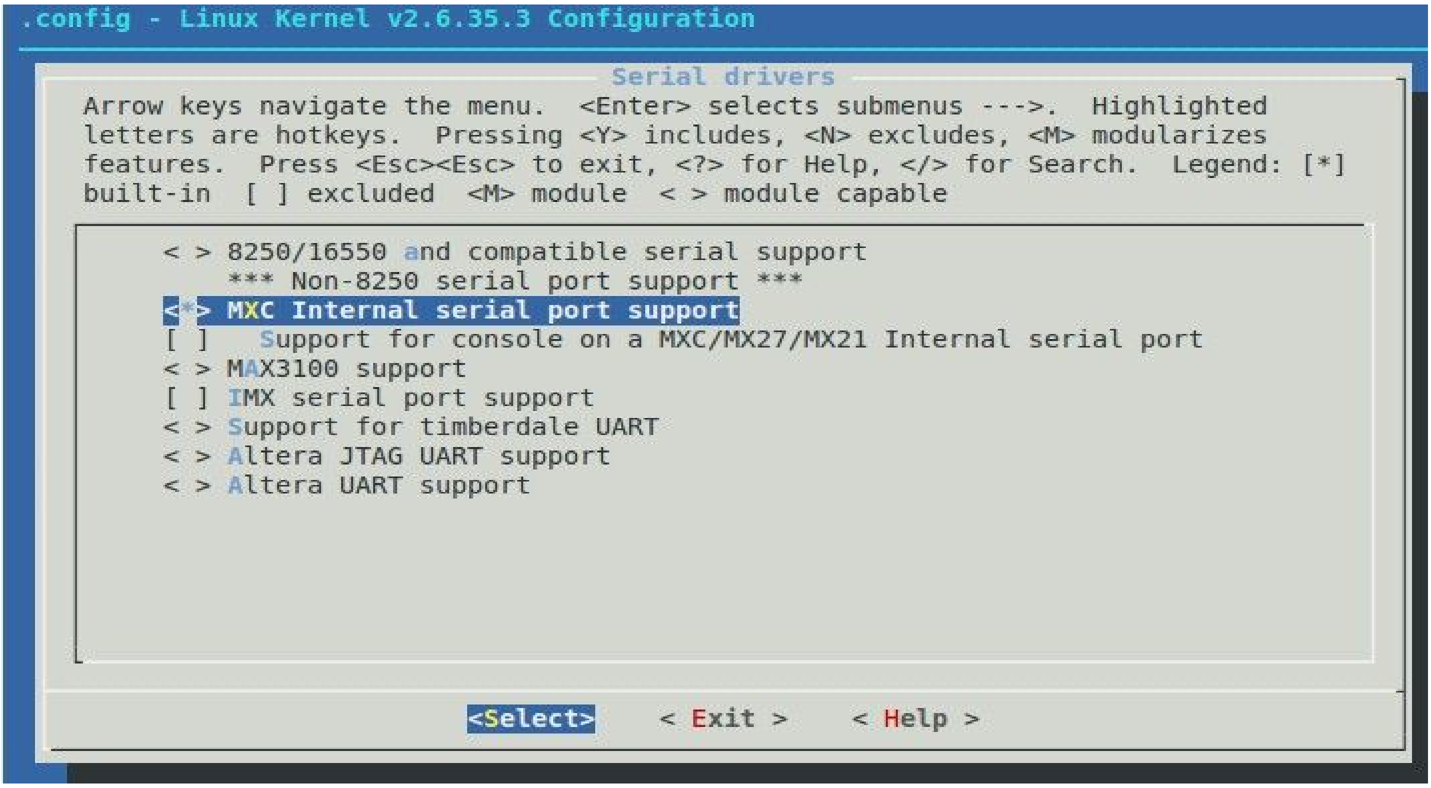
```
.config - Linux Kernel v2.6.35.3 Configuration
                        Ethernet (10 or 100Mbit)
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*]
  built-in  [ ] excluded  <M> module  < > module capable
           ^(-)
           < >    SMC 91C9x/91C1xxx support
           < >    DM9000 support
           < >    ENC28J60 support
           < >    OpenCores 10/100 Mbps Ethernet MAC support
           < >    SMSC LAN911[5678] support
           <*>    SMSC LAN911x/LAN921x families embedded ethernet support
           < >    Dave ethernet support (DNET)
           < >    Broadcom 440x/47xx ethernet support
           < >    Micrel KSZ8842
           < >    Micrel KS8851 SPI
           < >    Micrel KS8851 MLL
           [*]    FEC ethernet controller (of ColdFire and some i.MX CPUs)
           [ ]      Enable FEC 1588 timestamping
           [ ]    Second FEC ethernet controller (on some ColdFire CPUs)

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

选择 MMC/SD 支持，路径在 Device drivers->MMC/SD/SDIO support，将 MMC block device driver 勾选上，将 Freescale i.MX Secure Digital Host Controller Interface support 勾选上。



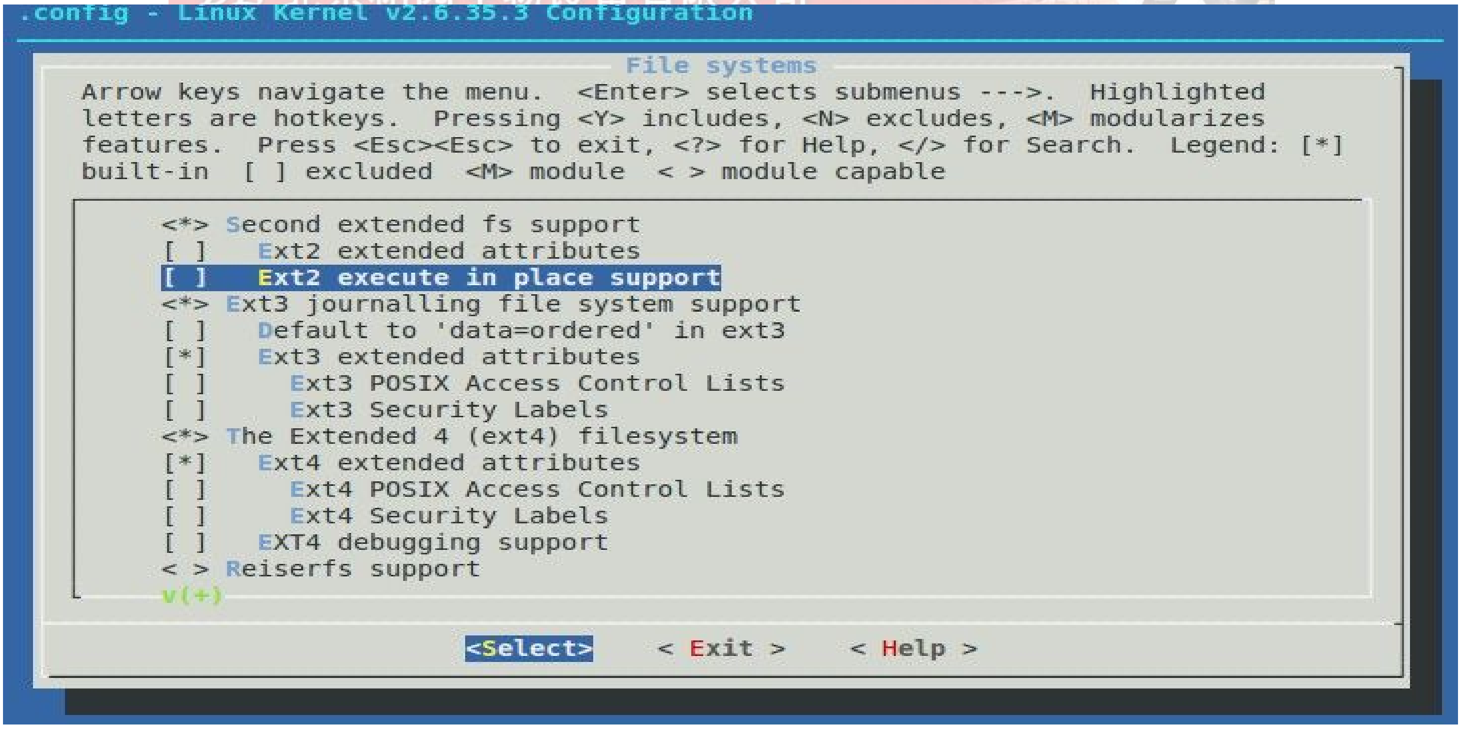
```
.config - Linux Kernel v2.6.35.3 Configuration
