
Freescale Linux SDK Development Environment with Linux Virtual Machine

User's Guide

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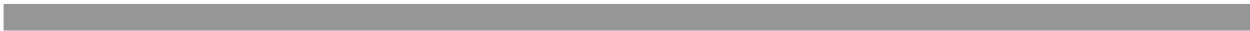
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Chapter 1 Getting Started

1.1 About This Manual

This User Manual describes the Freescale Linux BSP development environment with Linux virtual machine installed on windows XP system, and provides you with instructions about how to use this environment:

- About the End User License Agreement (EULA).

- Software emulation tools.

- Installing the Linux Virtual Machine on a host Windows XP system.

- The Linux Virtual Machine with System Builder development environment.

- Other Freescale tools installed in the Linux Virtual Machine.

1.2 Audience

This document is addressed to developers who want to take advantage of the Freescale Yocto and other tools by a Linux Virtual Machine.

1.3 Organization

This document is organized into five chapters.

Chapter 1	Getting Started
Chapter 2	Introduction to the Virtual Machine environment.
Chapter 3	Information about host computer and VirtualBox.
Chapter 4	Information about this Linux Virtual Machine.
Chapter 5	Deployment information.

1.4 Conventions

This document uses the following notational conventions:

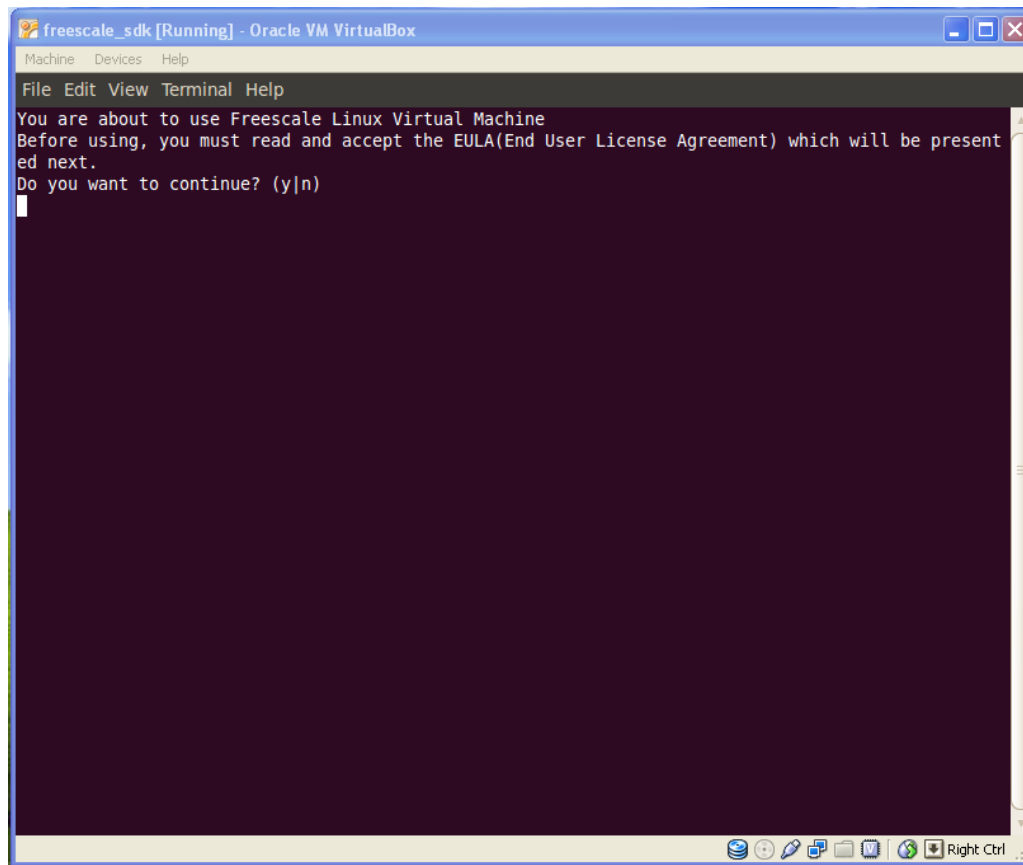
- Courier monospaced type indicates commands, command parameters, code examples, expressions, data types, and directives.

- Italic type indicates replaceable command parameters.

1.5 End User License Agreement

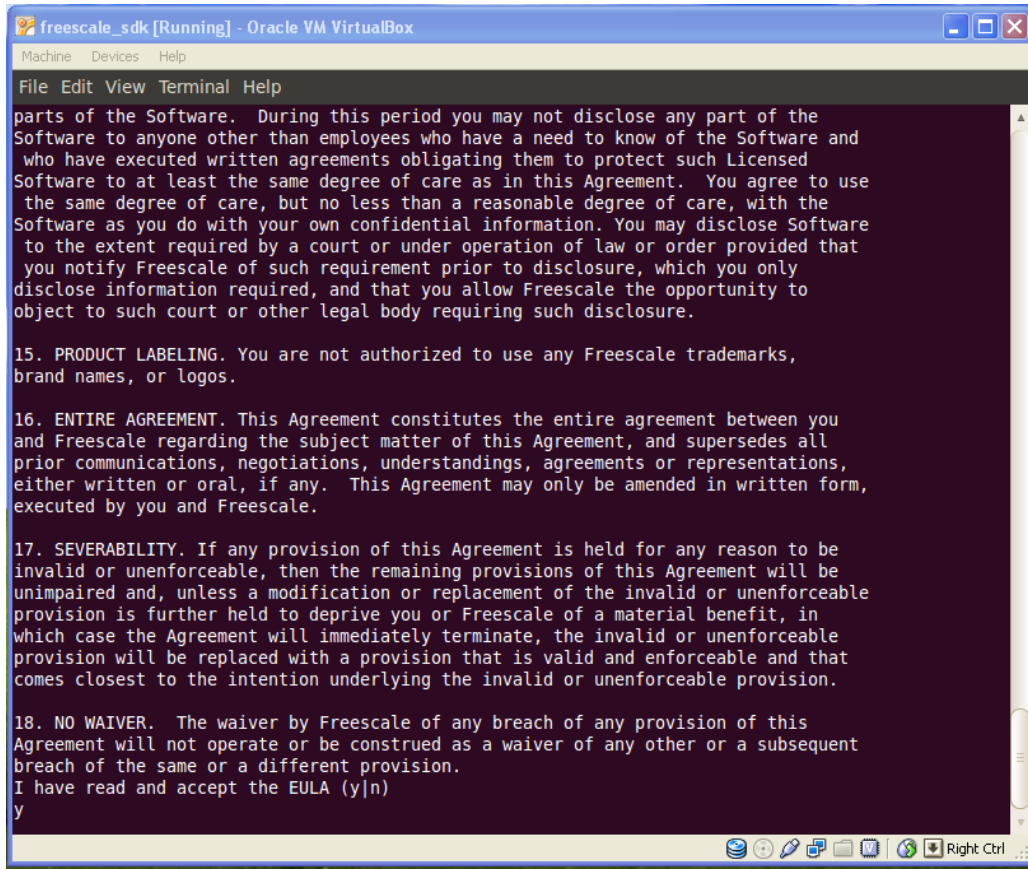
To use the Freescale Linux Virtual Machine, you must read and accept the EULA.

