Freescale Semiconductor
Application Note

Document Number: AN3094
Rev. 0, 11/2006

LTIB Quick Start: Targeting the MPC8548E CDS System

To take advantage of the Freescale Linux target image builder (LTIB), you can use the PowerQUICC™ MPC8548E Linux board support package (BSP) with the LTIB to develop an embedded Linux solution with kernel 2.6. The MPC8548E configurable development system (CDS) environment features a Freescale PowerQUICC III MPC8548E high-performance integrated processor.

This document summarizes the features of the MPC8548E Linux BSP and provides instructions on how to accomplish the following tasks:

- Install the LTIB-based BSP on a host development system.
- Run LTIB to build target images needed for deployment.
- Deploy the built image to the MPC8548CDS board.
- Boot Linux on the MPC8548CDS board.

Contents

1 System and BSP Overview

The MPC8548E is a high-performance embedded processor based on the e500v2 core. The MPC8548E Linux BSP supports the PowerPC Book E e500v2 core and related drivers. The Freescale LTIB bundled with the MPC8548E BSP is a tools framework to manage, configure, extend, and build Linux software elements. It runs on an x86 PC running the Linux OS. See Figure 1. Using the LTIB-based MPC8548BSP, you can easily build a u-boot image, a Linux target image, and a file system.

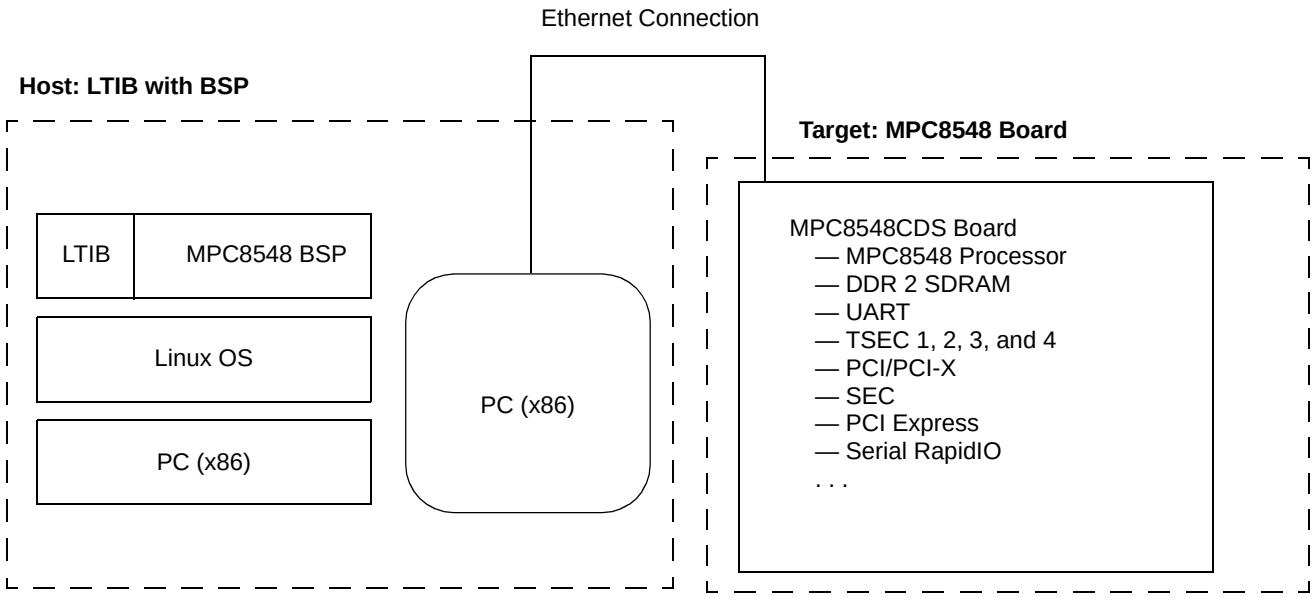

Figure 1. MPC8548E BSP on x86 PC Running Linux OS

The MPC8548E BSP provides the configuration information and support to give you a head start in developing a Linux-based solution with kernel 2.6. After the BSP is installed and running with its basic configuration, you can use the LTIB to customize the MPC8548E CDS system with additional features.

2 BSP and Target System Requirements

The BSP operates with LTIB running on a host development system with an Ethernet card and with disk space in the host partition that contains 500 MBytes of free disk space. Be aware that these packages may not work properly on all Linux distributions. The target system is the MPC8548CDS board equipped with the MPC8548E processor. For specific board parameters, consult the MPC8548CDS reference manual.