                        MMC/SD/SDIO card support
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*]
  built-in  [ ] excluded  <M> module  < > module capable
           ^(-)
           [*]    Assume MMC/SD cards are non-removable (DANGEROUS)
                  *** MMC/SD/SDIO Card Drivers ***
           <*>    MMC block device driver
           [*]      Use bounce buffer for simple hosts
           [ ]      Deferr MMC layer resume until I/O is requested
           < >    SDIO UART/GPS class support
           < >    MMC host test driver
           <M>    UniFi SDIO glue for Freescale MMC/SDIO
                  *** MMC/SD/SDIO Host Controller Drivers ***
           < >    Secure Digital Host Controller Interface support
           < >    Freescale i.MX2/3 Multimedia Card Interface support
           < >    Freescale MXC Multimedia Card Interface support
           <*>    Freescale i.MX Secure Digital Host Controller Interface support
           [ ]    Freescale i.MX Secure Digital Host Controller Interface PIO mode

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

串口驱动，路径在 Device drivers->Character devices->Serial drivers,[*] MXC Internal serial port support。

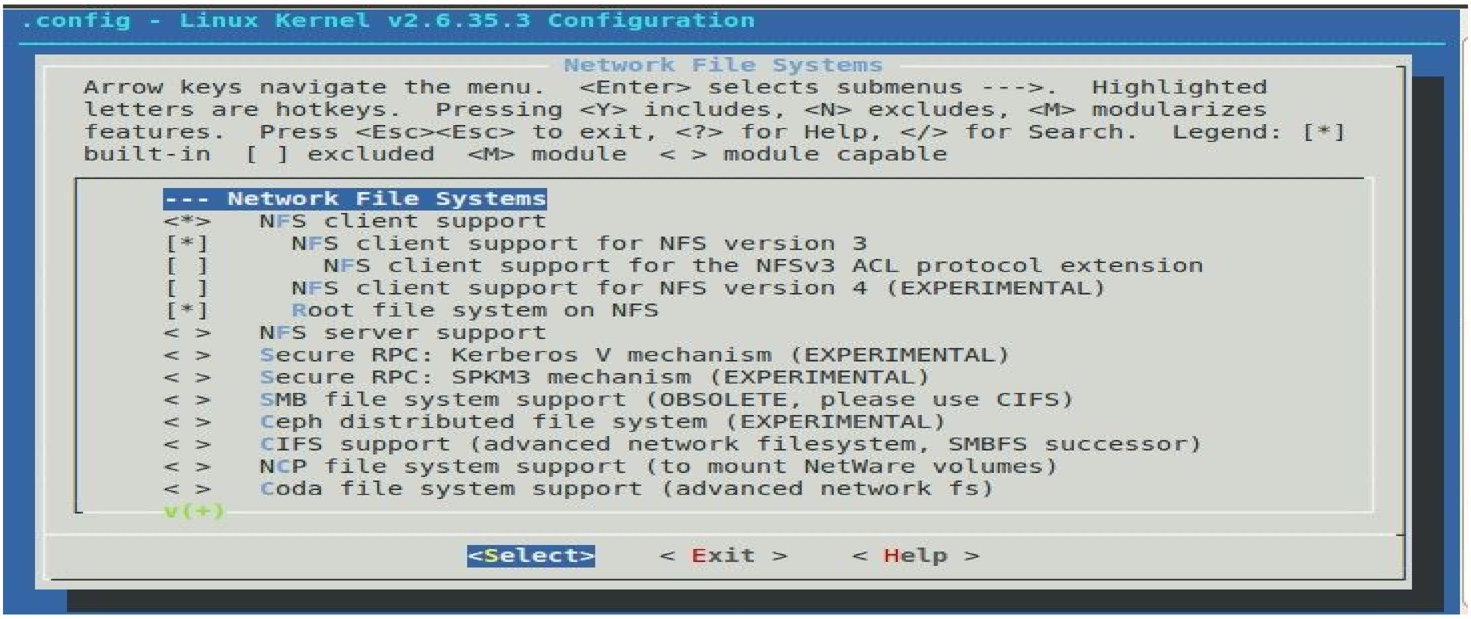


```