1. The Freescale Linux Virtual Machine displays the EULA in a terminal window and prompts you to continue reading the EULA.



2. Enter **y** at the prompt to continue reading the EULA. The EULA displays.

NOTE: If you enter **n**, the Freescale Linux Virtual Machine will not be started. The EULA will display each time you start the Freescale Linux Virtual Machine, until you accept the EULA.



3. Enter **y** to accept the EULA and start the Freescale Linux Virtual Machine. The EULA will not display any more.

Chapter 2 Overview

2.1 Virtual Machine Overview

A **virtual machine (VM)** is a completely isolated operating system installation within your normal operating system, behaves exactly like a physical computer and contains its own virtual (i.e., software-based) CPU, RAM hard disk and network interface card (NIC). This is implemented by either software emulation or hardware virtualization.

In general, Virtual Machines possess four key characteristics that benefit the user:

- **Compatibility:** Virtual machines are compatible with all standard x86 computers.
- **Isolation:** Virtual machines are isolated from each other as if physically separated.
- **Encapsulation:** Virtual machines encapsulate a complete computing environment.
- **Hardware independence:** Virtual machines run independently of underlying hardware.

Running on the Microsoft Windows® operating system, a Linux virtual machine can be implemented by a software emulation tool like VMware Workstation, or VMware Player, or VirtualBox. Then the Freescale Linux development packages like the Yocto can run on this Linux virtual machine.

This Linux Virtual Machine was built with the VirtualBox and Ubuntu distributions, and contains entire Freescale Linux BSP development environment.

2.2 VirtualBox Overview and Some Terminology

The **Oracle VM VirtualBox** software is an x86 and AMD64/Intel64 virtualization software package. It is installed on an existing host operating system; within this application, additional guest operating systems, each known as a *Guest OS*, can be loaded and run, each with its own virtual environment.

With version 4 of Virtualbox, released in December 2010, the core package is free software released under **GNU General Public License** version 2 (GPLv2). This is the fully-featured package, excluding some proprietary components not available under GPLv2. These components provide support for USB 2.0 devices, RDP and PXE boot for Intel cards and are released as a separate **VirtualBox Oracle VM VirtualBox extension pack** under a proprietary Personal Use and Evaluation License (PUEL), which permits use of the software for personal use, educational use, or evaluation, free of charge.

Prior to version 4, there were two different packages of the VirtualBox software. The full package was offered for free under the PUEL, with licenses for other commercial deployment purchasable from

Oracle. A second package called the **VirtualBox Open Source Edition (OSE)** was released under GPLv2. This removed the same proprietary components not available under GPLv2.

When dealing with virtualization (and also for understanding the following chapters of this documentation), it helps to acquaint oneself with a bit of crucial terminology, especially the following terms:

- **Host operating system (host OS).** This is the operating system of the physical computer on which VirtualBox was installed. There are versions of VirtualBox for Windows, Mac OSX, Linux and Solaris hosts.
- **Guest operating system (guest OS).** This is the operating system that is running inside the virtual machine. Theoretically, VirtualBox can run any x86 operating system (DOS, Windows, OS/2, FreeBSD, OpenBSD).
- **Virtual machine (VM).** This is the special environment that VirtualBox creates for your guest operating system while it is running. In other words, you run your guest operating system “in” a VM. Normally, a VM will be shown as a window on your computer’s desktop, but depending on which of the various frontends of VirtualBox you use, it can be displayed in full-screen mode or remotely on another computer. In a more abstract way, internally, VirtualBox thinks of a VM as a set of parameters that determine its behavior. They include hardware settings (how much memory the VM should have, what hard disks VirtualBox should virtualize through which container files, what CDs are mounted etc.) as well as state information (whether the VM is currently running, saved, its snapshots etc.). These settings are mirrored in the VirtualBox Manager window as well as the VBoxManage command line program. In other words, a VM is also what you can see in its settings dialog.
- **Guest Additions.** This refers to special software packages which are shipped with VirtualBox but designed to be installed inside a VM to improve performance of the guest OS and to add extra features.

2.3 Ubuntu Overview

Ubuntu is a computer operating system based on the Debian GNU/Linux distribution and distributed for free as open source software.