3 Installing/Uninstalling the BSP to the Host System

To install the BSP, use the ISO file named `MPC8548CDS_20060224-ltib.iso`. To install the LTIB on your host machine, perform the following steps:

1. As root, mount the ISO image on your machine:
   ```
   mount -o loop MPC8548CDS_20060224-ltib.iso /mnt/cdrom
   ```
2. Change to a non-root user, install the LTIB:

```
/mnt/cdrom/install
```

3. Input the desired LTIB `install_path` to install.

The script installs LTIB into two different directories on your machine. The `/opt/freescale/pkgs` directory contains all the packages, including the Linux kernel, u-boot, and the application packages. The `install_path/ltib` directory contains the main LTIB scripts and specification files for the MPC8548CDS BSP.

There are no BSP uninstall scripts. To uninstall the LTIB, manually remove the `/opt/freescale/pkgs`, `/opt/freescale/ltib`, and `install_path/ltib` directories.

4 Running LTIB

To run the LTIB, you must complete the following tasks:

1. Build the image files with the default configurations.
2. Fully reconfigure and recompile all the images.
3. Change the target image configuration.
4. Debug u-boot and the kernel.

The remainder of this section discusses each of these tasks in detail.

4.1 Building the Image Files with the Default Configurations

To run LTIB, change into the directory where LITB is installed and then run `./ltib`. For example, the sequence could be:

```
cd install_path/ltib
./ltib
```

If you have never installed a copy of LTIB on your machine before, a number of host packages are built and installed to help support LTIB. This may take a few minutes. Note that LTIB can be run only by a non-root user.

Because the pre-built RPM packages are included in the BSP, LTIB installs them to the root file system without recompiling them. When the installation of the packages is complete, the following directory/image files are available on your system:

- `rootfs`. Directory, the root file system to be deployed on your board.
- `vmlinux.gz.u-boot`. Kernel image that can be loaded with u-boot.
- `rootfs.ext2.gz.uboot`. Ramdisk image that can be loaded with u-boot.
- `rootfs.ext2.gz`. gzipped ramdisk image
- `rootfs/boot/u-boot.bin`. u-boot binary image that can be programmed into MPC8548CDS Flash memory.

For a description of the usage of these image files, refer to Section 5, “Running the Target Image on the MPC8548E CDS Board.”

4.2 Reconfiguring and Recompiling the Images

To reconfigure and recompile all the packages, perform the following steps:

1. Clean up all the configure files and objects thoroughly:

   ```
   ./ltib -m distclean
   ```

2. Run LITB:

   ```
   ./ltib
   ```

   A blue screen appears, similar to the kernel's menuconfig. From this screen, choose the platform for which to install a target image. As shown in Figure 2, select `Freescale MPC8548CDS PPC development board` and then exit and save.

