openSUSE

10.2

November 24, 2006 | 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

There are other manuals available on this openSUSE product, either online at `http://www.novell.com/documentation/opensuse102` or in your installed system under `/usr/share/doc/manual`:

KDE User Guide
> This manual introduces the KDE desktop of your openSUSE and a variety of applications that will be available to you when working with the KDE 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 KDE in everyday life.

GNOME User Guide
> This manual introduces the GNOME desktop of your openSUSE and a variety of applications that will be available to you 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
> This manual gives you a general understanding of openSUSE and covers advanced system administration tasks with openSUSE . 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 Administration Guide
> This guide contains in-depth information about the use of *AppArmor* in your environment.

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, ↑*Reference*): This is a reference to a chapter in another book.

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

1

You 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 will probably follow the default YaST proposals in most parts, but you can also adjust the settings as described here if you want to fine-tune your system according to your needs and wishes. Background information is provided where appropriate. Many parts of the basic system configuration (such as user accounts or system language) can also be modified after the installation process.

1.1 Hardware Requirements

openSUSE supports most PC hardware components. The following requirements should be met to ensure smooth operation of openSUSE:

Processor
> Intel: Pentium 1-4 or Xeon
>
> AMD: Duron, Athlon, Athlon XP, Athlon MP, Athlon 64, Sempron or Opteron

Main Memory
> At least 256 MB; 512 MB recommended

Hard Disk Space
> At least 500 MB for minimal system; 3 GB recommended for standard system

Sound and Graphics Cards
> Supports most modern sound and graphics cards

For complete system requirements, visit `www.opensuse.org/sysreqs`.

1.2 System Start-Up for Installation

You can install openSUSE either from local installation sources, such as the openSUSE CDs or DVD or you can choose a network-based installation and get the installation sources from an FTP, HTTP, or NFS 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, no matter which installation source or method you prefer.

1.2.1 Boot Options

Boot options other than CD or DVD exist and can be used if problems arise booting from CD or DVD. These options are described in Table 1.1, "Boot Options" (page 5).

Table 1.1   *Boot Options*

Boot Option	Description
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.
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 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 CD 1 to the hard disk and add the appropriate entry to the boot loader.

1.2.2 Installing from the openSUSE Media

Install from physical boot media (your openSUSE media kit) as follows:

1 Insert the medium into your CD or DVD drive.

2 Reboot the system.

3 At the boot screen, select *Installation* and follow the instructions given in Section 1.3, "The Boot Screen" (page 7) and the following sections.

1.2.3 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 OpenSLP (see Section 1.2, "Setting Up the Server Holding the Installation Sources" (Chapter 1, *Remote Installation*, ↑Reference)), proceed as follows to install openSUSE.

1 Set up an installation server as described in Section 1.2, "Setting Up the Server Holding the Installation Sources" (Chapter 1, *Remote Installation*, ↑Reference).

2 Insert the first CD of the media kit into the CD-ROM drive an reboot the machine.

3 At the boot screen, select *Installation*, 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 normally.

4 Finish the installation as if you had chosen to install from physical media.

1.2.4 Installing from a Network Server

To perform a manual installation using a network installation source, proceed as follows:

1 Set up an installation server as described in Section 1.2, "Setting Up the Server Holding the Installation Sources" (Chapter 1, *Remote Installation*, ↑Reference).

2 Insert the first CD or DVD of the media kit into the corresponding drive then reboot the machine.

3 At the boot screen, select *Installation* and use the boot options prompt to pass additional information, such as:

• Location of the installation server:

```
install=protocol:inst_source
```

Replace *protocol* with the protocol prefix for the service used by the installation server (`nfs`, `http`, or `ftp`). Replace *inst_source* with the IP address of the installation server.

- Network configuration parameters if your setup does not support DHCP configuration (for reference, see Section 1.4.3, "Using Custom Boot Options" (Chapter 1, *Remote Installation*, ↑Reference)).

4 Press Enter to boot for installation. If no network parameters have been specified at the boot options prompt, the installation routines try to set up the network using DHCP. If this fails, you are prompted for these parameters. After you have provided them, the installation proceeds.

5 Finish the installation as if you had chosen to install from the physical media.

1.3 The Boot Screen

The boot screen displays a number of options for the installation procedure. *Boot from Hard Disk* boots the installed system. This item is selected by 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.

