LINEO™
Embedix™
SDK

Getting Started

LINEO™

Embedix SDK 2.4
Getting Started

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About This Guide

This preface includes information on formatting practices used throughout this Lineo® Embedix® document and a list of additional resources.

Conventions Used in This Document

The style conventions used in the printed and PDF format of this document do not necessarily apply to other formats. During conversion to HTML, some of these conventions may be lost.

This document uses the following graphical and typographical conventions:

‣ Admonitions

‣ Key combinations

‣ Special fonts and capitalization

Admonitions

Note, Tip, and Warning paragraphs draw your attention to additional information which may help you avoid losing data or time.

Note: Notes contain additional information about the current topic.

Tip: Tips contain suggestions that may save you time or effort.

Warning: Warnings contain critical information that you need to understand before proceeding. Ignoring information in a warning may cause loss of data or time.

Key Combinations

Key combinations (such as Ctrl+O) are presented throughout this document and should be used in the following way:

1. Press and hold the first key (such as Ctrl).

2. Press the second key (such as O).

3. Release both keys.

Special Fonts and Capitalization

In the printed or PDF version of this document, the following special fonts and capitalization rules apply:

▸ **Commands or user input:** All commands or data to be entered on an on-screen data entry line appear in `bolded Courier` font. This may include commands used with options, paths to directories or files, or other simple input, such as filenames.

▸ **Code or computer output:** Any code sample, including command output, is shown in `Courier` font.

▸ **Capitalization:** Linux filenames and commands are case-sensitive. In most instances, they are lowercase. When you enter a filename or command, use the same case that appears in your instructions or examples.

▸ **On-screen buttons:** When procedures refer to a particular on-screen button, the name of the button appears in uppercase (such as "click SAVE"), regardless of how it appears on the screen.

▸ **Keyboard keys:** When procedures refer to a particular key on a keyboard, only the initial key is capitalized (such as "press Tab"), just as it appears on a U.S. standard keyboard. This also applies to key combinations.

Additional Resources

Note: Most printed manuals that ship with Lineo products are also available in PDF and HTML formats on the product CD-ROM unless otherwise stated.

The following resources are available to provide you with additional support.

▸ ***Embedix SDK Tools* book**:
Available in print and PDF only in this release.

▸ ***Embedix SDK Target Wizard User Guide***:
Available in print and PDF only in this release.

▸ ***Embedix SDK Reference Manual***

▸ ***Embedix RealTime Programming Guide***

▸ ***Embedix Board Support Package <Boardname> User Guide***:
For PDF and HTML versions, see the <Boardname> CD-ROM.

▸ ***Embedix SDK DDD Manual:***
Available on the SDK CD-ROM only in this release.

▸ **Lineo Support Web site:**
http://www.lineo.com/services/support/index.html

▸ **Lineo Developers Support Web Pages:**
http://members.lineo.com/dev-wiki

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1 Embedix SDK Overview

This chapter contains the following sections:

▸ "Host System Requirements" on page 1

▸ "Target Device Requirements" on page 3

▸ "What's New in Embedix SDK 2.4" on page 3

▸ "What Is Embedix?" on page 6

▸ "Development Process Overview" on page 7

Host System Requirements

Hardware

You need a Linux/x86 machine that meets this criteria:

▸ 128 MB or greater recommended

▸ 1.5 GB disk space minimum for installation only and an additional 2.0 GB or more for project storage

▸ Pentium-class processor

▸ (Pentium II/K6, 400 MHz or greater recommended)

▸ Ethernet card

▸ CD-ROM drive for installation

▸ (Optional) Compact Flash Target Deployment support:

Some targets may deploy using a Compact Flash (CF) card such as the ADS Graphics Client Plus. For this to work, the host needs to be able to write to the CF card. Several options exist:

▷ PCMCIA slot on the host

▷ PCMCIA slot on third machine, which is mounted on host over NFS

▷ USB/CF adapter

▷ Some other kind of PCMCIA adapter on host

Software

You need a Linux operating system that includes these packages and services:

▸ Target Wizard support:

Installation support:
posix shell, rpm, rpm database, eject, tar, perl/python, ethernet card MAC (PCMCIA support for laptops)

Run/Launch support:
X KDE/GNOME, posix shell, bison

Perl Scripts support:
On some distributions, Perl has a dependency to csh. Ideally, tcsh should be installed and there should be a link from /usr/bin/csh to the tcsh binary.

▸ Deployment GUI support:

Deploy support:
nfs, tftp, loopback, bootp, dhcp, minicom, ethernet, serial mkcramfs, db, binutils, diffutils, fileutils, findutils, flex, gawk, grep, make, ncurses, patch, sed, shutils, tar, texinfo, vim, textutils, wget, xmessage, zlib, gzip

Flashing & ppcboot support:
The ocdemon does not work with kernels newer than 2.4.2

Note: Embedix SDK 2.4 must be installed on a host running Linux (from distributions such as Mandrake, Red Hat, or SuSE).