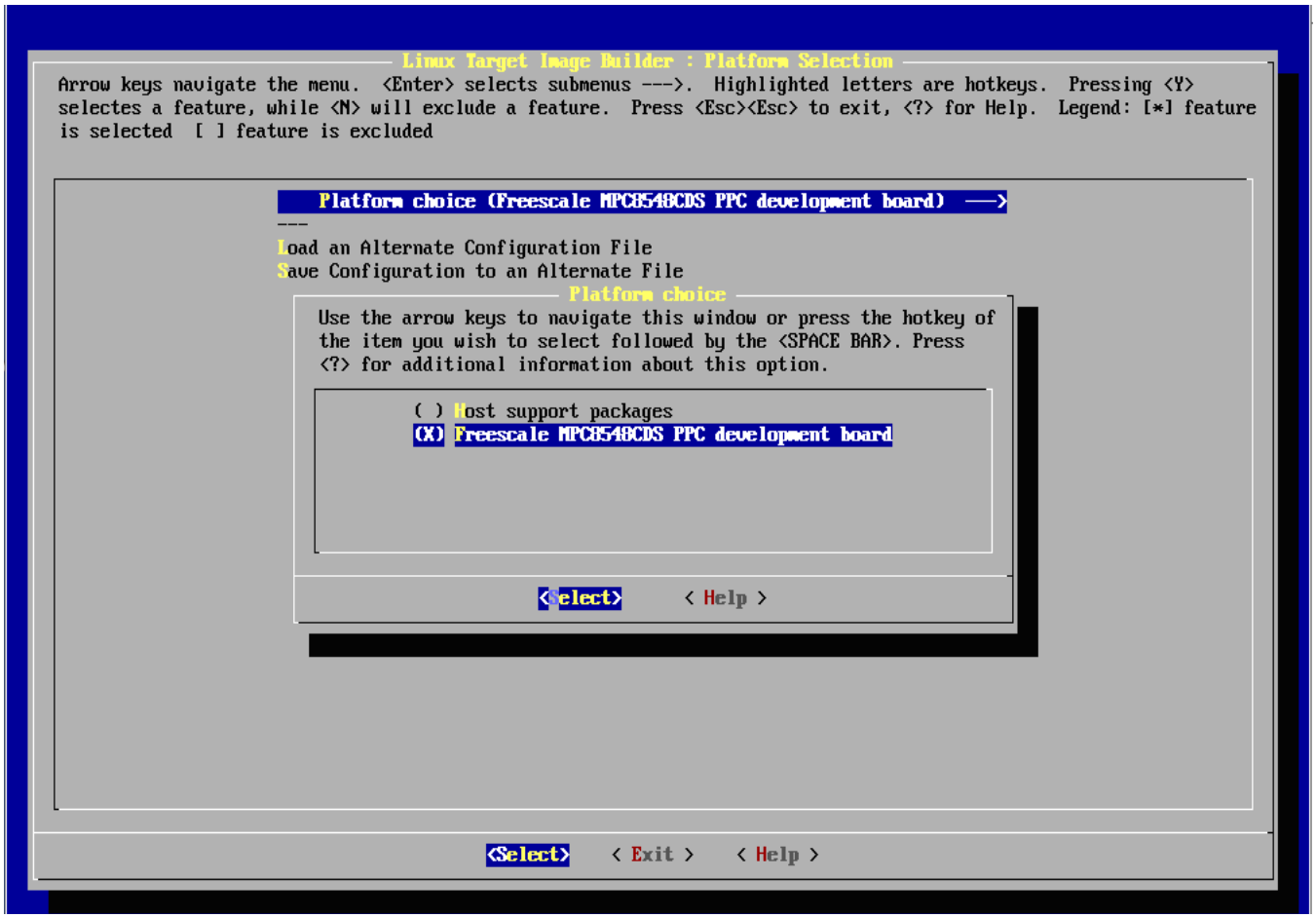

Figure 2. Platform Select Screen

After you save, the platform configuration menu appears, as shown in Figure 3. If the default is acceptable, simply exit and save. Your target images is then built and installed.

