openSUSE

10.3

www.novell.com

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Start-Up

Start-Up

Contents

About This Guide

This manual will see you through your initial contact with openSUSE®. Check out the various parts of this manual to learn how to install, use and enjoy your system.

Installation and Setup

> Guides you through the installation process and the basic configuration of your system. Introduces YaST, the central tool for installation and configuration of your system. Learn how to set up or modify key components of your system: hardware components such as monitors or printers and network connections such as Internet access. Find how to install or remove software, how to administer users and groups, and how to make use of the various system languages available with openSUSE.

Basics

> This part mainly addresses to users changing to Linux from other operating systems. It introduces basic Linux concepts such as the user concept, the structure of the file system and access permissions for files and directories. An introduction to the shell is also provided, although you hardly ever need the command line to interact with your system nowadays.

Mobility

> Get an overview of the features openSUSE offers to support mobile working with laptops, mobile storage devices such as external hard disks and PDAs or cellular phones. Learn how to use NetworkManager to easily integrate your machine into different network environments or different types of networks. Find advice on how to exchange files between different systems, be it on different partitions of one computer (Linux/Windows*), or from one computer to another (Linux/Linux, Linux/Windows).

Help and Troubleshooting

> Provides an overview of where to find help and additional documentation in case you need more information or want to perform specific tasks with your system. Also find a compilation of the most frequent problems and annoyances and learn how to solve these problems on your own.

1 Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with this product. Please use the User Comments feature at the bottom of each page of the online documentation and enter your comments there.

2 Additional Documentation

We provide HTML and PDF versions of our books in different languages. The following manuals are available on this product:

Start-Up

Guides you through the installation and basic configuration of your system. For newcomers, the manual also introduces basic Linux concepts such as the file system, the user concept and access permissions and gives an overview of the features openSUSE offers to support mobile computing. Provides help and advice in troubleshooting.

KDE Quick Start

Gives a short introduction to the KDE desktop and some key applications running on it.

KDE User Guide

Introduces the KDE desktop of openSUSE and a variety of applications shipping with it. It guides you through using these applications and helps you perform key tasks. It is intended mainly for end users who want to make efficient use of KDE in everyday life.

GNOME Quick Start

Gives a short introduction to the GNOME desktop and some key applications running on it.

GNOME User Guide

Introduces the GNOME desktop of openSUSE and a variety of applications you will encounter when working with the GNOME desktop. It guides you through using these applications and helps you perform key tasks. It is intended mainly for end users who want to make efficient use of applications running on the GNOME desktop.

Reference
> Gives you a general understanding of openSUSE and covers advanced system administration tasks. It is intended mainly for system administrators and home users with basic system administration knowledge. It provides detailed information about advanced deployment scenarios, administration of your system, the interaction of key system components and the set-up of various network and file services openSUSE offers.

Novell AppArmor Quick Start
> Helps you understand the main concepts behind Novell® AppArmor.

Novell AppArmor Administration Guide
> Contains in-depth information about the use of Novell AppArmor in your environment.

Lessons For Lizards
> A community book project for the openSUSE distribution. A snapshot of the manual written by the open source community is released on an equal footing with the Novell/SUSE manuals. The lessons are written in a cook book style and cover more specific or exotic topics than the traditional manuals. For more information, see http://developer.novell.com/wiki/index.php/Lessons_for_Lizards.

Find HTML versions of the openSUSE manuals in your installed system under `/usr/share/doc/manual` or in the help centers of your KDE or GNOME desktop. You can also access the documentation on the Web at http://www.novell.com/documentation/opensuse103/ where you can download PDF or HTML versions of the manuals. For information where to find the books on your installation media, refer to the Release Notes of this product, available from your installed system under `/usr/share/doc/release-notes/`.

3 Documentation Conventions

The following typographical conventions are used in this manual:

- `/etc/passwd`: filenames and directory names

- *placeholder*: replace *placeholder* with the actual value

- `PATH`: the environment variable PATH

- `ls`, `--help`: commands, options, and parameters

- `user`: users or groups

- Alt, Alt + F1: a key to press or a key combination; keys are shown in uppercase as on a keyboard

- *File*, *File* > *Save As*: menu items, buttons

- *Dancing Penguins* (Chapter *Penguins*, ↑Another Manual): This is a reference to a chapter in another manual.

4 About the Making of This Manual

This book is written in Novdoc, a subset of DocBook (see http://www.docbook.org). The XML source files were validated by xmllint, processed by xsltproc, and converted into XSL-FO using a customized version of Norman Walsh's stylesheets. The final PDF is formatted through XEP from RenderX.