.config - Linux Kernel v2.6.35.3 Configuration
                              Serial drivers
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*]
  built-in  [ ] excluded  <M> module  < > module capable

      < > 8250/16550 and compatible serial support
          *** Non-8250 serial port support ***
      <*> MXC Internal serial port support
      [ ]   Support for console on a MXC/MX27/MX21 Internal serial port
      < > MAX3100 support
      [ ] IMX serial port support
      < > Support for timberdale UART
      < > Altera JTAG UART support
      < > Altera UART support

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

配置内核支持的文件系统，这里配置上 ext2/3/4，网络文件系统选择 NFS client support。这样在挂载 NFS 的时候会用到。

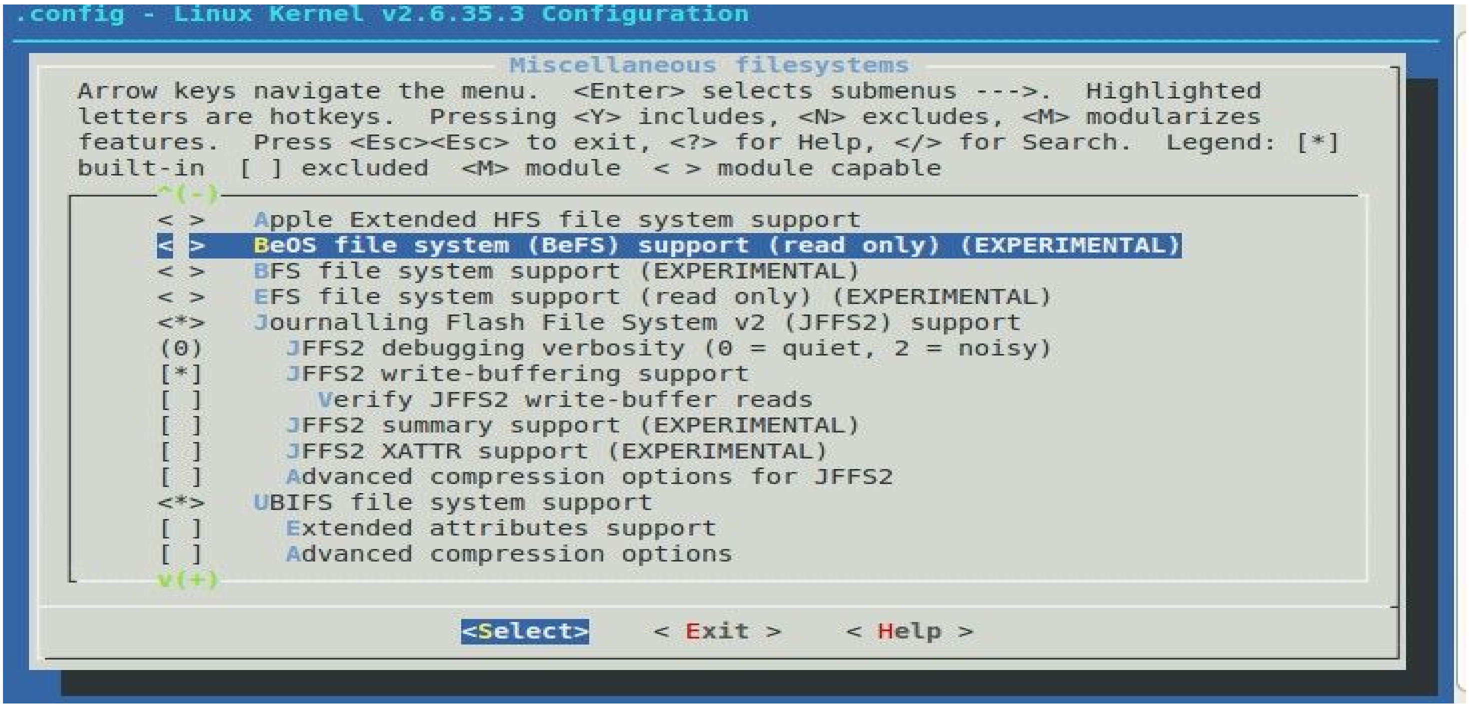


```
.config - Linux Kernel v2.6.35.3 Configuration
                              File systems
  Arrow keys navigate the menu.  <Enter> selects submenus --->.  Highlighted
  letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes
  features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*]
  built-in  [ ] excluded  <M> module  < > module capable

      <*> Second extended fs support
      [ ]   Ext2 extended attributes
      [ ]   Ext2 execute in place support
      <*> Ext3 journalling file system support