Installation—ACPI Disabled
If the normal installation fails, this might be due to the system hardware not supporting ACPI (advanced configuration and power interface). If this seems to be the case, use this option to install without ACPI support.

Installation—Local APIC Disabled
If the normal installation fails, this might be due to the system hardware not supporting local APIC (Advanced Programmable Interrupt Controllers). If this seems to be the case, use this option to install without local APIC support.

If you are not sure, try one of the following options first: *Installation—ACPI Disabled* or *Installation—Safe Settings*.

Installation—Safe Settings

Boots the system with the DMA mode (for CD-ROM drives) and power management functions disabled. Experts can also use the command line to enter or change kernel parameters.

Rescue System

Starts a minimal Linux system without a graphical user interface. For more information, see Section "Using the Rescue System" (page 193).

Firmware Test

Starts a BIOS checker that validates ACPI and other parts of your BIOS.

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 168).

Use the function keys indicated in the bar at the bottom of the screen to change a number of installation settings.

F1

Get context-sensitive help for the active element of the boot screen.

F2

Select the display language for the installation.

F3

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

F4

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. Information about SLP is available in Chapter 22, *SLP Services in the Network* (↑Reference).

F5

Press this key to tell the system that you have an optional disk with a driver update for openSUSE. You will be asked to insert the update disk at the appropriate point in the installation process.

A few seconds after starting the installation, openSUSE loads a minimal Linux system to run the installation procedure. If you want to know what is going on during the boot process, press Esc to see messages and copyright notices scroll by. At the end of the loading process, the YaST installation program starts. After a few more seconds, the screen should display the graphical installer. The actual installation of openSUSE begins at this point.

1.4 Language Selection

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. If your mouse does not work, select the language with the arrow keys and press Tab until *Next* is highlighted. Then press Enter to confirm your language selection.

Figure 1.1 *Language Selection*
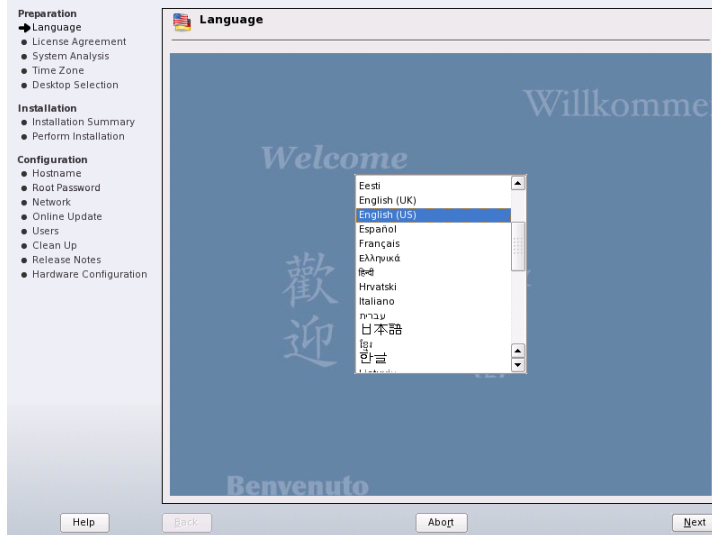
1.5 Media Check

This dialog only appears if you install your openSUSE from a CD or DVD. With the media check you can examine the medium integrity. To start the media check, select the drive in which you have inserted your installation medium and click *Start Check* The check can take some time. In case you want to test several media, wait until a result message appears in the dialog, before you change the medium to check the next one. If the last medium you check is not the one with which you started the installation, YaST will prompt you to reinsert 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 since installation may fail or you may lose your data. Replace the broken medium and restart the installation process.

If the result of the media check is positive, click *Next* to continue the installation.