Target Device Requirements

The target image can be deployed either to an x86 machine or to a target board for which a Board Support Package (BSP) is available for Embedix SDK 2.4.

x86 Machine Requirements

▸ Pentium II/K6 or higher CPU

▸ Floppy diskette drive

▸ Minimum target partition size

To determine your minimum target partition size for x86 deployment, consider the target image size, which includes the target kernel size, filesystem size, and application size.

Note: Lineo ships one or more Board Support Packages (BSPs) for specific boards of a particular processor architecture, depending on the edition of the SDK. For board-specific requirements, refer to the BSP documentation on the BSP 2.4 CD-ROM and the documentation that shipped with your development board.

What's New in Embedix SDK 2.4

The new features in Embedix SDK 2.4 include the following:

Package Editor and Update Wizard
CodeWarrior Templates (Stationery)
Simplified Debugging with DDD/GDB Initialization

Package Editor and Update Wizard

The Package Editor is an application designed to aid in the process of creating, importing, editing and exporting SDK packages. The SDK 2.4 features the new 'Tools' menu in Target Wizard. From this menu you are able to launch the Package Editor. You can also launch the Package Editor on a specific package in the Target Wizard tree by

pointing at the package and right clicking to select "Run Package Editor on Component" from the context sensitive menu. Package Editor has facilities to handle the three main portions of a package:

LBC file

ECD file

Source files

You also can use Package Editor to add your applications into SDK packages that will then be available in the Target Wizard tree view.

Packages and applications imported or created with the Package Editor become readily available within the Target Wizard tool. Packages and applications can also be easily exported with the Package Editor and then imported to other Embedix SDK development machines.

Simplified updating and importing is done using a new import tool called Update Wizard, which is available from the Target Wizard menu bar (see Update > Launch Update Wizard). This makes sharing and with other developers ad distribution to users quick and efficient.

CodeWarrior Templates (Stationery)

Embedix SDK 2.4 also features more complete integration with the Metrowerks CodeWarrior IDE. We now allow the IDE to be started directly from the Target Wizard menu via the the File > Run Wizard menu. Once CodeWarrior has started, when you open a new project, we now include architecture-specific templates (stationery), which provide cross-compile pre-configurations for processor specific elements including: compiler/linker tool, debug agents, libraries, and include files. Stationery are currently in-place for the following architectures:

ARM

M68k-elf

M68k-coff

PowerPC

SH3

SH4

i386

MIPS

Once the architecture has been selected, you then choose a specific template for a C Application, C++ Application, or a Kernel Module. These stationery result in a system in which the developer can quickly go to work creating their unique application(s), without having to determine and enter the full cross-compilation configuration. Also, because CodeWarrior is configured to use the same software elements used by Target Wizard, it ensures that user developed software will be fully interoperable with the operating system.

Once the architecture and application type have been selected and the new project is opened, CodeWarrior provides the ability to specify different "targets" for which the compile time-options may be set independently. These targets include debug and release targets (which have unique optimization options) and a self-hosted x86 target option. This option, useful because of the portability of the Linux API, allows the developer to quickly compile, debug, and test the application on common x86 hardware (like the Embedix SDK host) even before the development or production hardware is available.

Simplified Debugging with DDD/GDB Initialization

The SDK 2.4 features the new Tools menu in Target Wizard. From this menu you are able to launch DDD and have the SDK automatically attach it to a GDB for your board.

When you launch DDD from the Target Wizard Tools menu, DDD version 3.3 is invoked. This is a precompiled and statically linked version of DDD installed in /opt/Embedix/usr/X11R6/bin/.

After DDD is launched, it will attach to a specific GDB based on your current project settings (DDD cannot be launched unless a project is open).

The SDK has nine preconfigured GDB's located under /opt/Embedix/tools/bin/. These nine GDB's are listed below:

arm-linux-gdb

                    m68k-elf-gdb
                    m68k-coff-gdb
                    powerpc-linux-gdb
                    sh3-linux-gdb
                    sh4-linux-gdb
                    i386-linux-gdb
                    mips-linux-gdb
                    mipsel-linux-gdb

Each GDB includes the name of the cross-compiler it has been configured for in the file name. These are the most common cross-compilers used in the SDK.

However, if your project uses a cross-compiler not listed above, or if the default GDB does not work for your target, you have the option of building your own GDB binary and placing it under *<project_directory>*/emb-bin/(it must be named "gdb"). Some Lineo BSP's have special GDB binaries which are placed in this directory for each project. Please refer to each BSP's documentation for details.

What Is Embedix?

Lineo Embedix SDK installs on your favorite Linux distribution (such as those from Mandrake, Red Hat, and SuSE).