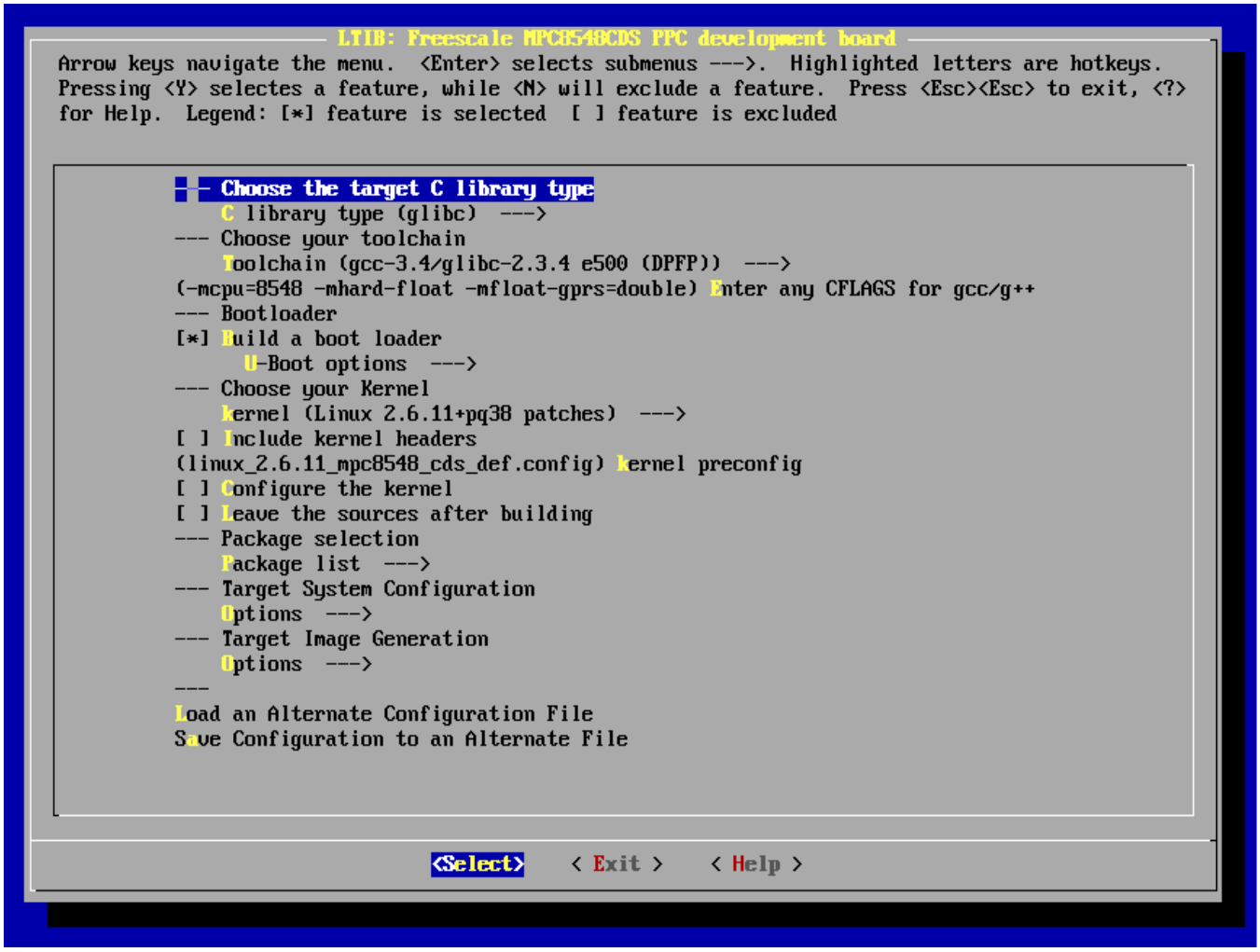

Figure 3. Platform Configuration Menu

Configuration settings for the options listed in Figure 3 are as follows:

- `C library type (glibc)`. Select glibc for MPC8548CDS.
- `Toolchain`. Select gcc-3.4/glibc-2.3.4 e500(DPFP) for the MPC8548CDS.
- `Build a boot loader`. Build a u-boot or not. You can enable/disable CodeWarrior debugging support in u-boot options.
- `Include kernel headers`. Selecting this option copies the kernel headers to `rootfs/usr/src/linux/include`
- `Configure the kernel`. Run kernel menuconfig when processing the kernel package.
- `Leave the sources after building`. This option can be used to build the kernel and leave the build source tree in `rpm/BUILD` in place.
- `Package list`. Select the packages to include in the file system.
- `Target System Configuration`. Configure the board information and startup daemons.
- `Target Image Generation`. Options for deployment

NOTE:

The default `Allocate extra space` is 0. You need to set this value if you want to allocate extra free space on your target root file system.

4.3 Changing the Target Image Configuration Without distclean

To modify the configuration without distclean, simply run the following command:

```
./ltib --configure
```

The system re-prompts you for the platform/board configuration. In the board configuration screens, change settings and select packages as appropriate. When you exit the configuration screen, your target image is adjusted accordingly.

4.4 Debugging U-Boot and the Kernel

Because CodeWarrior needs the entire source directory and `ELF` file for debugging, you must manually extract the u-boot/kernel and compile them. The LTIB auto-build removes the source directory when finished.

4.4.1 Debugging U-Boot

To debug u-boot, perform the following steps:

1. Extract u-boot:
   ```
   ./ltib -p u-boot-fsl-pq3 -m prep
   ```
2. Enable `CodeWarrior support` in the LTIB menu:
   Run `./ltib -configure` and choose **U-BOOT OPTIONS → CODEWARRIOR SUPPORT** in the LTIB menu. Save and exit.
3. LTIB may return an error message to prompt you to remove the `ltib/rpm/BUILD/u-boot-cvs-20050607` directory. Ignore it, and run the following command:
   ```
   ./ltib -p u-boot-fsl-pq3 -m scbuild
   ```
   The u-boot begins compiling.