5 Source Code

The source code of openSUSE is publicly available. To download the source code, proceed as outlined under http://www.novell.com/products/suselinux/source_code.html. If requested we send you the source code on a DVD. We need to charge a \$15 or €15 fee for creation, handling and postage. To request a DVD of the source code, send an e-mail to sourcedvd@suse.de [mailto:sourcedvd@suse.de] or mail the request to:

```
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```

6 Acknowledgments

With a lot of voluntary commitment, the developers of Linux cooperate on a global scale to promote the development of Linux. We thank them for their efforts—this distribution would not exist without them. Furthermore, we thank Frank Zappa and Pawar. Special thanks, of course, go to Linus Torvalds.

Have a lot of fun!

Your SUSE Team

Part I. Installation and Setup

Installation with YaST

<div style="text-align: right; font-size: 3em; font-weight: bold;">1</div>

Install your openSUSE® system with YaST, the central tool for installation and configuration of your system. YaST guides you through the installation process and the basic configuration of your system. During the installation and configuration process, YaST analyzes both your current system settings and your hardware components and proposes installation settings based on this analysis. By default, YaST displays an overview of all installation steps on the left hand side of the window and provides online help texts for each step. Click *Help* to view the help text and *Steps* to switch back to the overview.

If you are a first-time user of openSUSE, you might want to follow the default YaST proposals in most parts, but you can also adjust the settings as described here to fine-tune your system according to your needs and wishes. Many parts of the basic system configuration, such as user accounts or system language, can also be modified after the installation process.

1.1 Choosing the Installation Media

When installing openSUSE, choose from several media available either online or in the retail box:

DVD-retail
> Two DVD9 media, only available with the retail box. The installation DVD contains the openSUSE distribution with open source software (OSS) as well as non-open source software (non-OSS) for 32bit and 64bit systems. The second DVD contains a snapshot of `ftp.opensuse.org` with a large number of additional packages.

This installation option does not require any network access for installation, nor do you need to set up external repositories to install the full openSUSE. You can, however, make the contents of the DVDs available on an installation server and make them available all across your network.

DVD-download

One DVD5, available via download, containing OSS software either for 32bit or 64bit systems.

Choose this installation option, if you want a fully-fledged openSUSE system consisting entirely of open source software. Beyond the downloading of the DVD ISO, there is no network connection required to make use of this installation option. Once the medium has been fully downloaded and the physical medium created, you can go ahead with the installation. You can, however, make the contents of the DVDs available on an installation server and make them available all across your network.

CD-KDE

The one CD-KDE version which is available via download includes the KDE desktop together with the most popular applications for 32bit or 64bit systems.

Choose this installation option, if you prefer a single-desktop solution and a lean software selection. There is no network connection required beyond the mere download of the medium.

CD-GNOME

The one CD-GNOME version which is available via download includes the GNOME desktop together with the most popular applications for 32bit or 64bit systems.

Choose this installation option, if you prefer a single-desktop solution and a lean software selection. There is no network connection required beyond the mere download of the medium.

Mini CD

The Mini CD contains a minimal Linux system needed to run the installation. The installation system itself and the installation data are loaded from a network source. To install from a network providing SLP, please start the installation as described in Section 1.2.1, "Installing from a Network Server Using SLP" (page 6). To install from a HTTP, FTP, NFS, or SMB server, follow the instructions in Section 1.2.2, "Installing from a Network Source without SLP" (page 7).

> **IMPORTANT: Add-On CDs—Installing Additional Software**
>
> Although add-on CDs cannot be used as stand-alone installation media, they can be embedded as additional software sources during the installation. Currently available are CDs with non-OSS software and additional languages. Add-on CDs can be used with any of the above installation media.

1.2 Choosing the Installation Method

After having selected the installation medium, determine a suitable installation method and boot option that best match your needs:

Installing from the openSUSE Media

> Choose this option, if you want to perform a stand-alone installation and do not want to rely on a network providing the installation data or the boot infrastructure. The installation proceeds exactly as outlined in Section 1.3, "The Installation Workflow" (page 8).

Installing from a Network Server

> Choose this option, if you have an installation server available in your network or want to use an external server as the source of your installation data. This setup can be configured to use from physical media (Floppy, CD/DVD, or hard disk) for booting or configured to boot via network using PXE/BOOTP. Refer to Section 1.2.1, "Installing from a Network Server Using SLP" (page 6), Section 1.2.2, "Installing from a Network Source without SLP" (page 7), and Chapter 1, *Remote Installation* (↑Reference) for details.

Installing with `instlux` from Windows

> Choose this installation option, if you prefer a smooth transition from using Windows to Linux. `instlux` allows you to boot into the openSUSE installation right from a running Windows by modifying the Windows boot loader. This installation option is only available from the DVD media. Refer to Section 1.2.3, "Installing with `instlux` from Windows" (page 7) for details.

openSUSE supports several different boot options from which you can choose depending on the hardware available and on the installation scenario you prefer. Booting from the openSUSE media or using instlux are the most straightforward options, but special requirements might call for special setups:

Table 1.1   *Boot Options*

Boot Option	Description
DVD/CD-ROM	This is the easiest boot option. This option can be used if the system has a local CD-ROM drive that is supported by Linux.
instlux	instlux is installed under Microsoft Windows* and makes it possible to boot directly into the installation
Floppy	The images for generating boot floppies are located on CD 1 in the /boot directory. A README is available in the same directory.
PXE or BOOTP	This must be supported by the system's BIOS or firmware and a boot server must be available in the network. This task can also be handled by another openSUSE system.
Hard Disk	openSUSE installation can also be booted from the hard disk. To do this, copy the kernel (linux) and the installation system (initrd) from the directory /boot/loader on the installation media to the hard disk and add the appropriate entry to the existing boot loader of a previous openSUSE installation.

1.2.1 Installing from a Network Server Using SLP

If your network setup supports OpenSLP and your network installation source has been configured to announce itself via SLP (described in Section "Setting Up the Server Holding the Installation Sources" (Chapter 1, *Remote Installation*, ↑Reference)), boot the system from the media or with another boot option. In the boot screen, select the desired installation option. Press F4 then select *SLP*.

The installation program retrieves the location of the network installation source using OpenSLP and configures the network connection with DHCP. If the DHCP network configuration fails, you are prompted to enter the appropriate parameters manually. The installation then proceeds as described below with the exception of the network

configuration step needed prior to adding additional repositories. This step is not needed as the network is already configured and active at this point.

1.2.2 Installing from a Network Source without SLP

If your network setup does not support OpenSLP for the retrieval of network installation sources, boot the system from the media or with another boot option. In the boot screen, select the desired installation option. Press F4 then select the desired network protocol (NFS, HTTP, FTP, or SMB). Provide the server's address and the path to the installation media.

The installation program configures the network connection with DHCP. If the DHCP network configuration fails, you are prompted to enter the appropriate parameters manually. The installation retrieves the installation data from the source specified. The installation then proceeds as described below with the exception of the network configuration step needed prior to adding additional repositories. This step is not needed as the network is already configured and active at this point.

1.2.3 Installing with `instlux` from Windows

`instlux` is a Microsoft Windows* application that prepares your computer to directly boot into the openSUSE installation without having to adjust BIOS settings. To use instlux, insert the openSUSE media under Windows. The `openSUSE 10.3 Installer` setup automatically starts. Choose a language for the installation and follow the instructions on the screen. The language you choose here is also used for the openSUSE installation. instlux is only available on DVD media.

On the next reboot, the Microsoft Windows boot loader launches. Choose *openSUSE 10.3 installer* to start the openSUSE installation. In order to proceed with the installation, you will be prompted to insert the installation media. The installation proceeds as described below. When Microsoft Windows is booted again, `instlux` is automatically uninstalled.

1.3 The Installation Workflow

The openSUSE installation is split into three main parts: preparation, installation, configuration. During the preparation phase you configure some basic parameters such as language, time, and desktop type. In the installation phase you decide which software to install, where to install it and how to boot the installed system. Upon finishing the installation the machine reboots into the newly installed system and starts the configuration. In this stage you set up users and passwords, and configure network and Internet access as well as hardware components such as printers.

1.4 System Start-Up for Installation

You can install openSUSE from local installation sources, such as the openSUSE CDs or DVD, or from network source of an FTP, HTTP, NFS, or SMB server. Any of these approaches requires physical access to the system to install and user interaction during the installation. The installation procedure is basically the same regardless of the installation source. Any exceptions are sufficiently highlighted in the following workflow description.

1.5 The Boot Screen

The boot screen displays a number of options for the installation procedure. *Boot from Hard Disk* boots the installed system and is selected default, because the CD is often left in the drive. To install the system, select one of the installation options with the arrow keys. The relevant options are:

Installation
> The normal installation mode. All modern hardware functions are enabled. In case the installation fails, see F5 *Kernel* (page 9) for boot options that disable potentially problematic functions.

Repair Installed System
> Boots into the graphical repair system. More information on repairing an installed system is available in Section 13.6.3, "Recovering a Corrupted System" (page 216). This option is not available when installing from CD.

Rescue System

Starts a minimal Linux system without a graphical user interface. For more information, see Section "Using the Rescue System" (page 221).

Firmware Test

Starts a BIOS checker that validates ACPI and other parts of your BIOS. This option is not available with the CD-KDE and CD-GNOME media.

Memory Test

Tests your system RAM using repeated read and write cycles. Terminate the test by rebooting. For more information, see Section 13.2.5, "Fails to Boot" (page 196). This option is not available with the CD-KDE and CD-GNOME media.

Use the function keys indicated in the bar at the bottom of the screen to change the language, screen resolution, installation source or to add addition driver from your hardware vendor:

F1 *Help*

Get context-sensitive help for the active element of the boot screen. Use the arrow keys to navigate, Enter to follow a link, and Esc to leave the help screen.

F2 *Language*

Select the display language for the installation. The default language is English.

F3 *Video Mode*

Select various graphical display modes for the installation. Select *Text Mode* if the graphical installation causes problems.

F4 *Source*

Normally, the installation is performed from the inserted installation medium. Here, select other sources, like FTP or NFS servers. If the installation is carried out in a network with an SLP server, select one of the installation sources available on the server with this option. Find information about SLP in Chapter 21, *SLP Services in the Network* (↑Reference).

F5 *Kernel*

In case you encounter problems with the regular installation, this menu offers to disable a few potentially problematic functions. If your hardware does not support ACPI (advanced configuration and power interface) select *No ACPI* to install without ACPI support. *No local APIC* disables support for APIC (Advanced Programmable Interrupt Controllers) which may cause problems with some hardware.

If you are not sure, try the following options first: *Installation—ACPI Disabled* or *Installation—Safe Settings*. Experts can also use the command line (*Boot Options*) to enter or change kernel parameters.

F6 *Driver*

Press this key to tell the system that you have an optional disk with a driver update for openSUSE. With *File*, load drivers directly from CD before the installation starts. If you select *Yes*, you are prompted to insert the update disk at the appropriate point in the installation process. *Safe Settings* boots the system with the DMA mode (for CD-ROM drives) and power management functions disabled.

F7 *Arch*

If you install from an installation medium supporting 32bit and 64bit architectures and have an AMD or Intel processor with 64-bit support, select whether to install a 64-bit or 32-bit system. By default, a 64-bit system is installed on a computer with 64-bit support. To install a 32-bit system, press F7 then select *32bit*.

After starting the installation, openSUSE loads and configures a minimal Linux system to run the installation procedure. To view the boot messages and copyright notices during this process, press Esc. On completion of this process, the YaST installation program starts and displays the graphical installer.

TIP: Installation without a Mouse

If the installer does not detect your mouse correctly, use Tab for navigation, arrow keys to scroll, and Enter to confirm a selection.

1.6 Language

YaST and openSUSE in general can be configured to use different languages according to your needs. The language selected here is also used for the keyboard layout. In addition, YaST uses the language setting to guess a time zone for the system clock. These settings can be modified later along with the selection of secondary languages to install on your system. This dialog is not available when installing from CD-KDE and CD-GNOME—only English is available on these media.

You can change the language later during installation in the *Installation Summary*, described in . For information about language

settings in the installed system, see Chapter 6, *Changing Language and Country Settings with YaST* (page 77).

Figure 1.1   *Language Selection*
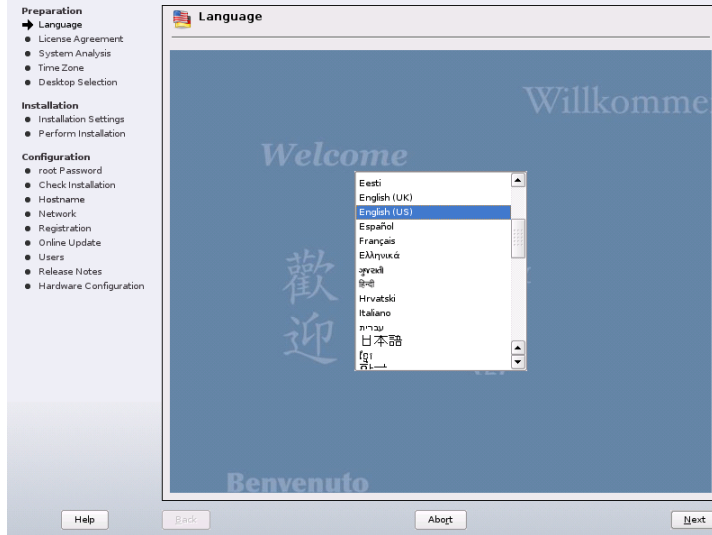
1.7 Media Check

The media check dialog appears only if you install from media created from downloaded ISOs. If you install from the original media kit, the dialog is skipped.

The media check examines the integrity of a medium. To start the media check, select the drive in that contains the installation medium and click *Start Check*. The check can take some time.

To test multiple media, wait until a result message appears in the dialog before changing the medium. If the last medium checked is not the one with which you started the installation, YaST prompts for the appropriate medium before continuing with the installation.

WARNING: Failure of Media Check

If the media check fails, your medium is damaged. Do not continue the installation because installation may fail or you may lose your data. Replace the broken medium and restart the installation process.

If the media check turns out positive, click *Next* to continue the installation.

Figure 1.2   *Media Check*
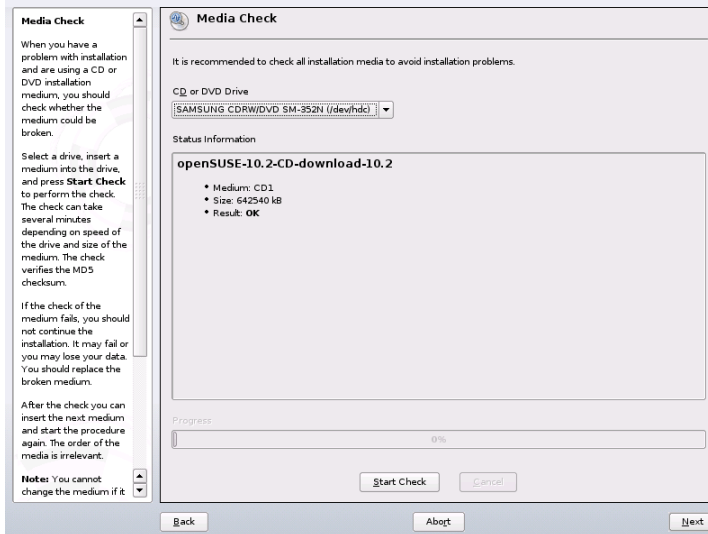
1.8 License Agreement

Read the license agreement that is displayed on screen thoroughly. If you agree to the terms, choose *Yes, I Agree to the License Agreement* and click *Next* to confirm your selection. If you do not agree to the license agreement, you cannot install openSUSE and the installation terminates.

1.9 Installation Mode

After a system analysis where YaST tries to find other installed systems or an already existing openSUSE system on your machine, YaST displays the installation modes available:

New installation
> Select this option to start a new installation from scratch.

Update
> Select this option to update to a newer version. For more information about system update, see Chapter 5, *Updating the System and System Changes* (↑Reference).

Other Options
> This option provides an opportunity to abort the installation and boot or repair an installed system instead. More information on repairing an installed system is available in Section 13.6.3, "Recovering a Corrupted System" (page 216).

1.9.1 Add-On Products and Repositories

You can also choose to install add-on products or add default repositories with additional software together with your openSUSE. Add-on products are official extensions for your openSUSE, for example non-open source software, extra languages, or proprietary third-party products. A repository maintains and distributes a collection of software packages. With the default repositories you configure access to software packages available on the Internet. Among others, the list of repositories includes the official ftp distribution of openSUSE. Repositories added here are activated immediately and are available during the installation.

It is also possible to configure additional repositories at any time in the installed systems (see Section 3.5, "Adding Software Repositories" (page 53). Using Add-On Products in the installed system is described in Section 3.6, "Installing Add-On Products" (page 54).

To include add-on products during the installation of openSUSE, select *Include Add-On Products from Separate Media*, click *Next* and specify the product source. Source types available are CD, DVD, a local directory or a URL. Depending on the source's content it may be necessary to accept additional license agreements. After the add-on

product has successfully been added, you can *Add* further product add-ons or *Delete* existing ones.

IMPORTANT

Choosing add-products available on the Internet is only possible if you either have successfully configured the network as described in Section 1.9.2, "Network Setup" (page 14) or are running a network installation.

To add default repositories select *Include Default Repositories*. A predefined list of repositories is downloaded from the openSUSE server. Click on a repository name to see a description; choose one or more repositories by ticking the check box(es). Specify a *Filter* on long repository lists to narrow down the number of entries. Depending on the repository's content it may be necessary to accept additional license agreements.

IMPORTANT

Adding default repositories is only possible if you either have successfully configured the network as described in Section 1.9.2, "Network Setup" (page 14) or are performing a network installation.

1.9.2 Network Setup

If you have chosen to configure add-on products or default repositories and you are not running a network installation, a network setup step is offered first. While a working network is a requirement if you want to add default repositories, it is only needed with add-on products if you want to add product sources available on the Internet.

Choose *Yes, Run the Network Setup* to start the network configuration. If more than one network card is found, you have to choose a card to configure from the list.

IMPORTANT: Wired Ethernet Cards Only

It is only possible to configure wired ethernet adapters at this stage. If your computer is equipped with other network devices (e.g. wireless network adapters), you have to configure the network at a later stage (see Section 1.14.3, "Network" (page 26) for more information).

If the network adapter is not already connected, a warning will open. Make sure the network cable is plugged in and choose *Yes. Use it*. In following dialog the actual network configuration is done. If your network is equipped with a DHCP server, choose *Automatic Address Setup (via DHCP)*. To manually set up the network choose *Static Address Setup* and specify *IP Address*, *Netmask*, *Default Gateway IP*, and the *DNS Server IP*.

Some networks require the use of a proxy server to access the Internet. Tick the check box *Use Proxy for Accessing the Internet* and enter the appropriate specifications. Click *Accept* to perform the network setup. The installation procedure will continue with the add-on products or repositories setup as described in Section 1.9.1, "Add-On Products and Repositories" (page 13).

1.10 Clock and Time Zone

In this dialog, select your region and time zone from the lists. During installation, both are preselected according to the selected installation language.

Figure 1.3 *Clock and Time Zone*
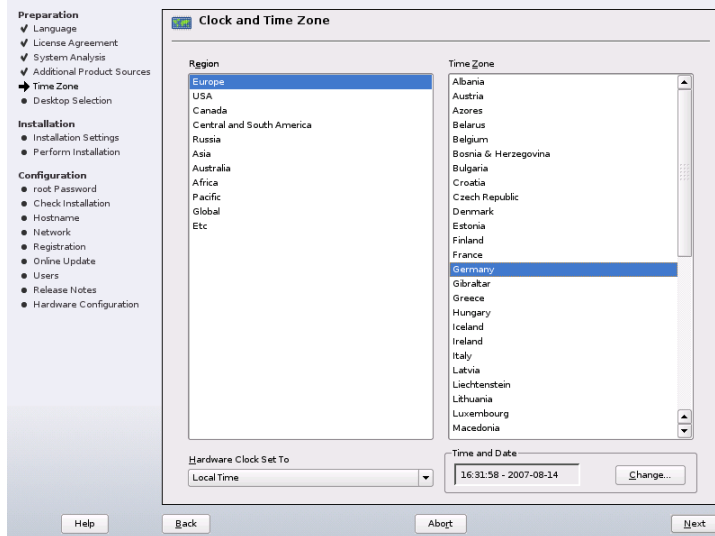
To set up the clock, choose between *Local Time* and *UTC* (GMT) for *Hardware Clock Set To*. If you run another operating system on your machine, such as Microsoft Windows*, it is likely your system uses *Local Time*. If you only run Linux on your machine, set the hardware clock to UTC and have the switch form standard time to daylight saving time performed automatically. Click *Change* to set the current date and time.

You can either enter time and date *Manually* or *Synchronize with an NTP Server*. See Chapter 24, *Time Synchronization with NTP* (↑Reference) for more information. When finished, click *Accept* to continue the installation.

1.11 Desktop Selection

In openSUSE, you can choose from various desktops. *KDE* and *GNOME* are powerful graphical desktop environments similar to Windows*. Find information about these in *KDE User Guide* and *GNOME User Guide*. This dialog is not available when installing from the CD-KDE or CD-GNOME.

If you want neither KDE nor GNOME, choose *Other* for more options. With *Minimal Graphical System*, install a graphical window manager that allows for running stand-alone X applications and console windows but does not provide the usual integrated desktop functionality. In *Text Mode*, only console terminals are available.

Figure 1.4 *Desktop Selection*

1.12 Installation Settings

After a thorough system analysis, YaST presents reasonable suggestions for all installation settings. Basic settings can be changed in the *Overview* tab, advanced options are available on the *Experts* tab. To modify the suggestions, either click *Change* and select the category to change or click on one of the headlines. After configuring any of the items presented in these dialogs, you are always returned to the summary window, which is updated accordingly.

Figure 1.5 *Installation Settings*
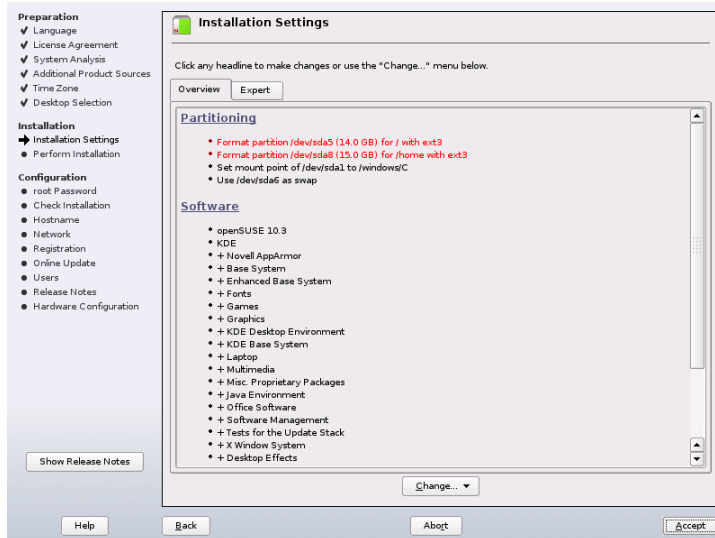
TIP: Resetting the Installation Summary to the Default

You can reset all changes to the defaults by clicking *Change > Reset to Defaults*. YaST then shows the original proposal again.

1.12.1 Overview

The options that sometimes need manual intervention in common installation situations are presented in the *Overview* tab. Modify Partitioning, Software selection and Locale settings here.

Partitioning

In most cases, YaST proposes a reasonable partitioning scheme that can be accepted without change. YaST can also be used to customize the partitioning, but only experienced users should change partitioning.

When you select the partitioning item in the suggestion window for the first time, the YaST partitioning dialog displays the proposed partition settings. To accept these settings, click *Accept Proposal*.

To make small changes in the proposal, select *Base Partition Setup on This Proposal* and adjust partitioning in the next dialog. For a completely different partitioning, select *Create Custom Partition Setup*. In the next dialog, choose a specific disk to partition or *Custom Partitioning* if you want to have access to all disks. For more information about custom partitioning, refer to Section "Using the YaST Partitioner" (Chapter 2, *Advanced Disk Setup*, ↑Reference). The YaST partitioner also provides a tool for LVM creation. To create an LVM proposal, select *Create LVM Based Proposal*. See Section "LVM Configuration" (Chapter 2, *Advanced Disk Setup*, ↑Reference) for more information on LVM.

Figure 1.6 *Partitioning*
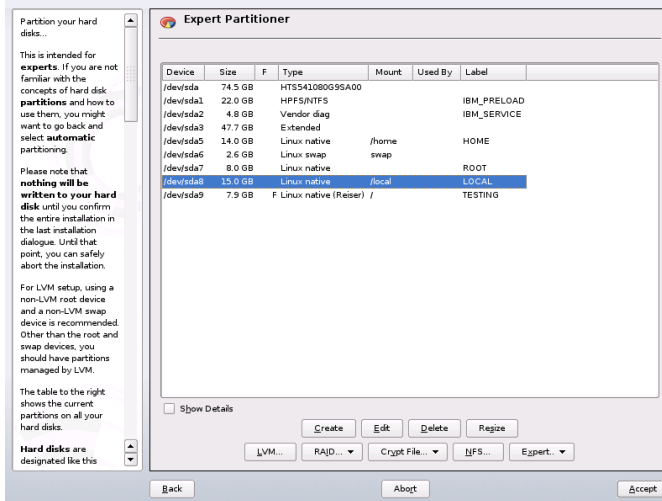
The partitioning scheme proposed should have sufficient disk space. When implementing your own partitioning scheme, consider the following recommendations concerning the requirements for different system types.

Table 1.2 *Space Requirements*

Installation Type	Minimum Space Required
GNOME Desktop	4 GB
KDE Desktop	4 GB
Minimal Graphical System	2 GB
Text Mode	1 GB

The requirements in Table 1.2, "Space Requirements" (page 19) cover only the disk space needed for the system itself. Personal data, such as documents, music files, and images, require additional space.

Resizing a Windows Partition

If a hard disk containing a Windows FAT or NTFS partition is selected as the installation target, YaST offers to delete or shrink this partition. This functionality is especially useful if the selected hard disk contains only one Windows partition that covers the entire hard disk (see Figure 1.7, "Possible Options for Windows Partitions" (page 20).)

If you select *Delete Windows Completely*, the Windows partition is marked for deletion and the space is used for the installation of openSUSE.

WARNING: Deleting Windows

If you delete Windows, all data will be lost beyond recovery as soon as the formatting starts.

Figure 1.7 *Possible Options for Windows Partitions*
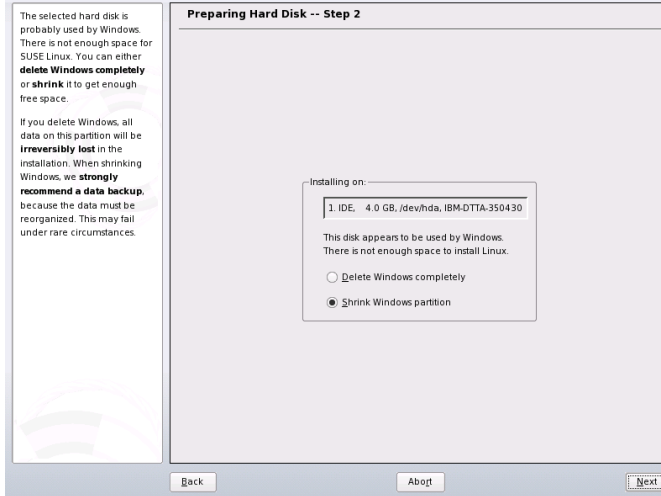
To *Shrink the Windows partition*, you need to interrupt the installation and boot Windows to prepare before shrinking it. For all Windows file systems, proceed as follows:

1. Deactivate a `Virtual Memory` file, if there is one.

2. Run `scandisk`.

3. Run `defrag`.

After these preparations, restart the openSUSE installation. When you turn to the Linux partitioning setup, select *Shrink Windows Partition*. After a quick check of the partition, YaST opens a dialog with a suggestion for resizing the Windows partition.

The first bar graph shows how much disk space is currently occupied by Windows and how much space is still available. The second bar graph shows how the space would be distributed after the resizing, according to YaST's current proposal. See Figure 1.8, "Resizing the Windows Partition" (page 21). To change the proposed settings use the slider or the input fields to change the partition sizing.

Figure 1.8 *Resizing the Windows Partition*
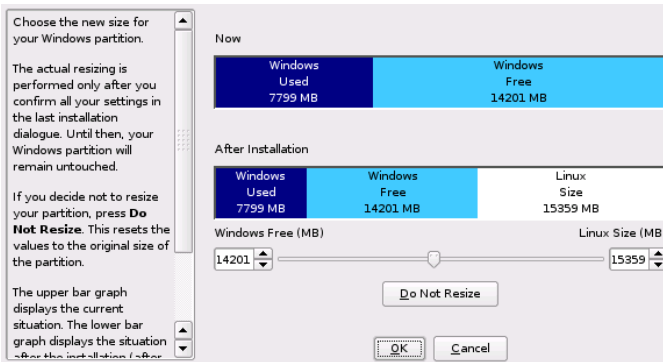
If you leave this dialog by selecting *Next*, the settings are stored and you are returned to the previous dialog. The actual resizing takes place later, before the hard disk is formatted.

IMPORTANT: Writing on NTFS Partitions

By default, the Windows versions NT, 2000, and XP use the NTFS file system. openSUSE includes read and write access the NTFS file system, but this feature has a few limitations. This means that you cannot read or write encrypted or compressed files. Furthermore the Windows file permissions are not honored at the moment. See http://en.opensuse.org/NTFS for more information.

Software

openSUSE contains a number of software packages for various application purposes. Click *Software* in the suggestion window to start the software selection and modify the installation scope according to your needs. Select your pattern from the list in the middle and see the description in the right part of the window. Each pattern contains a number of software packages needed for specific functions (e.g. Multimedia or Office software). For a more detailed selection based on software packages to install, select *Details* to switch to the YaST Software Manager. See Figure 1.9, "Installing and Removing Software with the YaST Software Manager" (page 22).

Figure 1.9   *Installing and Removing Software with the YaST Software Manager*
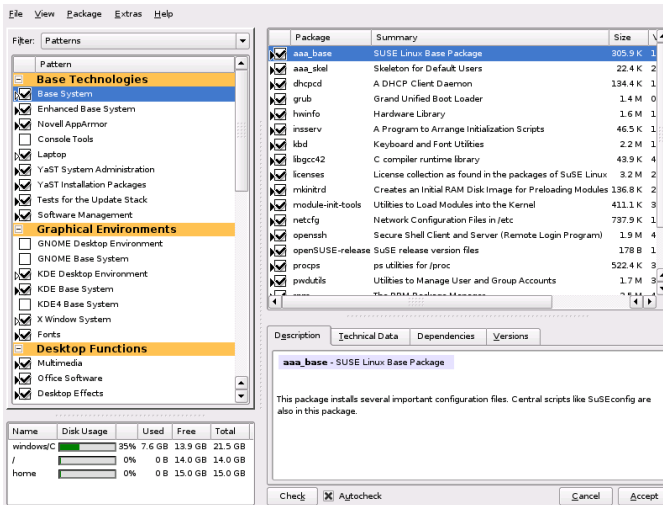
You can also install additional software packages or remove software packages from your system at any time later with the YaST Software Manager. For more information, refer to Chapter 3, *Installing or Removing Software* (page 49).

Locale Settings

Here you can change the system *Language* and *Keyboard Layout*. To change the system language or to configure support for secondary languages, select *Language*. Select the language from the list. The primary language is used as the system language. You can also adapt keyboard layout and time zone to the primary language if the current settings differ. *Details* lets you tune language settings for the user `root`, set `UTF-8` support, or further specify the language (e.g. select South African English).

Choose secondary languages to be able to switch to one of these languages at any time without having to install additional packages. For more information, see Chapter 6, *Changing Language and Country Settings with YaST* (page 77).

To change the keyboard layout, select *Keyboard Layout*. By default, the layout corresponds to the language chosen for installation. Select the keyboard layout from the list. Use the *Test* field at the bottom of the dialog to check if you can enter special characters of that layout correctly. Find more information about changing the keyboard layout in

(page 37). When finished, click *Accept* to return to the installation summary.

1.12.2 Expert

If you are an advanced user and want to configure booting, change the time zone, or default runlevel, select the *Expert* tab. It shows the following additional entries not part of the *Overview* tab:

System
> This dialog presents all the hardware information YaST could obtain about your computer. Select any item in the list and click *Details* to see detailed information about the selected item. Advanced users can also change the PCI ID setup and Kernel Settings by choosing *System Settings*.

Booting
> YaST proposes a boot configuration for your system. Normally, you can leave these settings unchanged. However, if you need a custom setup, modify the proposal for your system. For information, see Section "Configuring the Boot Loader with YaST" (Chapter 13, *The Boot Loader*, ↑Reference). The boot method should only be changed by experienced users.

Time Zone
> This is the same configuration as shown earlier in (page 15).

Default Runlevel
> openSUSE can boot to different runlevels. Normally there should be no need to change anything here, but if necessary set the default runlevel with this dialog. Refer to Section "Configuring System Services (Runlevel) with YaST" (Chapter 12, *Booting and Configuring a Linux System*, ↑Reference) for more information about runlevel configuration.

1.13 Performing the Installation

After making all installation settings, click *Accept* in the suggestion window to start the installation. In the dialog that opens, confirm with *Install*. Some software may require a license confirmation. If your software selection includes such software, license con-

firmation dialogs are displayed. Click *Accept* to install the software. When not agreeing to the license, click *I Disagree* and the software will not be installed.

The installation usually takes between 15 and 30 minutes, depending on the system performance and the selected software scope. During this procedure a slide show introduces the features of openSUSE. Choose *Details* to switch to the installation log or *Release Notes* to read important up-to-date information which was not available when the manuals were printed. As soon as all packages are installed, YaST boots into the new Linux system, where you can configure the hardware and set up system services.

NOTE: Release Notes

The release notes that can be viewed during this step are the ones printed on the installation CD. A newer version may be available on the Internet. When configuring network and Internet access as described in Section 1.14.3, "Network" (page 26), the latest version of the release notes will be displayed at the end of the installation.

1.14 Configuration of the Installed System

The system is now installed, but not yet configured for use. Users, hardware of services are not configured yet. If the configuration fails at one of the steps of this stage, it restarts and continues from the last successful step.

First, provide a password for the account of the system administrator (the `root` user). Configure your Internet access and network connection. With a working Internet connection, you can perform an update of the system as part of the installation. You can also connect to an authentication server for centralized user administration in a local network. Finally, configure the hardware devices connected to the machine.

1.14.1 root Password

`root` is the name of the superuser, the administrator of the system. Unlike regular users, who may or may not have permission to do certain things on the system, `root` has unlimited power to do anything: change the system configuration, install programs,

and set up new hardware. If users forget their passwords or have other problems with the system, `root` can help. The `root` account should only be used for system administration, maintenance, and repair. Logging in as `root` for daily work is rather risky: a single mistake could lead to irretrievable loss of system files.

For verification purposes, the password for `root` must be entered twice. Do not forget the `root` password. Once entered, this password cannot be retrieved.

When typing passwords, the characters are replaced by dots, so you do not see the string you are typing. If you are unsure whether you typed the correct string, use the *Test Keyboard Layout* field for testing purposes.

openSUSE can use the DES, MD5, or Blowfish encryption algorithms for passwords. The default encryption type is Blowfish. To change the encryption type, click *Expert Options > Encryption Type* and select the new type.

The `root` can be changed any time later in the installed system. To do so run YaST and start *Security and Users > User Management*.

WARNING: The root User

The user `root` has all the permissions needed to make changes to the system. To carry out such tasks, the `root` password is required. You cannot carry out any administrative tasks without this password.

1.14.2 Hostname and Domain Name

The hostname is the computer's name in the network. The domain name is the name of the network. A hostname and domain are proposed by default. If your system is part of a network, the hostname has to be unique in this network whereas the domain name has to be common to all hosts on the network.

In many networks, the system receives its name over DHCP. In this case it is not necessary to modify the hostname and domain name. Select *Change Hostname via DHCP* instead. To be able to access your system using this hostname, even when it is not connected to the network, select *Write Hostname to /etc/hosts*. If you often change networks without restarting the desktop environment (e.g. when switching between different WLANs), do not enable this option, because the desktop system may get confused when the hostname in `/etc/hosts` changes.

To change hostname settings at any time after installation, use YaST *Network Devices > Network Card*. For more information, see Section "Configuring the Network Card with YaST" (Chapter 20, *Basic Networking*, ↑Reference).

1.14.3 Network

If you are installing openSUSE on a laptop computer, *Interfaces controlled by Network-Manager* is enabled. NetworkManager is a tool that enables automatic connection with minimal user intervention. It is ideal for WLAN and mobile computing. If you want to use the traditional method without NetworkManager, click *Disable NetworkManager*. Find detailed information about NetworkManager in Chapter 10, *Managing Network Connections with NetworkManager* (page 137). If you are installing openSUSE on any other type of machine, the traditional method without NetworkManager is selected by default. This configuration step also lets you configure the network devices of your system and make security settings, for example, for a firewall or proxy.

The network can also be configured after the system installation has been completed. If you skip it now, your system is left offline unable to retrieve any available updates. To configure your network connection later, select *Skip Configuration* and click *Next*.

The following network settings can be configured in this step:

General Network Settings
> Enable or disable the use of NetworkManager as described above. Also change the IPv6 support here. By default the IPv6 support is enabled. To disable it, click *Disable IPv6*. For more information about IPv6, see Section "IPv6—The Next Generation Internet" (Chapter 20, *Basic Networking*, ↑Reference).

Firewall
> By default SuSEfirewall2 is enabled on all configured network interfaces. To globally disable the firewall for this computer, click on *disable*. If the firewall is enabled, you may *open* the SSH port in order to allow remote connections via secure shell. To open the detailed firewall configuration dialog, click on *Firewall*. See Section "Configuring the Firewall with YaST" (Chapter 35, *Masquerading and Firewalls*, ↑Reference) for detailed information.

Network Interfaces
> All network cards detected by YaST are listed here. If you have already set up a network connection during the installation (as described in Section 1.9.2, "Network

Setup" (page 14)) the card used for this connection is listed as *Configured*. A click on *Network Interfaces* opens the *Network Settings* dialog, where you can change existing configurations, set up networks cards not configured yet, or add and configure additional cards. See Section 4.2, "Internet Connection Via Network" (page 64) for checklists of configuration requirements for the various connection types and Section "Configuring the Network Card with YaST" (Chapter 20, *Basic Networking*, ↑Reference) for configuration details.

DSL Connections, *ISDN Adapters*, and *Modems*

If your computer is equipped with an internal DSL modem, an internal ADSL Fritz Card, an ISDN card or a modem, clicking on the respective headline opens the configuration dialog. Refer to Chapter 4, *Accessing the Internet* (page 61) for further information.

VNC Remote Administration

To enable remote administration of your machine via VNC, click *VNC Remote Administration*. *Allow Remote Administration* in the following dialog and adjust your firewall settings accordingly.

Proxy

If you have a proxy server controlling the Internet access in your network, configure the proxy URLs and authentication details in this dialog.

TIP: Resetting the Network Configuration to the Default Values

Reset the network settings to the original proposed values by clicking *Change > Reset to Defaults*. This discards any changes made.

Test Internet Connection

After having configured a network connection, you can test it. For this purpose, YaST establishes a connection to the openSUSE server and downloads the latest release notes. Read them at the end of the installation process. A successful test is also a prerequisite for registering and updating online.

If you have multiple network interfaces, verify that the the desired card is used to connect to the Internet. If not, click *Change Device*.

To start the test, select *Yes, Test Connection to the Internet* and click *Next*. In the next dialog, view the progress of the test and the results. Detailed information about the test

process is available via *View Logs*. If the test fails, click *Back* to return to the network configuration to correct your entries.

If you do not want to test the connection at this point, select *No, Skip This Test* then *Next*. This also skips downloading the release notes, configuring the customer center, and updating online. These steps can be performed any time after the system has been initially configured.

1.14.4 Registration

To get technical support and product updates, first register and activate your product. If you are offline or want to skip this step, select *Configure Later*. This also skips openSUSE online update.

In *Include for Convenience*, select whether to send unsolicited additional information when registering. Click on *Details* to obtain in-depth information about data privacy and the data collected.

IMPORTANT: Support for openSUSE

Free installation support is only available for customers of the openSUSE retail box. Make sure to specify your *Registration Code* in order to become entitled for support. Find more information about the free installation support at http://www.novell.com/support/products/opensuse/. Refer to Section 13.7, "Support for openSUSE" (page 226) for more information on all support options available for openSUSE.

Upon a successful registration, a repository containing official online updates is added to the repository catalog. This repository is used in the following *Online Update* step to update your system.

1.14.5 Online Update

If the *Registration* was successful, select whether to perform a YaST online update. If there are any patched packages available on the servers, download and install them now to fix known bugs or security issues. For detailed instructions see Section "YaST Online Update" (Chapter 3, *Online Update*, ↑Reference). Directives on how to perform an

online update in the installed system are available at Section 3.7, "Keeping the System Up-to-date" (page 55) or Chapter 3, *Online Update* (↑Reference).

IMPORTANT: Downloading Software Updates

The download of updates might take quite some time, depending on the bandwidth of the Internet connection and the size of the update files. In case the patch system itself is updated, the online update will restart and download more patches after the restart. If the kernel was updated, the system will reboot before completing the configuration.

1.14.6 Users

If network access was configured successfully during the previous steps of the installation, you can now choose from several user management options. If a network connection has not been configured, create local user accounts. For detailed information about user management, see Chapter 5, *Managing Users with YaST* (page 65).

Local (/etc/passwd)

Users are administered locally on the installed host. This is a suitable option for stand-alone workstations. User data is managed by the local file `/etc/passwd`. All users who are entered in this file can log in to the system even if no network is available.

If YaST found a former version of openSUSE or another system using `/etc/passwd`, it offers to import local users. To do so, check *Read User Data from a Previous Installation* and click *Choose*. In the next dialog, select the users to import and click *OK*.

After entering the first name and last name, specify a username (login). Click *Suggestion* for the system to automatically generate a username. Finally, enter a password for the user. Reenter it for confirmation (to ensure that you did not type something else by mistake). To provide effective security, a password should be between five and eight characters long. The maximum length for a password is 128 characters. However, if no special security modules are loaded, only the first eight characters are used to discern the password. Passwords are case-sensitive. Special characters like umlauts are not allowed. Other special characters (7-bit ASCII) and the digits 0 to 9 are allowed.

IMPORTANT: Username and Password

Remember both your username and the password because they are needed each time you log in to the system.

Two additional options are available for local users:

Receive System Messages via E-Mail
> Checking this box sends the user messages created by the system services. These are usually only sent to `root`, the system administrator. This option is useful for the most frequently used account, because it is highly recommended to log in as `root` only in special cases.
>
> The mails sent by system services are stored in the local mailbox `/var/spool/mail/`*`username`*, where *`username`* is the login name of the selected user. To read e-mails after installation, you can use any e-mail client, for example KMail or Evolution.

Automatic Login
> This option is only available if KDE is used as the default desktop. It automatically logs the current user into the system when it starts. This is mainly useful if the computer is operated by only one user.

WARNING: Automatic Login

With the automatic login enabled, the system boots straight into your desktop with no authentication at all. If you store sensitive data on your system, you should not enable this option if the computer can also be accessed by others.

Click *User Management* to create more than one user. Refer to Chapter 5, *Managing Users with YaST* (page 65) for more information about user management.

LDAP
> Users are administered centrally on an LDAP server for all systems in the network. More information is available in Section "Configuring an LDAP Client with YaST" (Chapter 26, *LDAP—A Directory Service*, ↑Reference).

NIS

Users are administered centrally on a NIS server for all systems in the network. See Section "Configuring NIS Clients" (Chapter 25, *Using NIS*, ↑Reference) for more information.

Windows Domain

SMB authentication is often used in mixed Linux and Windows networks. Detailed information is available in Section "Configuring a Linux Client for Active Directory" (Chapter 27, *Active Directory Support*, ↑Reference).

IMPORTANT

SMB authentication also requires to *Set up Kerberos Authentication*.

You can also add additional user accounts or change the user authentication method in the installed system. For detailed information about user management, see Chapter 5, *Managing Users with YaST* (page 65) .

Along with the selected user administration method, you can use Kerberos authentication. To use Kerberos authentication, select *Set Up Kerberos Authentication*. For more information on Kerberos, refer to Chapter 38, *Network Authentication—Kerberos* (↑Reference).

NOTE: Content of the Authentication Menu

If you have chosen a custom package selection for installation, not all mentioned authentication methods may be displayed, because the required packages are not installed.

1.14.7 Release Notes

After completing the user authentication setup, YaST displays the release notes. Reading them is recommended, because they contain important up-to-date information which was not available when the manuals were printed. If you successfully tested the Internet connection, read the most recent version of the release notes, as fetched from openSUSE's servers. Use *Miscellaneous > Release Notes* or start the SUSE Help Center to view the release notes after installation.

1.14.8 Hardware Configuration

At the end of the installation, YaST opens a dialog for the configuration of the graphics card and other hardware components connected to the system, such as printers or sound cards. Click the individual components to start the hardware configuration. For the most part, YaST detects and configures the devices automatically.

You can skip any peripheral devices and configure them later, as described in Chapter 2, *Setting Up Hardware Components with YaST* (page 35) . To skip the configuration, select *Skip Configuration* and click *Next*.

However, you should configure the graphics card right away. Although the display settings as configured by YaST should be generally acceptable, most users have very strong preferences as far as resolution, color depth, and other graphics features are concerned. To change these settings, select the respective item and set the values as desired.

TIP: Resetting Hardware Configuration to the Default Values

You can cancel any changes to the hardware configuration by clicking *Change > Reset to Defaults*. YaST then shows the original proposal again.

1.14.9 Completing the Installation

After a successful installation, YaST shows the *Installation Completed* dialog. In this dialog, select whether to clone your newly installed system for AutoYaST. To clone your system, select *Clone This System for AutoYaST*. The profile of the current system is stored in /root/autoyast.xml.

AutoYaST is a system for installing one or more openSUSE systems automatically without user intervention. AutoYaST installations are performed using a control file with installation and configuration data. Finish the installation of openSUSE with *Finish* in the final dialog.

1.15 Graphical Login

openSUSE is now fully installed and configured. Unless you enabled the automatic login function or customized the default runlevel, you should see the graphical login on your screen in which to enter a username and password to log in to the system. On single user systems with automatic login enabled, the desktop starts automatically.

For a short introduction to the KDE or GNOME desktop environments, refer to *KDE Quick Start* and *GNOME Quick Start*. Find detailed information about both desktop environments and about the applications to run on KDE or GNOME in *KDE User Guide* and *GNOME User Guide*.

Setting Up Hardware Components with YaST

2

YaST allows you to configure hardware items at installation time as well as in the installed system. Configure additional graphics cards and monitors, adjust mouse and keyboard settings and configure sound hardware. If you need printer or scanner support, use the appropriate YaST modules to configure these hardware items. Learn which hardware components are connected to your computer by using the YaST Hardware Information module.

2.1 Probing Your Hardware

Use YaST, if you want to know more about your hardware or if you need to find out details like vendor and model of a certain hardware to be able to properly configure it. Here and in the following sections we assume that you already started YaST (for example, by pressing Alt + F2 and entering yast2 followed by the root password, because YaST needs system administrator permissions to change the system files):

1 In YaST click *Hardware > Hardware Information*. Hardware probings starts immediately and it will take some time until you see the hardware information tree in a separate window.

2 In the hardware information tree recursively click on the plus icons to expand the information about a specific device.

3 Click *Close* to leave the hardware information overview.

2.2 Setting Up Graphics Card and Monitor

After the installation you can change the configuration of your graphics system (graphics card and monitor) according to your needs. Such a change can be necessary because of accessibility issues or hardware upgrades.

Change the resolution, if fonts are too small or if circles appear misshapen:

1 In YaST, click *Hardware > Graphics Card and Monitor*. SaX2 checks the system resources and displays the *Card and Monitor Properties* dialog.

2 Make sure the monitor is properly detected. If not, use *Change* to select the appropriate model from the list.

3 Now select an appropriate *Resolution*.
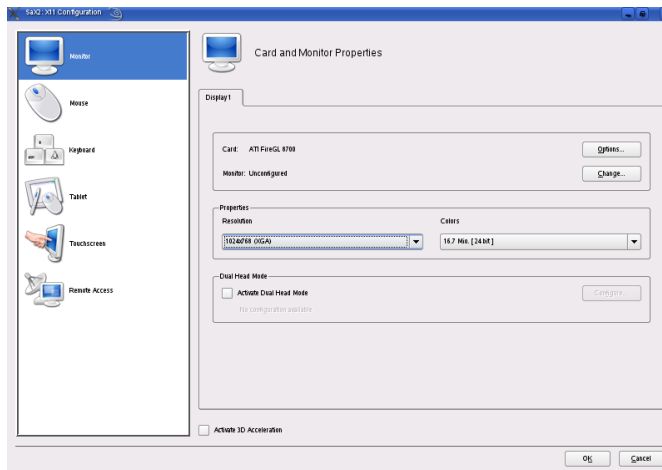
4 Test the new configuration before it is applied to the system. Click *OK > Test* and either *Cancel* or *Save* the configuration.

WARNING: Changing Monitor Frequencies

Although there are safety mechanisms, you should still be very careful when manually changing the allowed monitor frequencies. Incorrect values might destroy your monitor. Always refer to the monitor's manual before changing frequencies.

To activate a second monitor, proceed as follows:

1 In YaST, click *Hardware > Graphics Card and Monitor*. SaX2 checks the system resources and displays the *Card and Monitor Properties* dialog.

2 Make sure the monitor is properly detected. If not, use *Change* to select the appropriate model from the list.

3 Now enable *Activate Dual Head Mode* and click *Configure* for further tuning.

4 Make sure the second monitor is properly detected. If not, use *Change* to select the appropriate model from the list.

5 Decide whether you want to use the second monitor in *Cloned Multihead* or in *Xinerama Multihead* mode and click *Ok*.

6 Test the new configuration before it is applied to the system. Click *OK > Test* and either *Cancel* or *Save* the configuration.

2.3 Setting Up Keyboard and Mouse

Reconfigure input devices such as the keyboard or the mouse, or add more than one of these devices using the YaST Keyboard and Mouse modules.

2.3.1 Keyboard Layout

In case you want to replace a standard 104-key keyboard with a multimedia keyboard or a use different language or country layout, proceed as follows:

1 In YaST, click *Hardware > Keyboard Layout*. The SaX2 configuration tool reads the system resources and displays the *Keyboard Properties* dialog.
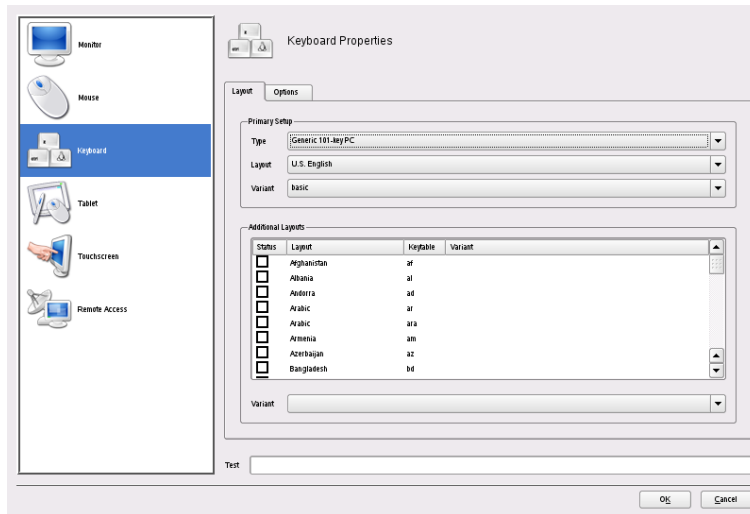
2 Select your keyboard model from the *Type* list.

3 In *Layout*, select the country layout.

4 Depending on the country layout, you can choose a certain *Variant*. The selections are applied immediately for testing.

5 As an option you can enable *Additional Layouts*. Check one or more boxes in the list. This feature is handy if you want to switch between different languages or scripts in the running system without the need for reconfiguration.

6 Before saving the configuration, use the *Test* field at the bottom of the dialog to check if special characters like umlauts and accented characters can be entered and displayed correctly.

7 Click *OK* to leave the configuration dialog and in the following message click *Save* to apply your changes.

2.3.2 Mouse Model

The mouse is usually detected automatically, but you can set up your mouse model manually if the automatic detection fails. Refer to the documentation of your mouse for a description of the model. If you want to modify your mouse configuration, proceed as follows:

1 In YaST, click *Hardware > Mouse Model*. The SaX2 configuration tool reads the system resources and displays the *Mouse Properties* dialog.

2 Click *Change* and select your mouse model from the list displayed.

3 Click *OK* to leave the configuration dialog and apply your changes with *Save*.

In the *Options* part of the dialog, set various options for operating your mouse.

Activate 3-Button Emulation
> If your mouse has only two buttons, a third button is emulated whenever you click both buttons simultaneously.

Activate Mouse Wheel
> Check this box to use a scroll wheel.

Invert X-Axis / Invert Y-Axis
> Check these options if you want to change the direction in which the mouse pointer moves.

Activate Left-Hand Button Mapping
> Check this box to switch the button mapping suitable for left-hand usage.

Emulate Wheel with Mouse Button
> If your mouse does not have a scroll wheel but you want to use a similar functionality, you can assign an additional button for this. Select the button to use. While pressing this button, any movement of the mouse is translated into scroll wheel commands. This feature is especially useful with trackballs.

NOTE: Restarting the X Server

Any changes you make here take effect only after you restart the X server. If you want to restart the X server now, log out from the graphical system and log in again.

2.4 Setting Up Sound Cards

Most sound cards are detected automatically and configured with reasonable values. In YaST, use *Hardware > Sound* if you want to add a problematic sound card that could not be configured automatically or change the default settings. It is also possible to set up additional sound cards or switch their sequence.

Figure 2.1   *Detecting Old Sound Chips*

No card was found.
Attempt to detect the presence some old chips?

Warning: The probe procedure can take some time and could make your system unstable.

Select the Drivers to Probe

☑ Yamaha OPL3SA2+ (opl3sa2)
☑ Cirrus Logic CS4235-9 (cs4236)
☑ Cirrus Logic CS4232 (cs4232)
☑ Generic CS4231 (cs4231)
☑ ESS ES18xx AudioDrive (es18xx)
☑ Generic ESS ES1688/ES688 AudioDrive (es1688)
☑ Sound Blaster 16 (sb16)
☑ Sound Blaster 1.0/2.0/Pro (sb8)

[Yes, Probe]   [Cancel]

TIP: Probing for Old Sound Chips

If you know a legacy sound board is installed in your computer, let YaST probe for old chips, if YaST cannot find a sound board. Within the pop-up click *Yes, probe*. See Figure 2.1, "Detecting Old Sound Chips" (page 40).

If YaST cannot detect your sound card automatically, proceed as follows:

Figure 2.2 *Sound Configuration*
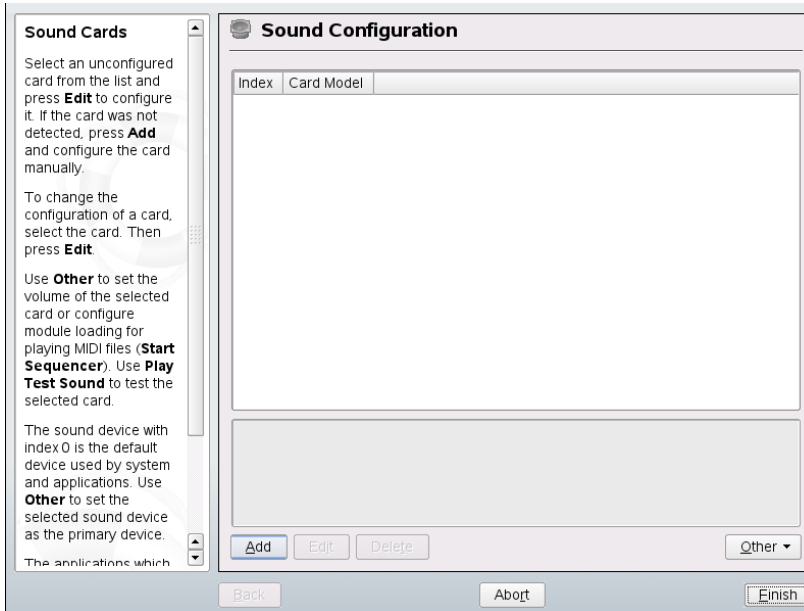
1 Click *Add* to open a dialog in which to select a sound card vendor and model. Refer to your sound card documentation for the information required. Find a reference list of sound cards supported by ALSA with their corresponding sound modules in /usr/share/doc/packages/alsa/cards.txt and at http://www.alsa-project.org/alsa-doc/.

Make your choice and click *Next*.

2 In the *Sound Card Configuration* dialog, choose the configuration level in the first setup screen:

Quick automatic setup
> You are not required to go through any of the further configuration steps and no sound test is performed. The sound card is configured automatically.

Normal setup
> Adjust the output volume and play a test sound.

Advanced setup with possibility to change options
> Customize all settings manually.

Enable *Configure joystick*, if you need to configure a joystick. Click *Next* to continue.

3 In *Sound Card Volume*, test your sound configuration and make adjustments to the volume. You should start at about ten percent to avoid damage to your hearing or the speakers. A test sound should be audible when you click *Test*. If you cannot hear anything, increase the volume. Press *Next > Finish* to complete the sound configuration.

If you want to change the configuration of a sound card, go to the *Sound Configuration* dialog, select a displayed *Card Model* and click *Edit*. Use *Delete* to remove a sound card altogether.

Click *Other* to customize one of the following options manually:

Volume
> Use this dialog is for setting the volume.

Start Sequencer
> For playback of MIDI files, check this option.

Set as Primary Card
> Click *Set as Primary Card* if you want to adjust the sequence of your sound cards. The sound device with index 0 is the default device and thus used by the system and the applications.

The volume and configuration of all sound cards installed are saved when you click *Finish*. The mixer settings are saved to the file `/etc/asound.conf` and the ALSA configuration data is appended to the end of the files `/etc/modprobe.d/sound` and `/etc/sysconfig/hardware`.

2.5 Setting Up a Printer

YaST can be used to configure a local printer that is directly connected to your machine (normally with USB or parallel port) or to set up printing over the network. It is also possible to add PPD (PostScript Printer Description) files for your printer with YaST. Further information about printing (concepts, technical details, and troubleshooting) is available in Chapter 7, *Printer Operation* (↑Reference).

2.5.1 Configuring Local Printers

If an unconfigured local printer is detected, YaST starts automatically to configure it. YaST can configure the printer automatically if the parallel or USB port can be set up automatically and the connected printer can be detected. The printer model must also be listed in the database used during the automatic hardware detection.

If the printer model is unknown or cannot be automatically detected, configure it manually. There are two possible reasons why a printer is not automatically detected:

- The printer does not identify itself correctly. This may apply to very old devices. Try to configure your printer as described in Section "Configuring Manually" (page 43).

- If the manual configuration does not work, communication between printer and computer is not possible. Check the cable and the plugs to make sure that the printer is properly connected. If this is the case, the problem may not be printer-related, but rather a USB or parallel port–related problem.

Configuring Manually

To manually configure the printer, select *Hardware > Printer* in the YaST control center. This opens the main *Printer Configuration* window, where the detected devices are listed in the upper part. The lower part lists any queues configured so far (refer to Section "The Workflow of the Printing System" (Chapter 7, *Printer Operation*, ↑Reference) for more information about print queues). If no printer was detected, both parts of the configuration window are empty. Use *Edit* to change the configuration of a listed printer or *Add* to set up a printer not automatically detected. Editing an existing configuration uses the same dialogs as in Adding a Local Printer Manually (page 44).

In *Printer Configuration*, you can also *Delete* an existing entry. Clicking *Other* opens a list with advanced options. Select *Restart Detection*, to manually start the automatic printer detection. If more than one printer is connected to the machine or more than one queue is configured for a printer, you can mark the active entry as the default. *CUPS Expert Settings* and *Change IPP Listen* are advanced configuration options— refer to Chapter 7, *Printer Operation* (↑Reference) for details.

Procedure 2.1   *Adding a Local Printer Manually*

TIP: YaST Print Test

To make sure that everything works correctly, the crucial configuration steps can be checked with the print test function of YaST. The test page also provides important information about the configuration tested. If the output is garbled, for example, with several pages almost empty, you can stop the printer by first removing all paper then stopping the test from YaST.

---

1 Start YaST and choose *Hardware > Printer* to open the *Printer Configuration* dialog.

2 Click *Add* to open the *Printer Type* window.

3 Choose *Directly Connected Printers*.

4 Select the port to which the printer is connected (usually USB or parallel port) and choose the device in the next configuration screen. It is recommended to *Test the Printer Connection* at this point. If problems occur, select the correct device or choose *Back* to return to the previous dialog.

5 In *Queue Name*, set up a print queue. Specifying a *Name for Printing* is mandatory. It is recommended to choose a recognizable name—with this name, you can later identify the printer in the printing dialogs of applications. Use *Printer Description* and *Printer Location* to further describe the printer. This is optional, but useful if you have more than one printer connected to the machine or if you set up a print server. *Do Local Filtering* should be checked—it is needed for local printers. To enable network access for this printer, check *Share Printer*.

6 In *Printer Model*, specify the printer by *Manufacturer* and *Model*. If your printer is not listed, you can try *UNKNOWN MANUFACTURER* from the manufacturer list and select an appropriate standard language (the set of commands controlling

the printer) from the model list (refer to your printer's documentation to find out which language your printer understands). If this does not work, refer to Section "Adding PPD Files with YaST" (page 46) for another possible solution.

7 The *Configuration* screen lists a summary of the printer setup. This dialog is also shown when editing an existing printer configuration from the start screen of this YaST module.

Figure 2.3 *Printer Configuration Summary*
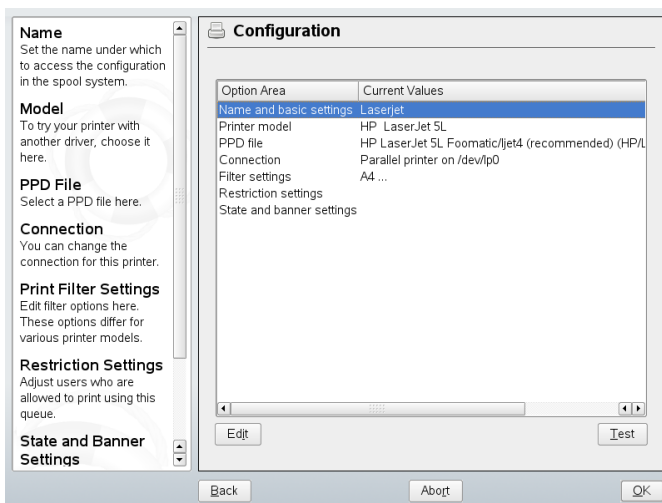
The summary contains the following entries, which you can also modify with *Edit*:

- *Name and basic settings*, *Printer Model*, and *Connection* let you change entries made while following this procedure.

- Refer to Section "Choosing an Alternative PPD File with YaST" (page 46) for details on *PPD file*.

- With *Filter settings* fine-tune the printer setup. Configure options like *Page Size*, *Color Mode*, and *Resolution* here.

- By default, every user is able to use the printer. With *Restriction settings*, list users that are forbidden to use the printer or list users that are allowed to use it.

- With *State and banner settings* you can, for example, deactivate the printer by changing its state and specify whether a page with a *Starting Banner* or *Ending Banner* is printed before or after each job (the default is not to print them).

Adding PPD Files with YaST

If your printer does not show up in the *Printer Model* dialog, a PPD (PostScript Printer Description) file for your model is missing (see Section "Installing the Software" (Chapter 7, *Printer Operation*, ↑Reference) for more information about PPD files). With *Add PPD File to Database*, add a PPD file from the local file system or an FTP or HTTP server.

Get PPD files directly from your printer vendor or from the driver CD of the printer (see Section "No Suitable PPD File Available for a PostScript Printer" (Chapter 7, *Printer Operation*, ↑Reference) for details). An alternative source for PPD files is http://www.linuxprinting.org/, the "Linux Printing Database". When downloading PPD files from linuxprinting.org, keep in mind that it always shows the latest Linux support status, which is not necessarily met by openSUSE.

Choosing an Alternative PPD File with YaST

For many printer models, several PPD files are available. When configuring the printer, YaST defaults to the one marked recommended as a general rule. To get a list of PPD files available for a printer, select *PPD file* in *Configuration* then click *Edit*. See Figure 2.3, "Printer Configuration Summary" (page 45).

Normally it should not be necessary to change the PPD file—the PPD file chosen by YaST should produce the best results. However, if you want a color printer to print only in black and white, for example, it is most convenient to use a PPD file that does not support color printing. If you experience performance problems with a PostScript printer when printing graphics, it may help to switch from a PostScript PPD file to a PCL PPD file (provided your printer understands PCL).

2.5.2 Configuring Network Printers

Network printers are not detected automatically. They must be configured manually using the YaST printer module. Depending on your network setup, you can print to a print server (CUPS, LPD, SMB, or IPX) or directly to a network printer (preferably via TCP). Ask your network administrator for details on configuring a network printer in your environment.

Procedure 2.2   *Configuring a Network Printer with YaST*

1 Start YaST and choose *Hardware > Printer* to open the *Printer Configuration* dialog.

2 Click *Add* to open the *Printer Type* window.

3 Choose *Network Printers* to open a dialog in which to specify further details that should be provided by your network administrator.

See Section "Network Printers" (Chapter 7, *Printer Operation*, ↑Reference) for detailed technical information.

2.6 Setting Up a Scanner

You can configure a scanner at any time using YaST. The `sane-backends` package contains hardware drivers and other essentials needed to use a scanner.

1 Connect your scanner to your computer and turn on the scanner.

2 Start YaST and select *Hardware > Scanner*. YaST will check if the `sane-backends` package is available and will try to detect your scanner model automatically.

3 Depending on the results, proceed as follows:

- If you scanner is detected properly, select the entry and click *Edit*.

- If your scanner cannot be automatically detected, try *Other > Restart Detection* first. If this does not work, click *Add* to open the manual configuration

dialog and select the appropriate model and driver. Refer to the help text on the left for detailed information.

4 Click *Next*.

5 Test the scanner by clicking *Other > Test*.

6 Click *Finish* to close this module.

For details and background information about scanner configuration have a look at our support database article at `http://opensuse.org/SDB:Configuring _Scanners_from_SUSE_LINUX_9.2`. If you have problems configuring your scanner model, find the support contact data in Section 13.7, "Support for openSUSE" (page 226).

Installing or Removing Software

3

Change the software collection of your system using YaST. In YaST's software management tool search for software components you want to add or remove. YaST resolves all the dependencies for you. Add additional software repositories to your setup to install packages not shipped with the installation media and let YaST manage them. Keep your system up-to-date by managing software updates with openSUSE Updater.

3.1 Installing Software

Software is available via RPM packages. Each package contains the program itself, the configuration files, and additional documentation. If you want to add more software to the system, proceed as follows:

1 Click *Software > Software Management* to start the YaST package manager.

2 In the search field enter the name of the software you want to install (e.g. `jhead`, a tool for manipulating JPEG meta data) and press Enter.

3 The package is listed in the right frame. Select it for installation. Once done, you can search for more packages and select them for installation in one go.

4 Click *Accept*.

5 When all selected packages are installed, YaST asks you whether you want to install or remove additional packages. Press *No* to close YaST.

By specifying various search criteria, you can restrict the search to display a few or even only one package. You can also define special search patterns using wild cards and regular expressions in *Search Mode*.

If you do not know the name of the software you are interested in, you can browse through the software catalog in various ways. For example, you can filter by patterns, package groups, languages, or repositories. Filter by patterns, if you are looking for software for a specific task:

1 From the filter list in the upper left corner, select *Patterns*. Now you see various pattern sets listed in the area below.
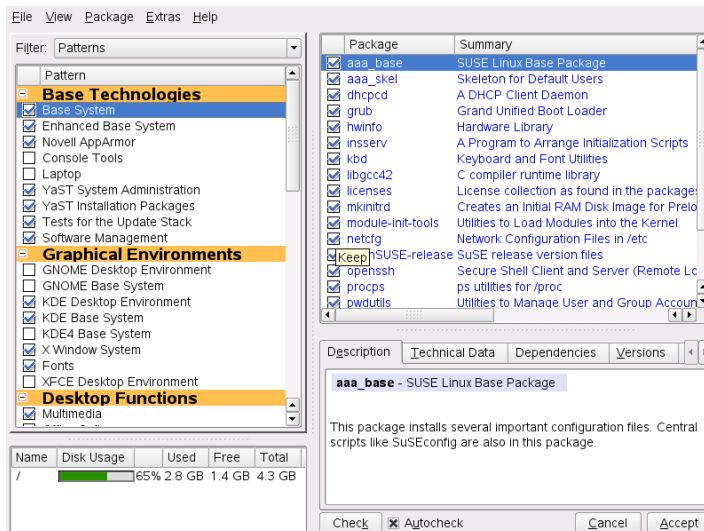
2 From the patterns select one or more patterns you are interested in. If you click on the name of a pattern, for example on *Base Development*, you see the packages it contains, in the right frame. If you activate it, the status markers at the beginning of the line will change: all packages get marked either with the status *Keep* or

Install. The meaning of all the symbols and of font color changes is explained in *Help > Symbols*.

3 Click *Accept*.

Alternatively, filter by package groups. The package groups feature offers a more detailed view of the software grouped by categories. Often packages depend on other packages; if you select a package, you might be requested to install additional packages to resolve possible package dependencies.

Filtering by languages is similar to filtering by package groups. Using the languages view enables you to select packages like translated program messages, documentation, or special fonts which are needed to support a specific language.

3.2 Checking Software Dependencies

The software of one package might only work properly if the required package is also installed. If packages with identical or similar functionality use the same system resource, they should not be installed at the same time, because this would cause a package conflict.

When the package manager starts, it examines the system and displays the installed packages. When you select to install and remove packages, the package manager automatically checks the dependencies and selects any other required packages (resolution of dependencies). If you select or deselect conflicting packages, the package manager indicates this and suggests possible solutions to this problem (resolution of conflicts).

Check Dependencies and *Autocheck* are located under the information window. If you click *Check Dependencies*, the package manager checks if the current package selection results in any unresolved package dependencies or conflicts. In the event of unresolved dependencies, the required additional packages are selected automatically. For package conflicts, the package manager opens a dialog that shows the conflict and offers various options for solving the problem.

If you activate *Autocheck*, any change of a package status triggers an automatic check. This is a useful feature, because the consistency of the package selection is monitored permanently. However, this process consumes resources and can slow down the package manager. For this reason, *Autocheck* is not activated by default. In either case, a consistency check is performed when you confirm your selection with *Accept*.

For example, `sendmail` and `postfix` may not be installed concurrently. Figure 3.1, "Conflict Management of the Package Manager" (page 52) shows the conflict message prompting you to take a decision. `postfix` is already installed. Accordingly, you can refrain from installing `sendmail`, remove `postfix`, or take the risk and ignore the conflict.

WARNING: Handling Package Conflicts

Unless you are very experienced, follow the suggestions of YaST when handling package conflicts, because otherwise the stability and functionality of your system could be endangered by the existing conflict.

Figure 3.1   *Conflict Management of the Package Manager*
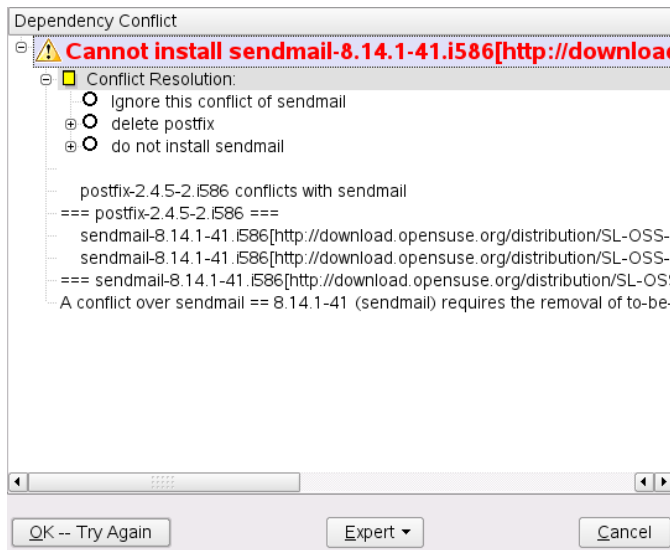
3.3 Packages and Software Repositories

If you want to search for packages originating from one particular software repository, use the *Repositories* filter. In the default configuration, this filter shows a list of all packages from the selected installation source. To restrict the list, use a secondary filter.

To view a list of the all installed packages from the selected repository, select the filter *Repositories* then select *Installation Summary* from *Secondary Filter* list and deactivate all check boxes except *Keep*.

3.4 Removing Software

If you want to remove software from the system, proceed as follows:

1 Make use of a search strategy explained in Section 3.1, "Installing Software" (page 49).

2 Depending on the search strategy, you can either select a complete set or single packages one by one. For patterns, both ways are possible.

3 Click *Accept* and either watch the de-installation progress or adjust your selection, if YaST complains about dependency issues.

3.5 Adding Software Repositories

Add additional software repositories to your system to install third-party software.

WARNING: Trusting External Software Sources

Before adding external software repositories to your list of repositories, make sure this repository can be trusted. openSUSE is not responsible for any potential problems arising from software installed from third-party software repositories.

To add default product repositories, proceed as follows:

1 Click *Software* > *Additional Product Repositories* to display the list of default external repositories.

2 In the list of repositories activate the items you are interested in.

3 Click *Finish*. It can take some time until YaST has downloaded and parsed the metadata of the repository. Once done you can install software from this repository as described in Section 3.1, "Installing Software" (page 49).

If you want to add a repository of the openSUSE® Build Service, such as a version of GPhoto (`http://download.opensuse.org/repositories/GPhoto/`), use the *Software Repositories* configuration dialog of YaST:

1 Click *Software > Software Repositories* to start the YaST repository management.

2 Click *Add* and begin adding the data provided by the software vendor. First determine the protocol—in this case it is `http`. Then click *Next*.

3 In the *Server and Directory* dialog enter `download.opensuse.org` as the server name and `repositories/GPhoto/`*`VERSION`*`/` as the directory on the server. Determine the *`VERSION`* string by browsing the repository.

4 Click *Ok*. The new software repository is now listed in the *Configured Software Repositories* as one of the media containing a software from where you can install additional packages.

5 Click *Finish*. Now you can install software from this repository as described in .

3.6 Installing Add-On Products

Add-on products are system extensions. You can install a third party add-on product or a special system extension of openSUSE, for example, a CD with support for additional languages or a CD with binary drivers.

3.6.1 Add-Ons

To install a new add-on, proceed as follows:

1 Click *Software > Add-On Product*. You can select various types of product media, like CD, FTP or local directory. You can also use ISO images instead of CD media.

2 To add an add-on as ISO file media, click *Local Directory > Next* and select *ISO Images*.

3 After successfully adding the add-on media, the package manager window appears. If the add-on provides a new pattern, see the new item in the *Patterns* filter. To view the list of all packages from the selected software repository, select the filter *Software Repositories* and choose the repository to view. To view packages from a selected add-on by package groups, select the secondary filter *Package Groups*.

3.6.2 Binary Drivers

Some hardware needs binary-only drivers to function properly. If you have such hardware, refer to the release notes for more information about availability of binary drivers for your system. To read the release notes, open YaST and select *Miscellaneous > Release Notes*.

3.7 Keeping the System Up-to-date

openSUSE offers a continuous stream of software security patches for your product. The openSUSE Updater applet informs you about the availability of patches and lets you easily install them with just a few clicks. The openSUSE community also provides updates to newer versions of software packages. openSUSE Updater keeps a list of all programs installed on your system and informs you whenever newer versions are available.

NOTE: Patches vs. New Versions

The patches offered by openSUSE either fix security holes or serious errors in the software. A patch normally does not upgrade to a newer version and does not offer additional functionality. A new program version offered by the community may offer fixes, too, but primarily adds new functionality.

The openSUSE Updater applet resides in the system tray (KDE) of your panel or in the notification area (GNOME) as an icon depicting the head of the openSUSE mascot (Geeko), which changes depending on the availability and relevance of patches and the status of openSUSE Updater. Whenever the icon changes, a tool tip displaying the current status is shown, too.

Green Geeko Head
    No patches or new versions available.

Blinking Green Geeko Head (KDE) / Gray Geeko (GNOME)
    openSUSE Updater is busy (for example checking for updates, installing software).

Red Triangle with Exclamation Mark
    Security patches available.

Orange Star with Arrow
    Recommended/Optional patches and/or new versions are available.

Yellow Triangle with Exclamation Mark
    An error occurred.

3.7.1 Installing Patches

The current patches for openSUSE are available from an update software repository. If you have registered your product during the installation, an update catalog is already configured. If you have not registered openSUSE, you can do so by running *Software > Online Update Configuration* in YaST.

openSUSE provides patches sorted by relevance level. Security patches fix severe security hazards and should definitely be installed. Recommended patches fix issues that could compromise your computer, whereas Optional patches fix non-security relevant issues or provide enhancements.

Whenever the openSUSE Updater icon shows the availability of patches, left-click to open the software installation window. It lists the number of Security and Recommended patches available. While the security patches are installed by default, you can choose whether to install the recommended ones as well. Some patches, such as new kernel versions, require to restart your computer. Check *Don't install updates that require a restart* to skip these updates for now. Start updating your system by clicking *Install*.

Figure 3.2 *openSUSE Updater: Simple Update View*
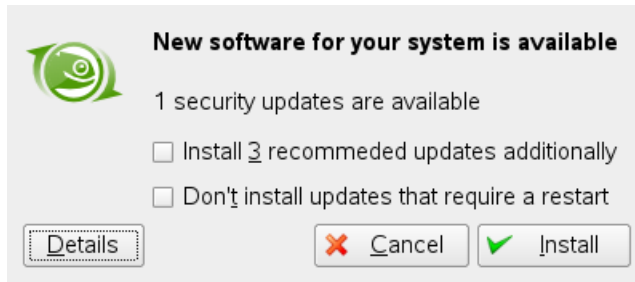
A click on *Details* opens the `Available Updates` window which shows a detailed list of all patches and allows you to alter the selection of packages that will be installed. Apart from the patch name the *Type* (Security, Recommended or Optional), a short *Summary* and the patch version number is shown. Patches are sorted alphabetically by default—change this by clicking on a column headline (*Name*, *Summary*, *Type* or *New Version*). Click *Install* to proceed.

Figure 3.3 *openSUSE Updater: Detailed Update View*
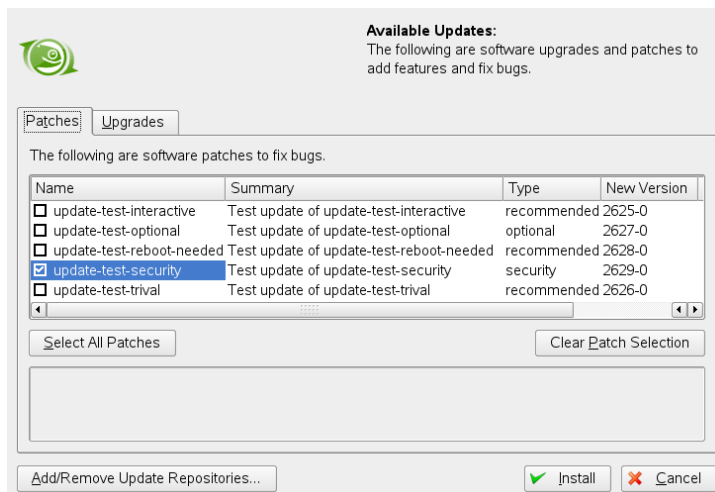
You will be prompted for the `root` password after having proceeded with *Install*. openSUSE Updater performs the installation of the patches. See the system tray (KDE) or the notification area (GNOME) for status messages and a progress meter.

The YaST Online Update offers advanced features to customize the patch installation. Please refer to Section "YaST Online Update" (Chapter 3, *Online Update*, ↑Reference) for more information.

3.7.2 Installing New Software Versions

New software versions are available from software repositories provided by the open-SUSE community. By default no such repositories are preconfigured. To add a repository, right-click on the openSUSE Updater icon and choose *Add/Remove Update Sources*. Before the YaST module *Software Repositories* starts, you will be prompted for the root password. Please refer to Section 3.5, "Adding Software Repositories" (page 53) for more information. A list of popular community repositories is available at http://en.opensuse.org/Additional_YaST_Package_Repositories.

WARNING: Trusting External Software Sources

Before adding external software repositories to your list of repositories make sure this repository can be trusted. openSUSE is not responsible for any potential problems arising from software installed from third party software repositories.

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openSUSE Updater does not monitor repositories for new software versions by default. To enable this feature, open the configuration window as described in Section 3.7.3, "Configuring openSUSE Updater" (page 58) and tick the check box of *Show available updates when backend provides them*. When the openSUSE Updater icon indicates the availability of updates, click on the icon to launch the software installation window. Click on *Details* and then on the *Upgrade* tab to open the list with new software versions. Either select single packages by checking the box in front of an entry, or click *Select All Packages*. Click *Install* to start the installation of the selected software packages. You will be prompted for the root password. See the system tray (KDE) or the notification area (GNOME) for status messages and a progress meter.

3.7.3 Configuring openSUSE Updater

By default openSUSE Updater is started on login, checks for updates every 24 hours, shows no notifications and only monitors the availability of patches. To change this behavior, right-click the applet icon and choose *Configure Applet*.

Figure 3.4 *openSUSE Updater: Configuration*
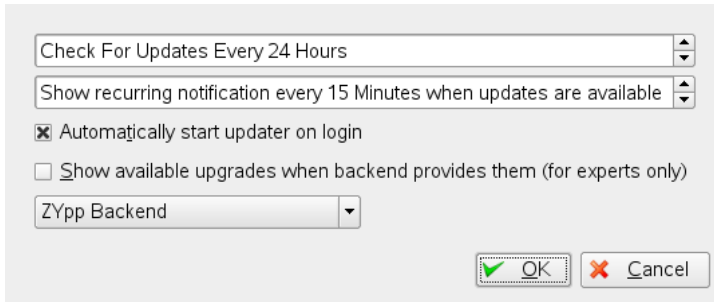
The configuration dialog also offers to change the back-end. Currently, only *ZYpp backend* is available. Support for other back-ends is planned for future versions.

Accessing the Internet

<div style="text-align: right; font-size: 3em; font-weight: bold;">4</div>

If you have chosen not to configure Internet access during the installation, you can perform this task at any time using YaST. How to configure your computer to access the Internet depends on your environment. If the computer you are installing is part of a network which already is connected to the Internet, the only thing to do is to link your machine into the network. If you are installing a machine that is directly connected to the Internet, the hardware and the access to the Internet Service Provider (ISP) need to be set up.

Please refer to the checklists below to make sure you have all the data ready to hand when starting to configure the Internet access.

4.1 Direct Internet Connection

When your computer is directly connected to the Internet, you first need to configure the hardware that is used for this task. This can either be an internal device (such as an ISDN card) or an external device (for example a modem). In most cases it is detected automatically.

In a second step you need to enter the data of your ISP, such as login and password, for example.

4.1.1 Checklist DSL

There are different types of DSL devices available that use different point-to-point protocol (PPP) methods:

- a regular ethernet card connected to the external DSL modem uses PPP over Ethernet (PPPoE). In Austria the Point-to-Point Tunneling Protocol (PPTP) is used. With PPTP the external modem also has a static IP address.

- an internal DSL modem uses PPP over ATM (PPPoATM)

- an internal ADSL Fritz Card uses CAPI for ADSL

The DSL configuration module already contains the data for major ISPs in some countries. If your ISP is not listed, you will need to know how name resolving (DNS) and IP allocation is handled (in most cases this data is received automatically when connecting). Regardless whether you chose an ISP from the list or added a custom provider, you need to enter at least your login and password.

For configuration details, refer to Section "DSL" (Chapter 20, *Basic Networking*, ↑Reference).

4.1.2 Checklist ISDN

In case your internal ISDN card is not detected automatically you will need to know the vendor and the name of the device.

NOTE: ISDN Modem or Terminal Adapter

If you are using an external ISDN modem or terminal adapter, refer to Section 4.1.3, "Checklist Modem" (page 63) instead.

In order to configure the ISDN device you will need the following data:

- ISDN Protocol (depends on your country)

- Area code and phone number.

- Interface type (SyncPPP or RawIP). If unsure, select SyncPPP, because RawIP is only used in connection with certain telephone systems.

- In case you got a static IP-address from your provider: local and remote IP-addresses for the dial-in server and the gateway.

- The ISDN configuration module already contains the data for major ISPs in some countries. If your ISP is not listed, you will need to know how name resolving (DNS) and IP allocation is handled (in most cases this data is received automatically when connecting). Regardless whether you chose an ISP from the list or added a custom provider, you need to enter at least your login and password.

For configuration details, refer to Section "ISDN" (Chapter 20, *Basic Networking*, ↑Reference).

4.1.3 Checklist Modem

In case your modem is not detected automatically, you need to know whether it is connected to a serial port or to an USB port. Please not that not all USB modems and internal modems are supported by openSUSE®.

The modem configuration module already contains the data for major ISPs in some countries. If your ISP is not listed, you will need to know its dial-in number and how name resolving (DNS) and IP allocation is handled (in most cases this data is received automatically when connecting). Regardless whether you chose an ISP from the list or added a custom provider, you need to enter at least your login and password.

For configuration details, refer to Section "Modem" (Chapter 20, *Basic Networking*, ↑Reference).

4.1.4 Checklist Cable Modem

Accessing the Internet through the TV cable requires a cable modem. Such a modem is connected to the computer via ethernet cable. Therefore it is only necessary to configure your network card accordingly. For details, refer to Section "Cable Modem" (Chapter 20, *Basic Networking*, ↑Reference).

4.2 Internet Connection Via Network

If your machine is part of a network which is already connected to the Internet, it is very easy to gain Internet access—just connect your machine to the existing network and you are done. This not only applies to large company networks, but to small home networks as well. Even if the machine you are installing is only connected to a router (e.g. a DSL router) it is already part of a network.

NOTE: Routing and Name Services

In the following it is assumed that the network is connected to the Internet and provides routing and name services. In case these services are provided by a router, make sure the router is configured correctly before setting up the client.

4.2.1 Checklist Network

If your network provides DHCP (Dynamic Host Configuration Protocol) check the appropriate check box when setting up the network card and you are done—all parameters needed will be provided by the DHCP server.

In case DHCP is not available, ask your network administrator for the following details:

- Hostname

- Name server

- Gateway

For configuration details, refer to Section "Configuring the Network Card with YaST" (Chapter 20, *Basic Networking*, ↑Reference).

Managing Users with YaST

5

During installation, you have chosen a method for user authentication , either local via `/etc/passwd` or (if a network connection is established), via NIS, LDAP, Kerberos or Samba (see Section 1.14.6, "Users" (page 29)). You can create or modify user accounts and can change the authentication method with YaST at any time.

Every user is assigned a user ID (UID) which identifies him in the system. Apart from the users which can log in to your machine, there are also a number of *system users* for internal use only. Each user is assigned to one or more groups. Similar to *system users*, there are also *system groups* for internal use. For information about the Linux user and group concept, refer to Section 7.1, "User Concept" (page 85).

To administrate users or groups, start YaST and click *Security and Users > User Management* or click *Security and Users > Group Management*. The *User and Group Administration* dialog opens, showing a list of users or groups in the system.

The dialog provides similar functionality for user and group management. You can easily switch between the user and group administration view by choosing the appropriate option at the top of the dialog.

Filter options allow you to define the set of users or groups you want to modify: Click *Set Filter* to view and edit users according to certain categories, such as *Local Users* or *LDAP Users*, for instance (if you are part of a network which uses LDAP). With *Set Filter > Customize Filter* you can also set up and use a custom filter.

Figure 5.1   *YaST User and Group Management*
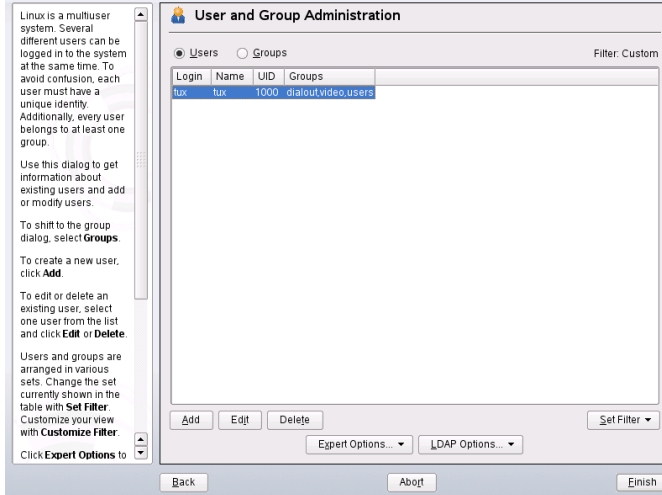
5.1 Managing User Accounts

YaST offers to create, modify, delete or temporarily disable user accounts. Do not modify user accounts unless you are an experienced user and know about the implications.

WARNING: Changing User IDs of Existing Users

After a user ID change, the user will no longer own the files he formerly created in the file system other since file ownership is bound to the user ID, not to the user name. Only the files in the user's home directory are automatically adjusted to reflect this change.

In the following, learn how to set up default user accounts. For some special options, such as auto login, login without password, setting up encrypted home directories or managing quotas for users and groups, refer to Section 5.2, "Special Options" (page 68).

Procedure 5.1   *Adding or Modifying User Accounts*

1 Open the YaST *User and Group Management* dialog in the *Users* view.

2 With *Set Filter* define the set of users you want to manage. The dialog shows a list of users in the system and the groups the users belong to.

3 To modify options for an existing user, select an entry and click *Edit*.

4 Click *Add* to create a new user account.

5 Enter the appropriate user data on the first tab, such as *Username* (which is used for login) and *Password*. This data is sufficient to create a new user. If you click *Accept* now, the system will automatically assign a user ID and set all other values according to the default.

6 If you want to adjust further details such as the user ID or the path to the user's home directory, do so on the *Details* tab.

If you need to relocate the home directory of an existing user, enter the path to the new home directory there and move the contents of the current home directory with *Move to New Location*. Otherwise a new home directory is created without any of the existing data.

7 To force users to regularly change their password or set other password options, switch to *Password Settings* and adjust the options.

8 If all options are set according to your wishes, click *Accept*.

9 Click *Expert Options* > *Write Changes Now* to save all changes without exiting the administration dialog. Or click *Finish* to close the administration dialog and to save the changes. A newly added user can now log in to the system using the login name and password you created.

TIP: Matching User IDs

For a new (local) user on a laptop which should also integrate in a network environment where this user already has a user ID, it is useful to match the (local) user ID to the ID in the network. This ensures that the file ownership of the files the user creates "offline" is the same as if he created them directly on the network.

Procedure 5.2 *Disabling or Deleting User Accounts*

1 To temporarily disable a user account without deleting it, select the user from the list and click *Edit*. Activate *Disable User Login*. The user cannot log in to your machine until you enable the account again.

2 To delete a user account, select the user from the list and click *Delete*. Choose if you also want to delete the user's home directory or if you want to retain the data.

Procedure 5.3 *Assigning Users to Groups*

Local users are assigned to several groups according to the default settings which you can access from the *User and Group Administration* dialog by clicking *Expert Options > Defaults for New Users*. To adjust the group assignment for a user, proceed as follows:

1 Open the *User and Group Administration* dialog in YaST. It shows a list of users and of the groups the users belong to.

2 Click *Edit* and switch to the *Details* tab.

3 To change the primary group the user belongs to, click *Default Group* and select the group from the list.

4 To assign the user to additional secondary groups, activate the corresponding check boxes on the right.

5 Click *Accept* to apply your changes.

6 Click *Expert Options > Write Changes Now* to save all changes without exiting the administration dialog. Or click *Finish* to close the administration dialog and to save the changes.

5.2 Special Options

In addition to the settings for a default user account, openSUSE offers some special options, such as auto login, login without password, encrypted home directories or quotas for users and groups.

5.2.1 Auto Login and Passwordless Login

If you use KDE or GNOME desktop environment you can configure *Auto Login* for a certain user as well as *Passwordless Login* for all users. Auto login causes a user to become automatically logged in to the desktop environment on boot. This functionality can only be activated for one user at a time. Login without password allows all users to log in to the system after they have entered their username in the login manager.

WARNING: Potential Security Risk

Enabling *Auto Login* or *Passwordless Login* on a machine that can be accessed by more than one person bears a potential security risk. Without the need to authenticate any user can gain access to your system and your data. If your system contains confidential data, do not use this functionality.

If you want to activate auto login or login without password, access these functions from *Expert Options* > *Login Settings*.

5.2.2 Managing Encrypted Home Directories

To protect data in home directories against theft and hard disk removal, you can create encrypted home directories for users. These are encrypted with LUKS (Linux Unified Key Setup), which results in an image and an image key generated for the user. The image key is protected with the user's login password. When the user logs in to the system, the encrypted home directory is mounted and the contents are made available to the user.

With YaST, you can create encrypted home directories for new or existing users. To encrypt or modify encrypted home directories of already existing users, you need to enter the user's current login password. By default, all existing user data is copied to the new encrypted home directory, but it is not deleted from the unencrypted directory.

Procedure 5.4   *Creating Encrypted Home Directories*

1 Open the YaST *User and Group Management* dialog in the *Users* view.

2 To encrypt the home directory of an existing user, select an entry and click *Edit*.

Otherwise, click *Add* to create a new user account and enter the appropriate user data on the first tab.

3 In the *Details* tab, activate *Use Encrypted Home Directory*. With *Directory Size in MB*, specify the size of the encrypted image file to be created for this user.
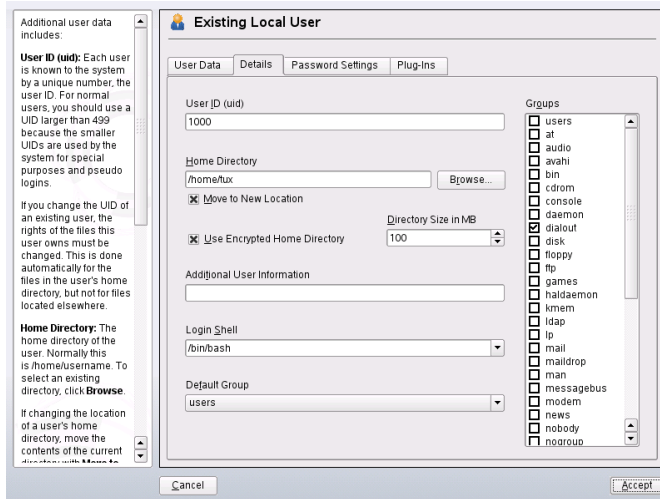
4 Apply your settings with *Accept*.

5 If you have changed the encryption options for an already existing user, YaST prompts you for the user's current login password. Enter the user's password to proceed.

6 Click *Expert Options* > *Write Changes Now* to save all changes without exiting the administration dialog. Or click *Finish* to close the administration dialog and to save the changes.

Procedure 5.5 *Modify or Disable Encrypted Home Directories*

Of course, you can also disable the encryption of a home directory or change the size of the image file at any time.

1 Open the YaST *User and Group Management* dialog in the *Users* view.

2 Select a user from the list and click *Edit*.

3 If you want to disable the encryption, switch to the *Details* tab and disable *Use Encrypted Home Directory*.

If you need to enlarge or reduce the size of the encrypted image file for this users, change the *Directory Size in MB*.

4 Apply your settings with *Accept*.

5 Enter the user's password to proceed.

6 Click *Expert Options > Write Changes Now* to save all changes without exiting the administration dialog. Or click *Finish* to close the administration dialog and to save the changes.

WARNING: Security Restrictions

Encrypting a user's home directory does not provide strong security from other users. If strong security is required, the system should not be physically shared.

Further options for encrypted home directories are available from a command line tool, `cryptconfig`. Find more information about cryptconfig and which additional actions to take for stronger security in Section "Using Encrypted Home Directories" (Chapter 40, *Encrypting Partitions and Files*, ↑Reference).

5.2.3 Using Fingerprint Authentication

If your system includes the fingerprint reader by UPEK/SGS Thomson Microelectronics shipped with some IBM and Lenovo ThinkPads (also to be found in some other laptops, USB keyboards or as stand-alone device), you can use biometric authentication in addition to standard authentication via login and password. After registering their fingerprint, users can log in to the system either by swiping a finger on the fingerprint reader or by typing in a password.

Fingerprints can either be registered with YaST or from the command line. Find detailed information about configuration and use of fingerprint authentication at `http://en.opensuse.org/Using_Fingerprint_Authentication`.

5.2.4 Managing Quotas

To prevent system capacities from being exhausted unnoticed, system administrators can set up quotas for users or groups. Quotas can be defined for one or more file systems and restrict the amount of disk space that can be used and the number of inodes that can be created there. For information about inodes, refer to Section "Terminology" (Chapter 16, *File Systems in Linux*, ↑Reference). openSUSE allows usage of `soft` and `hard` quotas. Soft quotas usually define a warning level at which users are informed they are nearing their limit, whereas hard quotas define the limit at which write requests are denied. Additionally, grace intervals can be defined that allow users or groups to temporarily violate their quotas by certain amounts.

Procedure 5.6 *Enabling Quota Support for a Partition*

In order to configure quotas for certain users and groups, you need to enable quota support for the respective partition in the YaST partitioner first.

1 In YaST, select *System > Partitioner* and click *Yes* to proceed.

2 In the *Expert Partitioner*, select the partition for which to enable quotas and click *Edit*.

3 Click *Fstab Options* and activate *Enable Quota Support*.

4 Confirm your changes with *OK* and leave the *Expert Partitioner* with *Apply*.

Procedure 5.7 *Setting Up Quotas for Users or Groups*

Now you can define soft or hard quotas for specific users or groups and set time periods as grace intervals.

1 In the YaST *User and Group Administration*, select the user or the group for that you want to set quotas and click *Edit*.

2 On the *Plug-In*tab, select the quota entry and click *Launch* to open the *Quota Configuration* dialog.

3 From *File System*, select the partition to which the quota should apply.
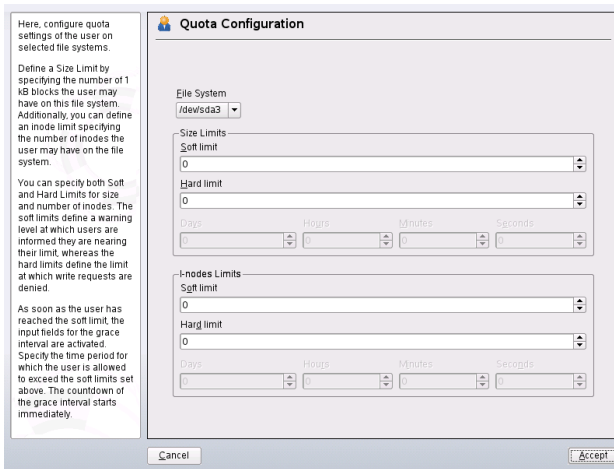
4 Below *Size Limits*, restrict the amount of disk space. Enter the number of 1 kB blocks the user or group may have on this partition. Specify a *Soft Limit* and a *Hard Limit* value.

5 Additionally, you can restrict the number of inodes the user or group may have on the partition. Below *Inodes Limits*, enter a *Soft Limit* and *Hard Limit*.

6 You can only define grace intervals if the user or group has already exceeded the soft limit specified for size or inodes. Otherwise the time-related input fields are not activated. Specify the time period for which the user or group is allowed to exceed the limits set above.

7 Confirm your settings with *Accept*.

5.3 Managing Groups

With YaST you can also easily add, modify or delete groups.

Procedure 5.8 *Creating and Modifying Groups*

1 Open the YaST *User and Group Management* dialog in the *Groups* view.

2 With *Set Filter* define the set of groups you want to manage. The dialog shows a list of groups in the system.

3 To create a new group, click *Add*.

4 To modify an existing group, select the group and click *Edit*.

5 In the following dialog, enter or change the data. The list on the right shows an overview of all available users and system users which can be members of the group.
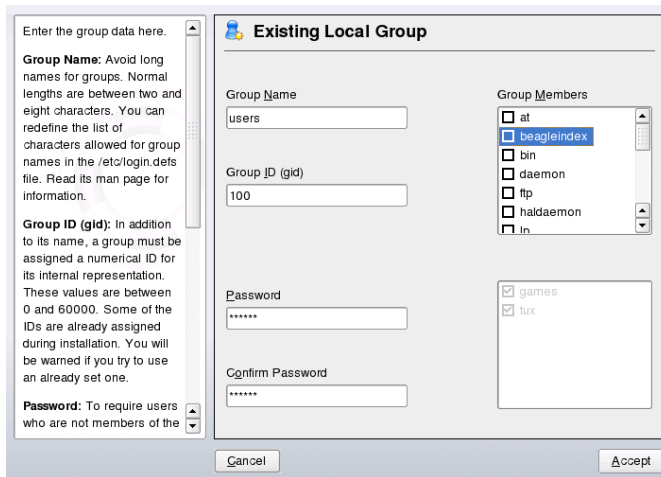
6 To add existing users to a new group select them from the list of possible *Group Members* by checking the corresponding box. To remove them from the group just uncheck the box.

7 Click *Accept* to apply your changes.

In order to delete a group, it must not contain any group members. To delete a group, select it from the list and click *Delete*. Click *Expert Options > Write Changes Now* to save all changes without exiting the administration dialog. Or click *Finish* to close the administration dialog and to save the changes.

5.4 Changing the User Authentication Method

When your machine is connected to a network, you can change the authentication method you set during installation. The following options are available:

NIS
> Users are administered centrally on a NIS server for all systems in the network. For details, see Chapter 25, *Using NIS* (↑Reference).

LDAP
> Users are administered centrally on an LDAP server for all systems in the network. For details about LDAP, see Chapter 26, *LDAP—A Directory Service* (↑Reference).
>
> You can manage LDAP users with the YaST user module. All other LDAP settings, including the default settings for LDAP users, have to be defined with the YaST LDAP client module as described in Section "Configuring an LDAP Client with YaST" (Chapter 26, *LDAP—A Directory Service*, ↑Reference) .

Kerberos
> With Kerberos, a user registers once and then is trusted in the complete network for the rest of the session.

Samba
> SMB authentication is often used in mixed Linux and Windows networks. For details, see Chapter 29, *Samba* (↑Reference) and Chapter 27, *Active Directory Support* (↑Reference).

To change the authentication method, proceed as follows:

1 Open the *User and Group Administration* dialog in YaST.

2 Click *Expert Options > Authentication and User Sources*. A dialog opens which shows an overview of the available authentication methods and the current settings.

3 To change the authentication method, click *Configure* and select the authentication method you want to modify. This takes you directly to the client configuration

modules in YaST. For information about the configuration of the appropriate client, refer to the following sections:

NIS: Section "Configuring NIS Clients" (Chapter 25, *Using NIS*, ↑Reference)

LDAP: Section "Configuring an LDAP Client with YaST" (Chapter 26, *LDAP—A Directory Service*, ↑Reference)

Samba: Section "Configuring a Samba Client with YaST" (Chapter 29, *Samba*, ↑Reference)

4 After accepting the configuration, return to the *User and Group Administration* overview.

5 Click *Finish* to close the administration dialog.

Changing Language and Country Settings with YaST

<div style="text-align: right; font-size: 2em;">**6**</div>

Working in different countries or having to work in a multilingual environment requires your computer to be set up to support this. Use the YaST language and timezone modules to install additional system languages and adjust the country and timezone settings accordingly. The YaST language module also lets you change your system language or determine a primary language that you use most often. Install secondary languages to get optional localizations if you need to start applications or desktops in languages other than the primary one. The YaST timezone module allows you to adjust your country and timezone settings and synchronize your system clock against a local time server.

6.1 Changing the System Language

Depending on how you use your desktop and whether you want to switch the entire system to another language or just the desktop environment itself, there are several ways to achieve this:

Change the System Language Globally
> Proceed as described in Section 6.1.1, "Installing Additional System Languages" (page 78) and Section 6.1.2, "Switching the System Language" (page 80) to install additional localized packages with YaST and set the default language. Changes are effective after relogin. To ensure that the entire system reflects the change, reboot the system or close and restart all running services, applications, and programs.

Change the Language for the Desktop Only

Provided you have previously installed the desired language packages for your desktop environment with YaST as described below, you can switch the language of your desktop using the desktop's control center. After X has been restarted, your entire desktop reflects your new choice of language. Applications not belonging to your desktop framework are not affected by this change and may still appear in the language that was set in YaST.

Temporarily Switch Languages for One Application Only

To run a single application in another language (that has already been installed with YaST), use one of the following commands:

- `LANG=de_DE` *application* to start any standard X application or GNOME application in German. For other languages, use the appropriate language code. Get a list of all language codes available using the `locale -av` command.

- `KDE_LANG=de` *application* to start any KDE application in German. For other languages, use the appropriate language code.

6.1.1 Installing Additional System Languages

The main language was selected during installation (see Section 1.6, "Language" (page 10)) and keyboard and time zone settings were adjusted. However, you can install additional languages on your system and determine which of the different languages installed should be taken as the default. Before installing additional languages, determine which of them should be activated after you install it. YaST knows two different language categories:

Primary Language

The primary language set in YaST applies to the entire system, including YaST and the desktop environment. This language is used whenever available unless you manually specify another language.

Secondary Languages

Secondary languages are languages selected manually for a specific situation. For example, use a secondary language to start an application in a certain language, for example, to do word processing in this language.

Figure 6.1   *Setting the Language*
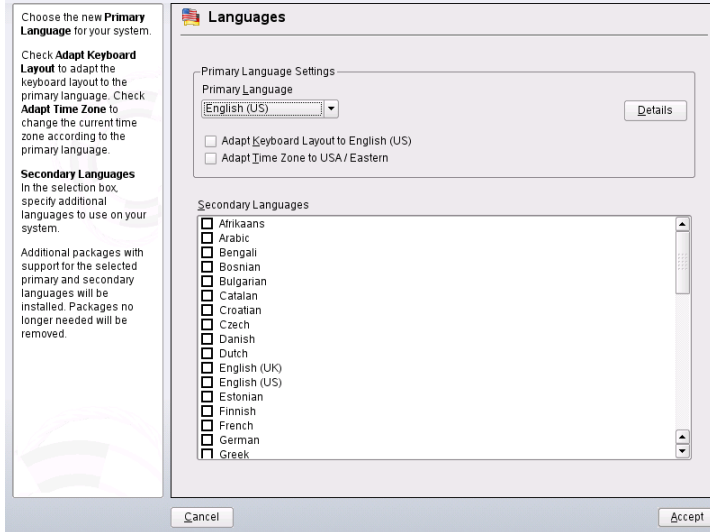
To install an additional language, proceed as follows:

1 As root, start YaST.

2 Select *System* > *Language*.

3 Select the desired languages from the list of languages offered in *Secondary Languages*. When you leave this dialog with *Accept*, YaST installs the additional localized software packages. The system is multilingual, but you need to set the desired language explicitly to start an application in a language other than the primary one.

4 To make this language the default (the primary language), select it under *Primary Language*:

    4a Adapt the keyboard to the new primary language and adjust the time zone, if appropriate.

    4b Select *Details* to change language settings specific to root and to determine the exact locale:

Locale Settings for User root
> ctype only adjusts the LC_TYPE variable in /etc/sysconfig/
> language for root, which sets the localization for language-specific
> function calls. yes sets the language for root to the same as the lan-
> guage for local users. no means the language settings for root are not
> affected by language changes. All locale values remain unset.

Detailed Locale Setting
> If your locale was not included in the list of primary languages available,
> try explicitly specifying it here. However, some of these localizations
> may be incomplete.

5 Leave this dialog and apply your settings with *Accept*.

6.1.2 Switching the System Language

Switching the system language is similar to installing additional languages. Use the
YaST language module to change the primary language and to adjust keyboard and
time zone. Once YaST has applied your changes and any open X sessions have been
restarted, YaST, applications, and the desktop reflect your new language settings.

6.2 Changing the Country and Time Settings

Using the YaST date and time module, adjust your system date, clock and time zone
information to the area you are working in. First, select a general region, such as *Europe*
for example. Choose an appropriate time zone that matches the one you are working
in, e.g. *Germany*.

Depending on which operating systems run on your workstation, adjust the hardware
clock settings, accordingly:

- If you run another operating system on your machine, such as Microsoft Windows*,
  it is likely your system uses *Local Time*.

• If you only run Linux on your machine, set the hardware clock to UTC and have the switch form standard time to daylight saving time performed automatically.

You can change the date and time manually or opt for synchronizing your machine against an available NTP server.

Figure 6.2   *Setting Country and Time*
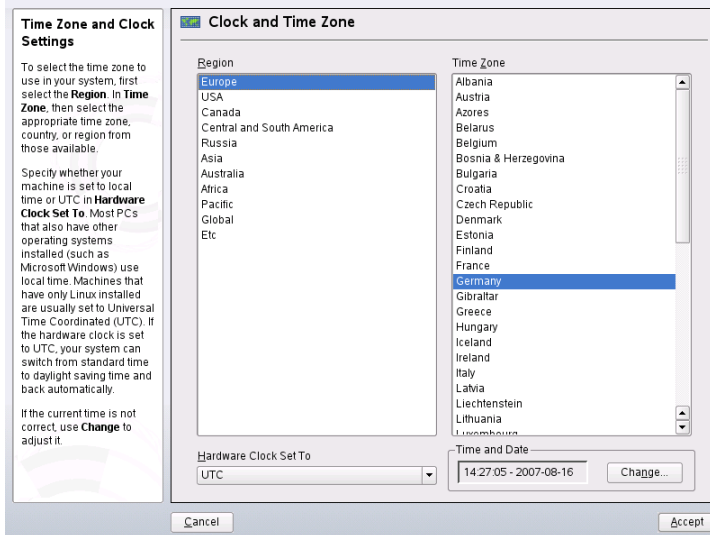
Part II. Basics

Basic Concepts

7

If this is your first encounter with a Linux system you probably want to learn something about the basic concepts of Linux before getting started. The graphical user interfaces of Linux, Mac OS* and Windows* show rather similar desktop components which makes it easy to move from one graphical environment to the next. However, if you take a look at the underlying system you will soon notice some differences.

The following sections are meant to guide you through the first steps with your Linux system and to help Linux "newbies" to orientate themselves in their new operating system. You will learn about the user concept of Linux, the structure of the Linux file system (where to find what in the directory tree) and how to deal with access permissions for files and directories which are an essential feature in Linux.

Users who have been working with Mac OS will probably recognize that the concepts explained in the following sections are rather similar to what they know already from Mac OS. Windows users may realize some crucial differences which are worth noticing.

7.1 User Concept

From the beginning, Linux has been designed as a multiuser system: Any number of users can simultaneously work on one machine. These users can connect to the system via different terminals or network connections. Usually users need to log in to the system before starting a session. Personal information and individual desktop configuration are stored separately for any user.

7.1.1 Distinct User Roles

Among the users working on a machine, Linux distinguishes between different kinds of user roles: you can log in to a Linux machine as "normal" user or as superuser (administrator), traditionally called `root` in Linux. The superuser has privileges which authorize him to access all parts of the system and to execute administrative tasks: He has the unrestricted capacity to make changes to the system and has unlimited access to all files. If you are logged in as a normal user you lack these privileges. User and `root` can of course be the same physical person but acting in different roles.

The `root` user account is always created on your Linux system by default — during installation you are therefore requested to specify a password for `root`. Which other users can log in to your system depends on the method of authentication you choose during installation (see Section 1.14.6, "Users" (page 29)).

For your daily work, you usually log in to your system as normal user. Performing some administrative tasks or running certain programs such as YaST require `root` permissions. You can easily switch from your normal account to `root` and back to your normal user account after accomplishing the administrative task. How to do so in a shell is described in Section 8.4, "Becoming Root" (page 109). If you are working with a graphical user interface you are usually prompted to enter the `root` password when necessary. Closing the application which required `root` permissions results in withdrawal of the `root` privileges: you automatically switch back to your normal user account.

While this concept might not look very appealing at first, it adds to security. A user without `root` privileges cannot damage the entire system. Any damage caused is strictly limited to the user's own account and data. Any operation executed with `root` privileges may potentially harm the entire system. Anyone intending to harm a running Linux system must gain `root` privileges first. This is why it is much harder to create viruses for Linux systems. They must overcome the root barrier first.

7.1.2 Groups

Every user in a Linux system belongs at least to one group. A group, in this case, can be defined as a set of connected users with certain collective privileges. Groups are usually defined according to functional roles or the data and resources the members of the group need to access. When a new user account is created on your system, the user is usually assigned to a default, primary group. The system administrator can change this primary group or assign the user to an additional group, if necessary.

Figure 7.1   *Group Membership for a User in YaST*
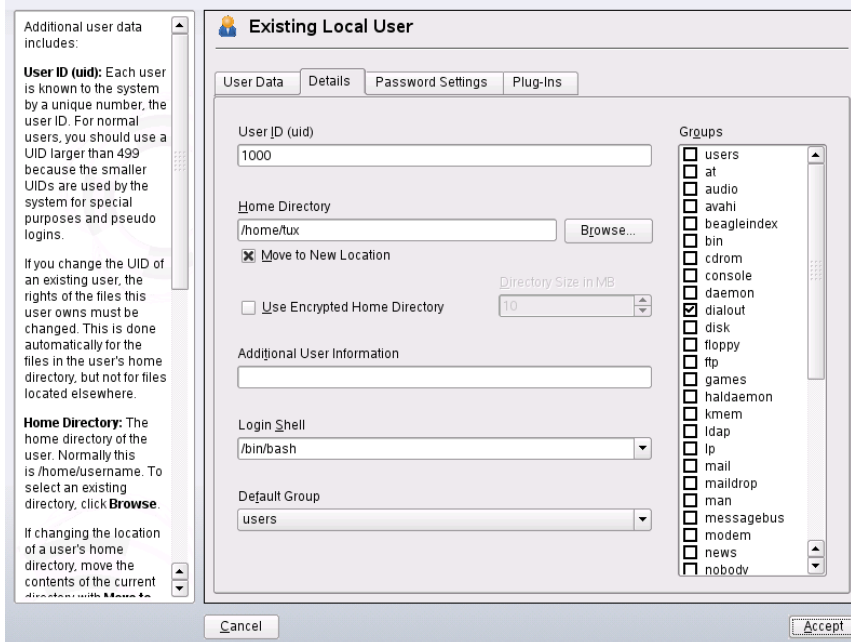
7.2 The Linux File System

All users including the superuser have their own home directories where all private data, like documents, bookmarks, or e-mail, are stored. System directories holding central configuration files or executable files can only be modified by the superuser.

Read more about access permissions and how to modify them according to your needs in Section 8.5, "Modifying File Permissions" (page 110).

In Linux, you can choose whether you want to manage files and folders with a file manager or if you rather like to use the command line which is the traditional way. The last-mentioned method is often faster but requires some deeper knowledge of several commands to list, create, delete, or edit files and their properties. For more information about commands for manipulating files refer to Section 8.3, "Working with Files and Directories" (page 105). A file manager provides a graphical and more intuitive way to handle these tasks. Learn more about the file managers of GNOME and KDE in *GNOME User Guide* and *KDE User Guide*. Whatever method you choose: the following sections provide you with some basic knowledge of the file system and provide an overview of the default directory structure in Linux.

7.2.1 Key Features

In Linux, all files and directories are located in a tree-like structure. The topmost directory is referred to as the file system *root* or just / (not to be confused with the `root` user). The counterpart of / in a Windows system would probably be `C:\`. All other directories in Linux can be accessed from the root directory and are arranged in a hierarchical structure.

Find the key features of the Linux file system in the following list which also highlights some of the major differences between the Linux and the Windows/DOS file system:

Specifying Paths
As opposed to Windows, Linux does not use backslashes to separate the components of a pathname, it uses slashes instead. For example, the private data of users in Windows may be stored under `C:\My Documents\Letters`, whereas in Linux it would be stored under `/home/username/Letters`.

Partitions, Drives/Devices and Directories
Linux does not use drive letters as Windows does. From the mere appearance of a pathname in Linux you can not tell whether you are addressing a partition, a drive/device, a network device or an "ordinary" directory.

Mounting and Unmounting
Another crucial difference between Windows/DOS and Linux is the concept of *mounting* and *unmounting* partitions, drives or directories. Windows detects parti-

tions and drives during the boot process and assigns a drive letter to them. In Linux however, partitions or devices are usually not visible in the directory tree unless they are *mounted*, that means integrated into the file system at a specific location in the directory tree. As a normal user you cannot access data on a partition or a device unless it is mounted. But don't worry— most of the times you do not have to mount partitions or devices manually. During the installation of your system, you can define partitions to be mounted automatically when the system is started. Removable devices are usually also detected and mounted automatically by your system—the desktop environments such as KDE or GNOME will inform you about the appearance of a new device.

Figure 7.2   *Autodetection of a USB Stick in KDE*
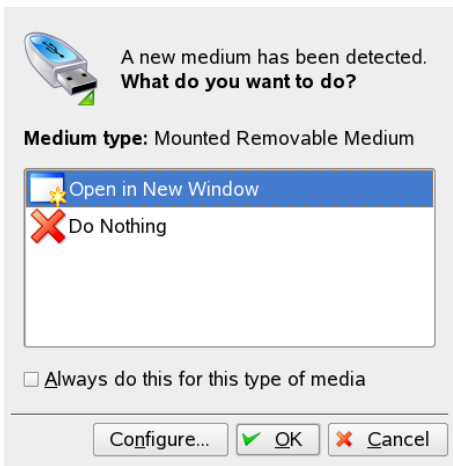
Although this concept of mounting and unmounting may appear complicated or cumbersome at first sight this also offers great flexibility: for example you can easily mount a directory from a another machine over the network and act on that directory as though it were located on your local machine.

Case-Sensitivity

Linux distinguishes between uppercase and lowercase letters in the file system. For example, whether you name a file `test.txt`, `TeST.txt` or `Test.txt` make a difference in Linux. This also holds true for directories: You cannot access a directory named `Letters` by the name `letters`.

File Extensions

As opposed to Windows, files in Linux *may* have a file extension, such as `.txt`, but do not need to have one. When you start working with the shell this sometimes makes it difficult for beginners to differentiate between files and folders, depending on the command you use to list the contents of a directory. Learn more about some basic shell commands in Chapter 8, *Shell Basics* (page 99). If you use the graphical file managers in KDE or GNOME (see *GNOME User Guide* and *KDE User Guide*), files and folders are symbolized by various different icons depending on the view you choose.

Figure 7.3 *File and Folders in KDE File Manager*
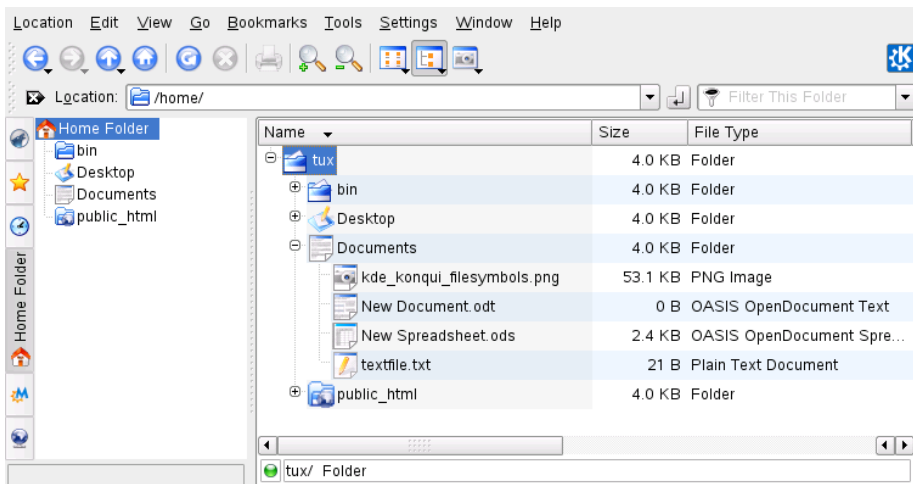
Hidden Files

Similar to Windows, Linux also distinguishes between "normal" files and *hidden files* which are often configuration files that you usually do not want to access or see as a normal user. In Linux, hidden files are indicated by a dot in front (for example, `.hiddenfile`). In order to access hidden files you can switch view in the file managers as described in Section "Managing Folders and Files with Konqueror" (Chapter 1, *Getting Started with the KDE Desktop*, ↑KDE User Guide) or use a certain command in the shell as described in Section 8.2.2, "Using Commands with Options" (page 102).

File System Permissions

Because Linux is a multiuser system, every file in a Linux file system belongs to a user and a group. Only the owner of a file or directory (or, of course, `root`) can

grant other users access permission to it. Linux basically distinguishes between three different types of access permissions: write permission, read permission and execute permission. You can only access a file or a folder if you have at least read permission to it. There are several ways to change the access permissions of files and folders: either traditionally via the shell or with the help of your desktop's file manager (see Section "Changing Access Permissions" (Chapter 1, *Getting Started with the KDE Desktop*, ↑KDE User Guide)). If you have `root` privileges, you can also change the owner and the group of a file or folder. Read how to do so in a shell in .

For more detailed information about file system permissions refer to . Apart from the traditional permission concept for file system objects there are also extensions available which handle permissions more flexibly. Read more in Chapter 17, *Access Control Lists in Linux* (↑Reference).

7.2.2 The Directory Structure

The following table provides a short overview of the most important higher-level directories you find on a Linux system. Find more detailed information about the directories and important subdirectories in the following list.

Table 7.1   *Overview of a Standard Directory Tree*

Directory	Contents
/	Root directory—the starting point of the directory tree.
/bin	Essential binary files, such as commands that are needed by both the system administrator and normal users. Usually also contains the shells, such as Bash.
/boot	Static files of the boot loader.
/dev	Files needed to access host-specific devices.
/etc	Host-specific system configuration files.

Directory	Contents
/home	Holds the home directories of all users who have an account on the system. Only root's home directory is not located in /home but in /root.
/lib	Essential shared libraries and kernel modules.
/media	Mount points for removable media.
/mnt	Mount point for temporarily mounting a file system.
/opt	Add-on application software packages.
/root	Home directory for the superuser root.
/sbin	Essential system binaries.
/srv	Data for services provided by the system.
/tmp	Temporary files.
/usr	Secondary hierarchy with read-only data.
/var	Variable data such as log files
/windows	Only available if you have both Microsoft Windows* and Linux installed on your system. Contains the Windows data.

The following list provides more detailed information and gives some examples which files and subdirectories can be found in the directories:

/bin
 Contains the basic shell commands that may be used both by root and by other users. These commands include ls, mkdir, cp, mv, rm, and rmdir. /bin also contains Bash, the default shell in openSUSE.

`/boot`

   Contains data required for booting, such as the boot loader, the kernel, and other data that is used before the kernel begins executing user mode programs.

`/dev`

   Holds device files that represent hardware components.

`/etc`

   Contains local configuration files that control the operation of programs like the X Window System. The `/etc/init.d` subdirectory contains scripts that are executed during the boot process.

`/home/`*`username`*

   Holds the private data of every user who has an account on the system. The files located here can only be modified by their owner or by the system administrator. By default, your e-mail directory and personal desktop configuration are located here in form of hidden files and directories. KDE users find the personal configuration data for their desktop in `.kde`, GNOME users find it in `.gconf`. For information about hidden files, refer to .

NOTE: Home Directory in a Network Environment

If you are working in a network environment, your home directory may be mapped to a directory in the file system other than `/home`.

`/lib`

   Contains essential shared libraries needed to boot the system and to run the commands in the root file system. The Windows equivalent for shared libraries are DLL files.

`/media`

   Contains mount points for removable media, such as CD-ROMs, USB sticks, and digital cameras (if they use USB). `/media` generally holds any type of drive except the hard drive of your system. As soon as your removable medium has been inserted or connected to the system and has been mounted, you can access it from here.

`/mnt`

   This directory provides a mount point for a temporarily mounted file system. `root` may mount file systems here.

/opt

Reserved for the installation of additional software. Optional software and larger add-on program packages can be found there. KDE3 is located there, whereas KDE4 and GNOME have moved to /usr now.

/root

Home directory for the root user. Personal data of root is located here.

/sbin

As the s indicates, this directory holds utilities for the superuser. /sbin contains binaries essential for booting, restoring, and recovering the system in addition to the binaries in /bin.

/srv

Holds data for services provided by the system, such as FTP and HTTP.

/tmp

This directory is used by programs that require temporary storage of files.

/usr

/usr has nothing to do with users, but is the acronym for UNIX system resources. The data in /usr is static, read-only data that can be shared among various hosts compliant to the Filesystem Hierarchy Standard (FHS). This directory contains all application programs and establishes a secondary hierarchy in the file system. /usr holds a number of subdirectories, such as /usr/bin, /usr/sbin, /usr/local, and /usr/share/doc.

/usr/bin

Contains generally accessible programs.

/usr/sbin

Contains programs reserved for the system administrator, such as repair functions.

/usr/local

In this directory, the system administrator can install local, distribution-independent extensions.

/usr/share/doc

Holds various documentation files and the release notes for your system. In the manual subdirectory, find an online version of this manual. If more than one

language is installed, this directory may contain versions of the manuals for different languages.

Under `packages`, find the documentation included in the software packages installed on your system. For every package, a subdirectory `/usr/share/doc/packages/`*`packagename`* is created that often holds README files for the package and sometimes examples, configuration files, or additional scripts.

If HOWTOs are installed on your system `/usr/share/doc` also holds the `howto` subdirectory in which to find additional documentation on many tasks relating to the setup and operation of Linux software.

`/var`
Whereas `/usr` holds static, read-only data, `/var` is for data which is written during system operation and thus is variable data, such as log files or spooling data. For example, the log files of your system are in `/var/log/messages` (only accessible for `root`).

`/windows`
Only available if you have both Microsoft Windows and Linux installed on your system. Contains the Windows data available on the Windows partition of your system. Whether you can edit the data in this directory depends on the file system your Windows partition uses. If it is FAT32, you can open and edit the files in this directory. For an NTFS file system, however, you can only read your Windows files from Linux, but not modify them. Learn more in Section 11.3, "Accessing Files on Different OS on the Same Computer" (page 154).

7.3 File Access Permissions

In Linux, objects such as files or folder or processes generally belong to the user who created or initiated them. There are some exceptions from this rule. For more information about the exceptions, refer to Chapter 17, *Access Control Lists in Linux* (↑Reference). The group which is associated with a file or a folder depends on the primary group the user belongs to when creating the object.

When you create a new file or directory, initial access permissions for this object are set according to a predefined scheme. As an owner of a file or directory, you can change the access permissions to this object. For example, you can protect files holding sensitive data against read access by other users and you can authorize the members of your

group or other users to write, read, or execute several of your files where appropriate. As `root`, you can also change the ownership of files or folders.

7.3.1 Permissions for User, Group and Others

Three permission sets are defined for each file object on a Linux system. These sets include the read, write, and execute permissions for each of three types of users—the owner, the group, and other users. You can view and change the access permissions of a file or folder in the file managers of your desktop, as described in Section "Changing Access Permissions" (Chapter 1, *Getting Started with the KDE Desktop*, ↑KDE User Guide) or in a shell (see Section 8.5, "Modifying File Permissions" (page 110)).

Figure 7.4   *File Access Permissions in KDE File Manager*
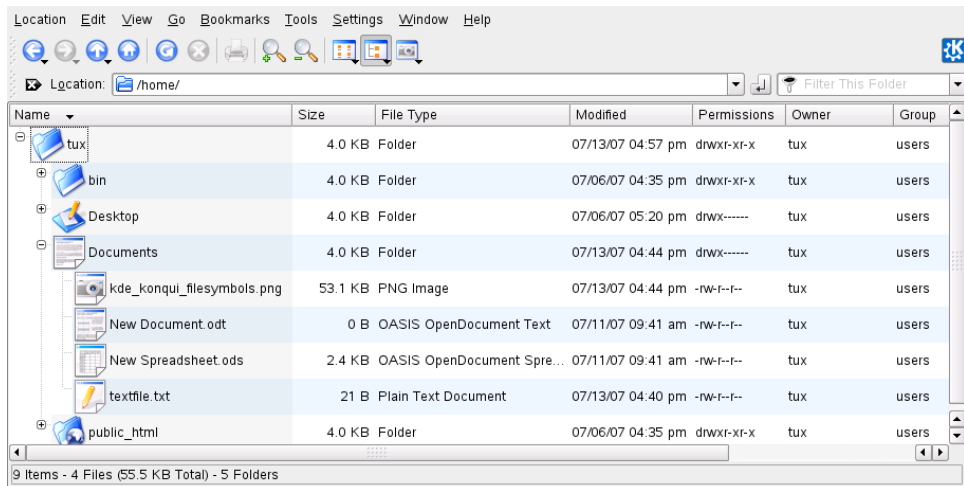
The following example shows the output of an `ls -l` command in a shell. This command lists the contents of a directory and shows the details for each file and folder in that directory.

Example 7.1 *Access Permissions For Files and Folders*

