

实验一、生成Linux镜像

Info

本文所有操作的工作空间均为Linux源码文件夹，`./` 目录即为Linux源码文件夹

1.安装系统工具包

在终端中输入以下命令安装编译所需的工具包

```
sudo apt update
sudo apt install bison g++-multilib git gperf libxml2-utils make python-
networkx zlib1g-dev:i386 zip u-boot-tools libncurses5-dev vim rar fastboot adb
```

Warning

可能会出现apt无法定位到python-networkx包位置的情况，可以通过pip进行python包管理，可以使用 `sudo pip install networkx` 解决这个问题

Tip

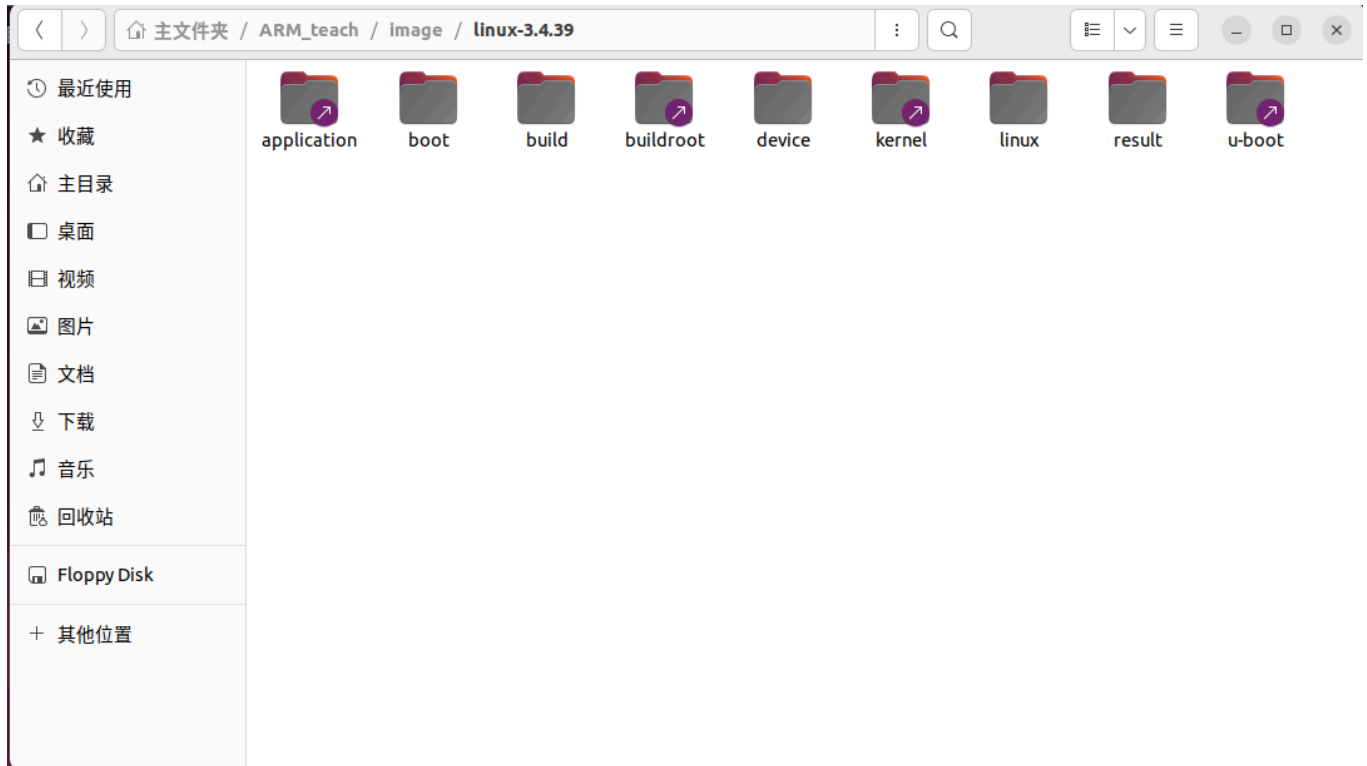
由于网络环境原因可能执行 `sudo apt update` 的速度很慢，可以更换国内的镜像源加快更新软件包信息的过程

[换源教程](#)

2.编译前的工作

镜像的编译包括u-boot,kernel,rootfs的编译，最后需要生成的镜像有：u-boot.bin、boot.img、rootfs.ext4。其中2ndboot.bin是烧录系统的过程中合成的，不需要编译。