Figure 1.2   *Media Check*
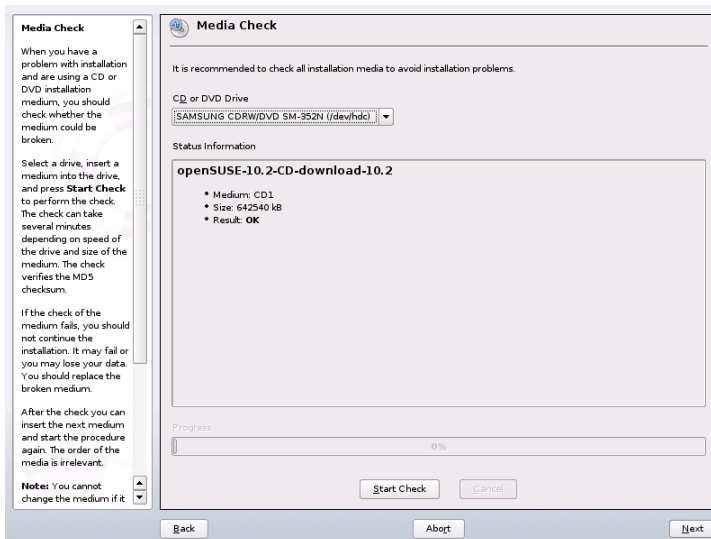
1.6 License Agreement

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 are not allowed to install openSUSE and the installation terminates.

Figure 1.3   *License Agreement*
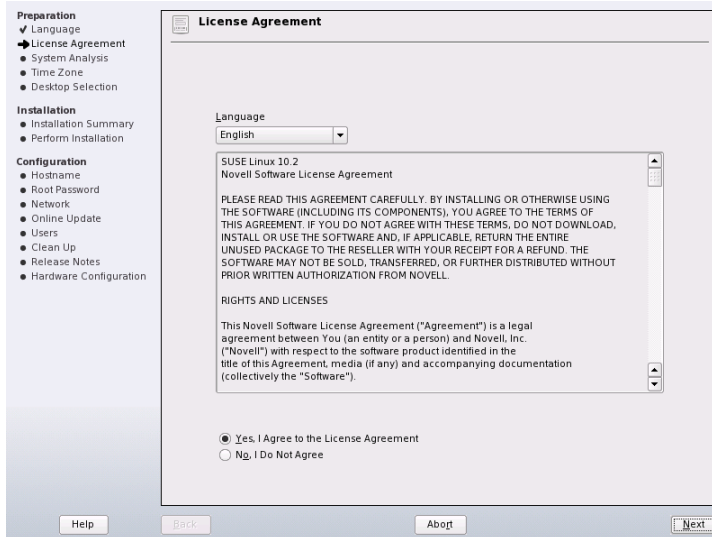
1.7 System Analysis

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. Select *New installation* or *Update an existing system*. Updating is only possible if an openSUSE system is already installed. The *Other* option is useful for the following cases: to boot an already installed openSUSE system or to repair an installed system which fails to boot. In this cases, select *Other Options* to access *Boot Installed System* or *Repair Installed System*. If no openSUSE system is installed, you can only perform a new installation.

The following sections describe the procedure of installing a new system. Find a description of the system repair options in Section "Using YaST System Repair" (page 189).

You can choose to install add-on products together with your openSUSE system during the initial installation process or at any time later as described Section 3.4, "Installing Add-On Products" (page 50). Add-on products are extensions for your system and can include proprietary third-party products (such as Acrobat Reader*, RealPlayer*, etc.) and additional languages for your system.

The openSUSE installation media include support for the following languages:

- English

- French

- Italian

- Spanish

- Brazilian Portuguese

- German

- Traditional Chinese

- Simplified Chinese

- Japanese

- Czech

For further languages use the language add-on medium.

For a detailed overview of the add-on media and add-on products which ship with openSUSE, refer to the openSUSE Release Notes.

Figure 1.4 *Installation Mode*
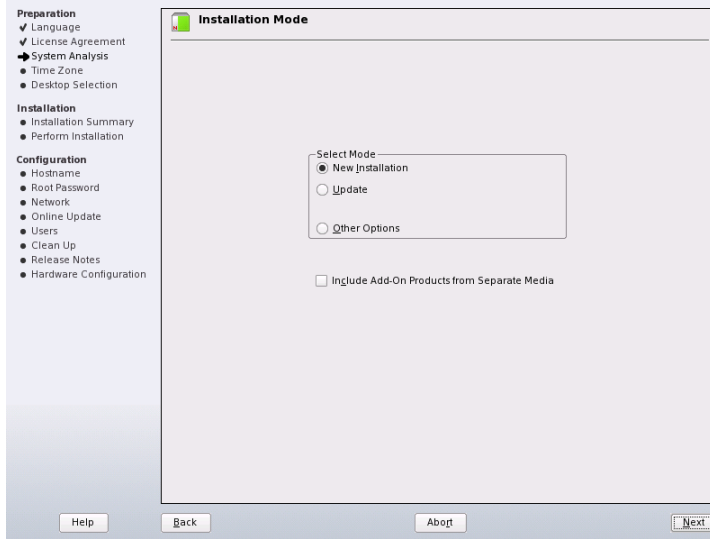
To include add-on products during the installation of openSUSE, select *Include Add-On Products from Separate Media* and click *Next*. In the next dialog, click *Add* to select the source from which to install the add-on products. You can select various types of media, like CD, FTP or local directory. After successfully adding the add-on media, you may have to agree to additional licenses for third-party products. The added source for add-on media appears in the overview.