```
-rw-r----- 1 tux users      0 2006-06-23 16:08 checklist.txt
-rw-r--r-- 1 tux users  53279 2006-06-21 13:16 gnome_quick.xml
-rw-rw---- 1 tux users      0 2006-06-23 16:08 index.htm
-rw-r--r-- 1 tux users  70733 2006-06-21 09:35 kde-start.xml
-rw-r--r-- 1 tux users  47896 2006-06-21 09:46 kde_quick.xml
drwxr-xr-x 2 tux users     48 2006-06-23 16:09 local
-r-xr-xr-x 1 tux users 624398 2006-06-23 15:43 tux.jpg
```

As shown in the third column, all objects belong to user `tux`. They are assigned to the group `users` which is the primary group the user `tux` belongs to. To retrieve the access permissions the first column of the list must be examined more closely. Let's have a look at the file `kde-start.xml`:

Type	User Permissions	Group Permissions	Permissions for Others
–	rw–	r--	r--

The first column of the list consists of one leading character followed by nine characters grouped in three blocks. The leading character indicates the file type of the object : in this case, the hyphen (–) shows that `kde-start.xml` is a file. If you find the character `d` instead, this shows that the object is a directory (like `local` in the example above). The next three blocks show the access permissions for the owner, the group and other users (from left to right). Each block follows the same pattern: the first position shows read permissions (`r`), the next position shows write permissions (`w`), the last one shows execute permission (`x`). A lack of either permission is indicated by –. In our example, the owner of `kde-start.xml` has read and write access to the file but cannot execute it. The `users` group can read the file but cannot write or execute it. The same holds true for the other users as shown by the third block of characters.

7.3.2 Files and Folders

Access permissions have a slightly different impact depending on the type of object they apply to: file or directory. The following table shows the details:

Table 7.2   *Access Permissions For Files And Directories*

Access Permission	File	Folder
Read (r)	Users can open and read the file.	Users can view the contents of the directory. Without this permission, users cannot list the contents of this directory with `ls -l`, for example. However, if they only have execute permission for the directory, they can nevertheless access certain files in this directory if they know of their existence.
Write (w)	Users can change the file: They can add or drop data and can even delete the contents of the file. However, this does not include the permission to remove the file completely from the directory as long as they do not have write permissions for the directory where the file is located.	Users can create, rename or delete files in the directory.
Execute (x)	Users can execute the file. This permission is only relevant for files like programs or shell scripts, not for text files. If the operating system can execute the file directly, users do not need read permission to execute the file. However, if the file must me interpreted like a shell script or a perl program, additional read permission is needed.	Users can change into the directory and execute files there. If they do not have read access to that directory they cannot list the files but can access them nevertheless if they know of their existence.

Note that access to a certain file is always dependent on the correct combination of access permissions for the file itself *and* the directory it is located in.

Shell Basics

8

When working with Linux nowadays, you can communicate with the system nearly without ever requiring a command line interpreter (the shell). After booting your Linux system, you are usually directed to a graphical user interface that guides you through the login process and the following interactions with the operating system. The graphical user interface in Linux (the X Window System or X11) is initially configured during installation. Both KDE and GNOME desktop and other window managers you can install use it for interaction with the user.

Nevertheless it is useful to have some basic knowledge of working with a shell because you might encounter situations where the graphical user interface is not available—for example, if some problem with the X Window System occurs. If you are not familiar with a shell, you might feel a bit uncomfortable at first when entering commands, but the more you get used to it, the more you will realize that the command line is often the quickest and easiest way to perform some daily tasks.

For UNIX or Linux several shells are available which differ slightly in behavior and in the commands they accept. The default shell in openSUSE® is Bash (GNU Bourne-Again Shell).

The following sections will guide you through your first steps with the Bash shell and will show you how to complete some basic tasks via the command line. If you are interested in learning more or rather feel like a shell "power user" already, refer to Chapter 19, *Working with the Shell* (↑Reference).

8.1 Starting a Shell

Basically, there are two different ways to start a shell from the graphical user interface which usually shows after you have booted your computer:

- you can leave the graphical user interface or

- you can start a terminal window *within* the graphical user interface.

While the first option is always available, you can only make use of the second option when you are logged in to a desktop such as KDE or GNOME already. Whichever way you choose: there is always a way back and you can switch back and forth between the shell and the graphical user interface.

If you want to give it a try, press Ctrl + Alt + F2 to leave the graphical user interface. The graphical user interface disappears and you are taken to a shell which prompts you to log in. Type your username and press Enter. Then type your password and press Enter. The prompt now changes and shows some useful information as in the following example:

```
❶    ❷    ❸
tux@linux:~>
```

❶   Your login.

❷   The hostname of your computer.

❸   Path to the current directory. Directly after login, the current directory usually is your home directory, indicated by the tilde symbol, ~.

When you are logged in at a remote computer the information provided by the prompt always shows you which system you are currently working on.

When the cursor is located behind this prompt, you can pass on commands directly to your computer system. For example, you can now enter `ls -l` to list the contents of the current directory in a detailed format. If this is enough for your first encounter with the shell and you want to go back to the graphical user interface you should log out from your shell session first. To do so, type `exit` and press Enter. Then press Alt + F7 to switch back to the graphical user interface. You will find your desktop and the applications running on it unchanged.

When you are already logged in to the GNOME or the KDE desktop and want to start a terminal window within the desktop, press Alt + F2 and enter `konsole` (for KDE) or `gnome-terminal` (for GNOME). This opens a terminal window on your desktop. As you are already logged in to your desktop the prompt shows information about your system as described above. You can now enter commands and execute tasks just like in any shell which runs parallel to your desktop. To switch to another application on the desktop just click on the corresponding application window or select it from the taskbar of your panel. To close the terminal window press Alt + F4.

8.2 Entering Commands

As soon as the prompt appears on the shell it is ready to receive and execute commands. A command can consist of several elements. The first element is the actual command, followed by parameters or options. You can type a command and edit it by using the following keys: ←, →, Home, End, <— (Backspace), Del, and Space. You can correct typing errors or add options. The command is not executed until you press Enter.

IMPORTANT: No News Is Good News

The shell is not verbose: in contrast to some graphical user interfaces, it usually does not provide confirmation messages when commands have been executed. Messages only appear in case of problems or errors —or if you explicitly ask for them by executing a command with a certain option.

Also keep this in mind for commands to delete objects. Before entering a command like `rm` (without any option) for removing a file, you should know if you really want to get rid of the object: it will be deleted irretrievably, without inquiry.

8.2.1 Using Commands without Options

In Section 7.3.1, "Permissions for User, Group and Others" (page 96) you already got to know one of the most basic commands: `ls`, which used to list the contents of a directory. This command can be used with or without options. Entering the plain `ls` command shows the contents of the current directory:

```
tux@knox:~> ls
bin Desktop Documents public_html tux.txt
tux@knox:~>
```

As you already learned in Section 7.2.1, "Key Features" (page 88) files in Linux may have a file extension or a suffix, such as `.txt`, but do not need to have one. This makes it difficult to differentiate between files and folders in this output of the `ls`. By default, the colors in the Bash shell give you a hint: directories are usually shown in blue, files in black.

8.2.2 Using Commands with Options

A better way to get more details about the contents of a directory is using the `ls` command with a string of options. Options modify the way a command works so that you can get it to carry out specific tasks. Options are separated from the command with a blank and are usually prefixed with a hyphen. The `ls -l` command shows the contents of the same directory in full detail (long listing format):

```
tux@knox:~> ls -l
drwxr-xr-x 1 tux users     48 2006-06-23 16:08 bin
drwx---r-- 1 tux users  53279 2006-06-21 13:16 Desktop
drwx------ 1 tux users    280 2006-06-23 16:08 Documents
drwxr-xr-x 1 tux users  70733 2006-06-21 09:35 public_html
-rw-r--r-- 1 tux users  47896 2006-06-21 09:46 tux.txt
tux@knox:~>
```

This output shows the following information about each object:

```
drwxr-xr-x❶ 1❷ tux❸ users❹ 48❺ 2006-06-23 16:08❻ bin❼
```

❶   Type of object and access permissions. For further information, refer to Section 7.3.1, "Permissions for User, Group and Others" (page 96).

❷   Number of hard links to this file.

❸   Owner of the file or directory. For further information, refer to Section 7.3.1, "Permissions for User, Group and Others" (page 96).

❹   Group assigned to the file or directory. For further information, refer to Section 7.3.1, "Permissions for User, Group and Others" (page 96).

❺   File size in bytes.

❻   Date and time of the last change.

❼   Name of the object.

Usually, you can combine several options by prefixing only the first option with a hyphen and then write the others consecutively without a blank. For example, if you want to see all files in a directory in long listing format, you can combine the two options `-l` and `-a` (show all files) for the `ls` command. Executing `ls -la` shows also hidden files in the directory, indicated by a dot in front (for example, `.hiddenfile`).

The list of contents you get with `ls` is sorted alphabetically by filenames. But like in a graphical file manager, you can also sort the output of `ls -l` according to various criteria such as date, file extension or file size:

- For date and time, use `ls -lt` (displays newest first).

- For extensions, use `ls -lx` (displays files with no extension first).

- For file size, use `ls -lS` (displays largest first).

To revert the order of sorting, add `-r` as an option to your `ls` command. For example, `ls -lr` gives you the contents list sorted in reverse alphabetical order, `ls -ltr` shows the oldest files first. There are lots of other useful options for `ls`—in the following section you will learn how to investigate them.

8.2.3 Getting Help

Nobody is expected to know all options of all commands by heart. If you remember the command name but are not sure about the options or the syntax of the command, choose one of the following possibilities:

`--help` option
   If you only want to look up the options of a certain command, try entering the command followed by a blank and `--help`. This `--help` option exists for many commands. For example, `ls --help` displays all the options for the `ls` command.

Manual Pages
   To learn more about the various commands, you can also use the manual pages. Manual pages also give a short description of what the command does. They can be accessed with `man` followed by the name of the command, for example, `man ls`.

The man pages are displayed directly in the shell. To navigate them, move up and down with Page ↑ and Page ↓. Move between the beginning and the end of a document with Home and End. End this viewing mode by pressing Q. Learn more about the man command itself with man man.

Info Pages

Info pages usually provide even more information about commands. To view the info page for a certain command, enter info followed by the name of the command, for example, info ls. You can browse an info page with a viewer directly in the shell and display the different sections, called "nodes." Use Space to move forward and <— to move backwards. Within a node, you can also browse with Page ↑ and Page ↓ but only Space and <— will take you also to the previous or subsequent node. Like for the man pages, press Q to end the viewing mode.

Note that man pages and info pages do not exist for all commands: sometimes both are available (usually for key commands), sometimes only a man page or an info page exists, sometimes neither of them.

8.2.4 Bash Shortcut Keys

When having entered several commands, your shell will soon be filled with all sorts of commands and the corresponding outputs. In the following table, find some useful shortcut keys for navigating and editing in the shell which help you to keep overview.

Shortcut Key	Function
Ctrl + L	Clears the screen and moves the current line to the top of the page.
Ctrl + C	Aborts the command which is currently being executed.
Shift + Page ↑	Scroll upwards.
Shift + Page ↓	Scroll downwards.
Ctrl + U	Delete from cursor position to start of line.

Shortcut Key	Function
Ctrl + K	Delete from cursor position to the end of line.
Ctrl + D	Closes the shell session.
↑, ↓	Browse in the history of executed commands.

8.3 Working with Files and Directories

To address a certain file or directory, you must specify the path leading to that directory or file. As you may know from MS DOS or Mac OS already, there are two ways to specify a path:

Absolute Path
>   Enter the entire path from the root directory to the respective file or directory.

Relative Path
>   Enter a path to the respective file or directory by using the current directory as a starting point. This implies to give the levels you have to move up or down in the file system tree to reach the target directory of file, starting from the current directory.

Paths contain filenames, directories or both, separated by slashes. Absolute paths always start with a slash. Relative paths do not have a slash at the beginning, but can have one or two dots.

When entering commands, you can choose either way to specify a path—depending on your preferences or the amount of typing—both will lead to the same result. To change directories, use the `cd` command and specify the path to the directory.

NOTE: Handling Blanks in Filenames or Directory Names

If a filename or the name of a directory contains a space, either escape the space using a back slash (\) in front of the blank or enclose the filename in single quotes. Otherwise Bash interprets a filename like `My Documents` as the names of two files or directories, `My` and `Documents` in this case.

When specifying paths, the following "shortcuts" can save you a lot of typing:

- The tilde symbol (~) is a shortcut for home directories. For example, to list the contents of your home directory, use `ls ~`. To list the contents of another user's home directory, enter `ls ~username` (or course, this will only work if you have permission to view the contents, see Section 7.3, "File Access Permissions" (page 95)). For example, entering `ls ~tux` would list the contents of the home directory of a user named `tux`. You can use the tilde symbol as shortcut for home directories also if you are working in a network environment and where your home directory may not be called `/home` but can be mapped to any directory in the file system.

  From anywhere in the file system, you can reach your home directory by entering `cd ~` or even shorter, by simply entering `cd` without any options.

- When using relative paths, refer to the current directory with a dot (`.`). This is mainly useful for commands such as `cp` or `mv` by which you can copy or move files or directories.

- The next higher level in the tree is represented by two dots (`..`). In order to switch to the parent directory of your current directory, enter `cd ..`, to go up two levels from the current directory enter `cd ../..` etc.

To apply your knowledge, find some examples below. They address basic tasks you may want to execute with files or folders using Bash.

8.3.1 Examples for Working with Files and Directories

Suppose you want to copy a file located somewhere in your home directory to a subdirectory of `/tmp`.

1 First, from your home directory create a subdirectory in `/tmp`:

  1a Enter

```
mkdir  /tmp/test
```

`mkdir` stands for "make directory". This command creates a new directory named `test` in the `/tmp` directory. In this case, you are using an absolute path to create the `test` directory.

1b To check what happened, now enter

```
ls -l /tmp
```

The new directory `test` should appear in the list of contents of the `/tmp` directory.

1c Switch to the newly created directory with

```
cd /tmp/test
```

2 Now create a new file in a subdirectory of your home directory and copy it to `/tmp/test`. Use a relative path for this task.

IMPORTANT: Overwriting of Existing Files

Before copying, moving or renaming a file, check if your target directory already contains a file with the same name. If yes, consider to change one of the filenames or use `cp` or `mv` with options like `-i` which will prompt before overwriting an existing file. Otherwise Bash will overwrite an existing file without inquiry.

2a To list the contents of your home directory, enter

```
ls -l ~
```

It should contain a subdirectory called `Documents` by default. If not, create this subdirectory with the `mkdir` command you already know:

```
mkdir ~/Documents
```

2b Enter

```
touch ~/Documents/myfile.txt
```

This command creates a new, empty file named `myfile.txt` in the `Documents` directory.

Usually, the `touch` command updates the modification and access date for an existing file. If you use `touch` with a filename which does not exist in your target directory, it creates a new file.

2c Enter

```
ls -l ~/Documents
```

The new file should appear in the list of contents.

2d Enter