      [ ]   Default to 'data=ordered' in ext3
      [*]   Ext3 extended attributes
      [ ]     Ext3 POSIX Access Control Lists
      [ ]     Ext3 Security Labels
      <*> The Extended 4 (ext4) filesystem
      [*]   Ext4 extended attributes
      [ ]     Ext4 POSIX Access Control Lists
      [ ]     Ext4 Security Labels
      [ ]   EXT4 debugging support
      < > Reiserfs support
      v(+)
                   <Select>    < Exit >    < Help >
```



```
.config - Linux Kernel v2.6.35.3 Configuration
                         Network File Systems
  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  < > module capable

        --- Network File Systems
        <*>   NFS client support
        [*]     NFS client support for NFS version 3
        [ ]       NFS client support for the NFSv3 ACL protocol extension
        [ ]     NFS client support for NFS version 4 (EXPERIMENTAL)
        [*]     Root file system on NFS
        < >   NFS server support
        < >   Secure RPC: Kerberos V mechanism (EXPERIMENTAL)
        < >   Secure RPC: SPKM3 mechanism (EXPERIMENTAL)
        < >   SMB file system support (OBSOLETE, please use CIFS)
        < >   Ceph distributed file system (EXPERIMENTAL)
        < >   CIFS support (advanced network filesystem, SMBFS successor)