But Embedix is not just a desktop distribution that has been forced into a small footprint. It is a full-featured Linux OS with a very small memory and disk footprint that has been developed especially for the embedded systems market.

Several strategies and techniques were used to achieve this small footprint:

‣ Multipurpose programs

‣ Alternate program versions with smaller footprints

If you choose, Embedix can provide a complete Linux execution environment with all of the core OS features of a full-featured Linux

system, including shared libraries, memory protection, multiprocessing, multiuser, UNIX security, networking, and so on.

And Embedix offers all this while requiring only a fraction of the footprint of a typical Linux distribution. Lineo then provides additional tools and services that allow you to develop a custom embedded Linux system.

Development Process Overview

The following flowchart provides a high-level overview of the tasks involved in building, editing, and transferring a target image.
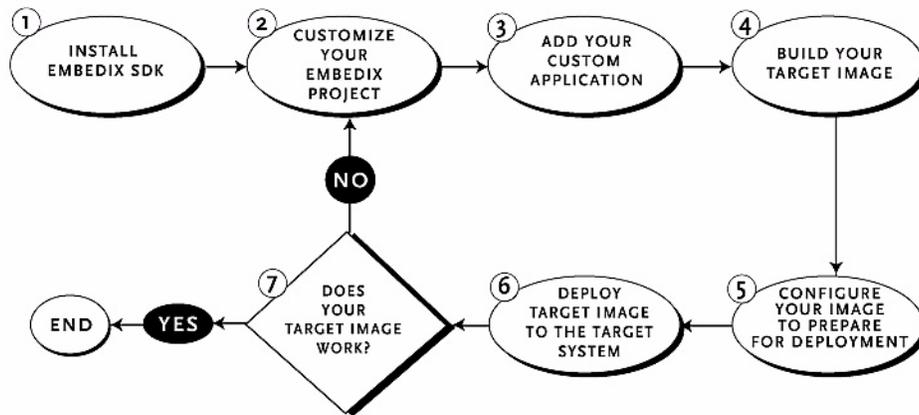
These macro-tasks are also summarized in the following list of essential development steps, which include references to pertinent chapters.

1. Install Embedix SDK (see Chapter 2 of this document) and then become familiar with the graphical interface (see the *Embedix SDK Target Wizard User Guide*).

2. Customize your Embedix project using Target Wizard (see the *Embedix SDK Target Wizard User Guide*).

   2a. Create a new project in Target Wizard.

   2b. (Optional) Load a state file for your project.

An Embedix state file is a pre-configured profile for a project. It includes settings for the Linux kernel, filesystem, and selected utilities.

  2c. Customize your project.

If you enable real-time features in your Embedix Target Wizard project, you will probably need to refer to the *Embedix RealTime Programming Guide* as well.

3. (Optional) Add your custom application to your Custom Embedix project (see the *Embedix SDK Target Wizard User Guide*) and then save the project (choose Project > Save).

4. Build your target image (see the *Embedix SDK Target Wizard User Guide*).

5. If necessary, configure your image to prepare for deployment (see the *Embedix SDK Target Wizard User Guide*).

6. For fine tuning your project, you will probably need to refer to the *Embedix SDK Reference Manual* as well.

7. Deploy your target image to the target system (see the *Embedix SDK Target Wizard User Guide*).

8. Test your target deployment and refine your project as needed using the guidelines provided in the *Embedix SDK Target Wizard User Guide*.

To help you become familiar with the Embedix Target Wizard interface and the general procedures used in building, editing, and transferring a target image, see the chapters referred to in the preceding list.

2 Installing Embedix SDK 2.4

This chapter provides basic instructions for installing Lineo® Embedix® SDK 2.4 on your Linux development host machine as well as other information you need to know.

Instructions are also included to install a Board Support Package (BSP) as an optional part of the SDK 2.4 installation.

Note: Embedix SDK 2.4 must be installed on a host running Linux (from distributions such as Mandrake, Red Hat, or SuSE).

By default, the installation script will place Embedix SDK into the `/opt/Embedix` directory, or in another directory you specify.

Warning: Embedix Target Wizard (the Embedix SDK graphical tool) requires root permission during installation. By default, Embedix Target Wizard is installed at `/opt/Embedix/bin/tw` and is owned by root.

1. Ensure your Linux development host machine meets the requirements listed in "Host System Requirements" on page 1.

2. On your development host machine, log in to the desktop as root.

    If your system uses the GNOME File Manager, you may receive a warning about running it as root. If so, you must click OK to continue.

3. Insert the Embedix SDK 2.4 CD-ROM into the CD-ROM drive.

4. Click the Terminal Emulation (X-term) icon on your screen to access a shell prompt.

5. If your system does not automatically mount the CD-ROM, then mount it by entering the following command at the root shell prompt:

   `mount /mnt/cdrom -o exec`

6. Start the Embedix Installation Wizard by entering the following command:

   `/mnt/cdrom/install.sh`

   The Embedix Installation Wizard "Welcome" page appears.

