

# Freescale Semiconductor

**Application Note** 

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# LTIB Quick Start: Targeting the MPC8548E CDS System

To take advantage of the Freescale Linux target image builder (LTIB), you can use the PowerQUICC<sup>TM</sup> 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.

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System and BSP Overview

# 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."



Running LTIB

### 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.

Arrow keys navigate the menu. <enter> selects submenus&gt;. Highlighted letters are hotkeys. Pressing <y> selectes a feature, while <n> will exclude a feature. Press <esc><esc> to exit, <? > for Help. Legend: [*] feature is selected [] feature is excluded</esc></esc></n></y></enter>	
Platform choice (Freescale MPC8548CDS PPC development board)>	
Load an Alternate Configuration File Save Configuration to an Alternate File Hatton choice Use the arrow keys to navigate this window or press the hotkey of the item you wish to select followed by the <space bar="">. Press <? > for additional information about this option. () Lost support packages (X) Preescale MPCH548CDS PPC development board</space>	
<pre></pre>	
(Select) < Exit > < Help >	

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

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### 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  $\rightarrow$  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

- $2. \ Run\,./\texttt{ltib}\ \texttt{-configure}\ and\ choose\ Configure\ The\ KERNEL\ in\ the\ LTIB\ menu.\ Save\ and\ exit.$
- 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  $\rightarrow$  KERNEL DEBUGGING  $\rightarrow$  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  $\rightarrow$  OPTIONS  $\rightarrow$  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.



Arrow keys navigate the menu. <Enter> selects submenus --->. Highlighted letters are hotkeys. Pressing  $\langle Y \rangle$  selectes a feature, while  $\langle N \rangle$  will exclude a feature. Press  $\langle Esc \rangle \langle Esc \rangle$  to exit,  $\langle ? \rangle$ for Help. Legend: [\*] feature is selected [] feature is excluded (192.168.1.1) \_ateway address (192.168.1.1) n meserver ip address [\*] Dable interface 0 (eth0) interface [] et network parameters using dhcp (192.168.1.100) ip address (255.255.255.0) n=tmask (192.168.1.255) broadcast address [] Dable interface 1 []]nable interface 2 [ ] Dable interface 3 [] Dable interface 4 (Select) < Exit > < Help >

#### 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.



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