```
cp ~/Documents/myfile.txt .
```

Do not forget the dot at the end.

This command tells Bash to go to your home directory and to copy `myfile.txt` from the `Documents` subdirectory to the current directory, `/tmp/test`, without changing the name of the file.

2e Check the result by entering

```
ls -l
```

The file `myfile.txt` should appear in the list of contents for `/tmp/test`.

Now suppose you want to rename `myfile.txt` into `tuxfile.txt`. Finally you decide to remove the renamed file and the `test` subdirectory.

1 To rename the file, enter

```
mv myfile.txt tuxfile.txt
```

2 To check what happened, enter

```
ls -l
```

Instead of `myfile.txt`, `tuxfile.txt` should appear in the list of contents.

`mv` stands for `move` and is used with two options: the first option specifies the source, the second option specifies the target of the operation. You can use `mv` either

- to rename a file or a directory,

- to move a file or directory to a new location or

- to do both in one step.

3 Coming to the conclusion that you do not need the file any longer, you can delete it by entering

```
rm tuxfile.txt
```

Bash deletes the file without any inquiry.

4 Move up one level with `cd ..` and check with

```
ls -l test
```

if the `test` directory is empty now.

5 If yes, you can remove the `test` directory by entering

```
rmdir test
```

8.4 Becoming Root

As you learned in , some tasks in Linux require `root` permissions, otherwise they cannot be executed. In order to temporarily become `root` in a shell, proceed as follows:

1 Enter `su`. You are prompted for the `root` password.

2 Enter the password. If you mistyped the `root` password, the shell displays a message. In this case, you have to re-enter `su` before retyping the password. If your password is correct, a hash symbol # appears at the end of the prompt, signaling that you are acting as `root` now.

3 Execute your task. For example, transfer ownership of a file to a new user which only `root` is allowed to do:

```
chown wilber kde_quick.xml
```

4 After having completed your tasks as `root`, switch back to your normal user account. To do so, enter

```
exit
```

The hash symbol disappears and you are acting as "normal" user again.

Alternatively, you can also use sudo (superuser "do") to execute some tasks which normally are for roots only. With sudo, administrators can grant certain users root privileges for some commands. Depending on the system configuration, users can then run root commands by entering their normal password only. Due to a timestamp function, users are only granted a "ticket" for a restricted period of time after having entered their password. The ticket usually expires after a few minutes. In openSUSE, sudo requires the root password by default (if not configured otherwise by your system administrator).

For users, sudo is comfortable as it prevents you from switching accounts twice (to root and back again). To change the ownership of a file using sudo, only one command is necessary instead of three:

```
sudo chown wilber kde_quick.xml
```

After you have entered the password which you are prompted for, the command is executed. If you enter a second root command shortly after that, you are not prompted for the password again, because your ticket is still valid. After a certain amount of time, the ticket automatically expires and the password is required again. This also prevents unauthorized persons from gaining root privileges in case a user forgets to switch back to his normal user account again and leaves a root shell open.

8.5 Modifying File Permissions

In Linux, objects such as files or folder or processes generally belong to the user who created or initiated them. The group which is associated with a file or a folder depends on the primary group the user belongs to when creating the object. When you create a new file or directory, initial access permissions for this object are set according to a predefined scheme. For further details refer to Section 7.3, "File Access Permissions" (page 95).

As the owner of a file or directory (and, of course, as root), you can change the access permissions to this object.

To change object attributes like access permissions of a file or folder, use the chmod command followed by the following parameters:

- the users for which to change the permissions,

- the type of access permission you want to remove, set or add and

- the files or folders for which you want to change permissions separated by spaces.

The users for which you can change file access permissions fall into the following categories: the owner of the file (user, u), the group that own the file (group, g) and the other users (others, o). You can add, remove or set one or more of the following permissions: read, write or execute.

As root, you can also change the ownership of a file: with the command chown (change owner) you can transfer ownership to a new user.

8.5.1 Examples for Changing Access Permissions and Ownership

The following example shows the output of an `ls -l` command in a shell.

Example 8.1 *Access Permissions For Files and Folders*

```
-rw-r----- 1 tux users      0 2006-06-23 16:08 checklist.txt
-rw-r--r-- 1 tux users  53279 2006-06-21 13:16 gnome_quick.xml
-rw-rw---- 1 tux users      0 2006-06-23 16:08 index.htm
-rw-r--r-- 1 tux users  70733 2006-06-21 09:35 kde-start.xml
-rw-r--r-- 1 tux users  47896 2006-06-21 09:46 kde_quick.xml
drwxr-xr-x 2 tux users     48 2006-06-23 16:09 local
-r-xr-xr-x 1 tux users 624398 2006-06-23 15:43 tux.jpg
```

In the example above, user tux owns the file kde-start.xml and has read and write access to the file but cannot execute it. The users group can read the file but cannot write or execute it. The same holds true for the other users as shown by the third block of characters.

Suppose you are tux and want to modify the access permissions to your files:

1 If you want to grant the users group also write access to kde-start.xml, enter

```
chmod g+w kde-start.xml
```

2 To grant the `users` group and other users write access to `kde-start.xml`, enter

```
chmod go+w kde-start.xml
```

3 To remove write access for all users, enter

```
chmod -w kde-start.xml
```

If you do not specify any kind of users, the changes apply to all users— the owner of the file, the owning group and the others. Now even the owner `tux` does not have write access to the file without first reestablishing write permissions.

4 To prohibit the `users`group and others to change into the directory `local`, enter

```
chmod go-x local
```

5 To grant others write permissions for two files, for `kde_quick.xml` and `gnome_quick.xml`, enter

```
chmod o+w  kde_quick.xml gnome_quick.xml
```

Suppose you are `tux` and want to transfer the ownership of the file `kde_quick`
`.xml` to an other user, named `wilber`. In this case, proceed as follows:

1 Enter the username and password for `root`.

2 Enter

```
chown wilber kde_quick.xml
```

3 Check what happened with

```
ls -l kde_quick.xml
```

You should get the following output:

```
-rw-r--r-- 1 wilber users  47896 2006-06-21 09:46 kde_quick.xml
```

4 If the ownership is set according to your wishes, switch back to your normal user account.

8.6 Useful Features of the Shell

As you probably noticed in the examples above, entering commands in Bash can include a lot of typing. In the following, get to know some features of the Bash that can make your work a lot easier and save a lot of typing.

History
> By default, Bash "remembers" commands you have entered. This feature is called *history*. You can browse through commands that have been entered before, select one you want to repeat and then execute it again. To do so, press ↑ repeatedly until the desired command appears at the prompt. To move forward through the list of previously entered commands, press ↓. For easier repetition of a certain command from Bash history, just type the first letter of the command you want to repeat and press Page ↑.
>
> You can now edit the selected command (for example, change the name of a file or a path), before you execute the command by pressing Enter. To edit the command line, just move the cursor to the desired position using the arrow keys and start typing.
>
> You can also search for a certain command in the history. Press Ctrl + R to start an incremental search function. showing the following prompt:
>
> ```
>  (reverse-i-search)`':
> ```
>
> Just type one or several letters from the command you are searching for. Each character you enter narrows down the search. The corresponding search result is shown on the right side of the colon whereas your input appears on the left of the colon. To accept a search result, press Esc. The prompt now changes to its normal appearance and shows the command you chose. You can now edit the command or directly execute it by pressing Enter.

Completion
> Completing a filename or directory name to its full length after typing its first letters is another helpful feature of Bash. To do so, type the first letters then press →|
> (Tabulator). If the filename or path can be uniquely identified, it is completed at once and the cursor moves to the end of the filename. You can then enter the next option of the command, if necessary. If the filename or path cannot be uniquely identified (because there are several filenames starting with the same letters), the filename or path is only completed up to the point where it is getting ambiguous

again. You can then obtain a list of them by pressing →| a second time. After this, you can enter the next letters of the file or path then try completion again by pressing →|. When completing filenames and paths with the help of →|, you can simultaneously check whether the file or path you want to enter really exists (and you can be sure of getting the spelling right).

Wild Cards

You can replace one or more characters in a filename with a wild card for pathname expansion. Wild cards are characters that can stand for other characters. There are three different types of these in Bash:

Wild Card	Function
`?`	Matches exactly one arbitrary character
`*`	Matches any number of characters
`[set]`	Matches one of the characters from the group specified inside the square brackets, which is represented here by the string `set`.

8.6.1 Examples For Using History, Completion and Wildcards

The following examples illustrate how to make use of these convenient features of Bash.

If you already did the example your shell buffer should be filled with commands which you can retrieve using the history function.

1 Press ↑ repeatedly until `cd ~` appears.

2 Press Enter to execute the command and to switch to your home directory.

By default, your home directory contains two subdirectories starting with the same letter, `Documents` and `Desktop`.

3 Enter `cd D` and press →|.

Nothing happens since Bash cannot identify to which one of the subdirectories you want to change.

4 Press →| again to see the list of possible choices:

```
tux@knox:~> cd D Desktop/   Documents/ tux@knox:~> cd D
```

5 The prompt still shows your initial input. Type the next character of the subdirectory you want to go to and press →| again.

Bash now completes the path.

6 You can now execute the command with Enter.

Now suppose that your home directory contains a number of files with various file extensions. It also holds several versions of one file which you saved under different filenames `myfile1.txt`, `myfile2.txt` etc. You want to search for certain files according to their properties.

1 First, create some test files in your home directory:

1a Use the `touch` command you already know to create several (empty) files with different file extensions, for example `.pdf`, `.xml` and `.jpg`.

You can do this consecutively (do not forget to use the Bash history function) or with only one `touch` command: simply add several filenames separated by a blank.

1b Create at least two files that have the same file extension, for example `.html`.

1c To create several "versions" of one file, enter

```
touch myfile{1..5}.txt
```

This command creates five consecutively numbered files:

```
myfile1.txt,…,myfile5.txt
```

1d List the contents of your home directory. It should look similar to this:

```
-rw-r--r-- 1 tux users   0 2006-07-14 13:34 foo.xml
-rw-r--r-- 1 tux users   0 2006-07-14 13:47 home.html
```

```
-rw-r--r-- 1 tux users   0 2006-07-14 13:47 index.html
-rw-r--r-- 1 tux users   0 2006-07-14 13:47 toc.html
-rw-r--r-- 1 tux users   0 2006-07-14 13:34 manual.pdf
-rw-r--r-- 1 tux users   0 2006-07-14 13:49 myfile1.txt
-rw-r--r-- 1 tux users   0 2006-07-14 13:49 myfile2.txt
-rw-r--r-- 1 tux users   0 2006-07-14 13:49 myfile3.txt
-rw-r--r-- 1 tux users   0 2006-07-14 13:49 myfile4.txt
-rw-r--r-- 1 tux users   0 2006-07-14 13:49 myfile5.txt
-rw-r--r-- 1 tux users   0 2006-07-14 13:32 tux.png
```

2 With the help of wild cards, select certain subsets of the files according to various criteria:

2a To list all files with the `.html` extension, enter

```
 ls -l *.html
```

2b To list all "versions" of `myfile.txt`, enter

```
ls -l myfile?.txt
```

Note that you can only use the `?` wild card here because the numbering of the files is single-digit. As soon as you also had a file named `myfile10.txt` you would have to use the `*` wild card to view all versions of `myfile.txt` (or add another question mark, so your string looks like `myfile??.txt`).

2c To remove, for example, version 1-3 and version 5 of `myfile.txt`, enter

```
rm myfile[1-3,5].txt
```

2d Check the result with

```
ls -l
```

Of all `myfile.txt` versions only `myfile4.txt` should be left.

Of course, you can also combine several wild cards in one command. In the example above, `rm myfile[1-3,5].*` would lead to the same result as `rm myfile[1-3,5].txt` because there are only files with the extension `.txt` available.

NOTE: Using Wildcards in rm Commands

Wildcards in a `rm` command can be very useful but also dangerous: you might delete more files from your directory than intended. To see which files would be affected by the `rm`, run your wildcard string with `ls` instead of `rm` first.

8.7 Editing Texts

In order to edit files from the command line, you will get to know the vi editor sooner or later. vi is a default editor which can be found on nearly every UNIX/Linux system. It can run several operating modes in which the keys you press have different functions. This does not make it very easy for beginners, but you should know at least the most basic operations with vi. There may be situations where no other editor than vi is available.

Basically, vi makes use of three operating modes:

command mode
    In this mode, vi accepts certain key combinations as commands. Simple tasks such as searching words or deleting a line can be executed.

insert mode
    In this mode, you can write normal text.

extended mode
    This mode is also known as colon mode as you have to enter a colon to switch to this mode. In this mode, vi can execute also more complex tasks such as searching and replacing text.

In the following (very simple) example, you will learn how to open and edit a file with vi, how to save your changes and quit vi. For more information about vi and vim (an improved version of vi), refer to Section "The vi Editor" (Chapter 19, *Working with the Shell*, ↑Reference).

8.7.1 Example: Editing with vi

NOTE: Display of Keys

In the following, find several commands that you can enter in vi by just pressing keys. These appear in uppercase as on a keyboard. If you need to enter a key in uppercase, this is stated explicitly by showing a key combination including the Shift key.

1 To create and open a new file with vi, enter

```
vi textfile.txt
```

By default, vi opens in *command* mode in which you cannot enter text.

2 Press I to switch to insert mode. The bottom line changes and indicates that you now can insert text.

3 Write some sentences. If you want to insert a new line, first press Esc to switch back to command mode. Press O to insert a new line and to switch to insert mode again.

4 In the insert mode, you can edit the text with the arrow keys and with Del.

5 To leave vi, press Esc to switch to command mode again. Then press : which takes you to the extended mode. The bottom line now shows a colon.

6 To leave vi and save your changes, type wq (w for `write`; q for `quit`) and press Enter. If you want to save the file under a different name, type w *filename* and press Enter.

To leave vi without saving, type q! instead and press Enter.

8.8 Searching for Files or Contents

Bash offers you several commands to search for files and to search for contents of files:

`locate`

This utility is only available if you have installed the `findutils-locate` package. With this command you can find out in which directory a specified file is located. If desired, use wild cards to specify filenames. The program is very speedy, because it uses a database specifically created for the purpose (rather than searching through the entire file system). This very fact, however, also results in a major drawback: locate is unable to find any files created after the latest update of its database. The database can be generated by `root` running `updatedb`.

`find`

With `find`, search for a file in a given directory. The first argument specifies the directory in which to start the search. The option `-name` must be followed by a search string, which may also include wild cards. Unlike `locate`, which uses a database, `find` scans the actual directory.

`grep`

The `grep` command finds a specific search string in the specified text files. If the search string is found, the command displays the line in which `searchstring` was found along with the filename. If desired, use wild cards to specify filenames.

8.8.1 Examples for Searching

KDE and GNOME desktop store user-specific application data in hidden directories, for example `.kde` and `.gnome`.

1 To locate these directories on your computer, enter

```
locate .kde
```

if you have installed KDE desktop or

```
locate .gnome
```

if you have installed GNOME desktop.

You will see that `locate` displays all file names in the database that contain the string `.kde` or `.gnome` anywhere. To learn how to modify this behavior refer to the man page of `locate`.

2 To search your home directory for all occurrences of filenames that contain the file extension `.txt`, use

```
find ~ -name *.txt
```

3 To search a directory (in this case, your home directory) for all occurrences of files which contain, for example, the word `music`, enter

```
grep music ~*.*
```

Note that grep is case-sensitive— unless you use it with the `-i` option. With the command above you will not find any files containing `Music`.

If you want to use a search string which consists of more than one word, enclose the string in double quotation marks, for example:

```
grep "music is great" ~*.*
```

8.9 Viewing Text Files

When searching for the contents of a file with `grep` the output gives you the line in which the `searchstring` was found along with the filename. Often this contextual information is still not enough information to decide whether you want to open and edit this file. Bash offers you several commands to have a quick look at the contents of a text file directly in the shell, without opening an editor.

head
> With `head` you can view the first lines of a text file. If you do not specify the command any further, `head` shows the first 10 lines of a text file.

tail
> The `tail` command is the counterpart of `head`. If you use `tail` without any further options it displays the last 10 lines of a text file. This can be very useful to view log files of your system, where the most recent messages or log entries are usually found at the end of the file.

less
> With `less`, display the whole contents of a text file. To move up and down half a page use Page ↑ and Page ↓. Use Space to scroll down one page. Home takes you to the beginning, and End to the end of the document. To end the viewing mode, press Q.

more
> Instead of `less`, you can also use the older program `more`. It has basically the same function—however, it is less convenient because it does not allow you to scroll backwards. Use Space to move forward. When you reach the end of the document, the viewer closes automatically.

cat
> The `cat` command displays the contents of a file, printing the entire contents to the screen without interruption. As `cat` does not allow you to scroll it is not very useful as viewer but it is rather often used in combination with other commands.

8.10 Redirection and Pipes

Sometimes it would be useful if you could write the output of a command to a file for further editing or if you could combine several commands, using the output of one command as input for the next one. The shell offers this function by means of redirection or pipes.

Normally, the standard output in the shell is your screen (or an open shell window) and the standard input is the keyboard. With the help of certain symbols you can redirect the input or the output to another object, such as a file or another command.

Redirection
> With > you can forward the output of a command to a file (output redirection), with < you can use a file as input for a command (input redirection).

Pipe
> By means of a pipe symbol | you can also redirect the output: with a pipe, you can combine several commands, using the output of one command as input for the next command. In contrast to the other redirection symbols > and <, the use of the pipe is not constrained to files.

8.10.1 Examples for Redirection and Pipe

1 To write the output of a command like `ls` to a file, enter

```
ls -l > filelist.txt
```

This creates a file named `filelist.txt` that contains the list of contents of your current directory as generated by the `ls` command.

However, if a file named `filelist.txt` already exists, this command overwrites the existing file. To prevent this, use `>>` instead of `>`. Entering

```
ls -l >> filelist.txt
```

simply appends the output of the `ls` command to an already existing file named `filelist.txt`. If the file does not exist, it is created.

2 If a command generates a lengthy output, like `ls -l` may do, it often may be useful to pipe the output to a viewer like `less` to be able to scroll through the pages. To do so, enter

```
ls -l | less
```

The list of contents of the current directory is shown in `less`.

The pipe is also often used in combination with the `grep` command in order to search for a certain string in the output of another command. For example, if you want to view a list of files in a directory which are owned by a certain user, `tux`, enter

```
ls -l | grep tux
```

8.11 Handling Processes

As you have seen in , programs can be started from the shell. Applications with a graphical user interface need the X Window System and can only be started from a terminal window within a graphical user interface. To open a file named `vacation.pdf` in your home directory from a terminal window in KDE or GNOME, simply run `xpdf ~/vacation.pdf` to start a PDF viewer displaying your file.

When looking at the terminal window again you will realize that the command line is blocked as long as the PDF viewer is open, meaning that your prompt is not available. To change this, press Ctrl + Z to suspend the process and enter `bg` to send the process to the background. Now you can still have a look at `vacation.pdf` while your prompt is available for further commands. An easier way to achieve this is by sending a process to the background directly when starting it. To do so, add an ampersand at the end of the command:

```
xpdf ~/vacation.pdf &
```

If you have started several background processes (also named jobs) from the same shell, the `jobs` command gives you an overview of the jobs (including the job number and their status):

```
tux@linux:~> jobs
[1]   Running         kpdf book.opensuse.startup-xep.pdf &
[2]-  Running         kpdf book.opensuse.reference-xep.pdf &
[3]+  Stopped         man jobs
```

To bring a job to the foreground again, enter `fg` *job number*.

Whereas `job` only shows the background processes started from a specific shell, the `ps` command (run without options) shows a list of all your processes—those you started. Find an example output below:

```
tux@linux:~> ps
PID TTY          TIME CMD
15500 pts/1   00:00:00 bash
28214 pts/1   00:00:00 xpdf
30187 pts/1   00:00:00 kate
30280 pts/1   00:00:00 ps
```

In case a program cannot be terminated in the normal way, use the `kill` command to stop the process (or processes) belonging to that program. To do so, specify the process ID (PID) shown by the output of `ps`. For example, to shut down the Kate editor in the example above, enter

```
kill 30187
```

This sends a *TERM* signal that instructs the program to shut itself down.

Alternatively, if the program or process you want to terminate is a background job and is shown by the `jobs` command, you can also use the `kill` command in combination with the job number to terminate this process:

```
kill % job number
```

If `kill` does not help—as is sometimes the case for "runaway" programs—try