The u-boot source is in `ltib/rpm/BUILD/u-boot-cvs-20050607`. The size of the ELF file `u-boot` is approximately 500 Kbytes. The u-boot is now ready for CodeWarrior debugging.

4.4.2 Debugging the Kernel

To debug the kernel, perform the following steps:

1. Extract the kernel as follows:
   ```
   ./ltib -p kernel-2.6.11-pq3 -m prep
   ```
2. Run `./ltib -configure` and choose **CONFIGURE THE KERNEL** in the LTIB menu. Save and exit.
3. LTIB may return an error message prompting you to remove the `ltib/rpm/BUILD/linux-2.6.10` directory. Ignore it, and run the following command:
   ```
   ./ltib -p kernel-2.6.11-pq3 -m scbuild
   ```

4. Now you can configure the kernel menuconfig. From the menu, select **KERNEL HACKING** → **KERNEL DEBUGGING** → **INCLUDE CODEWARRIOR KERNEL DEBUGGING**. Save and exit.

   The kernel begins compiling.

The kernel source is in the `ltib/rpm/BUILD/linux-2.6.10` directory. The size of the ELF file, `vmlinux`, is approximately 20 Mbytes. The kernel is now ready for CodeWarrior debugging.

5 Running the Target Image on the MPC8548E CDS Board

To run the target image on the CDS board, perform the following steps:

1. Use CodeWarrior for PPC version 8.6 + PowerTAP Pro to program the u-boot image into Flash memory, starting from 0xFFF80000.
2. Ramdisk deployment. The images generated by LTIB allow you perform ramdisk deployment, as follows:

   a) At the u-boot prompt, set u-boot environments as shown here:

```
=>setenv ipaddr board_ipaddress
=>setenv serverip tftp_serverip
=>setenv gatewayip your_gatewayip
=>setenv bootargs root=/dev/ram rw console=ttyS1,115200
=>saveenv
```

3. tftp images to the MPC8548E CDS system, then boot up the MPC8548E CDS system.

```
=>tftp 1000000 vmlinux.gz.uboot
=>tftp 2000000 rootfs.ext2.gz.uboot
=>bootm 1000000 2000000
```

Now that your board is booted up with the ramdisk file system, you are ready to perform NFS deployment using the NFS file system generated by LTIB, as follows:

1. Set the host NFS server environments:

   a) On the Linux host NFS server, add the following line in the file: `/etc/exports`:

   ```
   nfs_root_path board_ipaddress(rw,no_root_squash,async)
   ```

   Note that `nfs_root_path` *is* the NFS root directory path on the NFS server.

   b) Restart the NFS service:

   ```
   /etc/init.d/nfs restart
   ```

2. According to Section 4.3, “Changing the Target Image Configuration Without distclean, modify the configuration of LTIB:

   ```
   ./ltib --configure
   ```

   Figure 3 appears on the screen.
3. Select **TARGET SYSTEM CONFIGURATION** → **OPTIONS** → **NETWORK SETUP**.

   The network setup menu shown in Figure 4 appears on the screen.
4. Modify the items in the network setup menu according to your network configuration. If there is any problem, get help from your IT.

