Embedded System Design Lab4 Document

第八組

312553040 郭晉維 312551172 陳昱凱

操作步驟：

1. 準備壓縮檔

   alsa-lib-1.0.26.tar.bz2

   alsa-utils-1.0.26.tar.bz2

   libid3tag-0.15.1b.tar.gz

   libmad-0.15.1b.tar.gz

   madplay-0.15.2b.tar.gz

   zlib-1.2.3.tar.gz

   並將其移到某個資料夾，後續用$WORK_DIR 稱呼此資料夾

2. 使用 su 指令進入 root 來操作

3. Compile alsa-lib

   ```
   tar -xvf alsa-lib-1.0.26.tar.bz2
   cd alsa-lib-1.0.26
   mkdir –p "$WORK_DIR/madplay"
   CC=arm-linux-gnueabihf-gcc ./configure \
       --host=arm-linux-gnueabihf \
       --prefix="$WORK_DIR/madplay"
   make -j$(nproc) && make -j$(nproc) install
   cd ..
   ```

4. Compile alsa-utils

   ```
   tar -xvf alsa-utils-1.0.26.tar.bz2
   cd alsa-utils-1.0.26
   CC=arm-linux-gnueabihf-gcc ./configure \
     --prefix="$WORK_DIR/madplay" \
     --host=arm-linux-gnueabihf \
     --with-alsa-inc-prefix="$WORK_DIR/madplay/include" \
     --with-alsa-prefix="$WORK_DIR/madplay/lib" \
     --disable-alsamixer \
     --disable-xmlto \
     --disable-nls
   make -j$(nproc)
   cd ..
   ```

5. Compile zlib

```
tar -zxvf zlib-1.2.3.tar.gz
cd zlib-1.2.3
./configure --prefix="$WORK_DIR/madplay"
```

修改Makefile

```
sed -e 's/^CC *=.*/CC=arm-linux-gnueabihf-gcc/' \
  -e 's/^AR *=.*/AR=arm-linux-gnueabihf-ar rc/' \
  -e 's/^RANLIB *=.*/RANLIB=arm-linux-gnueabihf-
ranlib/'\
  -e 's/^CFLAGS=-O3 -DUSE_MMAP/CFLAGS=-O3 -fPIC/' \
  ./Makefile > Makefile1
cp -f Makefile1 Makefile
make -j$(nproc) && make -j$(nproc) install
cd ..
```

6. Compile libid3tag

```
tar -zxvf libid3tag-0.15.1b.tar.gz
cd libid3tag-0.15.1b
./configure --host=arm-linux-gnueabihf \
  --disable-debugging \
  --prefix="$WORK_DIR/madplay" \
  CPPFLAGS=-I"$WORK_DIR/madplay/include" \
  LDFLAGS=-L"$WORK_DIR/madplay/lib"
make -j$(nproc) && make -j$(nproc) install
cd ..
```

7. Compile libmad

```
tar -zxvf libmad-0.15.1b.tar.gz
cd libmad-0.15.1b
./configure --host=arm-linux-gnueabihf \
  --disable-debugging \
  --prefix="$WORK_DIR/madplay" \
  CPPFLAGS=-I"$WORK_DIR/madplay/include" \
  LDFLAGS=-L"$WORK_DIR/madplay/lib"
make -j$(nproc)
```

這裡會失敗，要更改Makefile，是因為gcc將-fforce-mem刪除了

```
sed '/-fforce-mem/d' ./configure > ./configure1
cp -f configure1 configure
chmod u+x configure
./configure --host=arm-linux-gnueabihf \
```

```
--prefix=/usr/local/libmad_arm \
--enable-shared \
--enable-static \
--enable-fpm=arm \
--with-gnu-ld=arm-linux-gnueabihf-ld \
--build=arm
```
這裡又會報錯：
```
Error:
/tmp/ccf2FxyW.s:1299: Error: selected processor does
not support Thumb mode `rscr0,r0,#0'……
```
修改fixed.h

將
```
# define MAD_F_MLN(hi, lo) \
asm ("rsbs %0, %2, #0\n\t" \
"rsc %1, %3, #0" \
: "=r" (lo), "=r" (hi) \
: "0" (lo), "1" (hi) \
: "cc")
```
改成
```
#ifdef __thumb__
# define MAD_F_MLN(hi, lo) \
asm ("rsbs %0, %0, #0\n\t" \
" sbc %1, %1, %1\n\t" \
"sub %1, %1, %2" \
: "+&r" (lo), "=&r" (hi) \
: "r" (hi) \
: "cc")
#else /* ! __thumb__ */
# define MAD_F_MLN(hi, lo) \
asm ("rsbs %0, %2, #0\n\t" \
"rsc %1, %3, #0" \
: "=r" (lo), "=r" (hi) \
: "=&r" (lo), "=r" (hi) \
: "0" (lo), "1" (hi) \
: "cc")
#endif /* __thumb__ */

make -j$(nproc)
```

```
make -j$(nproc) install
cd ..
```
8. Compile madplay
```
tar -zxvf madplay-0.15.2b.tar.gz
cd madplay-0.15.2b
./configure --host=arm-linux-gnueabihf \
  CC=arm-linux-gnueabihf-gcc \
  --disable-debugging \
  --with-alsa \
  CPPFLAGS="-I$WORK_DIR/madplay/include
I/usr/local/libmad_arm/include" \
  LDFLAGS="-L$WORK_DIR/madplay/lib
L/usr/local/libmad_arm/lib"
make -j$(nproc)
make -j$(nproc) install
```
9. 放入 madplay 以及 aplay
10. 將執行所需檔案放入 SD 卡，並將 symbolic link 換成 reallink
    madplay
    aplay
    libasound.so.2
    libid3tag.so.0
    libmad.so.0
    $WORK_DIR/madplay/share
    music.mp3
11. 執行 LD_LIBRARY_PATH=. ./madplay -o wav:-music.mp3 | ./aplay
12. ln -s ./aplay ./arecord
13. ./arecord -d 5 -f record.wav

Reference:

https://cloud.tencent.com/developer/article/1673901
https://blog.csdn.net/junjun5156/article/details/70307863
https://blog.csdn.net/qq_31811537/article/details/104842097
https://blog.csdn.net/qq_28643619/article/details/108944064
https://www.linode.com/docs/guides/linux-symlinks/