将linux系统源码解压，可得到系统源码



3.编译 U-Boot

进入Linux源码文件夹，执行下列命令编译U-Boot

```
./build/build_uboot.sh
```

× **Failure**

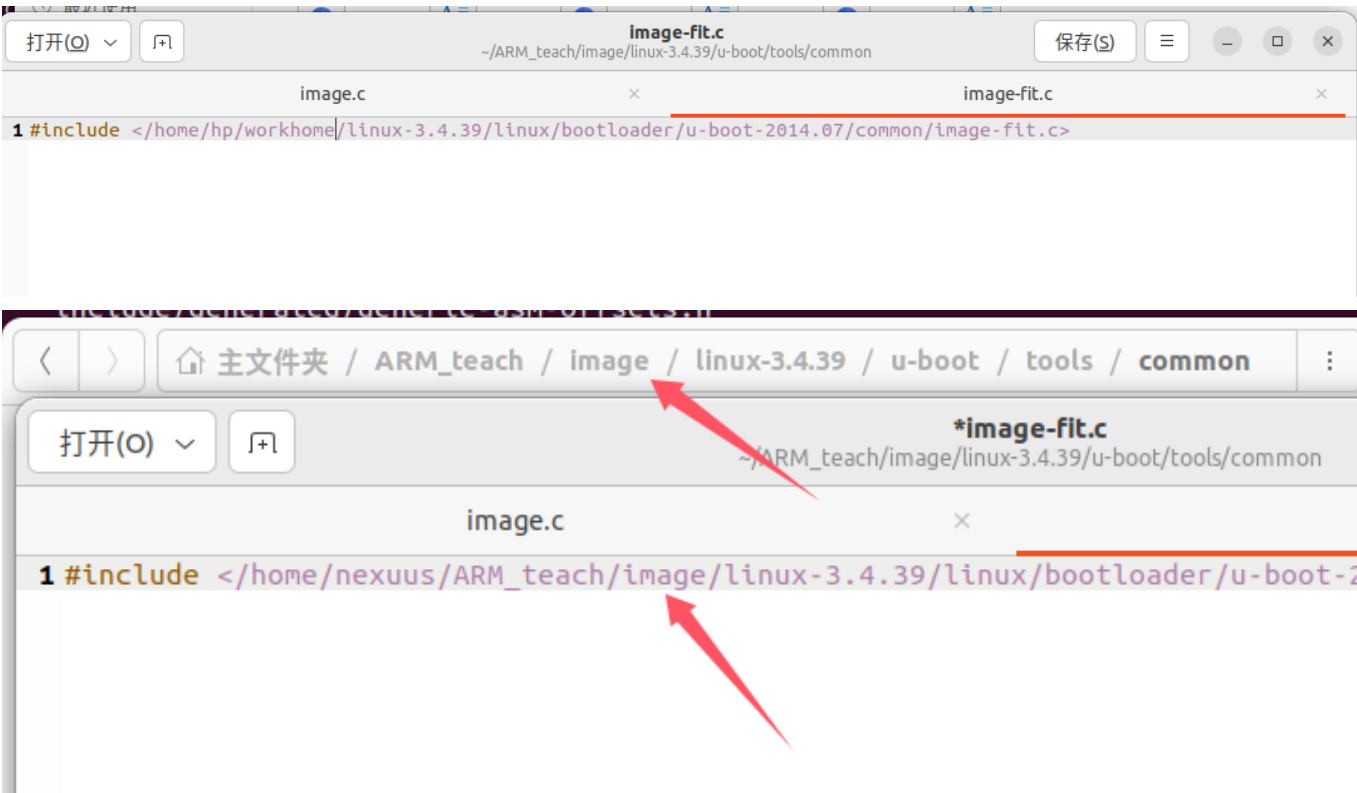
输入命令后会出现如下错误

```
tools/common/image-fit.c:1:10: fatal error: /home/hp/workhome/linux-3.4.39/linux/bootloader/u-boot-2014.07/common/image-fit.c: 没有那个文件或目录
1 | #include </home/hp/workhome/linux-3.4.39/linux/bootloader/u-boot-2014.07/common/image-fit.c>
  |
compilation terminated.
tools/common/image.c:1:10: fatal error: /home/hp/workhome/linux-3.4.39/linux/bootloader/u-boot-2014.07/common/image.c: 没有那个文件或目录
1 | #include </home/hp/workhome/linux-3.4.39/linux/bootloader/u-boot-2014.07/common/image.c>
  |
compilation terminated.
make[1]: *** [scripts/Makefile.host:134: tools/common/image.o] 错误 1
make[1]: *** 正在等待未完成的任务....
tools/lib/fdtdec_common.c:1:10: fatal error: /home/hp/workhome/linux-3.4.39/linux/bootloader/u-boot-2014.07/lib/fdtdec_common.c: 没有那个文件或目录
1 | #include </home/hp/workhome/linux-3.4.39/linux/bootloader/u-boot-2014.07/lib/fdtdec_common.c>
  |
make[1]: *** [scripts/Makefile.host:134: tools/common/image-fit.o] 错误 1
compilation terminated.
tools/lib/fdtdec.c:1:10: fatal error: /home/hp/workhome/linux-3.4.39/linux/bootloader/u-boot-2014.07/lib/fdtdec.c: 没有那个文件或目录
1 | #include </home/hp/workhome/linux-3.4.39/linux/bootloader/u-boot-2014.07/lib/fdtdec.c>
  |
```

进入构建脚本，脚本进入了 \$top/u-boot 文件夹(即Linux源码文件夹中的u-boot文件夹)进行make，找到出现报错的文件，如./u-boot/tools/common/image-fit.c

```
tools/common/image-fit.c:1:10: fatal error:
那个文件或目录
```