        < >   NCP file system support (to mount NetWare volumes)
        < >   Coda file system support (advanced network fs)
        v(+)

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

混杂文件系统选项中有针对 Flash 存储设备的文件系统 jffs2 和 ubifs，也一并选上。



```
.config - Linux Kernel v2.6.35.3 Configuration
                       Miscellaneous filesystems
  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  < > module capable
        ^(-)
        < >   Apple Extended HFS file system support
        < >   BeOS file system (BeFS) support (read only) (EXPERIMENTAL)
        < >   BFS file system support (EXPERIMENTAL)
        < >   EFS file system support (read only) (EXPERIMENTAL)
        <*>   Journalling Flash File System v2 (JFFS2) support
        (0)     JFFS2 debugging verbosity (0 = quiet, 2 = noisy)
        [*]     JFFS2 write-buffering support
        [ ]       Verify JFFS2 write-buffer reads
        [ ]     JFFS2 summary support (EXPERIMENTAL)
        [ ]     JFFS2 XATTR support (EXPERIMENTAL)
        [ ]     Advanced compression options for JFFS2
        <*>   UBIFS file system support
        [ ]     Extended attributes support
        [ ]     Advanced compression options
        v(+)

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

内核中其他的功能模块，根据需要进行相应的选择。

3、 编译内核

在编译内核之前需要配置好交叉编译器的路径，应该这里是针对于 ARM 平台进行交叉编译，我们直接将路径导入到用户的.bashrc 中。这样配置一次就可以了。

vim ~/.bashrc

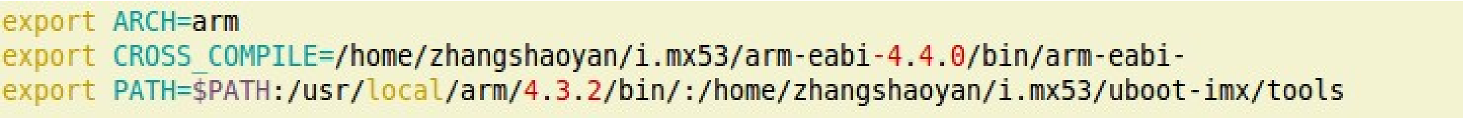
在文件的末尾加上如下两行：

export ARCH=arm

export CROSS_COMPILE=/home/zhangshaoyan/i.mx53/arm-eabi-4.4.0/bin/arm-eabi-

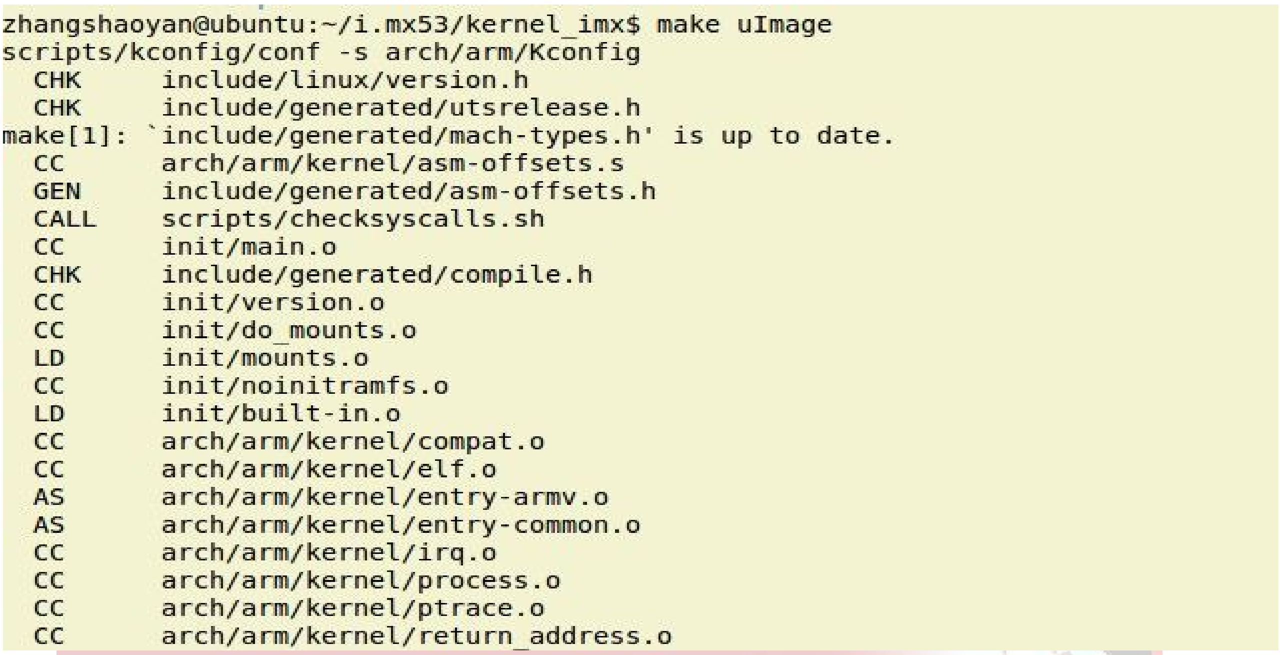
export PATH=$PATH:/home/zhangshaoyan/i.mx53/uboot-imx/tools

因为在编译生成 u-boot format 的内核时，需要使用到编译 uboot 生成的程序 mkimage，这里我们也一并导出到环境变量 PATH 中了。



```
export ARCH=arm
export CROSS_COMPILE=/home/zhangshaoyan/i.mx53/arm-eabi-4.4.0/bin/arm-eabi-
export PATH=$PATH:/usr/local/arm/4.3.2/bin/:/home/zhangshaoyan/i.mx53/uboot-imx/tools
```

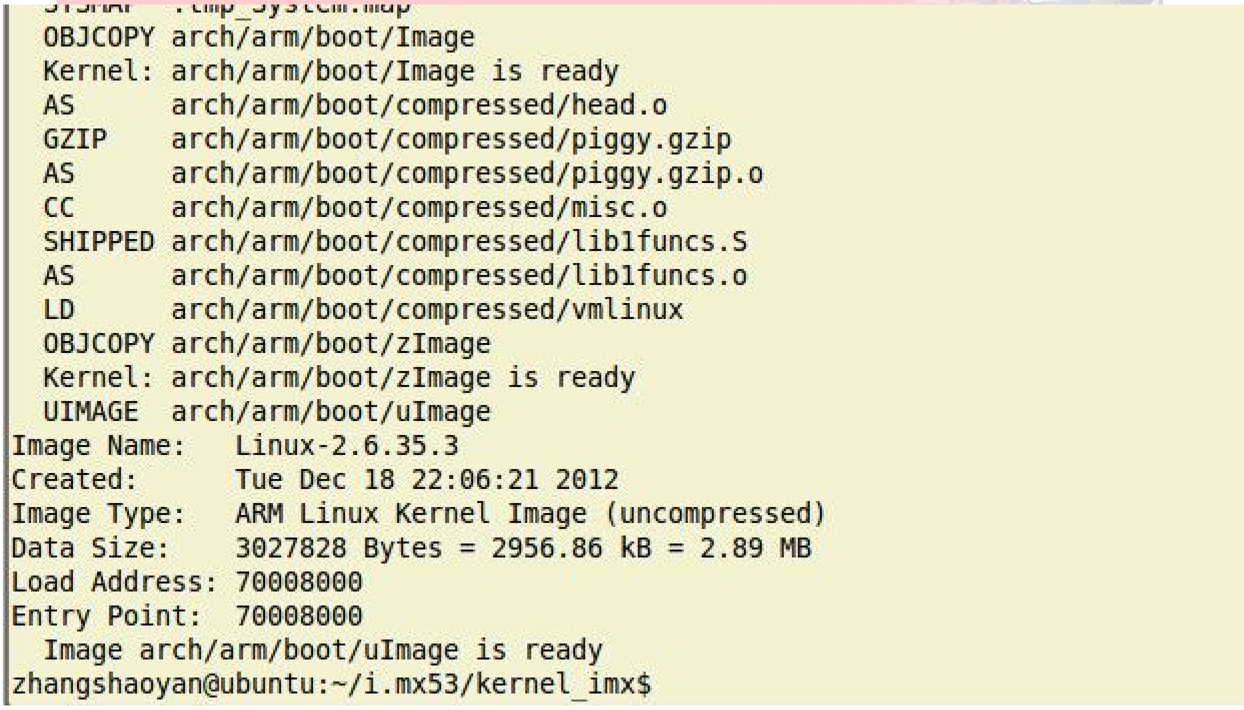
下面开始编译，直接输入命令：make uImage



```
zhangshaoyan@ubuntu:~/i.mx53/kernel_imx$ make uImage
scripts/kconfig/conf -s arch/arm/Kconfig
  CHK     include/linux/version.h
  CHK     include/generated/utsrelease.h
make[1]: `include/generated/mach-types.h' is up to date.
  CC      arch/arm/kernel/asm-offsets.s
  GEN     include/generated/asm-offsets.h
  CALL    scripts/checksyscalls.sh
  CC      init/main.o
  CHK     include/generated/compile.h
  CC      init/version.o
  CC      init/do_mounts.o
  LD      init/mounts.o
  CC      init/noinitramfs.o