Ubuntu is composed of many software packages, the vast majority of which are distributed under a free software license. The only exceptions are some proprietary hardware drivers. The main license used is the **GNU General Public License (GNU GPL)** which, along with the **GNU Lesser General Public License (GNU LGPL)**, explicitly declares that users are free to run, copy, distribute, study, change, develop and improve the software. On the other hand, there is also proprietary software available that can run on Ubuntu. Ubuntu focuses on usability, security and stability. Ubuntu also emphasizes accessibility and internationalization to reach as many people as possible. Beginning with 5.04, UTF-8 became the default character encoding, which allows for support of a variety of non-Roman scripts. As a security feature, the sudo tool is used to assign temporary privileges for performing administrative tasks, allowing the root account to remain locked, and preventing inexperienced users from inadvertently making catastrophic system changes or opening security holes.

NOTE: The Freescale Linux Virtual Machine was built based on **Ubuntu10.04.2-32bit desktop Linux distribution.**

2.4 Yocto Overview

Freescale Linux Virtual Machine contains many Linux BSP development resources, and provides you an entire Linux BSP development environment for Freescale boards. Wherein, Yocto is one of the very important Linux BSP development utility.

The Yocto Project is an open-source collaboration project focused on embedded Linux developers. Amongst other things, the Yocto Project uses the Poky build system to construct complete Linux images.

The Yocto Project through the Poky build system provides an open source development environment targeting the ARM, MIPS, PowerPC and x86 architectures for a variety of platforms including x86-64 and emulated ones. You can use components from the Yocto Project to design, develop, build, debug, simulate, and test the complete software stack using Linux, the X Window System, GNOME Mobile-based application frameworks, and Qt frameworks.

Here are some highlights for the Yocto Project:

- Provides a recent Linux kernel along with a set of system commands and libraries suitable for the embedded environment.
- Makes available system components such as X11, Matchbox, GTK+, Pimlico, Clutter, GuPNP and Qt (among others) so you can create a richer user interface experience on devices that use displays or have a GUI. For devices that don't have a GUI or display, you simply would not employ these components.
- Creates a focused and stable core compatible with the OpenEmbedded project with which you can easily and reliably build and develop.
- Fully supports a wide range of hardware and device emulation through the QEMU Emulator.

Chapter 3 Host Computer and Installing VirtualBox

3.1 Host Computer Environment

The host computer environment has the following expected requirements:

- 60GB of free disk space required for the Freescale Linux Virtual Machine.

As the virtual machine will most probably expect to see a hard disk built into its virtual computer, VirtualBox must be able to present “real” storage to the guest as a virtual hard disk.

VirtualBox supports two types of virtual hard disk files:

- A dynamically expanding file will only grow in size when the guest actually stores data on its virtual hard disk. It will therefore initially be small on the host hard drive and only later grow to the size specified as it is filled with data.
- A fixed-size file will immediately occupy the file specified, even if only a fraction of the virtual hard disk space is actually in use. While occupying much more space, a fixed-size file incurs less overhead and is therefore slightly faster than a dynamically expanding file.

To prevent your physical hard disk from running full, VirtualBox limits the size of the image file. Still, it needs to be large enough to hold the contents of your operating system and the applications you want to install.

The virtual hard disk file of the Freescale Linux Virtual Machine is set for dynamically expanding style and the maximum size is 60GB.

In addition, you need more several gigabytes disk space for the Freescale Virtual Machine Image file if download to your host system.

- 1GB of memory space required for the Freescale Linux Virtual Machine.

For better performance, recommended memory size for Virtual Machine is more than 1GB space. Also you can select another value based on your host computer.

- Windows XP SP3 host system.
- VirtualBox 4.2.14, to open this Freescale Linux Virtual Machine.
- Extension packages for VirtualBox 4.2.14.

3.2 Installing VirtualBox and Extension Packs

Before install the VirtualBox, you should obtain the software from:

<http://www.virtualbox.org/wiki/Downloads>.

Or you can obtain the old builds from:

http://www.virtualbox.org/wiki/Download_Old_Builds.

NOTE: We built this Linux Virtual Machine based on the VirtualBox 4.2.14, so you'd better select one compatible version of the VirtualBox.

The VirtualBox installation can be started by double-clicking on its executable file. This will display the installation welcome dialog and allow you to choose where to install VirtualBox to and which components to install.

Depending on your Windows configuration, you may see warnings about “unsigned drivers” or similar. Please select **Continue** on these warnings as otherwise VirtualBox might not be functional correctly after installation.

The installer will create a “VirtualBox” group in the Windows **Start** menu which allows you to launch the application and access its documentation. With standard settings, VirtualBox will be installed for all users on the local system.

VirtualBox extension packages have a *.vbox-extpack* file name extension. To install an extension, simply double-click on the package file, and the VirtualBox Manager will guide you through the required steps. To view the extension packs that are currently installed, please start the VirtualBox Manager. From the **File** menu, please select **Preferences**. In the window that shows up, go to the **Extensions** category which shows you the extensions which are currently installed and allows you to remove a package or add a new one.

More information about VirtualBox, please read the User Manual of the VirtualBox.

3.3 VirtualBox Virtual Disk Image

There are many and potentially complicated ways in which VirtualBox can provide hard disk space to a VM, but the most common way is to use a large image file on your “real” hard disk, whose contents VirtualBox presents to your VM as if it were a complete hard disk. This file represents an entire hard disk then, so you can even copy it to another host and use it with another VirtualBox installation.

Virtual Disk Image (VDI) is a VirtualBox container storage format. In particular, this format will be used when you create a new virtual machine with a new disk.

The Freescale Linux Virtual Machine Image is also a VirtualBox VDI file.

Chapter 4 Freescale Linux Virtual Machine

4.1 Introduction

The Freescale Linux Virtual Machine is a Virtual Disk Image (VDI) created by VirtualBox. It contains the Ubuntu operating system and the Yocto utility. You can get an entire Linux BSP development environment for Freescale development boards.