The following sections describe the procedure of installing a new system. Find a description of the system repair options in Section "Using YaST System Repair" (page 189).

1.8 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. Choose between *Local Time* and *UTC* (GMT) under *Hardware Clock Set To*. The selection depends on how the BIOS hardware clock is set on your machine. If it is set to GMT, which corresponds to UTC, your system can rely on openSUSE to switch from standard time to daylight saving time and back automatically. Click *Change* to set the current date and time. When finished, click *Next* to continue the installation.

Figure 1.5   *Clock and Time Zone*
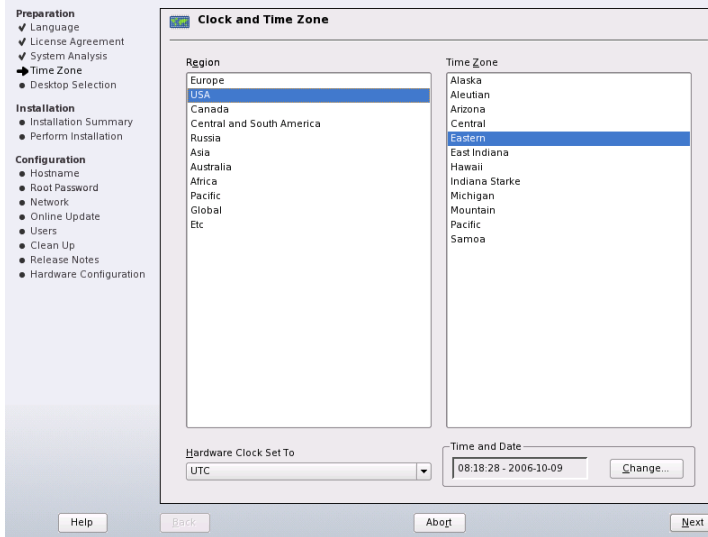
1.9 Desktop Selection

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*. If you do not want either, choose *Other* and click *Select* 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 1.6 *Time Zone*

1.10 Installation Summary

After a thorough system analysis, YaST presents reasonable suggestions for all installation settings. The options that sometimes need manual intervention in common installation situations are presented in the *Overview* tab. Find more special options in the *Expert* tab. To modify the suggestions, click *Change* and select the category you want to change. After configuring any of the items presented in these dialogs, you are always returned to the summary window, which is updated accordingly. You can reset changes you already made by clicking *Change → Reset to Defaults*. YaST then shows the original proposal again. The individual settings are discussed in the following sections.

The *Overview* tab consists of following options:

- Section 1.10.1, "Partitioning" (page 16)

- Section 1.10.2, "Software" (page 20)

- Section 1.10.3, "Locale Settings" (page 21)

Figure 1.7   *Installation Settings*
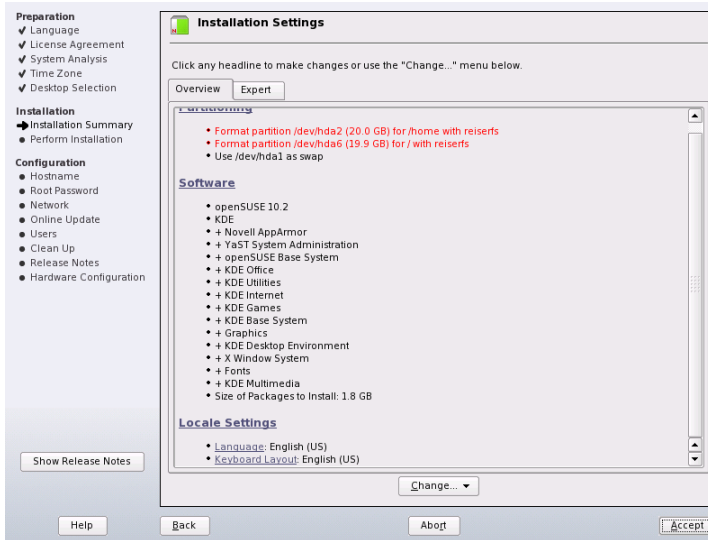
1.10.1 Partitioning