7. Follow the Embedix Installation Wizard page prompts to

   ▷ Read the software license

   ▷ Read the README file

Note: If a Validation of Disk Space page appears, the `/opt` directory has insufficient disk space to complete the SDK installation. You must exit the installation program, create an Embedix symlink to a partition with the required space, and restart the program.

   ▷ Install Embedix SDK 2.4 (tarfiles and RPMs)

   ▷ (Optional) Add support for Code Warrior IDE.

   This places an Embedix SDK > Target Wizard launch button on the CodeWarrior menu bar, installs preconfigured CodeWarrior stationary (templates), and installs a CodeWarrior Launch wizard in Target Wizard.

   ▷ Select the usernames of users who will be using Embedix Target Wizard on this machine (from the SUWrapper Setup page).

8. When the Start the Board Support Package Installation page appears, choose whether or not to install a BSP.

If you choose not to install a BSP, click No, click NEXT, and then skip to Step 10 to complete the SDK installation.

If you choose to install a BSP, click NEXT (Yes is default) and continue.

   8a. When prompted to do so, remove the Embedix SDK 2.4 CD-ROM.

   8b. Insert the Embedix BSP CD-ROM that shipped with this product into the CD-ROM drive and then click NEXT.

Note: If automount is enabled, close any automounted windows that open during the mount sequence.

The Embedix BSP Installation Wizard "Welcome" page appears.

9. Follow the Embedix BSP 2.4 Installation Wizard page prompts to help ensure that you:

   ▷ Read the software license

   ▷ Read the README file

   ▷ Install your Embedix BSP 2.4

   ▷ Click FINISH to complete the BSP installation.

10. Click FINISH again to complete the SDK installation.

11. After the SDK is installed, install your valid license key in the /opt/Embedix/emb-bin directory.

This version of the SDK will not run until a valid license key is in place on the host machine.

If you have not already received your license key, please visit http://www.lineo.com/licensing or contact sales@lineo.com to obtain your key and instructions. You can also call Lineo, Inc. at 800-490-9448 ext. 320.

IMPORTANT: You must include the mac address for your network card in order to obtain a license key. Make sure to include the mac address in your e-mail or have it handy when

you call. The MAC address can be found on your Linux host system by running the **ifconfig** command (usually located in /sbin) with the **-hw** option (such as **/sbin/ifconfig -hw**).

Once you have received your license, placed it in the /opt/ Embedix/emb-bin directory after the SDK is installed. We suggest you save an additional copy in another location because the /opt/Embedix/emb-bin directory and contents may be deleted if you later reinstall the SDK.

In some cases when copying the license file, permissions are not preserved. This is a behaviour that is controlled by the setup of the users host machine environment. If this occurs, it is possible that the license.lic file was copied with read permission for the root user only. If this happens, then the file cannot be read during Target Wizard initialization and this causes the FlexLM [license key] error. Changing file permissions to allow all users read permission corrects this problem.

Here's an example at the command line:

        [root@cobalt emb-bin]# chmod 644 license.lic
        [root@cobalt emb-bin]# ll license.lic
        -rw-r--r--   1 root   root   295 Apr 4 17:05 license.lic

Note: For a full description of files and directories created by running the Embedix SDK 2.4 installation script, see Chapter 5, "Target Wizard Files, Directories, and Utilities: Advanced Information," in the *Embedix SDK 2.4 Target Wizard User Guide*.

12. If your Netscape program is not located in the /usr/bin directory, then, while still logged in as root, modify the BROWSER entry in /etc/twdefaults file with the path to your Netscape program. This ensures complete access to all Target Wizard menu items.

13. (Optional) Unmount the CD-ROM.

You mounted the CD-ROM as root. You may choose to unmount it now, for security reasons, or you can leave it mounted so that you can view or print the PDF or HTML versions of the product manuals.

If your system does not automatically unmount the CD-ROM when you choose to eject it, unmount the CD-ROM by entering the following command at the root shell prompt:

```
umount /mnt/cdrom
```

14. Log out of the desktop as root.

15. Verify that Embedix SDK 2.4 has been successfully installed:

   15a. Log in to the desktop as a regular non-root user (using one of the usernames you selected in the SuWrapper Setup page).

   15b. Click the Terminal Emulation (X-term) icon on your screen to access a shell prompt.

   15c. Start Embedix Target Wizard by entering the command:
   ```
   tw
   ```

   Refer to *Embedix SDK Target Wizard User Guide* for information on using Embedix Target Wizard.

16. (Optional) Install CodeWarrior as outlined in the *Embedix SDK 2.4 Tool* book.

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