The VDI is named `freescale_sdk_ubuntu10.04_32bit_PPCxxxxxx_xxxxxxxx.vdi`, and you can obtain the zipped file named `freescale_sdk_ubuntu10.04_32bit_PPCxxxxxx_xxxxxxxx.zip`. The symbol “PPCxxxxxx” indicates the specific PowerPC platform and “xxxxxxx” indicates the creation date of the Linux Virtual Machine.

The Virtual Machine includes an entire prebuilt Freescale SDK 1.4 environment for all the five platforms as listed below:

```
freescale_sdk_ubuntu10.04_32bit_PPC64E5500_20130711.zip ---> E5500 64bit platform
freescale_sdk_ubuntu10.04_32bit_PPCE5500_20130711.zip ---> E5500 32bit platform
freescale_sdk_ubuntu10.04_32bit_PPCE500MC_20130711.zip ---> E500MC platform
freescale_sdk_ubuntu10.04_32bit_PPCE500V2_20130711.zip ---> E500V2 platform
freescale_sdk_ubuntu10.04_32bit_PPCE6500_20130711.zip ---> E6500 platform
```

The above 5 files represent 5 Virtual Machines which are independent to each other. Every Virtual Machine is a complete build of the specific platform. You can use any of the five Virtual Machines directly according to your needs. For example, if you want to use the SDK Virtual Machine for P4080, P3041, P2041, you just need to install the `freescale_sdk_ubuntu10.04_32bit_PPCE500MC_20130711.zip` and use it directly.

Note: If you want to work on multiple platforms in one physical machine, such as E500V2 Virtual Machine and E500MC Virtual Machine in one computer, you do not need to install multiple Virtual Machines in the computer. That would take up too much host’s disk space.

A better approach is to get the new SDK ISO for the specific PowerPC platform from Freescale, and to install the new SDK into your original Virtual Machine. So your Virtual Machine can support multiple platforms.

Some suggestions:

1. You must install the new SDK into the same directory with the installed SDK in your Virtual Machine:

```
./SDK
```

2. Because the SOURCE ISO of the SDK is common for all the PowerPC platforms and has been installed into your Virtual Machine, so you don't need to install again for the new platform.

3. For the images in the new SDK ISO, you can make a new directory under:

```
./SDK/Target_Images/
```

and copy them to this directory.

4. You can find the tool-chain file in the SDK ISO, if needed, you can install it to:

```
/opt/fsl-networking
```

4.2 Login and Work Directories

User and password:

Account	Password
root	Freescale
freescale	Freescale

NOTE: The password is case-sensitive.

Table 1: Directories of user freescale

Directory	Description
Home directory of user freescale	
./Documents	Documents about SDK, silicon, boards, and QorIQ configuration suite.
./Documents/SDK	Documents from the SDK ISO. You can get some helpful information when work under the SDK environment.
./Documents/Silicon_Boards	Silicon and board reference manuals.
./Documents/QorIQConfigSuite	Documents about QorIQ configuration suite.
./Fsl_tools	This directory includes Freescale Linux development tools. Now includes a CodeWarrior installer.

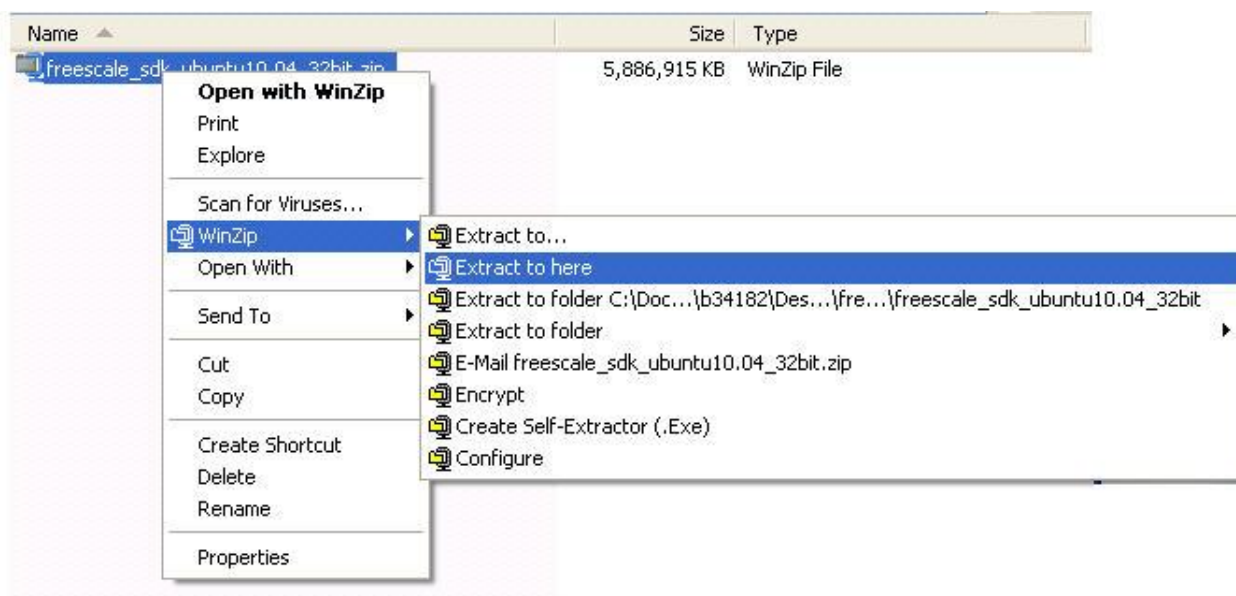
<p>./SDK</p> <p>./SDK/Target_Images</p>	<p>This directory includes an installed Yocot environment for QorIQ SDK.</p> <p>For the specific PowerPC platform, this directory includes all images which can be used directly on the specific PowerPC development boards. For example, there are flash images, uboot images, DTBs, RCWs, rootfs images.</p>
<p>Other useful directories for Linux BSP development</p>	
<p>/opt/freescale/QorIQConfigSuite/</p>	<p>Installed QorIQ Configuration Suite based on Eclipse. It contains some configuration tools for QorIQ architecture such as PBL. This suite was built based on Eclipse IDE for C/C++ Developers and the QorIQ Configuration suite package. Using this Configuration Suite, you can run “eclipse” directly.</p>
<p>/opt/fsl-networking</p>	<p>Installed tool-chain for the specific PowerPC platform.</p>

Chapter 5 Linux Virtual Machine Deployment

5.1 Deploying the Linux Virtual Machine

Use the following procedures to deploy the Linux Virtual Machine on your host Windows XP operating system.