  LD      init/built-in.o
  CC      arch/arm/kernel/compat.o
  CC      arch/arm/kernel/elf.o
  AS      arch/arm/kernel/entry-armv.o
  AS      arch/arm/kernel/entry-common.o
  CC      arch/arm/kernel/irq.o
  CC      arch/arm/kernel/process.o
  CC      arch/arm/kernel/ptrace.o
  CC      arch/arm/kernel/return_address.o
```

4、 编译完成

编译完成后，会在 arch/arm/boot 文件夹下生成 uImage 文件。这个文件就是我们刚才编译好的。使用 MFG Tool 烧写内核时，直接使用这里生成的内核映像文件即可。



```
  SYSMAP  .tmp_System.map
  OBJCOPY arch/arm/boot/Image
  Kernel: arch/arm/boot/Image is ready
  AS      arch/arm/boot/compressed/head.o
  GZIP    arch/arm/boot/compressed/piggy.gzip
  AS      arch/arm/boot/compressed/piggy.gzip.o
  CC      arch/arm/boot/compressed/misc.o
  SHIPPED arch/arm/boot/compressed/lib1funcs.S
  AS      arch/arm/boot/compressed/lib1funcs.o
  LD      arch/arm/boot/compressed/vmlinux
  OBJCOPY arch/arm/boot/zImage
  Kernel: arch/arm/boot/zImage is ready
  UIMAGE  arch/arm/boot/uImage
Image Name:   Linux-2.6.35.3
Created:      Tue Dec 18 22:06:21 2012
Image Type:   ARM Linux Kernel Image (uncompressed)
Data Size:    3027828 Bytes = 2956.86 kB = 2.89 MB
Load Address: 70008000
Entry Point:  70008000
  Image arch/arm/boot/uImage is ready
zhangshaoyan@ubuntu:~/i.mx53/kernel_imx$
```

shell.albert
2012/12/19