```
kill -9 PID
```

This sends a *KILL* signal instead of a *TERM* signal, bringing the specified process to an end in most cases.

This section only aimed to introduce the most basic set of commands for handling jobs and processes. Find an overview for system administrators in Section "Processes" (Chapter 10, *System Monitoring Utilities*, ↑Reference).

Part III. Mobility

Mobile Computing with Linux

9

Mobile computing is mostly associated with laptops, PDAs, and cellular phones and the data exchange between them. Mobile hardware components, such as external hard disks, flash drives, or digital cameras, can be connected to laptops or desktop systems. A number of software components are involved in mobile computing scenarios and some applications are tailor-made for mobile use.

9.1 Laptops

The hardware of laptops differs from that of a normal desktop system. This is because criteria like exchangeability, occupied space, and power consumption are relevant properties. The manufacturers of mobile hardware have developed the PCMCIA (Personal Computer Memory Card International Association) standard. This standard covers memory cards, network interface cards, ISDN and modem cards, and external hard disks.

TIP: openSUSE and Tablet PCs

openSUSE also supports Tablet PCs. Tablet PCs come with a touchpad/digitizer that allows you to use a digital pen or even fingertips to edit data right on the screen instead of using mouse and keyboard. They are installed and configured much like any other system. For a detailed introduction to the installation and configuration of Tablet PCs, refer to Chapter 34, *Using Tablet PCs* (↑Reference).

9.1.1 Power Conservation

The inclusion of energy-optimized system components when manufacturing laptops contributes to their suitability for use without access to the electrical power grid. Their contribution towards conservation of power is at least as important as that of the operating system. openSUSE® supports various methods that influence the power consumption of a laptop and have varying effects on the operating time under battery power. The following list is in descending order of contribution towards power conservation:

- Throttling the CPU speed

- Switching off the display illumination during pauses

- Manually adjusting the display illumination

- Disconnecting unused, hotplug-enabled accessories (USB CD-ROM, external mouse, unused PCMCIA cards, etc.)

- Spinning down the hard disk when idling

Detailed background information about power management in openSUSE is provided in Chapter 32, *Power Management* (↑Reference). For more information on how to use the KDE power management applet, refer to Section "Controlling Your Desktop's Power Management with KPowersave" (Chapter 1, *Getting Started with the KDE Desktop*, ↑KDE User Guide).

9.1.2 Integration in Changing Operating Environments

Your system needs to adapt to changing operating environments when used for mobile computing. A lot of services depend on the environment and the underlying clients must be reconfigured. openSUSE handles this task for you.

Figure 9.1   *Integrating a Mobile Computer in an Existing Environment*
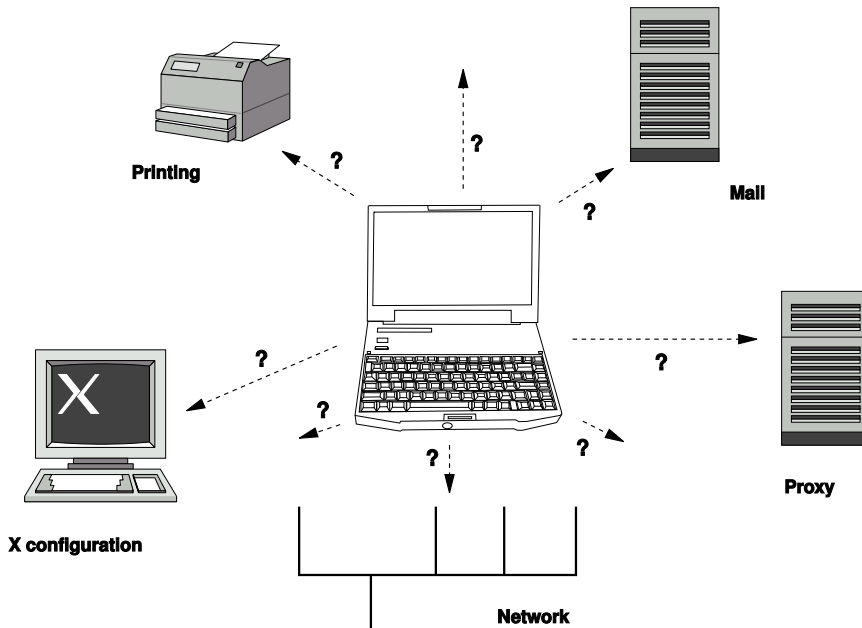
The services affected in the case of a laptop commuting back and forth between a small home network and an office network are:

Network
: This includes IP address assignment, name resolution, Internet connectivity, and connectivity to other networks.

Printing
: A current database of available printers and an available print server must be present, depending on the network.

E-Mail and Proxies
>   As with printing, the list of the corresponding servers must be current.

X (Graphical Environment)
>   If your laptop is temporarily connected to a beamer or an external monitor, the different display configurations must be available.

openSUSE offers several ways of integrating a laptop into existing operating environments:

NetworkManager
>   NetworkManager is especially tailored for mobile networking on laptops. It provides a means to easily and automatically switch between network environments or different types of networks, such as wireless LAN and ethernet. NetworkManager supports WEP and WPA-PSK encryption in wireless LANs. It also supports dial-up connections (with smpppd). Both desktop environments (GNOME and KDE) include a front-end to NetworkManager. For more information about the desktop applets, see Chapter 4, *Accessing the Internet* (page 61) and *GNOME User Guide*.

Table 9.1   *Use Cases for NetworkManager*

My computer…	Use NetworkManager
is a laptop	Yes
is sometimes attached to different networks	Yes
provides network services (such as DNS or DHCP)	No
only uses a static IP address	No

Use the YaST tools to configure networking whenever NetworkManager should not handle network configuration.

SCPM
>   SCPM (system configuration profile management) allows storage of arbitrary configuration states of a system into a kind of "snapshot" called a *profile*. Profiles can be created for different situations. They are useful when a system is operated in changing environments (home network, office network). It is always possible to switch between profiles. To get SCPM up and running on your system, add the

Profile Chooser KDE applet to your panel, enable SCPM using the YaST Profile Management module, and configure the users that should be allowed to switch profiles without the need of entering the `root` password. Determine whether profile changes should survive a system reboot or whether they should be discarded upon shutdown. Make sure all resource groups (i.e. services like network and printer, for example) are active. Proceed to creating actual profiles using the SUMF (SCPM Unified Management Front-End) tool which is started via Profile Chooser. Create profiles for all the different setups you want to use this system in. Switching between profiles can either be done in the running system via the Profile Chooser applet or at system boot time via the `F3` key. When switching profiles, SCPM automatically adjusts your system configuration to the new environment laid out in the profile you have chosen.

SLP
The service location protocol (SLP) simplifies the connection of a laptop to an existing network. Without SLP, the administrator of a laptop usually requires detailed knowledge of the services available in a network. SLP broadcasts the availability of a certain type of service to all clients in a local network. Applications that support SLP can process the information dispatched by SLP and be configured automatically. SLP can even be used for the installation of a system, sparing the effort of searching for a suitable installation source. Find detailed information about SLP in Chapter 21, *SLP Services in the Network* (↑Reference).

9.1.3 Software Options

There are various special task areas in mobile use that are covered by dedicated software: system monitoring (especially the battery charge), data synchronization, and wireless communication with peripherals and the Internet. The following sections cover the most important applications that openSUSE provides for each task.

System Monitoring

Two KDE system monitoring tools are provided by openSUSE:

KPowersave
KPowersave is an applet that displays the state of the rechargeable battery in the control panel. The icon adjusts to represent the type of power supply. When working on AC power, a small plug icon is displayed. When working on batteries, the icon changes to a battery. The corresponding menu opens the YaST module

for power management after requesting the `root` password. This allows setting the behavior of the system for different power sources. Find information about power management and about the corresponding YaST module in Chapter 32, *Power Management* (↑Reference).

KSysguard

KSysguard is an independent application that gathers all measurable parameters of the system into one monitoring environment. KSysguard has monitors for ACPI (battery status), CPU load, network, partitioning, and memory usage. It can also watch and display all system processes. The presentation and filtering of the collected data can be customized. It is possible to monitor different system parameters in various data pages or collect the data of various machines in parallel over the network. KSysguard can also run as a daemon on machines without a KDE environment. Find more information about this program in its integrated help function or in the SUSE help pages.

In the GNOME desktop, use GNOME Power Manager and System Monitor.

Synchronizing Data

When switching between working on a mobile machine disconnected from the network and working at a networked workstation in an office, it is necessary to keep processed data synchronized across all instances. This could include e-mail folders, directories, and individual files that need to be present for work on the road as well as at the office. The solution in both cases is as follows:

Synchronizing E-Mail

Use an IMAP account for storing your e-mails in the office network. Then access the e-mails from the workstation using any disconnected IMAP–enabled e-mail client, like Mozilla Thunderbird Mail, Evolution, or KMail as described in *GNOME User Guide* and *KDE User Guide*. The e-mail client must be configured so that the same folder is always accessed for `Sent messages`. This ensures that all messages are available along with their status information after the synchronization process has completed. Use an SMTP server implemented in the mail client for sending messages instead of the systemwide MTA postfix or sendmail to receive reliable feedback about unsent mail.

Synchronizing Files and Directories

There are several utilities suitable for synchronizing data between a laptop and a workstation. For detailed information, refer to Chapter 11, *Copying and Sharing Files* (page 151).

Wireless Communication

As well as connecting to a home or office network with a cable, a laptop can also wirelessly connect to other computers, peripherals, cellular phones, or PDAs. Linux supports three types of wireless communication:

WLAN

With the largest range of these wireless technologies, WLAN is the only one suitable for the operation of large and sometimes even spatially disjointed networks. Single machines can connect with each other to form an independent wireless network or access the Internet. Devices called *access points* act as base stations for WLAN-enabled devices and act as intermediaries for access to the Internet. A mobile user can switch among access points depending on location and which access point is offering the best connection. Like in cellular telephony, a large network is available to WLAN users without binding them to a specific location for accessing it. Find details about WLAN in Section "Wireless LAN" (Chapter 33, *Wireless Communication*, ↑Reference).

Bluetooth

Bluetooth has the broadest application spectrum of all wireless technologies. It can be used for communication between computers (laptops) and PDAs or cellular phones, as can IrDA. It can also be used to connect various computers within visible range. Bluetooth is also used to connect wireless system components, like a keyboard or mouse. The range of this technology is, however, not sufficient to connect remote systems to a network. WLAN is the technology of choice for communicating through physical obstacles like walls. Find more information about Bluetooth, its applications, and configuration in Section "Bluetooth" (Chapter 33, *Wireless Communication*, ↑Reference).

IrDA

IrDA is the wireless technology with the shortest range. Both communication parties must be within viewing distance of each other. Obstacles like walls cannot be overcome. One possible application of IrDA is the transmission of a file from a laptop to a cellular phone. The short path from the laptop to the cellular phone is then covered using IrDA. The long range transport of the file to the recipient of

the file is handled by the mobile network. Another application of IrDA is the wireless transmission of printing jobs in the office. Find more information about IrDA in Section "Infrared Data Transmission" (Chapter 33, *Wireless Communication*, ↑Reference).

9.1.4 Data Security

Ideally, you protect data on your laptop against unauthorized access in multiple ways. Possible security measures can be taken in the following areas:

Protection against Theft
> Always physically secure your system against theft whenever possible. Various securing tools, like chains, are available in retail stores.

Strong Authentication
> Use biometric authentication in addition to standard authentication via login and password. openSUSE supports fingerprint authentication. Refer to `http://en.opensuse.org/Using_Fingerprint_Authentication` for more details.

Securing Data on the System
> Important data should not only be encrypted during transmission, but also on the hard disk. This ensures its safety in case of theft. The creation of an encrypted partition with openSUSE is described in Chapter 40, *Encrypting Partitions and Files* (↑Reference).

IMPORTANT: Data Security and Suspend to Disk

Encrypted partitions are not unmounted during a suspend to disk event. Thus, all data on these partitions is available to any party who manages to steal the hardware and issue a resume of the hard disk.

Network Security
> Any transfer of data should be secured, no matter how it takes place. Find general security issues regarding Linux and networks in Chapter 42, *Security and Confidentiality* (↑Reference). Security measures related to wireless networking are provided in Chapter 33, *Wireless Communication* (↑Reference).

9.2 Mobile Hardware

openSUSE supports the automatic detection of mobile storage devices over FireWire (IEEE 1394) or USB. The term *mobile storage device* applies to any kind of FireWire or USB hard disk, USB flash drive, or digital camera. These devices are automatically detected and configured as soon as they are connected with the system over the corresponding interface. The file managers of both GNOME and KDE offer flexible handling of mobile hardware items. To unmount any of these media safely, use the *Safely Remove* (KDE) or *Unmount Volume* (GNOME) feature of either file manager. The handling of removable media by your desktop is described in more detail in the *GNOME User Guide* and *KDE User Guide*.

External Hard Disks (USB and FireWire)
> As soon as an external hard disk has been correctly recognized by the system, its icon appears in the file manager. Clicking the icon displays the contents of the drive. It is possible to create folders and files here and edit or delete them. To rename a hard disk from the name it had been given by the system, select the corresponding menu item from the menu that opens when the icon is right-clicked. This name change is limited to display in the file manager. The descriptor by which the device is mounted in /media remains unaffected by this.

USB Flash Drives
> These devices are handled by the system just like external hard disks. It is similarly possible to rename the entries in the file manager.

Digital Cameras (USB and FireWire)
> Digital cameras recognized by the system also appear as external drives in the overview of the file manager. KDE allows reading and accessing the pictures at the URL camera:/ as described in Section "Accessing Digital Cameras with Konqueror" (Chapter 1, *Getting Started with the KDE Desktop*, ↑KDE User Guide). The images can then be processed using digiKam or f-spot. For advanced photo processing use The GIMP. For a short introduction to digiKam and The GIMP, see Chapter 17, *Managing Your Digital Image Collection* (↑KDE User Guide) and Chapter 16, *Manipulating Graphics with The GIMP* (↑KDE User Guide). Find more information about f-spot in *GNOME User Guide*.

9.3 Cellular Phones and PDAs

A desktop system or a laptop can communicate with a cellular phone via Bluetooth or IrDA. Some models support both protocols and some only one of the two. The usage areas for the two protocols and the corresponding extended documentation has already been mentioned in Section "Wireless Communication" (page 133). The configuration of these protocols on the cellular phones themselves is described in their manuals. The configuration of the Linux side is described in Section "Bluetooth" (Chapter 33, *Wireless Communication*, ↑Reference) and Section "Infrared Data Transmission" (Chapter 33, *Wireless Communication*, ↑Reference).

The support for synchronizing with handheld devices manufactured by Palm, Inc., is already built into Evolution and Kontact. Initial connection with the device is, in both cases, easily performed with the assistance of a wizard. Once the support for Palm Pilots is configured, it is necessary to determine which type of data should be synchronized (addresses, appointments, etc.). For more information, see *KDE User Guide* and *GNOME User Guide*.

9.4 For More Information

The central point of reference for all questions regarding mobile devices and Linux is `http://tuxmobil.org/`. Various sections of that Web site deal with the hardware and software aspects of laptops, PDAs, cellular phones, and other mobile hardware.

A similar approach to that of `http://tuxmobil.org/` is made by `http://www.linux-on-laptops.com/`. Information about laptops and handhelds can be found here.

SUSE maintains a mailing list in German dedicated to the subject of laptops. See `http://lists.opensuse.org/opensuse-mobile-de/`. On this list, users and developers discuss all aspects of mobile computing with openSUSE. Postings in English are answered, but the majority of the archived information is only available in German. Use `http://lists.opensuse.org/opensuse-mobile/` for English postings.

Managing Network Connections with NetworkManager

10

NetworkManager is the ideal solution for a mobile workstation. With NetworkManager, you do not need to worry about configuring network interfaces and switching between wired or wireless networks when you are moving. NetworkManager can automatically connect to known wireless networks. If you have two or more connection possibilities, it can connect to the faster one. You can also switch between available networks manually and manage your network connection using an applet in the system tray.

10.1 Use Cases for NetworkManager

NetworkManager provides a sophisticated and intuitive user interface which enables users easily to switch their network environment. However, NetworkManager is not a suitable solution in the following cases:

- You want to use more than one provider for dial-up for one interface.

- Your computer is a router for your network.

- Your computer provides network services for other computers in your network, for example, it is a DHCP or DNS server.

- Your computer is a Xen server or your system is a virtual system inside Xen.

- You want to use SCPM for network configuration management. To use SCPM and NetworkManager at the same time, disable the network resource in SCPM configuration.

- You want to use more than one active network connection simultaneously.

10.2 Activating Use of NetworkManager

If you want to manage your network connection with NetworkManager, enable NetworkManager in the YaST Network Card module. If you switch your system from the traditional configuration with YaST to NetworkManager, NetworkManager adopts the configurations from YaST. To enable NetworkManager, proceed as follows:

1 Run YaST and go to *Network Devices > Network Card*.

2 The *Network Settings* dialog opens. Go to the *Global Options* tab.

3 In the *Network Setup Method* field, activate *User Controlled with NetworkManager*.

4 Click *Finish*.

If you want to deactivate NetworkManager and control network the traditional way, choose the *Traditional Method with ifup* option in the *Network Setup Method* field.

10.3 Using KNetworkManager

In KDE, the NetworkManager can be controlled with the KNetworkManager applet. The KNetworkManager applet should start automatically with the desktop environment an is shown as an icon in the system tray.

When it is running, an icon indicating the current network status is shown in the system tray. Hold the mouse cursor over it, to see details about the connection. Depending on the state of the network connection, the panel icon changes appearance:

A wired connection has been established.

Currently there is no connection to the Internet.

A wireless connection has been established. Blue bars show the strength of the signal. More blue bars means better signal strength.

A connection is being established or terminated.

If KNetworkManager is not running, start it with the command `knetworkmanager`.

Using the applet, choose a network to use explicitly at any time. Such a choice takes priority over automatically selected networks. The chosen network is used as long as it is available, meaning that plugging a network cable in does not switch to a wired network connection automatically.

Right-clicking the icon opens the KNetworkManager menu with various options for managing network connections. See Figure 10.1, "Available Networks in the KNetwork-Manager Applet" (page 140). The menu contains available network connections for both wired and wireless devices. The currently used connection is checked in the menu.

Figure 10.1   *Available Networks in the KNetworkManager Applet*

Left-clicking the KNetworkManager icon opens a tabbed *Connection Status* window with information about the currently used network device, the interface name and IP and hardware (MAC) addresses. Besides, network statistics including the transferred data, dropped packets and the transfer rate in KB/s.

10.3.1 Wired Networks

Available wired networks are listed in the KNetworkManager menu under *Wired Devices*. Hover the mouse pointer over a network in the list to get information about the used interface name, IP and hardware address, subnet mask, bandwidth and other data about the network. To activate a network click on it. The active network is checked.

10.3.2 Wireless Networks

Available visible wireless networks are listed in the KNetworkManager menu under *Wireless Networks*. The signal strength of each network is indicated by a blue bar. Encrypted wireless networks are marked with a lock icon. To connect to a wireless network, choose it from the menu. If the chosen network is encrypted, choose the type of *Encryp-*

tion the network uses and enter the appropriate *Passphrase* or *Key* in the dialog that opens.

TIP: Hidden Networks

To connect to a network that does not broadcast its service you have to set the identifier (ESSID) because it cannot be detected automatically. Choose *Connect to Other Wireless Network*. In the dialog that opens, enter the ESSID and set encryption parameters, if necessary.

To see a list of all known wireless networks, click *Options > Configure > Wireless Networks*. The networks are divided to two groups: *fallback* and *no-fallback*. Network-Manager will try to connect to networks in the fallback group even if they are not detected by the network card. This is useful for automatic connection to hidden networks.

10.3.3 Dial-Up Connections

To access dial-up connections, choose *Dial-Up Connections*. If one or more dial-up connections were already defined, they are shown in the menu. Start the connection by clicking the connection to use.

To configure dial-up connections, right click the KNetworkManager icon and choose *Options > Configure > Dial-Up Connections*. Then click *Configure Dial-Up Connections* to open a configuration dialog, where you can define a new dial-up connection.

10.3.4 Using NetworkManager with VPN

NetworkManager supports several VPN technologies. To use them, first install Network-Manager support for your VPN technology. You can choose between:

- NovellVPN

- OpenVPN

- vpnc (Cisco)

VPN support is included in the packages `NetworkManager-novellvpn`, `NetworkManager-openvpn`, and `NetworkManager-vpnc`. If you are using KNetworkManager you need the KNetworkManager specific packages

`NetworkManager-novellvpn-kde`, `NetworkManager-openvpn-kde`, and `NetworkManager-vpnc-kde` as well.

To configure a new VPN connection with KNetworkManager, left-click the KNetwork-Manager applet and follow these steps:

1 Choose *Options* > *Configure* > *VPN Connections*.

2 Press *Add* to start a configuration wizard.

3 Name your configuration in *Name*.

4 Choose the type of VPN connection to create in *Service*.

5 Insert all required information for your type of connection. For example, for an OpenVPN connection enter *Gateway* and choose the way to authenticate from *Connection type*. Complete the other required options depending on the connection chosen.

6 Press *OK*.

After the VPN is configured, you can select it from *VPN Connections*. To close a VPN connection, click *Disconnect VPN*.

10.3.5 NetworkManager and Security

NetworkManager distinguishes two types of wireless connections, trusted and untrusted. A trusted connection is any network that you explicitly selected in the past. All others are untrusted. Trusted connections are identified by the name and MAC address of the access point. Using the MAC address ensures that you cannot use a different access point with the name of your trusted connection.

NetworkManager scans for available wireless networks, if no wired connection is available. If multiple trusted networks are found, the most recently used is automatically selected. NetworkManager waits for your selection in case that all networks are untrusted.

If the encryption setting changes but the name and MAC address remain the same, NetworkManager attempts to connect, but first you are asked to confirm the new encryption settings and provide any updates, such as a new key.

In a system with a wireless connection only, NetworkManager does not automatically start the connection during boot. You must log in first to establish a connection. To make a wireless connection accessible without login, configure the trusted connection with YaST. Only wireless connections configured with YaST are sufficiently credible for NetworkManager to use them during boot.

If you switch to offline mode from using a wireless connection, NetworkManager blanks the ESSID. This ensures that the card is disconnected.

10.3.6 Switching Off the Network in KDE

If you are on an airplane or in any other environment where wireless networking is not allowed, you can switch it off easily using the KNetworkManager applet.

To switch off wireless networking in the KDE desktop, right-click the KNetworkManager applet then select *Options > Disable Wireless*, to switch it on again select *Options > Enable Wireless* respectively.

To switch off all networking in the KDE desktop, right-click the KNetworkManager applet then select *Options > Switch to Offline Mode*, to switch it on again select *Options > Switch to Online Mode*.

10.4 The GNOME NetworkManager Applet

In GNOME, the NetworkManager can be controlled with the GNOME NetworkManager applet. The GNOME NetworkManager applet should start automatically with the desktop environment and is then shown as an icon in the system tray. The appearance of the icon depends on the state of the network connection. Hold the mouse cursor over it until an explanation appears. Using the applet, choose a network to use explicitly at any time. Such a choice takes priority over automatically selected networks. The chosen network is used as long as it is available, meaning that plugging a network cable in does not switch to a wired network connection automatically.

If the GNOME NetworkManager applet does not start automatically, start it with the command `nm-applet`.

Left-click the applet icon to show a menu with available wired and wireless networks, shown in Figure 10.2, "Available Networks in GNOME NetworkManager Applet" (page 144). The currently used connection is checked in the menu. To connect to a network, choose it from the list. To disable networking, right-click the applet icon and uncheck *Enable Networking*.

Figure 10.2   *Available Networks in GNOME NetworkManager Applet*
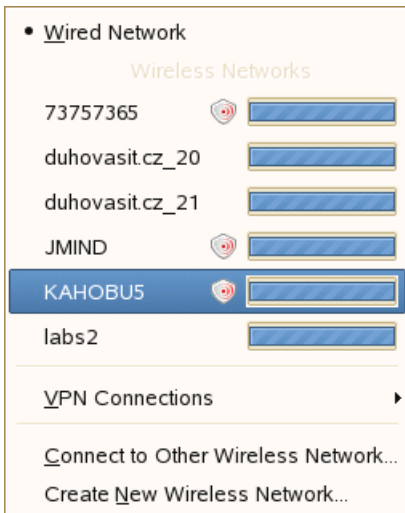
To get information about the current connection (including the used interface, IP address, and hardware address), right-click the applet icon and choose *Connection information* from the menu. In this dialog, you can also configure your network devices. To do so, click *Configure Networking*. It opens YaST where you can define a new connection. See Section "Configuring a Network Connection with YaST" (Chapter 20, *Basic Networking*, ↑Reference) for more information.

10.4.1 Wireless Networks

Available visible wireless networks are listed in the GNOME NetworkManager applet menu under *Wireless Networks*. The signal strength of each network is also shown in the menu. Encrypted wireless networks are marked with a shield icon. To connect to a wireless network, choose it from the menu. If the network is encrypted, choose the type of *Encryption* the network uses and enter the appropriate *Passphrase* or *Key* in the dilaog that opens.

TIP: Hidden Networks

To connect to a network that does not broadcast its service and therefore cannot be detected automatically, set the identifier (ESSID). Left-click the icon and choose *Connect to Other Wireless Network*. In the dialog that opens, enter the *Network Name* (ESSID) and set encryption parameters, if necessary. If you check *Fallback on this Network*, NetworkManager will try to access a network with this ESSID in situations where no trusted network is accessible.

If your wireless card supports access point mode, you can use NetworkManager for the configuration. To configure your wireless card as an access point, click *Create New Wireless Network*. See Figure 10.3, "Access Point Configuration" (page 146). Add the network name and set the encryption in the *Wireless Security*.

IMPORTANT: Wireless Security

If you set *Wireless Security* to `None`, everybody can connect to your network, reuse your connectivity and intercept your network connection. To restrict access to your access point and to secure your connection, use encryption. You can choose between various WEP and WPA–based encryptions. If you are not sure which technology is best for you, read Section "Authentication" (Chapter 33, *Wireless Communication*, ↑Reference).

Figure 10.3 *Access Point Configuration*

To disable wireless networking, right-click the applet icon and uncheck *Enable Wireless*.

10.4.2 Dial-Up Connections

To control dial-up connections with the GNOME NetworkManager applet, you have to configure them in YaST first. The dial-up connections will then be available in the GNOME NetworkManager applet menu. Support for direct configuration of dial-up connections in NetworkManager is planned for future versions. For the latest informations read the files in `/usr/share/doc/packages/NetworkManager`.

10.4.3 VPN Connections

NetworkManager supports several VPN technologies. To use them, first install Network-Manager support for your VPN technology. You can choose between:

- NovellVPN

- OpenVPN

- vpnc (Cisco)

VPN support is included in the packages `NetworkManager-novellvpn`, `NetworkManager-openvpn`, and `NetworkManager-vpnc`. If you are using the GNOME NetworkManager applet you also need the GNOME specific packages

`NetworkManager-novellvpn-gnome`, `NetworkManager-openvpn-gnome`, and `NetworkManager-vpnc-gnome`.

To configure a new VPN connection with the GNOME NetworkManager applet, left-click the GNOME NetworkManager applet icon and follow these steps:

1 Choose *VPN Connections > Configure VPN*.

2 In the dialog that opens, press *Add* to start a configuration wizard.

3 Choose the type of VPN connection to create in *Connection to*.

4 Name your configuration in *Connection Name*. This name will be used for identifying the connection to the private network.

5 Choose the type of VPN connection to create in *Service*.

6 Insert all *Required Information* for your type of connection. For example, for an OpenVPN connection enter *Gateway* and choose the way to authenticate in *Connection type*. Complete the other required options depending on the connection chosen.

7 Press *Forward*.

10.4.4 Switching Off the Network in GNOME

If you are on an airplane or in any other environment where wireless networking is not allowed, you can switch it off easily using the GNOME NetworkManager applet. You can also switch off all network connections, both wired and wireless.

To switch off wireless networking in the GNOME desktop, right-click the GNOME NetworkManager applet and uncheck *Enable Wireless*. To switch wireless networking on again check that option again.

To switch off all networking in the GNOME desktop, right-click the GNOME Network-Manager applet and uncheck *Enable Networking* To switch all networking on again check that option again.

10.5 Troubleshooting

Connection problems can occur. Some common problems related to NetworkManager include the applet not starting, a missing VPN option, and issues with SCPM. Methods for resolving and preventing these problems depend on the tool used.

10.5.1 NetworkManager Desktop Applet Does Not Start

NetworkManager applet should start automatically if the network is set up for Network-Manager control. If the applet does not start, first make sure that the appropriate package for your desktop environment is installed. If you are using KDE, the package is `NetworkManager-kde`. For GNOME the package is `NetworkManager-gnome`.

If the desktop applet is installed but is not running for some reason (perhaps you quit it accidentally), start it manually. To start the KNetworkManager applet manually, run `knetworkmanager` from a command prompt. To start the GNOME NetworkManager applet manually, run `nm-applet` from a command prompt.

10.5.2 NetworkManager Applet Does Not Include the VPN Option

Support for NetworkManager, applets, and VPN for NetworkManager is distributed in seperate packages. If your NetworkManager applet does not include the VPN option, check if the package with NetworkManager support for your VPN technology is installed. You need two packages for each VPN technology, generic support for NetworkManager and a specific package for your applet (KNetworkManager or GNOME NetworkManager applet):

VPN support is included in following packages:

- NovellVPN—package `NetworkManager-novellvpn`

- OpenVPN—package `NetworkManager-openvpn`

- vpnc (Cisco)—package `NetworkManager-vpnc`

Aditionally, you need these packages if you are using KDE and KNetworkManager applet:

- NovellVPN support for KNetworkManager—package
  `NetworkManager-novellvpn-kde`

- OpenVPN support for KNetworkManager—package
  `NetworkManager-openvpn-kde`

- vpnc (Cisco) support for KNetworkManager—package
  `NetworkManager-vpnc-kde`

If you are using GNOME and GNOME NetworkManager applet you need these packages:

- NovellVPN support for GNOME NetworkManager applet—package
  `NetworkManager-novellvpn-gnome`

- OpenVPN support for GNOME NetworkManager applet—package
  `NetworkManager-openvpn-gnome`

- vpnc (Cisco) support for GNOME NetworkManager applet—package
  `NetworkManager-vpnc-gnome`

10.5.3 SCPM Does Not Switch the Network Configuration

You are probably using SCPM together with NetworkManager. NetworkManager is not currently able to work with SCPM profiles. Do not use NetworkManager together with SCPM when SCPM profiles also change network settings. To use SCPM and NetworkManager at the same time, disable the network resource in SCPM configuration.

10.6 For More Information

More information about NetworkManager and D-BUS can be found on the following Web sites and directories:

- http://www.gnome.org/projects/NetworkManager/—NetworkManager project page

- http://en.opensuse.org/Projects/KNetworkManager—KNetworkManager on opensuse.org

- /usr/share/doc/packages/NetworkManager contains latest information about NetworkManager.

Copying and Sharing Files

11

If using multiple operating systems (OS) simultaneously, it is often necessary to exchange files among them. Different systems may reside on different partitions on the same machine or on different machines across your network. There are various approaches to file exchange with different basic instructions and possible pitfalls.

WARNING: Scenarios for Private Home Networks Only

Do not use the following scenarios in networks other than your own private and trusted home network that is protected by a firewall. Implementing high security measures for the configurations featured in the following sections is beyond the scope of this document.

Exchanging data may encompass either one of the following tasks:

Copying
> To copy your data means to transfer your data from one system to the other. This results in identical objects on both the source and the target system.
>
> Synchronizing data is a special way to copy data. If you change a file on one computer, it is automatically changed on the other computer after the synchronization. For example, think of a laptop that contains your modified files and you want to have the same contents on your desktop computer.

Sharing
> Sharing your files means establishing a client/server relationship. The server provides files that can be accessed by the client. When changing a file, you modify it

on the server, not locally on the client. File servers typically serve a large number of clients simultaneously.

11.1 Scenarios

The following list provides a number of possible scenarios involving file transfer:

Different OS on the Same Computer
Many users have an operating system preinstalled by their vendor and run Linux in a separate partition. Refer to Section 11.3, "Accessing Files on Different OS on the Same Computer" (page 154) for more information.

Different Computers Not Connected by a Network
Save the data to any media (CD, DVD, USB flash drive, or external hard disk) and connect these to the target machine to copy your files. This solution is inexpensive, intuitive, and straightforward. However, you need the appropriate drives or ports on both computers. Media are suited to occasional file transfers with limited file size. If you need a more permanent solution, consider connecting them with a network.

Different Computers Connected to the Same Network
Set up a server of any kind on one computer, connect the server and the client, and transfer the files from server to client. Choose from various protocols available and pick the one that best matches your needs and expertise.

The client/server setup requires more expertise and maintenance efforts, but is better suited to routine transfer needs and exchange with multiple systems. If you are looking for a permanent file exchange, choose a client/server-based method. This method does not impose any limits on the amount of data that can be transferred. See Section 11.2, "Access Methods" (page 153).

Different Computers on Different Networks
This scenario requires connection of different networks and is beyond the scope of this document. Transfer files as if the computers were not connected to a network.

11.2 Access Methods

The following methods and protocols are well-suited to file transfer and sharing.

FTP
> Use FTP (File Transfer Protocol) if you need to exchange files very often and with different users. Set up an FTP server on one system and access it with clients. There are many graphical client applications available for FTP on Windows*, MacOS, and Linux. Depending on how your FTP server is used, enable read and write permissions. See Section 11.4.4, "Copying Files with FTP" (page 161) for more details on FTP.

NFS
> NFS (Network File System) is a client/server system. A server exports one or more directories that can be imported by a client. For more information, see Chapter 28, *Sharing File Systems with NFS* (↑Reference).
>
> Use NFS if you share files very often and for different users. Generally, this protocol is more common in the Linux world than in the Windows world. An NFS export integrates well into your Linux system and you can browse the imported directory structure like any other folder on your local machine. Depending on how you configure it, enable write and read permissions or both on the server. In general, for a home user it makes sense to allow read and write access.

rsync
> Use rsync to transfer regularly large volumes of data that does not change considerably. It is available on Linux and Windows. A typical use case for rsync is managing data backups. Refer to the manual page of the `rsync` command and Section 11.4.2, "Transferring Files with rsync" (page 157) for more information.

Unison
> Unison is an alternative to rsync. It is used to regularly synchronize files between different computers but has the advantage to behave bidirectionally. Refer to the manual page of the Unison command and Section 11.4.3, "Transferring Files with Unison" (page 159) for more information. Unison is available on Linux and Windows.

SMB

Samba is a client/server system and an implementation of the SMB protocol. It is usually used in Windows networks, but is supported by several operating systems. Refer to Chapter 29, *Samba* (↑Reference) for more information about Samba.

Use Samba if you need to share files very often and with different users, especially to Windows systems. Samba as a Linux-only solution is uncommon, use NFS instead. For more information about setting up a Samba server, refer to Section 11.7, "Sharing Files between Linux and Windows with Samba" (page 167).

SSH

SSH (Secure Shell) enables a secure connection between computer. The SSH suite consists of several commands and uses public key encryption to authenticate users. For more information, see Chapter 36, *SSH—Secure Network Operations* (↑Reference).

Use SSH if you copy files occasionally over an untrusted network and if you are the only user doing so. Although there are graphical user interfaces available, SSH is mainly considered a command line utility and is available on Linux and Windows.

11.3 Accessing Files on Different OS on the Same Computer

New computers generally ship with a preinstalled operating system, usually Windows. If you have installed Linux on a different partition, you might want to exchange files between the different operating systems.

Windows can not read Linux partitions. If you want to exchange files between these two operating systems, you have to create an "exchange partition". The following file systems are used by Windows and can be accessed from a Linux machine:

FAT

Various flavors of this file system are used by MS-DOS and Windows 95 and 98. You can create this type of file system with YaST. It is possible to read and write files on FAT partitions from Linux. The size of a FAT partition and even the maximum size of a single file is subject to restrictions, depending on the FAT version. See `http://en.wikipedia.org/wiki/VFAT` for more information about FAT file systems.

NTFS

The NTFS file system is used by Windows NT, Windows 2000, Windows XP, Windows Server 2003 and Windows Vista. openSUSE includes write access support to the NTFS file system. However, the driver for the NTFS-3g filesystem has limited functionality. At the moment there is no support for Windows file permissions and you can not access encoded or compressed files. See http://en.opensuse.org/NTFS-3g for more information about NTFS-3g.

During the installation of openSUSE, your Windows partitions are detected. After starting your Linux system, the Windows partitions usually are mounted. These are possible ways of accessing your Windows data:

KDE

Press Alt + F2 and enter `sysinfo:/`. A new window opens displaying the characteristics of your machine. *Disk Information* lists your partitions. Look at those that are of the file system type `ntfs` or `vfat` and click on these entries. If the partition is not already mounted, KDE mounts the partition now and displays the contents.

Command Line

Just list the contents of `/win` to see one or more directories containing your Windows drives. The directory `/win/c` maps to the Windows drive `C:\`, for example.

NOTE: Changing the Accessibility of Windows Partitions

Initially Windows partitions are mounted read-only for normal users to avoid accidental damage to the file system. To grant normal users full access to a mounted Windows partition, change the mount behavior of this Windows partition. Refer to the manual page of the `mount` command for more information.

11.4 Copying Files between Linux Computers

Linux offers a rich set of protocols you can use to copy files between computers. Which protocol you use depends on how much effort you want to invest and whether you need to be compatible with future Windows installations. The following sections feature

various methods to transfer files from and to Linux computers. Make sure that you have a working network connection, because otherwise they will not work. All scenarios rely on working name resolution in the network. If your network does not include a name service, use IP addresses directly or add the IP addresses along with respective hostnames to `/etc/hosts` on all clients.

The following example IP addresses and hostnames are used across this section:

Target Hostname	`jupiter.example.com`
Target IP	`192.168.2.100`
Source Hostname	`venus.example.com`
Source IP	`192.168.2.101`
User	`tux`

11.4.1 Copying Files with SSH

The following requirements must be met on both computers that are accessed via SSH:

1. If you use a hostname, make sure each hostname is listed in `/etc/hosts` on both computers (see Section " `/etc/hosts` " (Chapter 20, *Basic Networking*, ↑Reference).) If you use SSH with IP addresses, you do not need to change anything.

2. If you use a firewall, open the SSH port. To do so, start YaST, and select *Security and Users > Firewall*. Go to *Allowed Services* and check whether *SSH* is displayed as part of the list. If this is not the case, select SSH from *Service to Allow* and click *Add*. Apply your changes and leave YaST with *Next* and *Accept*.

To copy files from one computer to another, you need to know where the files are located. For example, to copy a single file `/srv/foo_file` from computer `jupiter.example.com` to the current directory, use the `scp` command (the dot represents the current directory as the copy target location):

```
scp tux@jupiter.example.com:/srv/foo_file .
```

To copy a whole directory structure, use the recursive mode of `scp`:

```
scp -r tux@jupiter.example.com:/srv/foo_directory .
```

If your network does not provide name resolution, use the server's IP address directly:

```
scp tux@192.168.2.100:/srv/foo_file .
```

If you do not know exactly where your files are, use the `sftp` command. Copying files in KDE or GNOME with SFTP is very simple. Proceed as follows:

1 Press Alt + F2.

2 Enter the following at the address prompt:

```
sftp://tux@jupiter.example.com
```

3 Enter the password of `tux` on `jupiter.example.com`.

4 Drag and drop the desired files or directories to your desktop or a local directory.

KDE provides another protocol called `fish` that can be used if `sftp` is not available. The use of this protocol is similar to `sftp`. Just replace the `sftp` protocol prefix of the URL with `fish`:

```
fish://tux@jupiter.example.com
```

11.4.2 Transferring Files with rsync

Before using rsync to synchronize files and directories between different computers, make sure that the following requirements are met:

1. The package `rsync` is installed.

2. Identical users are available on both systems.

3. Enough disk space is available on the server.

4. If you want to benefit from rsync's full potential, make sure that rsyncd is installed on the system to use as the server.

rsync is useful for archiving or copying data and can also be used as a daemon to provide directories to the network (see Advanced Setup for rsync Synchronization (page 158)).

rsync Basic Mode

The basic mode of operation of rsync does not require any special configuration. rsync mirrors complete directories onto another system. Its usage is not much different from a regular copying tool, such as scp. The following command creates a backup of the home directory of `tux` on a backup server called `jupiter`:

```
rsync -Hbaz -e ssh /home/tux/ tux@jupiter:backup
```

Use the following command to apply your backup:

```
rsync -Haz -e ssh tux@jupiter:backup /home/tux/
```

rsync Daemon Mode

Start the rsyncd daemon on one of your systems to make use of the full functionality of rsync. In this mode, it is possible to create synchronization points (modules) that can be accessed without an account. To use the rsyncd daemon, proceed as follows:

Procedure 11.1 *Advanced Setup for rsync Synchronization*

1 Log in as `root` and install the `rsync` package.

2 Configure your synchronization points in `/etc/rsyncd.conf`. Add a point with its name in brackets and add the `path` keyword like in the following example:

```
[FTP]
  path = /srv/ftp
 comment = An Example
```

3 Start the rsyncd daemon as `root` with `rcrsyncd start`. To start the rsync service automatically during each system boot, run `insserv rsyncd`.

4 List all files located in the `/srv/ftp` directory (note the double colon):

```
rsync -avz jupiter::FTP
```

5 Initiate the transfer by providing a target directory (in this example, the current directory is represented by a dot):

```
rsync -avz jupiter::FTP .
```

By default, files are not deleted while synchronizing with rsync. To force file deletion, add the `--delete` option. To make sure that `--delete` does not accidentally remove newer files, use the `--update` option instead. Any conflicts that arise must be resolved manually.

11.4.3 Transferring Files with Unison

Before using Unison to synchronize files and directories between different computers, make sure that the following requirements are met:

1. The package `unison` is installed.

2. Enough disk space is available on your local and remote computer.

3. If you want to benefit from Unison's full potential, make sure that Unison is also installed and running on the remote computer.

In case you need help, run Unison with the `-doc topics` option to get a full list of available sections.

For permanent settings, Unison allows to create *profiles* that specify Unison preferences such as the directories (roots) to synchronize, which types of files to ignore, and other options. The profiles are stored as text files in `~/.unison` with the file extension `*.prf`.

Using the GUI

To synchronize different directories with Unison's GUI, proceed as follows:

1 Start Unison by pressing Alt + F2 and entering `unison`.

2 If you run Unison for the first time and without any further option, you are prompted for a source directory. Enter the source directory you want to synchronize and click *OK*.

3 Enter the target directory. It can be either local or remote. If you want to synchronize to a remote directory, choose the method (SSH, RSH or Socket) and enter the hostname and an optional user.

4 If you have not synchronized these two directories before, a warning dialog appears, informing you that Unison will now compare the contents of those directories. Close the warning with *OK* and wait until Unison has collected the information from both directories and displays the differences in the main window.

The left column shows the source directory you have selected, the third column shows the target directory. If there are differences between the directories, the *Action* column shows a symbol, proposing an action. A green arrow indicates that a file has been modified, added or deleted in the source or the target directory. The direction of the arrow indicates the direction that the change would be propagated if you performed the synchronization now. A question mark indicates a conflict (both files have been changed and Unison cannot decide which one to overwrite).

Figure 11.1   *File Synchronization Proposal*
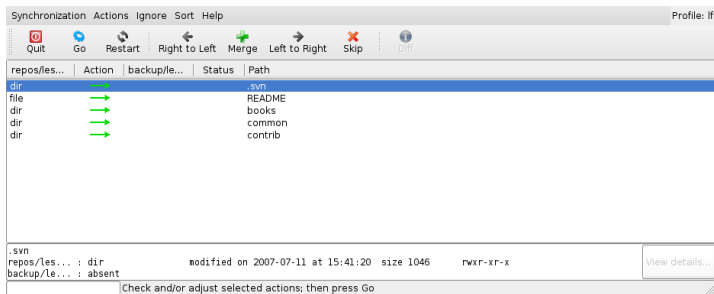
5 To modify the proposals Unison shows for each file (for example, if you want to change the direction), select the file and click *Right to Left* or *Left to Right*. With *Skip*, exclude a file from synchronization. The symbol in the *Action* column changes accordingly.

6 To start the synchronization, click *Go*.

The next time you start Unison, a dialog box shows the existing profiles, each specifying a pair of directories to be synchronized. Select a profile or create a new profile (for another pair of directories) and perform the synchronization as described above.

Using the Command Line

Unison can also be operated through the command line. To synchronize a local directory to a remote computer, proceed as follows:

1 Open a shell and enter the following command:

```
unison -ui text DIR
        ssh://tux@jupiter.example.com//PATH
```

Replace the placeholders with the respective values.

2 Unison asks you what to do with your files and directories, for example:

```
local                    jupiter
            <----  new file   dir [f]
```

3 Press F if you want to follow Unison's recommendation. For other commands, press ?.

4 Proceed with y, if you want to propagate your updates.

11.4.4 Copying Files with FTP

Before configuring your FTP server, make sure that the following requirements are met:

1. The package `vsftp` is installed.

2. You have `root` access to your FTP server.

3. Enough disk space is available on your computer.

WARNING: For Home Networks Only

This setup is suited for use in home networks only. Do not deploy it to sites unprotected by firewalls and do not enable world wide access.

To configure an FTP server, proceed as follows:

1 Prepare the FTP server:

1a Open a shell, log in as `root`, and save a backup copy of `/etc/vsftpd .conf`:

```
cp /etc/vsftpd.conf /etc/vsftpd.conf.bak
```

1b Create an access point for anonymous FTP

```
mkdir ~ftp/incoming
chown -R ftp:ftp ~ftp/incoming
```

2 Replace the configuration files according to the preferred scenario (refer to the manual page of `vsftpd.conf` for advanced configuration options):

Allowing Anonymous Read and Write Access

```
#
listen=YES

# Enable anonymous access to FTP server
anonymous_enable=YES

#
local_enable=YES
# Enable write access
write_enable=YES
anon_upload_enable=YES
anon_mkdir_write_enable=YES
dirmessage_enable=YES
# Write log file
xferlog_enable=YES
connect_from_port_20=YES
chown_uploads=YES
chown_username=ftp
ftpd_banner=Welcome to FTP service.
anon_root=/srv/ftp
```

Grant Restricted Permissions to FTP Users (Home Only)

```
chroot_local_users=YES
```

3 Restart the FTP server:

```
rcvsftp start
```

On the client, just enter the URL `ftp://HOST` in your browser or FTP client. Replace *HOST* with the hostname or IP address of your server. There are many graphical user

interfaces available that are suited to browsing the contents of your FTP server. For a list of them, just enter FTP at the search prompt of the YaST package manager.

11.5 Copying Files between Linux and Windows Computers with SSH

To transfer files from Linux to Windows using SSH, choose one of the following applications:

PuTTY

    PuTTY is a suite of different command line tools for working with an SSH daemon. Download it from `http://www.chiark.greenend.org.uk/~sgtatham/putty.html`.

WinSCP

    WinSCP is very similar to PuTTY, but includes a graphical user interface. Choose from an Explorer or Norton Commander style. Download it from `http://winscp.net`.

To copy a file from Windows to Linux with PuTTY, proceed as follows (on the Windows machine):

1 Start PSCP.

2 Enter the hostname of your SSH server.

3 Enter your login and password to the SSH server.

To connect from Windows to Linux with WinSCP, proceed as follows (on the Windows machine):

1 Start WinSCP.

2 Enter the hostname of the SSH server and username.

3 Click *Login* and acknowledge the following warning.

4 Drag and drop any files or directories from or to your WinSCP window.

NOTE: SSH Fingerprint

With both PuTTY and WinSCP, you must accept the SSH fingerprint when you log in for the first time.

11.6 Sharing Files between Linux Computers

The following sections feature various methods for sharing data. Use one of these if you are looking for a permanent solution for data sharing.

11.6.1 Transferring Files with NFS

To configure the server, proceed as follows:

1 Prepare the system:

    1a Open a shell, log in as `root`, and grant write permissions to all users:

```
mkdir /srv/nfs
chgrp users /srv/nfs
chmod g+w /srv/nfs
```

    1b Make sure that your user name and user ID is known on the client as well as on the server. Refer to Chapter 5, *Managing Users with YaST* (page 65) for detailed instructions about how to create and manage user accounts.

2 Prepare the NFS server:

    2a Start YaST as `root`.

    2b Select *Network Services > NFS Server*.

    2c Enable NFS services with *Start*.

    2d Open the appropriate firewall port with *Open Port in Firewall* if you are using a firewall.

3 Export the directories:

   3a Click *Add directory* and select `/srv/nfs`.

   3b Set the export options to:

   ```
   rw,root_squash,async
   ```

   3c Repeat these steps, if you need to export more than one directory.

4 Apply your settings and leave YaST. Your NFS server is ready to use.

To manually start the NFS server, enter `rcnfsserver start` as `root`. To stop the server, enter `rcnfsserver stop`. By default, YaST takes care of starting this service at boot time.

To configure the client, proceed as follows:

1 Prepare the NFS client:

   1a Start YaST as `root`.

   1b Select *Network Services* > *NFS Client*.

   1c Activate *Open Port in Firewall* if using a firewall.

2 Import the remote file system:

   2a Click *Add*.

   2b Enter the name or IP address of the NFS server or click *Choose* to automatically scan the network for NFS servers.

   2c Enter the name of your remote file system or automatically choose it with *Select*.

   2d Enter an appropriate mount point, for example `/mnt`.

   2e Repeat these steps, if you need to import more than one external directory.

3 Apply your settings and leave YaST. Your NFS client is ready to use.

To start the NFS client manually, enter `rcnfs start`.

NOTE: Consistent User Names

If your home network is used by just a small number of users, set up identical users manually on all machines. If, however, you need a larger consistent user base across a larger home network, consider using NIS or LDAP to manage user data. For further information, refer to Chapter 25, *Using NIS* (↑Reference) and Chapter 26, *LDAP—A Directory Service* (↑Reference).

11.6.2 Sharing Files with Samba

This sections introduces various methods to access files on a Samba server. Both KDE and GNOME ship with graphical tools for working with Samba shares. There is also a command line tool for accessing Samba servers.

Accessing Shares with KDE and GNOME

Both the KDE and GNOME desktops can access Samba shares through their file browsers. To access your share, proceed as follows:

1 Press Alt + F2 and enter `smb://jupiter.example.com/`*share*.

The syntax of this URL is `smb://`*HOST*`/`*SHARENAME* with *HOST* representing the hostname (`jupiter.example.com`) or IP address and *SHARENAME* representing the share. See Step 3b (page 168).

2 Log in with the username and password. The password is set in Step 4 (page 169) or just hit Enter if no password is needed.

3 Drag and drop any files or directories from or to your window.

If you do not know your workgroup, enter `smb:/` to list all workgroups available in your network. The Smb4K tool (package `smb4k`) can also be used to display all workgroups in your network and mount them on demand.

Accessing Shares from the Command Line

If you prefer using the command line, use the `smbclient` command. To log in to your Samba server, run:

```
smbclient //jupiter/share -U tux
```

Omit the `-U` option if you are the current user `tux`. After logging in successfully, use some basic commands like `ls` (list contents), `mkdir` (create directory), `get` (download file), and `put` (upload file). Use `help` to display all commands. Refer to the manual page of `smbclient` for more information.

11.7 Sharing Files between Linux and Windows with Samba

Samba is the first choice for transferring files between Windows and Linux machines. These are the most common use cases for Samba:

Transferring Files from Linux to Windows with the SMB Scheme
> In the easiest case you do not have to configure a Linux server. Use the `smb:/` scheme. For more information, see Section "Accessing Shares with KDE and GNOME" (page 166). Make sure that your workgroup is identical on both systems and that your directories are shared.

Transferring Files from Windows to Linux Using a Server
> Configure a Samba server on your Linux computer. See Setting Up a Samba Server (page 168).

TIP: Using Default Registry Entries for Your Windows System

Some Windows versions (95, 98) require a small change in the registry for enabling a different password authentication method. Simplify this step by installing the `samba-doc` package and copy the file `/usr/share/doc/packages/samba/registry` to your Windows drive. Start Windows and incorporate the changes by double-clicking on this file.

Procedure 11.2   *Setting Up a Samba Server*

To set up a Samba server, do the following:

1 Prepare the Samba server:

    1a Start YaST as `root`.

    1b Install the `samba` package.

    1c Create a directory, for example, `/srv/share`.

2 Create the server configuration:

    2a Select *Network Services* > *Samba Server*.

    2b Select one of the workgroups or enter a new one, for example, `Penguin`.

    2c Check *Primary Domain Controller (PDC)*

    2d Set *During Boot* if the Samba service should be started every time your computer boots. Otherwise set *Manually*.

    2e Activate *Open Port in Firewall* if you use a firewall.

3 Create your Windows share:

    3a Change to the *Shares* tab and click *Add*.

    3b Enter a name and description. The *Share Name* is used for accessing the share from your clients. *Share Description* describes the purpose of the share.

    3c Select your path, for example, `/src/share`.

    3d Proceed with *OK*.

    3e Activate *Allow Users to Share Their Directories*.

4 Provide a password for all users that are allowed to use this service:

```
smbpasswd -a tux
```

For easier configuration, just hit Enter to leave the password empty. Take into account that the usernames on your Windows and Linux computers are probably different. Configuring a consistent user base for both Windows and Linux is beyond the scope of this document.

5 Start the Samba server:

```
rcnmb start
rcsmb start
```

To check if everything has been successfully configured, enter:

```
smbclient -L localhost
```

After you hit Enter, you should get something like the following:

```
Anonymous login successful
Domain=[PENGUIN] OS=[Unix] Server=[Samba 3.0.22-11-SUSE-CODE10]

    Sharename       Type       Comment
    ---------       ----       -------
    share           Disk       Shared directory
    netlogon        Disk       Network Logon Service
    IPC$            IPC        IPC Service (Samba 3.0.22-11-SUSE-CODE10)
    ADMIN$          IPC        IPC Service (Samba 3.0.22-11-SUSE-CODE10)
Anonymous login successful
Domain=[PENGUIN] OS=[Unix] Server=[Samba 3.0.22-11-SUSE-CODE10]