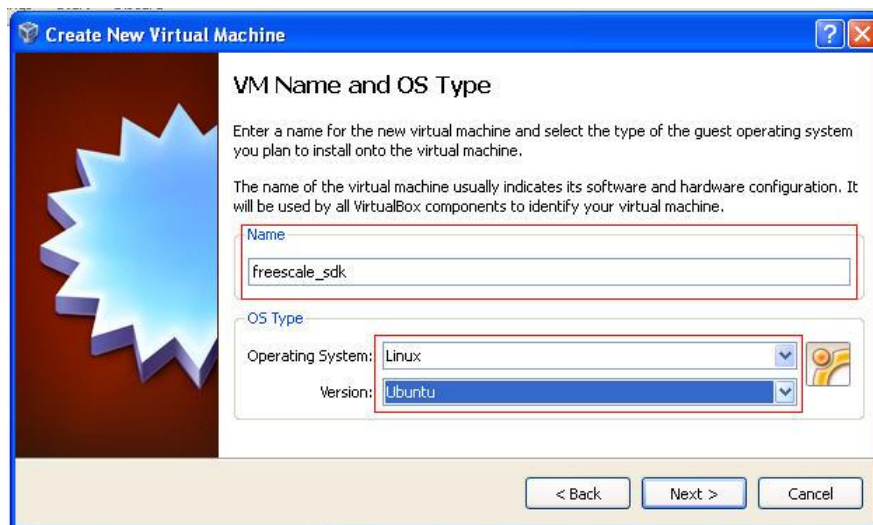
1. Unzip **freescale_sdk_ubuntu10.04_32bit_PPCxxxxxx_xxxxxxxx.zip** got from *freescale* company into your host Windows XP system and you will get a file named **freescale_sdk_ubuntu10.04_32bit_PPCxxxxxx_xxxxxxxx.vdi**.



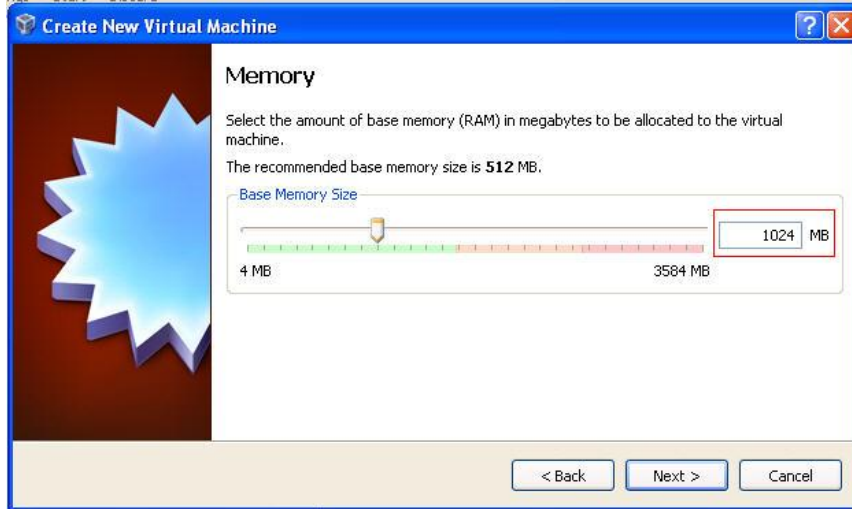
2. Run the VirtualBox installed in your host Windows XP system. Click **New**. The Welcome to the New Virtual Machine Wizard box displays.



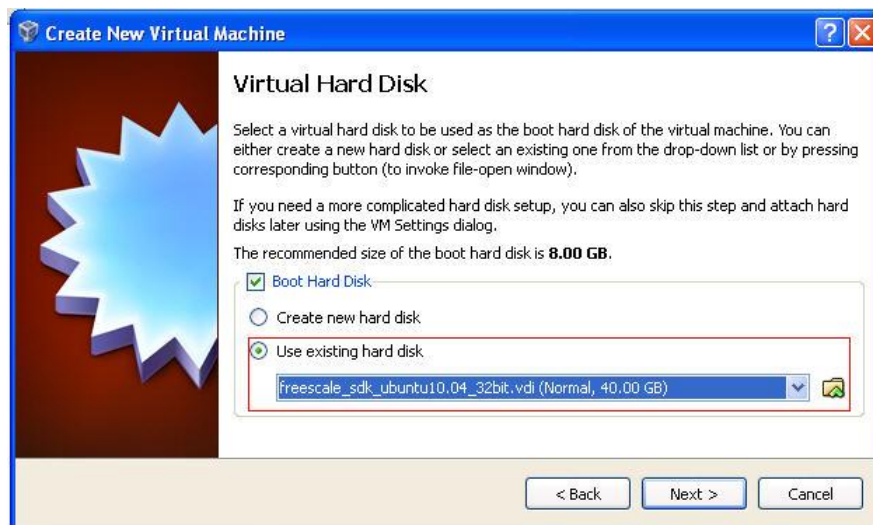
3. Click **Next**. Enter the Virtual Machine's **Name** and select the **Linux Operating System** and **Ubuntu Version**. Because the Linux Virtual Machine you obtained from Freescale was built with the Ubuntu operating system.