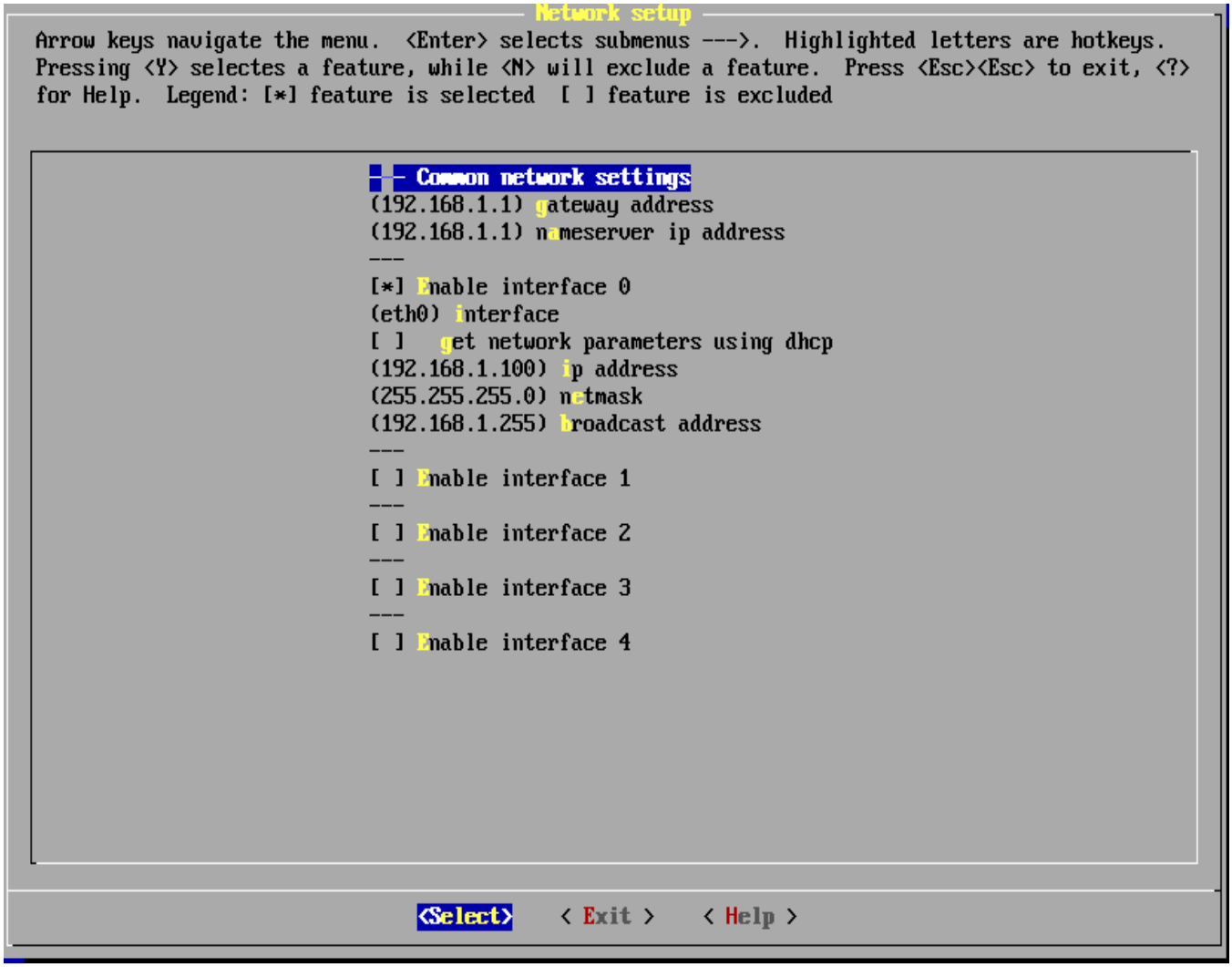

Figure 4. Network Setup Menu

5. At the u-boot prompts, set the u-boot environment as follows:

```
=>setenv ipaddr board_ipaddress
=>setenv serverip tftp_serverip
=>setenv gatewayip your_gatewayip
=>setenv bootargs root=/dev/nfs rw nfsroot=tftp_serverip:nfs_root_path
ip=board_ipaddress:tftp_serverip:your_gatewayip:your_netmask:mpc8548cds:eth0:off
console=ttyS1,115200
=>saveenv
```

   Note that `your_netmask` is the network netmask address.

6. tftp the kernel image to the board and then boot it up, as follows:

```
=>tftp 1000000 vmlinux.gz.uboot
=>bootm 1000000
```

Now your board is booted up with NFS file system.

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

How to Reach Us:

Home Page:
www.freescale.com

email:
support@freescale.com

USA/Europe or Locations Not Listed:
Freescale Semiconductor
Technical Information Center, CH370
1300 N. Alma School Road
Chandler, Arizona 85224
1-800-521-6274
480-768-2130
support@freescale.com

Europe, Middle East, and Africa:
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
support@freescale.com

Japan:
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku
Tokyo 153-0064, Japan
0120 191014
+81 3 5437 9125
support.japan@freescale.com

Asia/Pacific:
Freescale Semiconductor Hong Kong Ltd.
Technical Information Center
2 Dai King Street
Tai Po Industrial Estate,
Tai Po, N.T., Hong Kong
+800 2666 8080
support.asia@freescale.com

For Literature Requests Only:
Freescale Semiconductor
Literature Distribution Center
P.O. Box 5405
Denver, Colorado 80217
1-800-441-2447
303-675-2140
Fax: 303-675-2150
LDCForFreescaleSemiconductor
@hibbertgroup.com

Document Number: AN3094
Rev. 0
11/2006