发现该文件包含的文件使用绝对路径，需要我们逐个进行修改



只需要修改到linux-3.4.39文件夹前的路径即可

✓ Success

修改完后在result文件夹成功生成uboot





ARM_teach / image / linux-3.4.39 / result			:	Q	☐	▼	☰	—	□
名称		大小	修改时间						
 2ndboot.bin		18.1 kB	2023 年 9 月 22 日						
 boot.img		28.7 MB	20 : 38						
 rootfs.ext4		524.3 MB	2023 年 9 月 19 日						
 u-boot.bin		267.0 kB	20 : 35						

4.编译Kernel

进入Linux源码根目录，执行下面命令编译Kernel

```
./build/build_kernel.sh
```

编译完成后，在result文件夹下生成了新的 u-boot.bin 镜像文件

文件夹 / ARM_teach / image / linux-3.4.39 / result		
名称		
 2ndboot.bin		
 boot.img		
 rootfs.ext4		
 u-boot.bin		

5.编译Rootfs

进入源码根目录，执行下面命令编译Rootfs

```
./build/build_rootfs.sh
```

× Failure

输入命令后会出现错误

```

echo " PATH="/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/bin:/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/usr/bin:/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/usr/sbin:/home/nexusus/condabin:/opt/ros/humble/bin:/home/nexusus/esp32/esp-idf/tools:/home/nexusus/.local/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/usr/games:/snap/bin:/snap/bin" mke2img -d /home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/target -G 4 -R 1 -b 51264 -o /home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/images/rootfs.ext2" >> /home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/build/_fakeroot/build_a+x /home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/build/_fakeroot.fs
PATH="/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/bin:/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/usr/bin:/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/usr/sbin:/home/nexusus/condabin:/opt/ros/humble/bin:/home/nexusus/esp32/esp-idf/tools:/home/nexusus/.local/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/usr/games:/snap/bin:/snap/bin" /home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/usr/bin/fakeroot -- /home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/build/_fakeroot.fs
fakeroot: preload library 'libfakeroot.so' not found, aborting.
make[1]: *** [fs/ext2/ext2.mk:60: /home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/images/rootfs.ext2] 错误 1
make: *** [Makefile:36: _all] 错误 2
top: /home/nexusus/ARM_teach/image/linux-3.4.39 ; result_dir:/home/nexusus/ARM_teach/image/linux-3.4.39/result
build rootfs end !!!

```

该原因为构建时无法找到 `libfakeroot.so`，进入 `./buildroot/output/host/usr/bin/` 目录下的 `fakeroot` 文件

```
# strip /bin/fakeroot to find install prefix
FAKEROOT_PREFIX=/home/hp/workhome/linux-3.4.39/buildroot/output/host/usr
FAKEROOT_BINDIR=/home/hp/workhome/linux-3.4.39/buildroot/output/host/usr/bin

USEABSLIBPATH=0
LIB=libfakeroot.so
PATHS=/home/hp/workhome/linux-3.4.39/buildroot/output/host/usr/lib:${FAKEROOT_PREFIX}/lib64/libfakeroot:${FAKEROOT_PREFIX}/lib32/libfakeroot
FAKED=${FAKEROOT_BINDIR}/faked
```

需要对这几个路径进行修改

修改后的内容为

```
1 # strip /bin/fakeroot to find install prefix
2 FAKEROOT_PREFIX=/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/usr
3 FAKEROOT_BINDIR=/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/usr/bin
4
5 USEABSLIBPATH=0
6
7 LIB=libfakeroot.so
8 PATHS=/home/nexusus/ARM_teach/image/linux-3.4.39/buildroot/output/host/usr/lib:${FAKEROOT_PREFIX}/lib64/libfakeroot:${FAKEROOT_PREFIX}/lib32/libfakeroot
9 FAKED=${FAKEROOT_BINDIR}/faked
10
```

✓ **Success**

再次输入命令，编译成功，生成了新的Rootfs文件

```
home/nexuus/esp32/esp-idf/tools:/home/nexuus/.local/bin:/usr/local/sbin:/u
sr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/sn
ap/bin:/snap/bin" /home/nexuus/ARM_teach/image/linux-3.4.39/buildroot/outp
ut/host/usr/bin/fakeroot -- /home/nexuus/ARM_teach/image/linux-3.4.39/buil
droot/output/build/_fakeroot.fs
rootdir=/home/nexuus/ARM_teach/image/linux-3.4.39/buildroot/output/target
table='/home/nexuus/ARM_teach/image/linux-3.4.39/buildroot/output/build/_d
evice_table.txt'
=/usr/bin/install -m 0644 support/misc/target-dir-warning.txt /home/nexuus/
ARM_teach/image/linux-3.4.39/buildroot/output/target/THIS_IS_NOT_YOUR_ROOT
FS_FILESYSTEM
top: /home/nexuus/ARM_teach/image/linux-3.4.39 ; result_dir:/home/nexuus/A
RM_teach/image/linux-3.4.39/result
build rootfs end !!!
(base) nexuus@nexuus-v:~/ARM_teach/image/linux-3.4.39$
```