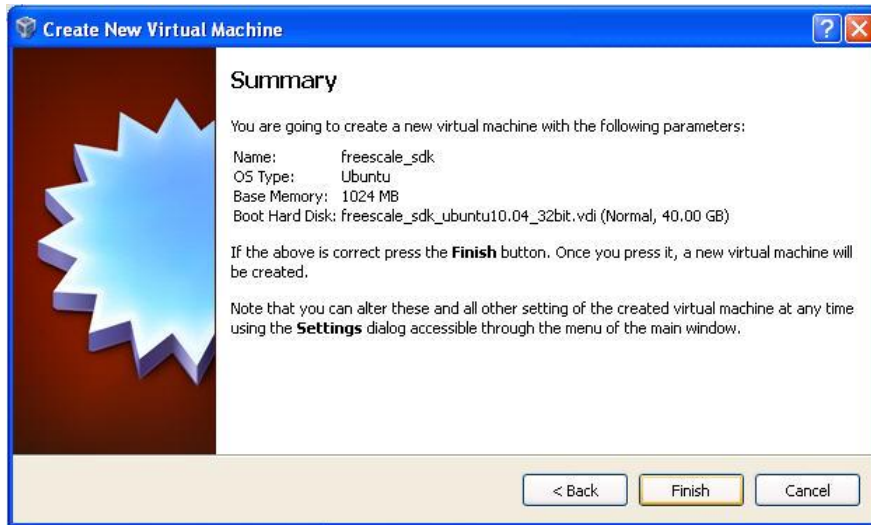
4. Click **Next**. Enter the **Base Memory Size** as 1024MB.



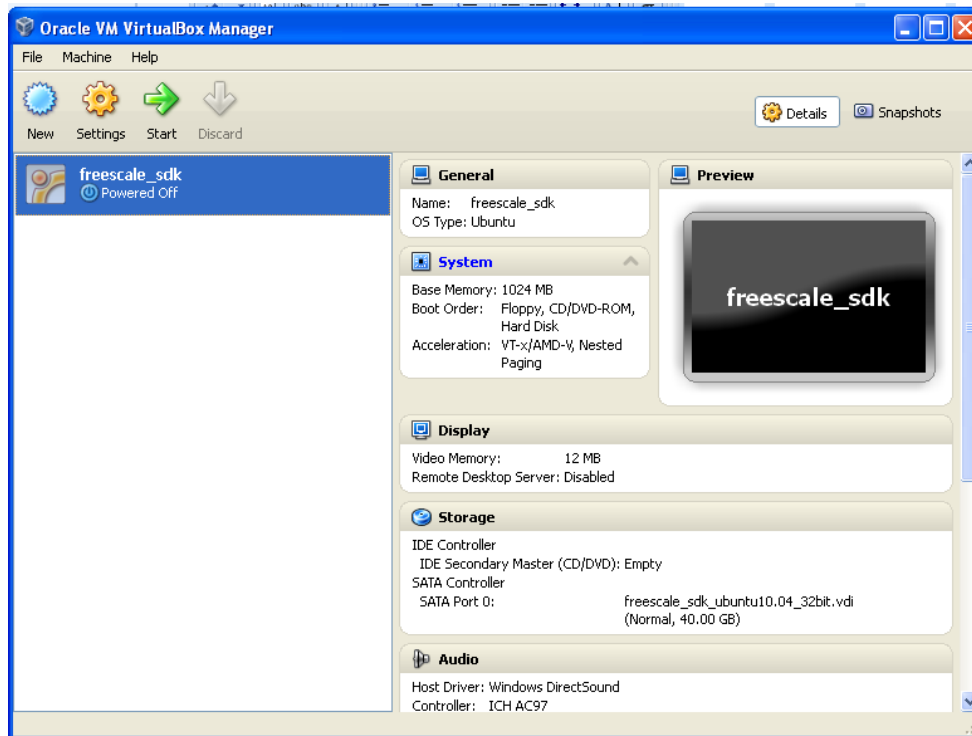
5. Click **Next**. Configure the **Virtual Hard Disk**. Click **Using existing hard disk** and select the `freescale_sdk_ubuntu10.04_32bit_PPCxxxxxx_xxxxxxx.vdi` file you previously unzipped.



6. Click **Next**.



7. Click **Finish**. The new Linux Virtual Machine displays using `freescale_sdk_ubuntu10.04_32bit_PPCxxxxxx_xxxxxxx.vdi`.



8. Click the **Start** icon in the toolbar and the Linux Virtual Machine will be powered on.
9. Login to the Ubuntu system using **User** `freescale` and **Password** `Freescale`. You can find the files and directories described above in the `/home/freescale` directory.



5.2 Set up USB in the Linux Virtual Machine

When use CodeWarrior USB TAP, you should set up USB interface in VirtualBox. Follow these steps to set up your VirtualBox USB interface.

1. Make sure that your VirtualBox has installed the dependent extension package for USB function. If necessary, you can get the extension package Oracle_VM_VirtualBox_Extension_Pack-x.x.x-xxxxx.vbox-extpack from this site:

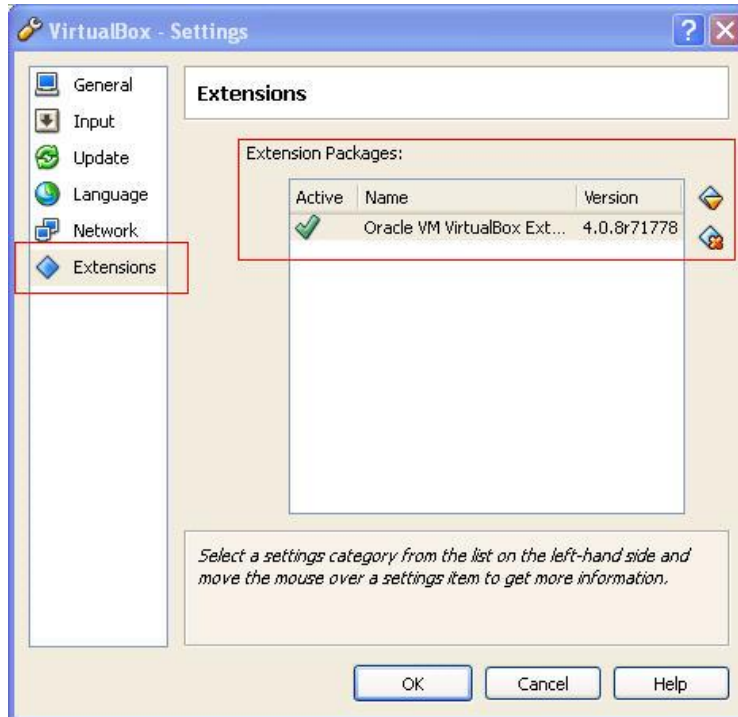
<http://www.virtualbox.org/wiki/Downloads>.