    Server              Comment
    ---------           -------
    SUSE-DESKTOP        Samba 3.0.22-11-SUSE-CODE10

    Workgroup           Master
    ---------           -------
    TUX-NET             jupiter
```

11.8 For More Information

- http://en.wikipedia.org/wiki/VFAT

- http://en.wikipedia.org/wiki/NTFS

- http://en.wikipedia.org/wiki/Fstab

- http://en.wikipedia.org/wiki/Network_File_System

- http://en.wikipedia.org/wiki/File_Transfer_Protocol

- http://en.wikipedia.org/wiki/SSH

- http://en.wikipedia.org/wiki/Rsync

- http://en.wikipedia.org/wiki/Samba_software

Part IV. Help and Troubleshooting

Help and Documentation

12

openSUSE® comes with various sources of information and documentation, many of which are already integrated in your installed system. For example, both the KDE and GNOME desktop include a help center that offers a wide range of online documentation for your product. There, you can access openSUSE-specific manuals by Novell/SUSE as well as documentation provided by the open source community. Explore your desktop's help center and read where to find other documentation shipped with your product or additional information on the Web.

12.1 Included Help Resources

There are several places where you can find online documentation shipped with your product:

Desktop Help Centers
> The help centers of both the KDE desktop (KDE help center) and the GNOME desktop (Yelp) provide central access to the most important documentation resources on your system in searchable form. These resources include online help for installed applications, man pages, info pages, and the Novell/SUSE manuals delivered with your product. Learn more about your desktop's help center in Section 12.1.1, "Using the KDE Help Center" (page 174) and Section 12.1.2, "Using GNOME Yelp" (page 177).

Documentation in `/usr/share/doc`

This traditional help directory holds various documentation files and the release notes for your system. Find more detailed information in Section 12.1.3, "Documentation Directory" (page 177).

Man Pages and Info Pages for Shell Commands

When working with the shell, you do not need to know the options of the commands by heart. Traditionally, the shell provides integrated help by means of man pages and info pages. Read more in Section 12.1.4, "Man Pages" (page 181) and Section 12.1.5, "Info Pages" (page 182).

Separate Help Packages for Some Applications

When installing new software with YaST, the software documentation is installed automatically in most cases and usually appears in the help center of your desktop. However, some applications, such as The GIMP, may have different online help packages that can be installed separately with YaST and do not integrate into the help centers.

12.1.1 Using the KDE Help Center

From the KDE desktop, you can access the KDE help center in various ways: If you need information from within an application, simply click the application's *Help* button or press F1 to open the application's documentation in the help center. If you start the help center from the main menu, or from the command line with `susehelp`, you are taken to the main window of the help center from which you can browse the help topics.

Figure 12.1 *Main Window of the KDE Help Center*
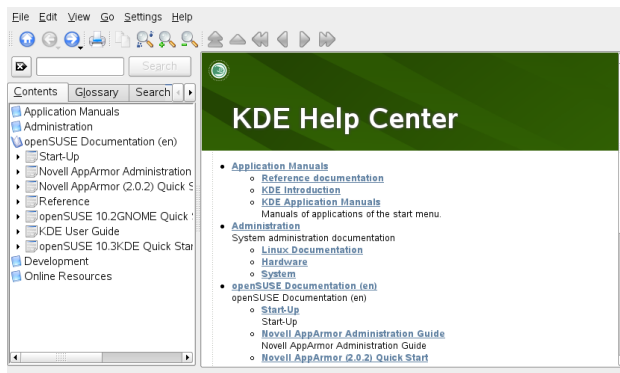
The menu and the toolbar provide options for printing contents from the help center, searching the currently displayed page, and navigating and customizing the help center. The display field in the right part of the window always shows the currently selected contents, such as online manuals, search results, or Web pages.

The navigation area in the left part of the window contains several tabs:

Contents
> Presents a tree view of all available information sources. The help center addresses various target groups, such as users, administrators, and developers. Click the book icons to open and browse the individual categories. Under the heading *Administration*, for example, you can also browse man (manual) and info (information) pages associated with command line programs. The help center also provides access to some online databases that cover special hardware and software issues for your product. All these sources can be searched conveniently once a search index has been generated.
>
> The contents of your help center depends on which software packages are currently installed and which languages are selected as your system languages.

Glossary
> Provides a quick reference where you can look up the definitions of words that might be unfamiliar to you.
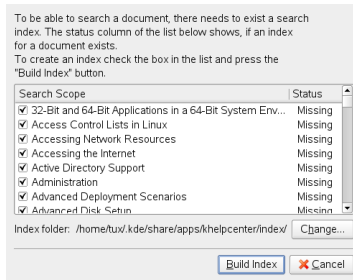
Search Options
> Holds options for the full text search of the help center. You can combine several search criteria.

Procedure 12.1   *Searching the Help Center*

To use the full text search KDE help center offers, generate a search index and set the search parameters. If the search index has not yet been generated, the system automatically prompts you to do so when you click the *Search* tab.

1 To search for a term, click *Search Options* and enter the search string.

2 To combine your search strings with operands, click *Method* and select the operand to use.

**3** Choose an option from *Max. Results* to limit the number of hits to display.

4 To restrict your search to certain types of documentation, choose an option from *Scope*. With *Default*, a predefined selection of documents is searched. *All* includes all types of documents in the search. *Custom* lets you define which documents to include in your search. Just activate the documents you want in the list.

5 When you have set the options according to your wishes, click *Search*. The search results are then displayed as a list of links in the display field and can be navigated with mouse clicks.

Procedure 12.2 *Generating a New Search Index*

1 To create a new search index, select *Settings > Build Search Index* from the menu. A window opens, showing a list of documentation currently available in the help center.

2 Select the documents to integrate in the search index and click *Build Index*. After the index has been generated, you can use the full text search.
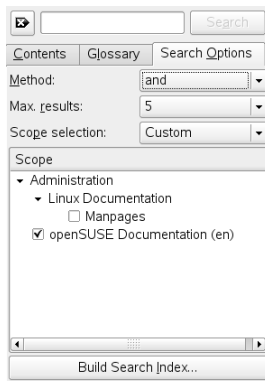
12.1.2 Using GNOME Yelp

On the GNOME desktop, to start Yelp directly from an application, either click the *Help* button or press F1. Both options take you directly to the application's documentation in the help center. However, you can also start Yelp from the main menu, or from the command line with `yelp` and then browse through the main window of the help center.

Figure 12.2   *Main Window of Yelp*
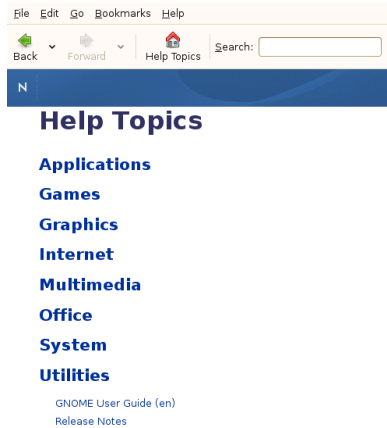
The menu and the toolbar provide options for navigating and customizing the help center, for searching and for printing contents from Yelp. To view a table of contents, click *Help Topics*. The help topics are grouped into categories presented as links. Click one of the links to open a list of topics for that category. To search for an item, just enter the search string into the search field at the top of the window.

12.1.3 Documentation Directory

The traditional directory to find documentation in your installed Linux system is `/usr/share/doc`. Usually, the directory contains information about the packages installed on your system, release notes, manuals, and more.

NOTE: Contents Depends on Installed Packages

In the Linux world, many manuals and other kinds of documentation are available in form of packages, just like software. How much and which information you find in `/usr/share/docs` also depends on the (documentation) packages installed. If you cannot find the subdirectories mentioned here, check if the respective packages are installed on your system and add them with YaST, if needed.

Novell/SUSE Manuals

We provide HTML and PDF versions of our books in different languages. In the `manual` subdirectory, find HTML versions of most of the Novell/SUSE manuals available for your product:

Start-Up
> Guides you through the installation and basic configuration of your system. For newcomers, the manual also introduces basic Linux concepts such as the file system, the user concept and access permissions and gives an overview of the features openSUSE offers to support mobile computing. Provides help and advice in troubleshooting.

KDE Quick Start
> Gives a short introduction to the KDE desktop and some key applications running on it.

KDE User Guide
> Introduces the KDE desktop of openSUSE and a variety of applications shipping with it. It guides you through using these applications and helps you perform key tasks. It is intended mainly for end users who want to make efficient use of KDE in everyday life.

GNOME Quick Start
> Gives a short introduction to the GNOME desktop and some key applications running on it.

GNOME User Guide
> Introduces the GNOME desktop of openSUSE and a variety of applications you will encounter when working with the GNOME desktop. It guides you through

using these applications and helps you perform key tasks. It is intended mainly for end users who want to make efficient use of applications running on the GNOME desktop.

Reference
Gives you a general understanding of openSUSE and covers advanced system administration tasks. It is intended mainly for system administrators and home users with basic system administration knowledge. It provides detailed information about advanced deployment scenarios, administration of your system, the interaction of key system components and the set-up of various network and file services open-SUSE offers.

Novell AppArmor Quick Start
Helps you understand the main concepts behind Novell® AppArmor.

Novell AppArmor Administration Guide
Contains in-depth information about the use of Novell AppArmor in your environment.

Lessons For Lizards
A community book project for the openSUSE distribution. A snapshot of the manual written by the open source community is released on an equal footing with the Novell/SUSE manuals. The lessons are written in a cook book style and cover more specific or exotic topics than the traditional manuals. For more information, see `http://developer.novell.com/wiki/index.php/Lessons_for_Lizards`.

If more than one language is installed, `/usr/share/doc/manual` may contain different language versions of the manuals. The HTML versions of the Novell/SUSE manuals are also available in the help center of both desktops. For information where to find the PDF and HTML versions of the books on your installation media, refer to the openSUSE Release Notes. They are available from your installed system under `/usr/share/doc/release-notes/` or online at `http://www.novell.com/documentation/opensuse103`.

HOWTOs

If the `howto` package is installed on your system `/usr/share/doc` also holds the `howto` subdirectory in which to find additional documentation on many tasks relating to the setup and operation of Linux software.

Package Documentation

Under `packages`, find the documentation included in the software packages installed on your system. For every package, a subdirectory `/usr/share/doc/packages/` `packagename` is created that often holds README files for the package and sometimes examples, configuration files, or additional scripts. The following list introduces typical files to be found under `/usr/share/doc/packages`. None of these entries is mandatory and many packages might just include a few of them.

AUTHORS
> List of the main developers.

BUGS
> Known bugs or malfunctions. Might also contain a link to a Bugzilla Web page where you can search all bugs.

CHANGES , ChangeLog
> Summary of changes from version to version. Usually interesting for developers, because it is very detailed.

COPYING , LICENSE
> Licensing information.

FAQ
> Question and answers collected from mailing lists or newsgroups.

INSTALL
> How to install this package on your system. As the package is already installed by the time you get to read this file, you can safely ignore the contents of this file.

README, README.*
> General information on the software, for what purpose and how to use it.

TODO
> Things that are not implemented yet, but probably will be in the future.

MANIFEST
> List of files with a brief summary.

NEWS
> Description of what is new in this version.

12.1.4 Man Pages

Man pages are an essential part of any Linux system. They explain the usage of a command and all available options and parameters. Man pages can be accessed with `man` followed by the name of the command, for example, `man ls`.

Man pages are displayed directly in the shell. To navigate them, move up and down with Page ↑ and Page ↓. Move between the beginning and the end of a document with Home and End. End this viewing mode by pressing Q. Learn more about the `man` command itself with `man man`. Man pages are sorted in categories as shown in (taken from the man page for man itself).

Table 12.1   *Man Pages—Categories and Descriptions*

Number	Description
1	Executable programs or shell commands
2	System calls (functions provided by the kernel)
3	Library calls (functions within program libraries)
4	Special files (usually found in /dev)
5	File formats and conventions (`/etc/fstab`)
6	Games
7	Miscellaneous (including macro packages and conventions), for example, man(7), groff(7)
8	System administration commands (usually only for root)
9	Kernel routines (nonstandard)

Each man page consists of several parts labeled *NAME*, *SYNOPSIS*, *DESCRIPTION*, *SEE ALSO*, *LICENSING*, and *AUTHOR*. There may be additional sections available depending on the type of command.

12.1.5 Info Pages

Info pages are another important source of information on your system. Usually they are more verbose than man pages. To view the info page for a certain command, enter info followed by the name of the command, for example, info ls. You can browse an info page with a viewer directly in the shell and display the different sections, called "nodes." Use Space to move forward and <— to move backwards. Within a node, you can also browse with Page ↑ and Page ↓ but only Space and <— will take you also to the previous or subsequent node. Like for the man pages, press Q to end the viewing mode. Not every man page comes with an info page and vice versa.

With KDE or GNOME desktop, you can also access (or print) man pages and info pages:

KDE
> In Konqueror, to view the man page for ls, type man:/ls in the location bar. If there are different categories for a command, Konqueror displays them as links. To display the info page for grep, for example, type info:/grep.
>
> In the KDE help center, check out *Administration* in the table of contents to browse man pages and info pages.

GNOME
> Run yelp man:ls or yelp info:ls to display the man or info page.

Figure 12.3 *Viewing a Man Page With Konqueror*
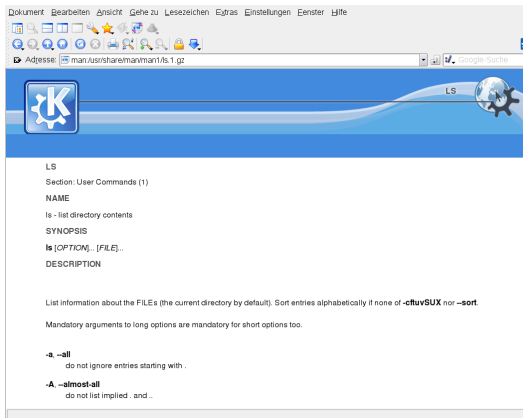
12.2 Additional Help Resources

In addition to the online versions of the Novell/SUSE manuals installed under `/usr/share/doc`, you can also access the product-specific manuals and documentation on the Web.

Find them at http://www.novell.com/documentation/opensuse103.

If you are searching for additional product-related information, you can also refer to the following Web sites:

- SUSE Support Database [http://en.opensuse.org/SDB:SDB]

- Novell Technical Support Knowledgebase [http://www.novell.com/support/]

- Product Support Community Resources [http://support.novell.com/forums/index.html]

- KDE Documentation Web site [http://www.kde.org/documentation]

- Documentation Web site for KDE applications [http://www.kde-apps.org]

- GNOME Documentation Web site [http://www.gnome.org/learn/]

You might also want to try general-purpose search engines. For example, you might try the search terms `Linux CD-RW help` or `OpenOffice file conversion problem` if you were having trouble with the CD burning or with OpenOffice.org file conversion. Google™ also has a specific Linux search engine at http://www.google.com/linux that you might find useful.

12.3 For More Information

Apart from the product-specific help resources, there is a broad range of information available for Linux topics.

12.3.1 The Linux Documentation Project

The Linux Documentation Project (TLDP) is run by a team of volunteers who write Linux-related documentation (see http://www.tldp.org). The set of documents contains tutorials for beginners, but is mainly focused on experienced users and professional system administrators. TLDP publishes HOWTOs, FAQs, and guides (handbooks) under a free license.

HOWTOs

HOWTOs are usually a short, informal, step-by-step guides to accomplishing specific tasks. HOWTOs can be found in the package howto and are installed under /usr/share/doc/howto

Frequently Asked Questions

FAQs (frequently asked questions) are a series of questions and answers. They originate from Usenet newsgroups where the purpose was to reduce continuous reposting of the same basic questions.

Guides

Manuals and guides for various topics or programs can be found at http://www.tldp.org/guides.html. They range from *Bash Guide for Beginners* to *Linux Filesystem Hierarchy* to *Linux Administrator's Security Guide*. Generally, guides are more detailed and exhaustive than a HOWTO or FAQ. They are usually written by experts for experts. Some of these books are old but still valid and ship with openSUSE. Search and install these books and guides with YaST.

12.3.2 Usenet

Created in 1979 before the rise of the Internet, Usenet is one of the oldest computer networks and still in active use. The format and transmission of Usenet articles is very similar to e-mail, but is developed for a many-to-many communication.

Usenet is organized into seven topical categories: `comp.*` for computer-related discussions, `misc.*` for miscellaneous topics, `news.*` for newsgroup-related matters, `rec.*` for recreation and entertainment, `sci.*` for science-related discussions, `soc.*` for social discussions, and `talk.*` for various controversial topics. The top levels are split in subgroups. For instance, `comp.os.linux.hardware` is a newsgroup for Linux-specific hardware issues.

Before you can post an article, have your client connect to a news server and subscribe to a specific newsgroup. News clients include Knode or Evolution. Each news server communicates to other news servers and exchanges articles with them. Not all newsgroups may be available on your news server.

Interesting newsgroups for Linux users are `comp.os.linux.apps`, `comp.os.linux.questions`, and `comp.os.linux.hardware`. If you cannot find a specific newsgroup, go to `http://www.linux.org/docs/usenetlinux.html`. Follow the general Usenet rules available online at `http://www.faqs.org/faqs/usenet/posting-rules/part1/`.

12.3.3 Wikipedia: The Free Online Encyclopedia

Wikipedia is "a multilingual encyclopedia designed to be read and edited by anyone" (see `http://en.wikipedia.org`). The content of Wikipedia is created by its users and is published under a free license (GFDL). Any visitor can edit articles.

12.3.4 Standards and Specifications

There are various sources that provide information about standards or specifications.

http://www.linux-foundation.org/en/LSB
> The Linux Foundation is an independent nonprofit organization that promotes the distribution of free software and open source software. The organization endeavors to achieve this by defining distribution-independent standards. The maintenance of several standards, such as the important LSB (Linux Standard Base), is supervised by this organization.

http://www.w3.org
> The World Wide Web Consortium (W3C) is one of the best-known standards organizations. It was founded in October 1994 by Tim Berners-Lee and concentrates on standardizing Web technologies. W3C promotes the dissemination of open, license-free, and manufacturer-independent specifications, such as HTML, XHTML, and XML. These Web standards are developed in a four-stage process in *working groups* and are presented to the public as *W3C recommendations* (REC).

http://www.oasis-open.org
> OASIS (Organization for the Advancement of Structured Information Standards) is an international consortium specializing in the development of standards for Web security, e-business, business transactions, logistics, and interoperability between various markets.

http://www.ietf.org
> The Internet Engineering Task Force (IETF) is an internationally active cooperative of researchers, network designers, suppliers, and users. It concentrates on the development of Internet architecture and the smooth operation of the Internet by means of protocols.
>
> Every IETF standard is published as an RFC (Request for Comments) and is available free-of-charge. There are six types of RFC: proposed standards, draft standards, Internet standards, experimental protocols, information documents, and historic standards. Only the first three (proposed, draft, and full) are IETF standards in the narrower sense (see http://www.ietf.org/rfc/rfc1796.txt).

http://www.ieee.org
> The Institute of Electrical and Electronics Engineers (IEEE) is an organization that draws up standards in the areas of information technology, telecommunication,

medicine and health care, transport, and others. IEEE standards are subject to a fee.

http://www.iso.org
The ISO Committee (International Organization for Standards) is the world's largest developer of standards and maintains a network of national standardization institutes in over 140 countries. ISO standards are subject to a fee.

http://www.din.de , http://www.din.com
The Deutsches Institut für Normung (DIN) is a registered technical and scientific association. It was founded in 1917. According to DIN, the organization is "the institution responsible for standards in Germany and represents German interests in worldwide and European standards organizations."

The association brings together manufacturers, consumers, trade professionals, service companies, scientists and others who have an interest in the establishment of standards. The standards are subject to a fee and can be ordered using the DIN home page.

Common Problems and Their Solutions

13

This chapter offers a range of common problems that can arise with an intention of covering as many of the various types of potential problems as possible. That way, even if your precise situation is not listed here, there might be one similar enough to offer hints as to the solution.

13.1 Finding and Gathering Information

Linux logs things in a fair amount of detail. There are several places to look when you have problems with your system, most of which are standard to Linux systems in general and some of which are peculiar to openSUSE systems. Most log files can also be viewed with YaST (*Miscellaneous > Start-Up Log*).

YaST offers the possibility to collect all system information needed by the support team. Use *Miscellaneous > Support Query*. Select the problem category. When all information is gathered, attach it to your support request.

The following is a list of the most commonly checked log files and what they typically contain.

Table 13.1 *Log Files*

Log File	Description
/var/log/boot.msg	Messages from the kernel during the boot process.
/var/log/mail.*	Messages from the mail system.
/var/log/messages	Ongoing messages from the kernel and system log daemon when running.
/var/log/ NetworkManager	Log file from NetworkManager to collect problems with network connectivity
/var/log/SaX.log	Hardware messages from the SaX display and KVM system.
/home/*user*/ .xsession-errors	Messages from the desktop applications currently running. Replace *user* with the actual username.
/var/log/warn	All messages from the kernel and system log daemon assigned WARNING level or higher.
/var/log/wtmp	Binary file containing user login records for the current machine session. View it with last.
/var/log/Xorg.*.log	Various start-up and runtime logs from the X Window system. It is useful for debugging failed X start-ups.
/var/log/YaST2/	Directory containing YaST's actions and their results.
/var/log/samba/	Directory containing Samba server and client log messages.

Apart from log files, your machine also supplies you with information about the running system. See

Table 13.2   *System Information*

File	Description
/proc/cpuinfo	This displays processor information, including its type, make, model, and performance.
/proc/dma	This shows which DMA channels are currently being used.
/proc/interrupts	This shows which interrupts are in use and how many of each have been in use.
/proc/iomem	This displays the status of I/O (input/output) memory.
/proc/ioports	This shows which I/O ports are in use at the moment.
/proc/meminfo	This displays memory status.
/proc/modules	This displays the individual modules.
/proc/mounts	This displays devices currently mounted.
/proc/partitions	This shows the partitioning of all hard disks.
/proc/version	This displays the current version of Linux.

Linux comes with a number of tools for system analysis and monitoring. See Chapter 10, *System Monitoring Utilities* (↑Reference) for a selection of the most important ones used in system diagnostics.

Each scenario included in the following begins with a header describing the problem followed by a paragraph or two offering suggested solutions, available references for more detailed solutions, and cross-references to other scenarios that might be related.

13.2 Installation Problems

Installation problems are situations when a machine fails to install. It may fail entirely or it may not be able to start the graphical installer. This section highlights some of the typical problems you might run into and offers possible solutions or workarounds for this kind of situations.

13.2.1 Checking Media

If you encounter any problems using the openSUSE installation media, you can check the integrity of your installation media with *Software > Media Check*. Media problems are more likely to occur with media you burn yourself. To check an openSUSE CD or DVD, insert the medium into the drive and click *Start* for YaST to check the MD5 checksum of the medium. This may take several minutes. If errors are detected, do not use this medium for installation.

13.2.2 Hardware Information

Display detected hardware and technical data using *Hardware > Hardware Information*. Click any node of the tree for more information about a device. This module is especially useful, for example, when submitting a support request for which you need information about your hardware.

Save the hardware information displayed to a file by clicking *Save to File*. Select the desired directory and filename then click *Save* to create the file.

13.2.3 No Bootable CD-ROM Drive Available

If your computer does not contain a bootable CD or DVD-ROM drive or if the one you have is not supported by Linux, there are several options for installing your machine without a need for a built-in CD or DVD drive:

Booting from a Floppy Disk
Create a boot floppy and boot from floppy disk instead of CD or DVD.

Using an External Boot Device
If it is supported by the machine's BIOS and the installation kernel, boot for installation from external CD or DVD drives.

Network Boot via PXE
If a machine lacks a CD or DVD drive, but provides a working ethernet connection, perform a completely network-based installation. See Section "Remote Installation via VNC—PXE Boot and Wake on LAN" (Chapter 1, *Remote Installation*, ↑Reference) and Section "Remote Installation via SSH—PXE Boot and Wake on LAN" (Chapter 1, *Remote Installation*, ↑Reference) for details.

Booting from a Floppy Disk (SYSLINUX)

On some older computers, there is no bootable CD-ROM drive available, but a floppy disk drive. To install on such a system, create boot disks and boot your system with them.

The boot disks include the loader SYSLINUX and the program linuxrc. SYSLINUX enables the selection of a kernel during the boot procedure and the specification of any parameters needed for the hardware used. The program linuxrc supports the loading of kernel modules for your hardware and subsequently starts the installation.

When booting from a boot disk, the boot procedure is initiated by the boot loader SYSLINUX (package `syslinux`). When the system is booted, SYSLINUX runs a minimum hardware detection that mainly consists of the following steps:

1. The program checks if the BIOS provides VESA 2.0–compliant framebuffer support and boots the kernel accordingly.

2. The monitor data (DDC info) is read.

3. The first block of the first hard disk (MBR) is read to map BIOS IDs to Linux device names during the boot loader configuration. The program attempts to read the block by means of the the lba32 functions of the BIOS to determine if the BIOS supports these functions.

If you keep Shift pressed when SYSLINUX starts, all these steps are skipped. For troubleshooting purposes, insert the line

```
verbose 1
```

in `syslinux.cfg` for the boot loader to display which action is currently being performed.

If the machine does not boot from the floppy disk, you may need to change the boot sequence in the BIOS to `A,C,CDROM`.

External Boot Devices

Most CD-ROM drives are supported. If problems arise when booting from the CD-ROM drive, try booting CD 2 of the CD set.

If the system does not have a CD-ROM or floppy disk, it is still possible that an external CD-ROM, connected with USB, FireWire, or SCSI, can be used to boot the system. This depends largely on the interaction of the BIOS and the hardware used. Sometimes a BIOS update may help if you encounter problems.

13.2.4 Booting from Installation Media Fails

There are two possible reasons for a machine not to boot for installation:

CD or DVD-ROM Drive Unable to Read the Boot Image
Your CD-ROM drive might not be able to read the boot image on CD 1. In this case, use CD 2 to boot the system. CD 2 contains a conventional 2.88 MB boot image that can be read even by unsupported drives and allows you to perform the installation over the network as described in Chapter 1, *Remote Installation* (↑Reference).

Incorrect Boot Sequence in BIOS
The BIOS boot sequence must have CD-ROM set as the first entry for booting. Otherwise the machine would try to boot from another medium, typically the hard disk. Guidance for changing the BIOS boot sequence can be found the documentation provided with your motherboard or in the following paragraphs.

The BIOS is the software that enables the very basic functions of a computer. Motherboard vendors provide a BIOS specifically made for their hardware. Normally, the

BIOS setup can only be accessed at a specific time—when the machine is booting. During this initialization phase, the machine performs a number of diagnostic hardware tests. One of them is a memory check, indicated by a memory counter. When the counter appears, look for a line, usually below the counter or somewhere at the bottom, mentioning the key to press to access the BIOS setup. Usually the key to press is Del, F1, or Esc. Press this key until the BIOS setup screen appears.

Procedure 13.1   *Changing the BIOS Boot Sequence*

1 Enter the BIOS using the proper key as announced by the boot routines and wait for the BIOS screen to appear.

2 To change the boot sequence in an AWARD BIOS, look for the *BIOS FEATURES SETUP* entry. Other manufacturers may have a different name for this, such as *ADVANCED CMOS SETUP*. When you have found the entry, select it and confirm with Enter.

3 In the screen that opens, look for a subentry called *BOOT SEQUENCE*. The boot sequence is often set to something like C, A or A, C. In the former case, the machine first searches the hard disk (C) then the floppy drive (A) to find a bootable medium. Change the settings by pressing PgUp or PgDown until the sequence is A, CDROM, C.

4 Leave the BIOS setup screen by pressing Esc. To save the changes, select *SAVE & EXIT SETUP* or press F10. To confirm that your settings should be saved, press Y.

Procedure 13.2   *Changing the Boot Sequence in a SCSI BIOS (Adaptec Host Adapter)*

1 Open the setup by pressing Ctrl + A.

2 Select *Disk Utilities*, which displays the connected hardware components.

Make note of the SCSI ID of your CD-ROM drive.

3 Exit the menu with Esc.

4 Open *Configure Adapter Settings*. Under *Additional Options*, select *Boot Device Options* and press Enter.

5 Enter the ID of the CD-ROM drive and press Enter again.

6 Press Esc twice to return to the start screen of the SCSI BIOS.

7 Exit this screen and confirm with *Yes* to boot the computer.

Regardless of what language and keyboard layout your final installation will be using, most BIOS configurations use the US keyboard layout as depicted in the following figure:

Figure 13.1 *US Keyboard Layout*
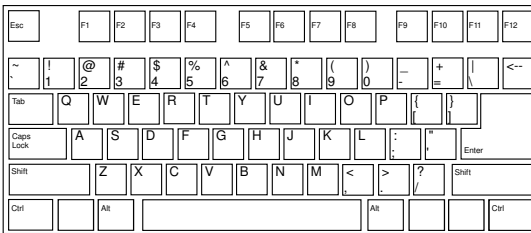
13.2.5 Fails to Boot

Some hardware types, mainly fairly old or very recent ones, fail to install. In many cases, this might happen because support for this type of hardware is missing from the installation kernel or due to certain functionality included in this kernel, such as ACPI, that still cause problems on some hardware.

If your system fails to install using the standard *Installation* mode from the first installation boot screen, try the following:

1 With the first CD or DVD still in the CD-ROM drive, reboot the machine with Ctrl + Alt + Del or using the hardware reset button.

2 When the boot screen appears, use the arrow keys of your keyboard to navigate to *Installation--ACPI Disabled* and press Enter to launch the boot and installation process. This option disables the support for ACPI power management techniques.

3 Proceed with the installation as described in Chapter 1, *Installation with YaST* (page 3).

If this fails, proceed as above, but choose *Installation--Safe Settings* instead. This option disables ACPI and DMA support. Most hardware should boot with this option.

If both of these options fail, use the boot options prompt to pass any additional parameters needed to support this type of hardware to the installation kernel. For more information about the parameters available as boot options, refer to the kernel documentation located in `/usr/src/linux/Documentation/kernel-parameters.txt`.

TIP: Obtaining Kernel Documentation

Install the `kernel-source` package to view the kernel documentation.

There are various other ACPI-related kernel parameters that can be entered at the boot prompt prior to booting for installation:

`acpi=off`
> This parameter disables the complete ACPI subsystem on your computer. This may be useful if your computer cannot handle ACPI at all or if you think ACPI in your computer causes trouble.

`acpi=force`
> Always enable ACPI even if your computer has an old BIOS dated before the year 2000. This parameter also enables ACPI if it is set in addition to `acpi=off`.

`acpi=noirq`
> Do not use ACPI for IRQ routing.

`acpi=ht`
> Run only enough ACPI to enable hyper-threading.

`acpi=strict`
> Be less tolerant of platforms that are not strictly ACPI specification compliant.

`pci=noacpi`
> Disable PCI IRQ routing of the new ACPI system.

`pnpacpi=off`
> This option is for seriell or parallel problems when your BIOS setup contains wrong interrupts or ports.

`notsc`
> Disable the time stamp counter. This option can be used to work around timing problems on your systems. It is a new feature, if you see regressions on your machine, especially time related or even total hangs, this option is worth a try.

`nohz=off`
> Disable the nohz feature. If your machine hangs, this option might help. Generally, you do not need it.

Once you have determined the right parameter combination, YaST automatically writes them to the boot loader configuration to make sure that the system boots properly next time.

If unexplainable errors occur when the kernel is loaded or during the installation, select *Memory Test* in the boot menu to check the memory. If *Memory Test* returns an error, it is usually a hardware error.

13.2.6 Fails to Launch Graphical Installer

After you insert the first CD or DVD into your drive and reboot your machine, the installation screen comes up, but after you select *Installation*, the graphical installer does not start.

There are several ways to deal with this situation:

- Try to select another screen resolution for the installation dialogs.

- Select *Text Mode* for installation.

- Do a remote installation via VNC using the graphical installer.

To change to another screen resolution for installation, proceed as follows:

1 Boot for installation.

2 Press F3 to open a menu from which to select a lower resolution for installation purposes.

3 Select *Installation* and proceed with the installation as described in Chapter 1, *Installation with YaST* (page 3).

To perform an installation in text mode, proceed as follows:

1 Boot for installation.

2 Press F3 and select *Text Mode*.

3 Select *Installation* and proceed with the installation as described in Chapter 1, *Installation with YaST* (page 3).

To perform a VNC installation, proceed as follows:

1 Boot for installation.

2 Enter the following text at the boot options prompt:

```
vnc=1 vncpassword=some_password
```

Replace `some_password` with the password to use for installation.

3 Select *Installation* then press Enter to start the installation.

Instead of starting right into the graphical installation routine, the system continues to run in text mode then halts, displaying a message containing the IP address and port number at which the installer can be reached via a browser interface or a VNC viewer application.

4 If using a browser to access the installer, launch the browser and enter the address information provided by the installation routines on the future openSUSE machine and hit Enter:

```
http://ip_address_of_machine:5801
```

A dialog opens in the browser window prompting you for the VNC password. Enter it and proceed with the installation as described in Chapter 1, *Installation with YaST* (page 3).

IMPORTANT

Installation via VNC works with any browser under any operating system, provided Java support is enabled.

If you use any kind of VNC viewer on your preferred operating system, enter the IP address and password when prompted to do so. A window opens, displaying the installation dialogs. Proceed with the installation as usual.

13.2.7 Only Minimalistic Boot Screen Started

You inserted the first CD or DVD into the drive, the BIOS routines are finished, but the system does not start with the graphical boot screen. Instead it launches a very minimalistic text-based interface. This might happen on any machine not providing sufficient graphics memory for rendering a graphical boot screen.

Although the text boot screen looks minimalistic, it provides nearly the same functionality as the graphical one:

Boot Options

Unlike the graphical interface, the different boot options cannot be selected using the cursor keys of your keyboard. The boot menu of the text mode boot screen offers some keywords to enter at the boot prompt. These keywords map to the options offered in the graphical version. Enter your choice and hit Enter to launch the boot process.

Custom Boot Options

After selecting a boot option, enter the appropriate keyword at the boot prompt or enter some custom boot options as described in Section 13.2.5, "Fails to Boot" (page 196). To launch the installation process, press Enter.

Screen Resolutions

Use the F keys to determine the screen resolution for installation. If you need to boot in text mode, choose F3.

13.3 Boot Problems

Boot problems are situations when your system does not boot properly (does not boot to the expected runlevel and login screen).

13.3.1 Fails to Load the GRUB Boot Loader

If the hardware is functioning properly, it is possible that the boot loader has become corrupted and Linux cannot start on the machine. In this case, it is necessary to reinstall the boot loader. To reinstall the boot loader, proceed as follows:

1 Insert the installation media into the drive.

2 Reboot the machine.

3 Select *Installation* from the boot menu.

4 Select a language.

5 Accept the license agreement.

6 In the *Installation Mode* screen, select *Other* and set the installation mode to *Repair Installed System*.

7 Once in the YaST System Repair module, select *Expert Tools* then select *Install New Boot Loader*.

8 Restore the original settings and reinstall the boot loader.

9 Leave YaST System Repair and reboot the system.

Other reasons for the machine not booting may be BIOS-related:

BIOS Settings
 Check your BIOS for references to your hard drive. GRUB might simply not be started if the hard drive itself cannot be found with the current BIOS settings.

BIOS Boot Order

Check whether your system's boot order includes the hard disk. If the hard disk
option was not enabled, your system might install properly, but fail to boot when
access to the hard disk is required.

13.3.2 No Graphical Login

If the machine comes up, but does not boot into the graphical login manager, anticipate
problems either with the choice of the default runlevel or the configuration of the X
Window System. To check the runlevel configuration, log in as the root user and
check whether the machine is configured to boot into runlevel 5 (graphical desktop).
A quick way to check this is to examine the contents of /etc/inittab, as follows:

```
nld-machine:~ # grep "id:" /etc/inittab
id:5:initdefault:
nld-machine:~ #
```

The returned line indicates that the machine's default runlevel (initdefault) is set
to 5 and that it should boot to the graphical desktop. If the runlevel is set to any other
number, use the YaST Runlevel Editor module to set it to 5.

IMPORTANT

Do not edit the runlevel configuration manually. Otherwise SuSEconfig (run by
YaST) will overwrite these changes on its next run. If you need to make manual
changes here, disable future SuSEconfig changes by setting *CHECK_INITTAB*
in /etc/sysconfig/suseconfig to no.

If the runlevel is set to 5, you might have corruption problems with your desktop or X
Windows software. Examine the log files at /var/log/Xorg.*.log for detailed
messages from the X server as it attempted to start. If the desktop fails during start, it
might log error messages to /var/log/messages. If these error messages hint at
a configuration problem in the X server, try to fix these issues. If the graphical system
still does not come up, consider reinstalling the graphical desktop.

One quick test: the startx command should force the X Window System to start with
the configured defaults if the user is currently logged in on the console. If that does not
work, it should log errors to the console. For more information about the X Window
system configuration, refer to Chapter 8, *The X Window System* (↑Reference).

13.4 Login Problems

Login problems are those where your machine does, in fact, boot to the expected welcome screen or login prompt, but refuses to accept the username and password or accepts them but then does not behave properly (fails to start the graphic desktop, produces errors, drops to a command line, etc.).

13.4.1 Valid Username and Password Combinations Fail

This usually occurs when the system is configured to use network authentication or directory services and, for some reason, is unable to retrieve results from its configured servers. The `root` user, as the only local user, is the only user that can still log in to these machines. The following are some common reasons why a machine might appear functional but be unable to process logins correctly:

- The network is not working. For further directions on this, turn to Section 13.5, "Network Problems" (page 209).

- DNS is not working at the moment (which prevents GNOME or KDE from working and the system from making validated requests to secure servers). One indication that this is the case is that the machine takes an extremely long time to respond to any action. Find more information about this topic in Section 13.5, "Network Problems" (page 209).

- If the system is configured to use Kerberos, the system's local time might have drifted past the accepted variance with the Kerberos server time (this is typically 300 seconds). If NTP (network time protocol) is not working properly or local NTP servers are not working, Kerberos authentication ceases to function because it depends on common clock synchronization across the network.

- The system's authentication configuration is misconfigured. Check the PAM configuration files involved for any typographical errors or misordering of directives. For additional background information about PAM and the syntax of the configuration files involved, refer to Chapter 18, *Authentication with PAM* (↑Reference).

In all cases that do not involve external network problems, the solution is to reboot the system into single-user mode and repair the configuration before booting again into operating mode and attempting to log in again. To boot into single-user mode:

1 Reboot the system. The boot screen appears, offering a prompt.

2 Enter `1` at the boot prompt to make the system boot into single-user mode.

3 Enter the username and password for `root`.

4 Make all the necessary changes.

5 Boot into the full multiuser and network mode by entering `telinit 5` at the command line.

13.4.2 Valid Username and Password Not Accepted

This is by far the most common problem users encounter, because there are many reasons this can occur. Depending on whether you use local user management and authentication or network authentication, login failures occur for different reasons.

Local user management can fail for the following reasons:

• The user might have entered the wrong password.

• The user's home directory containing the desktop configuration files is corrupted or write protected.

• There might be problems with the X Window System authenticating this particular user, especially if the user's home directory has been used with another Linux distribution prior to installing the current one.

To locate the reason for a local login failure, proceed as follows:

1 Check whether the user remembered his password correctly before you start debugging the whole authentication mechanism. If the user might not remember his password correctly, use the YaST User Management module to change the user's password.

2 Log in as `root` and check `/var/log/messages` for error messages of the login process and of PAM.

3 Try to log in from a console (using Ctrl + Alt + F1). If this is successful, the blame cannot be put on PAM, because it is possible to authenticate this user on this machine. Try to locate any problems with the X Window System or the desktop (GNOME or KDE). For more information, refer to Section 13.4.3, "Login Successful but GNOME Desktop Fails " (page 207) and Section 13.4.4, "Login Successful but KDE Desktop Fails" (page 208).

4 If the user's home directory has been used with another Linux distribution, remove the `Xauthority` file in the user's home. Use a console login via Ctrl + Alt + F1 and run `rm .Xauthority` as this user. This should eliminate X authentication problems for this user. Try a graphical login again.

5 If graphical login still fails, do a console login with Ctrl + Alt + F1. Try to start an X session on another display—the first one (`:0`) is already in use:

```
startx -- :1
```

This should bring up a graphical screen and your desktop. If it does not, check the log files of the X Window System (`/var/log/Xorg.displaynumber.log`) or the log file for your desktop applications (`.xsession-errors` in the user's home directory) for any irregularities.

6 If the desktop could not start because of corrupt configuration files, proceed with Section 13.4.3, "Login Successful but GNOME Desktop Fails " (page 207) or Section 13.4.4, "Login Successful but KDE Desktop Fails" (page 208).

The following are some common reasons why network authentication for a particular user might fail on a specific machine:

- The user might have entered the wrong password.

- The username exists in the machine's local authentication files and is also provided by a network authentication system, causing conflicts.

- The home directory exists but is corrupt or unavailable. Perhaps it is write protected or is on a server that is inaccessible at the moment.

- The user does not have permission to log in to that particular host in the authentication system.

- The machine has changed hostnames, for whatever reason, and the user does not have permission to log in to that host.

- The machine cannot reach the authentication server or directory server that contains that user's information.

- There might be problems with the X Window System authenticating this particular user, especially if the user's home has been used with another Linux distribution prior to installing the current one.

To locate the cause of the login failures with network authentication, proceed as follows:

1 Check whether the user remembered his password correctly before you start debugging the whole authentication mechanism.

2 Determine the directory server the machine relies on for authentication and make sure that it is up and running and properly communicating with the other machines.

3 Determine that the user's username and password work on other machines to make sure that his authentication data exists and is properly distributed.

4 See if another user can log in to the misbehaving machine. If another user can log in without difficulty or if root can log in, log in and examine the `/var/log/messages` file. Locate the time stamps that correspond to the login attempts and determine if PAM has produced any error messages.

5 Try to log in from a console (using Ctrl + Alt + F1). If this is successful, the blame cannot be put on PAM or the directory server on which the user's home is hosted, because it is possible to authenticate this user on this machine. Try to locate any problems with the X Window System or the desktop (GNOME or KDE). For more information, refer to Section 13.4.3, "Login Successful but GNOME Desktop Fails " (page 207) and Section 13.4.4, "Login Successful but KDE Desktop Fails" (page 208).

6 If the user's home directory has been used with another Linux distribution, remove the `Xauthority` file in the user's home. Use a console login via Ctrl + Alt + F1 and run `rm .Xauthority` as this user. This should eliminate X authentication problems for this user. Try a graphical login again.

7 If graphical login still fails, do a console login with Ctrl + Alt + F1. Try to start an X session on another display—the first one (`:0`) is already in use:

```
startx -- :1
```

This should bring up a graphical screen and your desktop. If it does not, check the log files of the X Window System (`/var/log/Xorg.`*`displaynumber`*`.log`) or the log file for your desktop applications (`.xsession-errors` in the user's home directory) for any irregularities.

8 If the desktop could not start because of corrupt configuration files, proceed with

13.4.3 Login Successful but GNOME Desktop Fails

If this is true for a particular user, it is likely that the user's GNOME configuration files have become corrupted. Some symptoms might include the keyboard failing to work, the screen geometry becoming distorted, or even the screen coming up as a bare gray field. The important distinction is that if another user logs in, the machine works normally. If this is the case, it is likely that the problem can be fixed relatively quickly by simply moving the user's GNOME configuration directory to a new location, which causes GNOME to initialize a new one. Although the user is forced to reconfigure GNOME, no data is lost.

1 Switch to a text console by pressing Ctrl + Alt + F1.

2 Log in with your user name.

3 Move the user's GNOME configuration directories to a temporary location:

```
mv .gconf  .gconf-ORIG-RECOVER
mv .gnome2 .gnome2-ORIG-RECOVER
```

4 Log out.

5 Log in again, but do not run any applications.

6 Recover your individual application configuration data (including the Evolution e-mail client data) by copying the `~/.gconf-ORIG-RECOVER/apps/` directory back into the new `~/.gconf` directory as follows:

```
cp -a .gconf-ORIG-RECOVER/apps .gconf/
```

If this causes the login problems, attempt to recover only the critical application data and reconfigure the remainder of the applications.

13.4.4 Login Successful but KDE Desktop Fails

There are several reasons why a KDE desktop would not allow users to login. Corrupted cache data can cause login problems as well as corrupt KDE desktop configuration files.

Cache data is used at desktop start-up to increase performance. If this data is corrupted, start-up is slowed down or fails entirely. Removing them forces the desktop start-up routines to start from scratch. This takes more time than a normal start-up, but data is intact after this and the user can login.

To remove the cache files of the KDE desktop, issue the following command as `root`:

```
rm -rf /tmp/kde-user /tmp/socket-user
```

Replace *user* with the actual username. Removing these two directories just removes the corrupted cache files. No real data is harmed using this procedure.

Corrupted desktop configuration files can always be replaced with the initial configuration files. If you want to recover the user's adjustments, carefully copy them back from their temporary location after the configuration has been restored using the default configuration values.

To replace a corrupted desktop configuration with the initial configuration values, proceed as follows:

1 Switch to a text console by pressing Ctrl + Alt + F1.

2 Log in with your user name.

3 Move the KDE configuration directory and the `.skel` files to a temporary location:

```
mv .kde  .kde-ORIG-RECOVER
mv .skel .skel-ORIG-RECOVER
```

4 Log out.

5 Log in again.

6 After the desktop has started successfully, copy the user's own configurations back into place:

```
cp -a .kde-ORIG-RECOVER/share .kde/share
```

IMPORTANT

If the user's own adjustments caused the login to fail and continue to do so, repeat the procedure as described above, but do not copy the `.kde/ share` directory.

13.5 Network Problems

Many problems of your system may be network-related, even though they do not seem to be at first. For example, the reason for a system not allowing users to log in might be a network problem of some kind. This section introduces a simple check list you can apply to identify the cause of any network problem encountered.

When checking the network connection of your machine, proceed as follows:

1 If using an ethernet connection, check the hardware first. Make sure that your network cable is properly plugged into your computer. The control lights next to your ethernet connector, if available, should both be active.

If the connection fails, check whether your network cable works with another machine. If it does, your network card causes the failure. If hubs or switches are included in your network setup, suspect them to be the culprits as well.

2 If using a wireless connection, check whether the wireless link can be established by other machines. If this is not the case, contact the wireless network's administrator.

3 Once you have checked your basic network connectivity, try to find out which service is not responding. Gather the address information of all network servers needed in your setup. Either look them up in the appropriate YaST module or ask your system administrator. The following list gives some of the typical network servers involved in a setup together with the symptoms of an outage.

DNS (Name Service)
> A broken or malfunctioning name service affects the network's functioning in many ways. If the local machine relies on any network servers for authentication and these servers cannot be found due to name resolution issues, users would not even be able to log in. Machines in the network managed by a broken name server would not be able to "see" each other and communicate.

NTP (Time Service)
> A malfunctioning or completely broken NTP service could affect Kerberos authentication and X server functionality.

NFS (File Service)
> If any application needed data stored in an NFS mounted directory, it would not be able to start or function properly if this service was down or misconfigured. In a worst case scenario, a user's personal desktop configuration would not come up if his home directory containing the `.gconf` or `.kde` subdirectories could not be found due to an outage of the NFS server.

Samba (File Service)
> If any application needed data stored in a directory on a Samba server, it would not be able to start or function properly if this service was down.

NIS (User Management)
> If your openSUSE system relied on a NIS server to provide the user data, users would not be able to log in to this machine if the NIS service was down.

LDAP (User Management)
> If your openSUSE system relied on an LDAP server to provide the user data, users would not be able to log in to this machine if the LDAP service was down.

Kerberos (Authentication)

    Authentication would not work and login to any machine would fail.

CUPS (Network Printing)

    Users would not be able to print.

4 Check whether the network servers are running and whether your network setup allows you to establish a connection:

IMPORTANT

The debugging procedure described below only applies to a simple network server/client setup that does not involve any internal routing. It assumes both server and client are members of the same subnet without the need for additional routing.

4a Use `ping` *hostname* (replace *hostname* with the hostname of the server) to check whether each one of them is up and responding to the network. If this command is successful, it tells you that the host you were looking for is up and running and that the name service for your network is configured correctly.

If ping fails with `destination host unreachable`, either your system or the desired server is not properly configured or down. Check whether your system is reachable by running `ping` *your_hostname* from another machine. If you can reach your machine from another machine, it is the server that is not running at all or not configured correctly.

If ping fails with `unknown host`, the name service is not configured correctly or the hostname used was incorrect. Use `ping` `-n` *ipaddress* to try to connect to this host without name service. If this is successful, check the spelling of the hostname and for a misconfigured name service in your network. For further checks on this matter, refer to . If ping still fails, either your network card is not configured correctly or your network hardware is faulty. Refer to for information about this.

4b Use `host` *hostname* to check whether the hostname of the server you are trying to connect to is properly translated into an IP address and vice versa. If this command returns the IP address of this host, the name service

is up and running. If the `host` command fails, check all network configuration files relating to name and address resolution on your host:

`/etc/resolv.conf`

This file is used to keep track of the name server and domain you are currently using. It can be modified manually or automatically adjusted by YaST or DHCP. Automatic adjustment is preferable. However, make sure that this file has the following structure and all network addresses and domain names are correct:

```
search fully_qualified_domain_name
nameserver ipaddress_of_nameserver
```

This file can contain more than one name server address, but at least one of them must be correct to provide name resolution to your host. If needed, adjust this file using the YaST DNS and Hostname module.

If your network connection is handled via DHCP, enable DHCP to change hostname and name service information by selecting *Change Hostname via DHCP* and *Update Name Servers and Search List via DHCP* in the YaST DNS and Hostname module.

`/etc/nsswitch.conf`

This file tells Linux where to look for name service information. It should look like this:

```
 ...
hosts: files dns
networks: files dns
...
```

The `dns` entry is vital. It tells Linux to use an external name server. Normally, these entries are automatically made by YaST, but it never hurts to check.

If all the relevant entries on the host are correct, let your system administrator check the DNS server configuration for the correct zone information. For detailed information about DNS, refer to Chapter 22, *The Domain Name System* (↑Reference). If you have made sure that the DNS configuration of your host and the DNS server are correct, proceed with checking the configuration of your network and network device.

4c If your system cannot establish a connection to a network server and you have excluded name service problems from the list of possible culprits, check the configuration of your network card.

Use the command `ifconfig` *network_device* (executed as `root`) to check whether this device was properly configured. Make sure that both `inet address` and `Mask` are configured correctly. An error in the IP address or a missing bit in your network mask would render your network configuration unusable. If necessary, perform this check on the server as well.

4d If the name service and network hardware are properly configured and running, but some external network connections still get long time-outs or fail entirely, use `traceroute` *fully_qualified_domain_name* (executed as `root`) to track the network route these requests are taking. This command lists any gateway (hop) a request from your machine passes on its way to its destination. It lists the response time of each hop and whether this hop is reachable at all. Use a combination of traceroute and ping to track down the culprit and let the administrators know.

Once you have identified the cause of your network trouble, you can resolve it yourself (if the problem is located on your machine) or let the system administrators of your network know about your findings so they can reconfigure the services or repair the necessary systems.

13.5.1 NetworkManager Problems

If you have a problem with network connectivity, narrow it down as described in (page 209). If NetworkManager seems to be the culprit, proceed as follows to get logs providing hints on why NetworkManager fails:

1 Open a shell and log in as `root`.

2 Restart the NetworkManager:

```
rcnetwork restart -o nm
```

3 Open a web page, for example, http://www.opensuse.org as normal user to see, if you can connect.

4 Collect any information about the state of NetworkManager in `/var/log/ NetworkManager.`

For more information about NetworkManager, refer to Chapter 10, *Managing Network Connections with NetworkManager* (page 137).

13.6 Data Problems

Data problems are when the machine might or might not boot properly but, in either case, it is clear that there is data corruption on the system and that the system needs to be recovered. These situations call for a backup of your critical data, enabling you to recover a system state from before your system failed. openSUSE offers dedicated YaST modules for system backup and restoration as well as a rescue system that can be used to recover a corrupted system from the outside.

13.6.1 Backing Up Critical Data

System backups can be easily managed using the YaST System Backup module:

1 As `root`, start YaST and select *System > System Backup*.

2 Create a backup profile holding all details needed for the backup, filename of the archive file, scope, and type of the backup:

2a Select *Profile Management > Add*.

2b Enter a name for the archive.

2c Enter the path to the location of the backup if you want to keep a local backup. For your backup to be archived on a network server (via NFS), enter the IP address or name of the server and the directory that should hold your archive.

2d Determine the archive type and click *Next*.

2e Determine the backup options to use, such as whether files not belonging to any package should be backed up and whether a list of files should be dis-

played prior to creating the archive. Also determine whether changed files should be identified using the time-consuming MD5 mechanism.

Use *Expert* to enter a dialog for the backup of entire hard disk areas. Currently, this option only applies to the Ext2 file system.

2f Finally, set the search constraints to exclude certain system areas from the backup area that do not need to be backed up, such as lock files or cache files. Add, edit, or delete items until your needs are met and leave with *OK*.

3 Once you have finished the profile settings, you can start the backup right away with *Create Backup* or configure automatic backup. It is also possible to create other profiles tailored for various other purposes.

To configure automatic backup for a given profile, proceed as follows:

1 Select *Automatic Backup* from the *Profile Management* menu.

2 Select *Start Backup Automatically*.

3 Determine the backup frequency. Choose *daily*, *weekly*, or *monthly*.

4 Determine the backup start time. These settings depend on the backup frequency selected.

5 Decide whether to keep old backups and how many should be kept. To receive an automatically generated status message of the backup process, check *Send Summary Mail to User root*.

6 Click *OK* to apply your settings and have the first backup start at the time specified.

13.6.2 Restoring a System Backup

Use the YaST System Restoration module to restore the system configuration from a backup. Restore the entire backup or select specific components that were corrupted and need to be reset to their old state.

1 Start *YaST > System > System Restoration*.

2 Enter the location of the backup file. This could be a local file, a network mounted file, or a file on a removable device, such as a floppy or a CD. Then click *Next*.

The following dialog displays a summary of the archive properties, such as the filename, date of creation, type of backup, and optional comments.

3 Review the archived content by clicking *Archive Content*. Clicking *OK* returns you to the *Archive Properties* dialog.

4 *Expert Options* opens a dialog in which to fine-tune the restore process. Return to the *Archive Properties* dialog by clicking *OK*.

5 Click *Next* to open the view of packages to restore. Press *Accept* to restore all files in the archive or use the various *Select All*, *Deselect All*, and *Select Files* buttons to fine-tune your selection. Only use the *Restore RPM Database* option if the RPM database is corrupted or deleted and this file is included in the backup.

6 After you click *Accept*, the backup is restored. Click *Finish* to leave the module after the restore process is completed.

13.6.3 Recovering a Corrupted System

There are several reasons why a system could fail to come up and run properly. A corrupted file system after a system crash, corrupted configuration files, or a corrupted boot loader configuration are the most common ones.

openSUSE offers two different methods to cope with this kind of situation. You can either use the YaST System Repair functionality or boot the rescue system. The following sections cover both flavors of system repair.

Using YaST System Repair

Before launching the YaST System Repair module, determine in which mode to run it to best fit your needs. Depending on the severity and cause of your system failure and your expertise, there are three different modes to choose from:

Automatic Repair

> If your system failed due to an unknown cause and you basically do not know which part of the system is to blame for the failure, use *Automatic Repair*. An extensive automated check will be performed on all components of your installed system. For a detailed description of this procedure, refer to Section "Automatic Repair" (page 217).

Customized Repair

> If your system failed and you already know which component is to blame, you can cut the lengthy system check with *Automatic Repair* short by limiting the scope of the system analysis to those components. For example, if the system messages prior to the failure seem to indicate an error with the package database, you can limit the analysis and repair procedure to checking and restoring this aspect of your system. For a detailed description of this procedure, refer to Section "Customized Repair" (page 219).

Expert Tools

> If you already have a clear idea of what component failed and how this should be fixed, you can skip the analysis runs and directly apply the tools necessary for the repair of the respective component. For details, refer to Section "Expert Tools" (page 220).

Choose one of the repair modes as described above and proceed with the system repair as outlined in the following sections.

Automatic Repair

To start the automatic repair mode of YaST System Repair, proceed as follows:

1 Insert the first installation medium of openSUSE into your CD or DVD drive.

2 Reboot the system.

3 At the boot screen, select *Installation*.

4 Confirm the license agreement and click *Next*.

5 In *Installation Mode*, select *Other Options* > *Repair Installed System*.

6 Select *Automatic Repair*.

YaST now launches an extensive analysis of the installed system. The progress of the procedure is displayed at the bottom of the screen with two progress bars. The upper bar shows the progress of the currently running test. The lower bar shows the overall progress of the analysis. The log window in the top section tracks the currently running test and its result. See Figure 13.2, "Automatic Repair Mode" (page 218). The following main test runs are performed with every run. They contain, in turn, a number of individual subtests.

Figure 13.2   *Automatic Repair Mode*
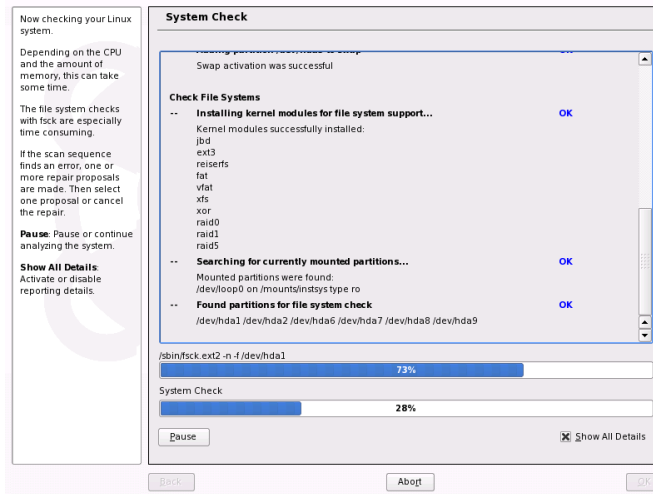
Check Partition Tables

Checks the validity and coherence of the partition tables of all detected hard disks.

Check Swap Areas

The swap partitions of the installed system are detected, tested, and offered for activation where applicable. This offer should be accepted for the sake of a higher system repair speed.

Check File Systems

All detected file systems are subjected to a file system–specific check.

Check fstab Entries

The entries in the file are checked for completeness and consistency. All valid partitions are mounted.

Check Package Database

This checks whether all packages necessary for the operation of a minimal installation are present. While it is optionally possible also to analyze the base packages, this takes a long time because of their vast number.

Check Boot Loader Configuration

The boot loader configuration of the installed system (GRUB or LILO) is checked for completeness and coherence. Boot and root devices are examined and the availability of the initrd modules is checked.

7 Whenever an error is encountered, the procedure stops and a dialog opens outlining the details and possible solutions.

Read the screen messages carefully before accepting the proposed fix. If you decide to decline a proposed solution, your system remains unchanged.

8 After the repair process has been terminated successfully, click *OK* and *Finish* and remove the installation media. The system automatically reboots.

Customized Repair

To launch the *Customized Repair* mode and selectively check certain components of your installed system, proceed as follows:

1 Insert the first installation medium of openSUSE into your CD or DVD drive.

2 Reboot the system.

3 At the boot screen, select *Installation*.

4 Confirm the license agreement and click *Next*.

5 In *Installation Mode*, select *Other Options > Repair Installed System*.

6 Select *Customized Repair*.

Choosing *Customized Repair* shows a list of test runs that are all marked for execution at first. The total range of tests matches that of automatic repair. If you already know where no damage is present, unmark the corresponding tests. Clicking *Next* starts a narrower test procedure that probably has a significantly shorter running time.

Not all test groups can be applied individually. The analysis of the fstab entries is always bound to an examination of the file systems, including existing swap partitions. YaST automatically resolves such dependencies by selecting the smallest number of necessary test runs.

7 Whenever an error is encountered, the procedure stops and a dialog opens outlining the details and possible solutions.

Read the screen messages carefully before accepting the proposed fix. If you decide to decline a proposed solution, your system remains unchanged.

8 After the repair process has been terminated successfully, click *OK* and *Finish* and remove the installation media. The system automatically reboots.

Expert Tools

If you are knowledgeable with openSUSE and already have a very clear idea of what needs to be repaired in your system, directly apply the tools skipping the system analysis.

To make use of the *Expert Tools* feature of the YaST System Repair module, proceed as follows:

1 Insert the first installation medium of openSUSE into your CD or DVD drive.

2 Reboot the system.

3 At the boot screen, select *Installation*.

4 Confirm the license agreement and click *Next*.

5 In *Installation Mode*, select *Other Options > Repair Installed System*.

6 Select *Expert Tools* and choose a repair option.

7 After the repair process has been terminated successfully, click *OK* and *Finish* and remove the installation media. The system automatically reboots.

The *Expert Tools* provides the following options to repair your faulty system:

Install New Boot Loader

This starts the YaST boot loader configuration module. Find details in Section "Configuring the Boot Loader with YaST" (Chapter 13, *The Boot Loader*, ↑Reference).

Start Partitioning Tool

This starts the expert partitioning tool in YaST.

Repair File System

This checks the file systems of your installed system. You are first offered a selection of all detected partitions and can then choose the ones to check.

Recover Lost Partitions

It is possible to attempt to reconstruct damaged partition tables. A list of detected hard disks is presented first for selection. Clicking *OK* starts the examination. This can take a while depending on the processing power and size of the hard disk.

IMPORTANT: *Reconstructing a Partition Table*

The reconstruction of a partition table is tricky. YaST attempts to recognize lost partitions by analyzing the data sectors of the hard disk. The lost partitions are added to the rebuilt partition table when recognized. This is, however, not successful in all imaginable cases.

Save System Settings to Floppy

This option saves important system files to a floppy disk. If one of these files becomes damaged, it can be restored from disk.

Verify Installed Software

This checks the consistency of the package database and the availability of the most important packages. Any damaged installed packages can be reinstalled with this tool.

Using the Rescue System

openSUSE contains a rescue system. The rescue system is a small Linux system that can be loaded into a RAM disk and mounted as root file system, allowing you to access your Linux partitions from the outside. Using the rescue system, you can recover or modify any important aspect of your system:

- Manipulate any type of configuration file.

- Check the file system for defects and start automatic repair processes.

- Access the installed system in a "change root" environment

- Check, modify, and reinstall the boot loader configuration

- Resize partitions using the parted command. Find more information about this tool at the Web site of GNU Parted (http://www.gnu.org/software/parted/parted.html).

The rescue system can be loaded from various sources and locations. The simplest option is to boot the rescue system from the original installation CD or DVD:

IMPORTANT: No rescue system on 64bit (x86-64) installation CDs

Due to lack of space, the installation CDs for 64bit (x86-64) do not contain a rescue system. Either get a x86-64 network installation Mini CD (44 MB) from http://software.opensuse.org/ or start the rescue system from a network source as described below (page 222).

---

1 Insert the installation medium into your CD or DVD drive.

2 Reboot the system.

3 At the boot screen, press F4 and choose *CD-ROM*. Then choose *Rescue System* from the main menu.

4 Enter `root` at the `Rescue:` prompt. A password is not required.

If your hardware setup does not include a CD or DVD drive, you can boot the rescue system from a network source (including the openSUSE FTP server). The following example applies to a remote boot scenario—if using another boot medium, such as a floppy disk, modify the `info` file accordingly and boot as you would for a normal installation.

1 Enter the configuration of your PXE boot setup and replace `install=`*protocol*`://`*instsource* with `rescue=`*protocol*`://`*instsource*. As with a normal installation, *protocol* stands for any of the supported network protocols (NFS, HTTP, FTP, etc.) and *instsource* for the path to your network installation source.

2 Boot the system using "Wake on LAN", as described in Section "Wake on LAN" (Chapter 1, *Remote Installation*, ↑Reference).

3 Enter `root` at the `Rescue:` prompt. A password is not required.

Once you have entered the rescue system, you can make use of the virtual consoles that can be reached with Alt + F1 to Alt + F6.

A shell and many other useful utilities, such as the mount program, are available in the `/bin` directory. The `sbin` directory contains important file and network utilities for reviewing and repairing the file system. This directory also contains the most important binaries for system maintenance, such as fdisk, mkfs, mkswap, mount, mount, init, and shutdown, and ifconfig, ip, route, and netstat for maintaining the network. The directory `/usr/bin` contains the vi editor, find, less, and ssh.

To see the system messages, either use the command `dmesg` or view the file `/var/log/messages`.

Checking and Manipulating Configuration Files

As an example for a configuration that might be fixed using the rescue system, imagine you have a broken configuration file that prevents the system from booting properly. You can fix this using the rescue system.

To manipulate a configuration file, proceed as follows:

1 Start the rescue system using one of the methods described above.

2 To mount a root file system located under `/dev/sda6` to the rescue system, use the following command:

```
mount /dev/sda6 /mnt
```

All directories of the system are now located under `/mnt`

3 Change the directory to the mounted root file system:

```
cd /mnt
```

4 Open the problematic configuration file in the vi editor. Adjust and save the configuration.

5 Unmount the root file system from the rescue system:

```
umount /mnt
```

6 Reboot the machine.

Repairing and Checking File Systems

Generally, file systems cannot be repaired on a running system. If you encounter serious problems, you may not even be able to mount your root file system and the system boot may end with a "kernel panic". In this case, the only way is to repair the system from the outside. It is strongly recommended to use the YaST System Repair for this task (see Section "Using YaST System Repair" (page 216) for details). However, if you need to do a manual file system check or repair, boot the rescue system. It contains the utilities to check and repair the ext2, ext3, reiserfs, xfs, dosfs, and vfat file systems.

Accessing the Installed System

If you need to access the installed system from the rescue system to, for example, modify the boot loader configuration, or to execute a hardware configuration utility, you need to do this in a "change root" environment.

To set up a "change root" environment based on the installed system, proceed as follows:

1 First mount the root partition from the installed system and the device file system:

```
mount /dev/sda6 /mnt
mount --bind /dev /mnt/dev
```

2 Now you can "change root" into the new environment:

```
chroot /mnt
```

3 Then mount /proc and /sys:

```
mount /proc
mount /sys
```

4 Finally, mount the remaining partitions from the installed system:

```
mount -a
```

5 Now you have access to the installed system. Before rebooting the system, unmount the partitions with `umount -a` and leave the "change root" environment with `exit`.

WARNING: Limitations

Although you have full access to the files and applications of the installed system, there are some limitations. The kernel that is running is the one that was booted with the rescue system. It only supports essential hardware and it is not possible to add kernel modules from the installed system unless the kernel versions are exactly the same (which is unlikely). So you cannot access a sound card, for example. It is also not possible to start a graphical user interface.

Also note that you leave the "change root" environment when you switch the console with Alt + F1 to Alt + F6.

Modifying and Reinstalling the Boot Loader

Sometimes a system cannot boot because the boot loader configuration is corrupted. The start-up routines cannot, for example, translate physical drives to the actual locations in the Linux file system without a working boot loader.

To check the boot loader configuration and reinstall the boot loader, proceed as follows:

1 Perform the necessary steps to access the installed system as described in Section "Accessing the Installed System" (page 224).

2 Check whether the following files are correctly configured according to the GRUB configuration principles outlined in Chapter 13, *The Boot Loader* (↑Reference).

- `/etc/grub.conf`

- `/boot/grub/device.map`

- `/boot/grub/menu.lst`

Apply fixes to the device mapping (`device.map`) or the location of the root partition and configuration files, if necessary.

3 Reinstall the boot loader using the following command sequence:

```
grub ––batch < /etc/grub.conf
```

4 Unmount the partitions, log out from the "change root" environment, and reboot the system:

```
umount –a
exit
reboot
```

13.7 Support for openSUSE

Useful support information for openSUSE is available in a number of sources.

- Free installation support for retail box customer

- Advanced Support

- Free community support http://en.opensuse.org/Communicate

If you encounter problems with the installation or use of openSUSE that you are unable to solve, our experienced support staff can offer practical assistance with the free installation support for registered releases and the incident-based support (Advanced Support) by phone or Web for unregistered, expired, or download versions. Nearly all common customer problems can be eliminated quickly and competently. You can use the extensive support offered through the community as well.

13.7.1 Free Installation Support

Our free installation support is provided for a period of 90 days following the activation of your registration code or following the release of the next version. If you cannot find an answer to your question in any of the available information sources, we will gladly provide assistance for the following issues:

- Installation on a typical home user system or laptop equipped with a single processor, at least 256 MB RAM, and 3 GB of free hard disk space.

- Resizing of one Windows partition that occupies the entire hard disk.

- Installation of a local ATAPI CD or DVD drive.

- Installation on the first or second hard disk in an IDE-only system (`/dev/sda` or `/dev/sdb`) or supported S-ATA system, excluding RAID.

- Integration of a standard keyboard and standard mouse.

- Configuration of the graphical user interface (without the hardware acceleration feature of the graphics card).

- Installation of the boot manager in the MBR of the first hard disk or on a floppy disk without modifying the BIOS mapping.

- Setup of Internet access with a supported PCI ISDN card or external serial modem (not USB). Alternatively, setup of DSL based on PPPoE with a supported NIC.

- Basic configuration of an ALSA-supported PCI sound card.

- Basic configuration of a locally-attached compatible printer with YaST.

- Basic configuration of an IDE CD writer for use with k3b (CD burning application) without changing the jumper setting.

- Configuration of a supported PCI ethernet card for LAN access with either DHCP (client) or static IP. This does not include the configuration of the LAN or any other computers or network components. It also does not cover the configuration of the computer as a router. Fault analysis is limited to checking for proper loading of the kernel module and the correct local network settings.

- Configuration of an e-mail client (Evolution or KMail) for collecting mail from a POP3 account. Fault analysis is limited to checking for proper settings in the e-mail client.

- Support for the package selection GNOME Desktop or KDE Desktop.

- Upgrade from the previous version of the product.

- Kernel updates (only official Novell update RPMs).

- Installation of bug fixes and security updates from the official update server using online update or the manual method.

For a detailed listing of the subjects covered by the free installation support, check http://support.novell.com/products/suselinux/support _overview.html.

In case you are not sure if your support is covered, please do not hesitate to give us a call. We are happy to assist.

Contact Information for Free Installation Support

Reach our support staff under the following links and phone numbers. Any prices listed are typical call costs, not costs for support.

- http://support.novell.com/eService

- United States and Canada: Phone: +1-800-796-3700 (Monday through Friday from 04:30 a.m. to 12:00 noon EST)

- Germany: Phone: 0180 500 36 12 (14 Cent/min) (Monday through Friday from 10:30 to 18:00 CET)

- Austria: Phone: 0820 500 781 (14.5 Cent/min) (Monday through Friday from 10:30 to 18:00 CET)

- Switzerland: Phone: 0848 860 847 (costs depend on provider) (Monday through Friday from 10:30 to 18:00 CET)

- UK: Phone: +44-1344-326-666 (Monday through Friday from 09:30 to 17:00 GMT)

- All other countries (English only): Phone: +44-1344-326-666 (Monday through Friday from 10:30 to 18:00 CET)

For the most recent contact information, refer to http://support.novell.com/ products/suselinux/contact.html.

Important Notes

1. Free installation support is offerd to customers with a valid, activated registration code. You can activate your registration code at `http://www.novell.com/usersupport`.

2. The registration code is not transferable to another person.

3. The free support covers only the initial installation on one computer. Refer to our Web site for further information `http://support.novell.com/products/opensuse/support_overview.html`.

4. We can provide support only for hardware supported by openSUSE. Refer to our Component Database at `http://www.novell.com/usersupport/hardware` for information about supported hardware components.

Contact Recommendations

We recommend to use `http://support.novell.com/eService` to open a service request and to provide us with the relevant information like problem description and log files. It helps us to avoid misspelled commands, links, or directory names, which often cause frustrating problems and are particularly common during phone conversations. You will receive a reply soon after that providing a practical solution.

13.7.2 Advanced Support

Advanced support is available at transparent rates. Take advantage of our Advanced Support Program if your question is not covered by the scope of the free service (e.g. no valid support claim, installation support has expired, usage of a download version). You can reach us by phone:

- United States and Canada: Phone: +1-800-796-3700, Price: $25 including tax, Monday through Friday from 04:30 a.m. to 12:00 noon EST or 01:30 a.m. to 09:00 a.m. PST

- Germany: 0900 1000 499 (1.86 €/minute) (Monday through Friday 10:30-18:00 CET)

- Austria: 0900-47 01 10 (1.80 €/minute) (Monday through Friday 10:30-18:00 CET)

- Switzerland: 0900-70 07 10 (3.13 SFr/minute) (Monday through Friday 10:30-18:00 CET)

- All other countries: Phone: +44-1344-326-666, Price: € 25 including VAT, Monday through Friday, 10:30-18:00 CET

The numbers for Germany, Austria, and Switzerland offer payment per minute. Other countries offer payment per incident. One incident covers up to 20 minutes of assistance from our experienced support staff. The payment is credit-card based. Visa, Eurocard, and Mastercard are accepted. Financial transactions may be handled by our service partner, Stream / ECE EMEA Ltd.

Please be aware that the phone numbers may change during the sales cycle of openSUSE 10.3. Find current numbers as well as a detailed listing of the subjects covered by the Advanced Support Service at `http://www.novell.com/usersupport`.

NOTE: Note

While our expert staff will do their best to provide top-quality support, we cannot guarantee a solution.

13.7.3 Preparing a Support Request

We endeavor to help you as quickly and precisely as possible. The effort and time needed is considerably reduced if the question is formulated clearly. Please have answers to the following questions ready before contacting us:

1. Which program and version are you using? During which process does the problem occur?

2. What exactly is the problem? Try to describe the error as precisely as possible, using phrases with words such as *when* (for example, "When X is pressed, this error appears").

3. What hardware do you use (graphics card, monitor, printer, ISDN card, etc.)? You can get this information from the YaST *Hardware Information* module.

Detailed documentation can be found in manuals, online help, and the Support Database. These comprehensive documentation of openSUSE gives guidance to solve a variety

of problems. The SUSE Help Center on your desktop provides additional information about installed packages, the vital HOWTOs, and info pages.

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