

Loopback Example

(online)

FHS Directory Structure

- ▶ what directories should be created?
 - ▶ strictly speaking, everything is configurable
 - ▶ however, a common subset FHS is safe and easy to debug
- ▶ starting point; use `mkdir`

```
/bin /dev /etc /lib /proc /tmp /usr /var /sbin /usr/bin /usr/lib  
/usr/sbin /var/lock /var/log /var/mail /var/run /var/spool /var/tmp  
/root
```

Add Dynamic-Linking Libraries

- ▶ next, we need to add the run-time libraries to our filesystem

```
cd opt/crosstool/gcc-3.3.2-glibc-2.3.2 cd powerpc-405-li  
cd powerpc-405-linux-gnu/lib tar cf - *-*.so *.so.[*0-9]  
(extras) | (cd $destdir/lib ; tar xf -)  
(I use tar to preserve symbolic links.)
```

- ▶ most embedded systems won't need static libraries
(* .a)

Populate with Executables

- ▶ Executables include:
 - ▶ system files (command line shells, ls, more)
 - ▶ user applications

System Executable Files

three options

- ▶ BusyBox (<http://busybox.net/>)
 - ▶ quick and easy
 - ▶ small filesystem
 - ▶ basic functionality

System Executable Files (cont'd)

- ▶ Linux From Scratch
(<http://www.linuxfromscratch.org/>)
 - ▶ full functionality
 - ▶ a lot of work
 - ▶ designed to be a tutorial
 - ▶ large filesystem
 - ▶ has cross-compiler specific version

System Executable Files (cont'd)

- ▶ Do-It-Yourself Linux
(<http://www.diy-linux.org/>)
similar to LFS; emphasis on speed (not tutorial)

in practice, usually a mix (start with busybox and add system tools one needs)

User Applications

- ▶ lots of variations in Unix (AT&T System V, BSD, Linux, Windows NT)
 - ▶ provide different capabilities
 - ▶ provide different interfaces
- ▶ hence, GNU has extensive configuration support with tools called autogen/automake/configure

GNU automake/autoconf

- ▶ several standard features
 - ▶ typical directory structure and files
INSTALL NEWS README src/
 - ▶ common options to configure
-prefix=dir

Configure Example

(online)

Step 3: Build Filesystem Image

- ▶ if you used a loopback device, umount and image is ready
- ▶ if you created a file system structure, use a program like `genext2fs` Or `gencramfs`

Generate Rootfs Image Example

(online)

Last Step: Tell kernel

- ▶ root file system can be compiled into kernel (“look for hard drive partition”)
- ▶ passed as a command-line parameter
(`root=/dev/hda2`)
- ▶ or combined with kernel image (ala RAM disk)

Building Linux Kernel RAMDISK

(online)