Or you can obtain the extension packages for old builds from:

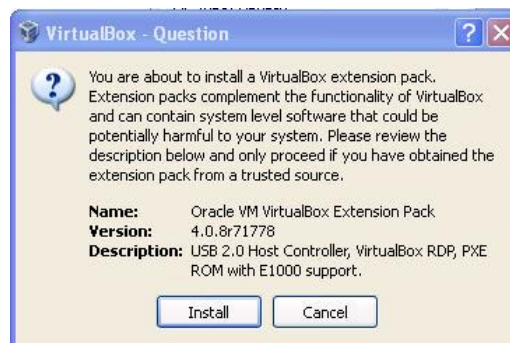
http://www.virtualbox.org/wiki/Download_Old_Builds.

NOTE: The extension package you obtained must be compatible with the version of your VirtualBox.

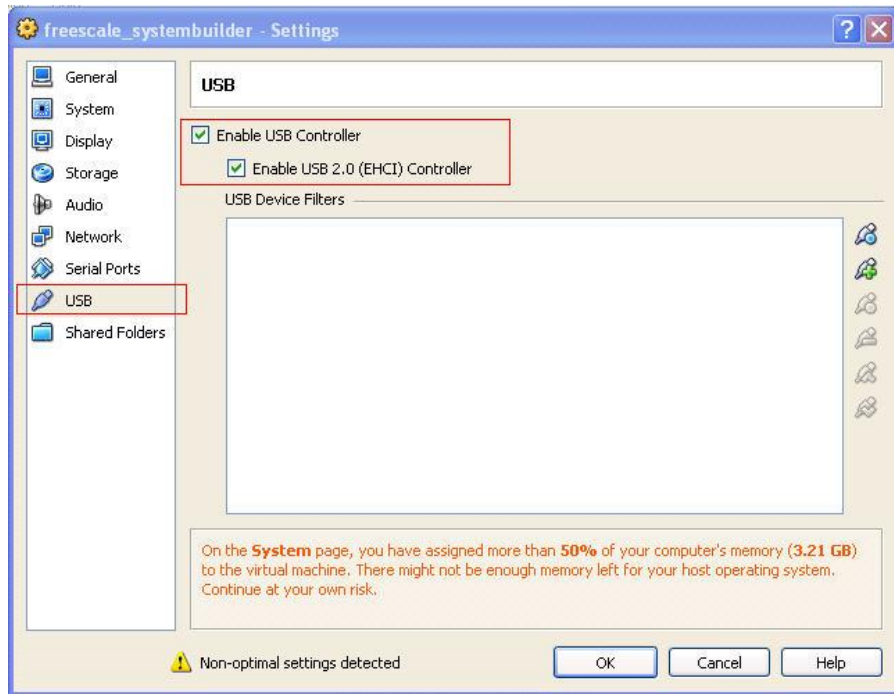
2. To confirm the extension package was installed, click **File>Preferences** in VirtualBox's main menu. The VirtualBox - Settings box will display. Click the **Extensions** category, and check the list to see if the **Extension Package** "Oracle VM VirtualBox Ext..." has been installed.



3. If extension package “Oracle VM VirtualBox Ext...” has not been installed, find the extension package you downloaded by Step 1. Double-click the package on your host Windows XP operating system. The VirtualBox - Question box will display. Click **Install**.



4. In the main window, click the **Settings** icon in the toolbar. Click the **USB** category. Check the checkboxes for **Enable USB Controller** and **Enable USB 2.0 (EHCI) Controller**.

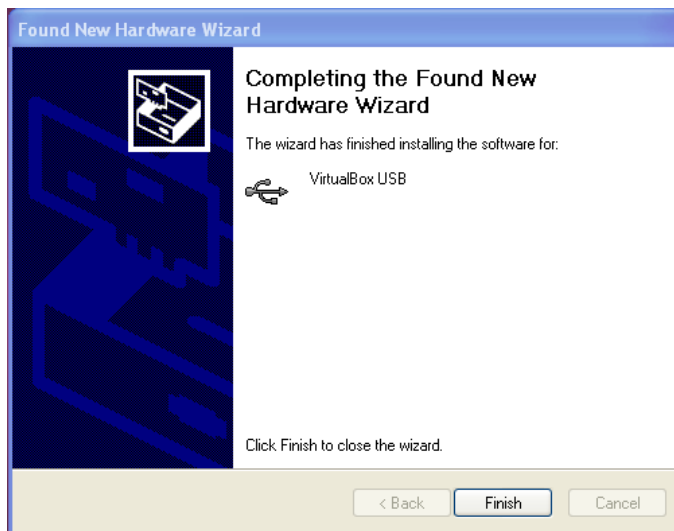
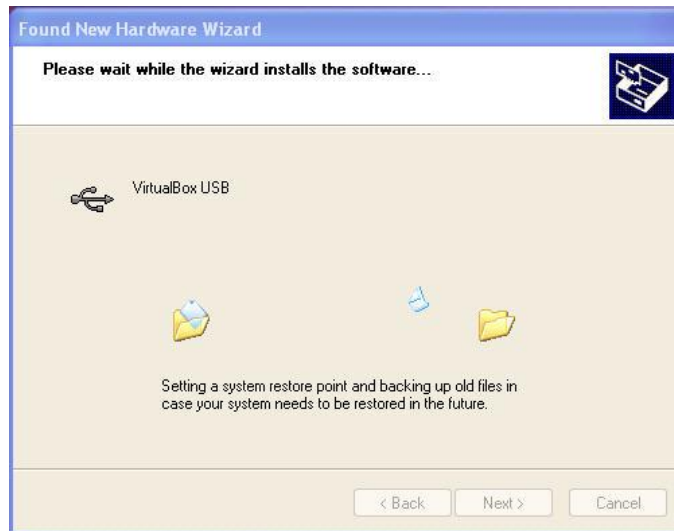


5. Click the **Start** icon in the toolbar and login to the Linux Virtual Machine. Plug a CodeWarrior USB TAP into your host computer. The host computer with Windows XP system will find this USB device but does not recognize it. Click the message to install the VirtualBox USB driver.

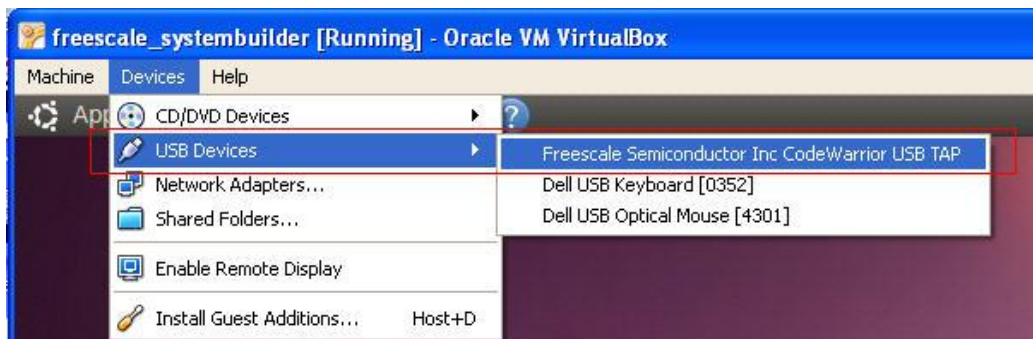


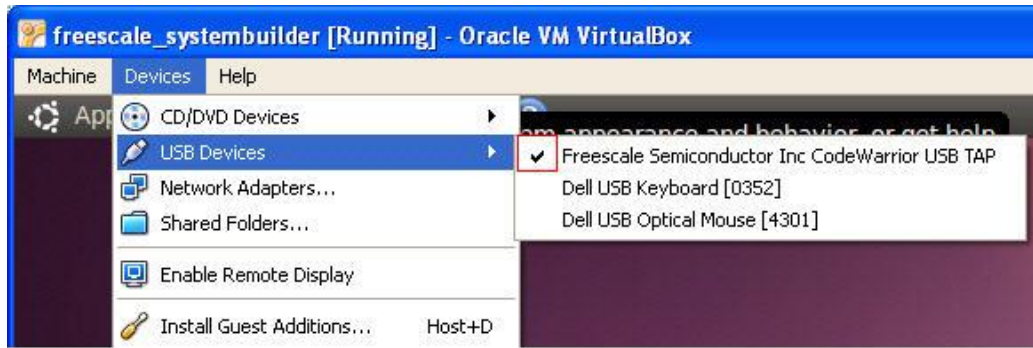
6. Click **Next** to install the USB driver. Click **Finish** when complete.





7. Click **Devices>USB Devices** in the VirtualBox main window, and select **Freescal Semiconductor Inc CodeWarrior USB TAP**, so you can use the USB TAP in the Linux Virtual Machine.





Appendix A Release History

VM Release Version	VM Binary Name	SDK Version	VM Release date
V1.1	freescall_sdk_ubuntu10.04_32bit_20111109.zip	V1.1	2011-11-09
V1.2	freescall_sdk_ubuntu10.04_32bit_PPC64E5500_20120719.zip freescall_sdk_ubuntu10.04_32bit_PPCE5500_20120719.zip freescall_sdk_ubuntu10.04_32bit_PPCE500MC_20120719.zip freescall_sdk_ubuntu10.04_32bit_PPCE500V2_20120719.zip	V1.2	2012-07-19
V1.3	freescall_sdk_ubuntu10.04_32bit_PPC64E5500_20121205.zip freescall_sdk_ubuntu10.04_32bit_PPCE5500_20121205.zip freescall_sdk_ubuntu10.04_32bit_PPCE500MC_20121205.zip freescall_sdk_ubuntu10.04_32bit_PPCE500V2_20121205.zip	V1.3	2012-12-05
V1.3.1	freescall_sdk_ubuntu10.04_32bit_PPCE6500_20130110.zip	V1.3.1	2013-01-10
V1.3.2	freescall_sdk_ubuntu10.04_32bit_PPC64E5500_20130409.zip freescall_sdk_ubuntu10.04_32bit_PPCE5500_20130409.zip freescall_sdk_ubuntu10.04_32bit_PPCE500MC_20130409.zip freescall_sdk_ubuntu10.04_32bit_PPCE500V2_20130409.zip freescall_sdk_ubuntu10.04_32bit_PPCE6500_20130409.zip	V1.3.2	2013-04-09
V1.4	freescall_sdk_ubuntu10.04_32bit_PPC64E5500_20130711.zip freescall_sdk_ubuntu10.04_32bit_PPCE5500_20130711.zip freescall_sdk_ubuntu10.04_32bit_PPCE500MC_20130711.zip freescall_sdk_ubuntu10.04_32bit_PPCE500V2_20130711.zip freescall_sdk_ubuntu10.04_32bit_PPCE6500_20130711.zip	V1.4	2013-07-11