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 you should be an experienced user to change partitioning. For more information about custom partitioning, refer to Section 2.1, "Using the YaST Partitioner" (Chapter 2, *Advanced Disk Setup*, ↑Reference).

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* or change them before continuing.

Figure 1.8 *Partitioning*
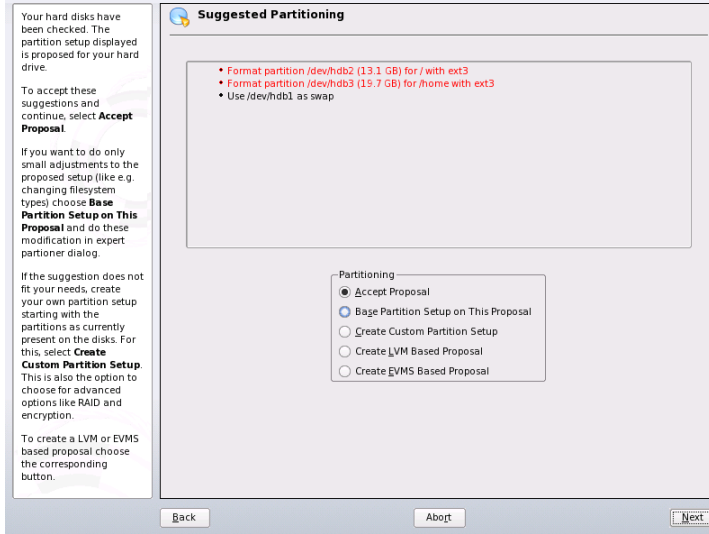
YaST normally proposes a reasonable partitioning scheme with sufficient disk space. If you want to implement your own partitioning scheme, consider the following recommendations concerning the requirements for different system types.

Table 1.2 *Space Requirements*

Installation Type	Minimal Required Space
GNOME Desktop	2.2 GB
KDE Desktop	2.0 GB
Minimal Graphical System	1 GB
Text Mode	700 MB

The requirements in the Table 1.2, "Space Requirements" (page 17) cover only the free disk space needed for the system. Your personal data like your 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. If YaST sees that there is not enough space on the selected hard disk, but that space could be made available by deleting or shrinking a Windows partition, it presents a dialog in which to choose one of these two options.

Figure 1.9 *Possible Options for Windows Partitions*
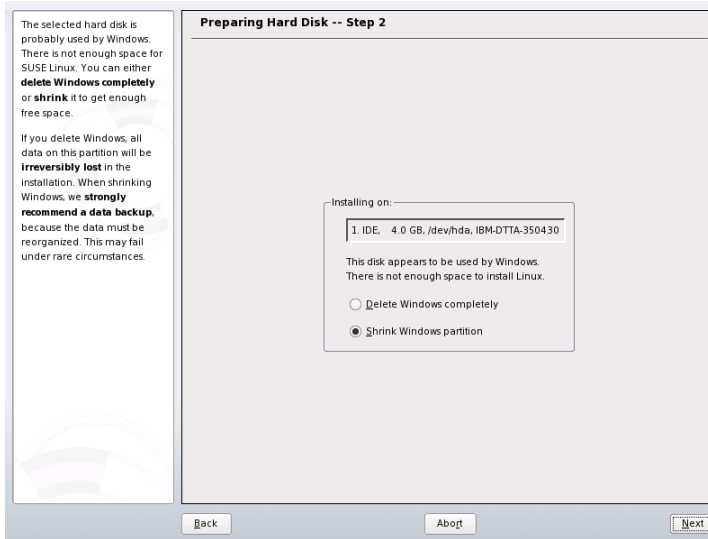
If you select *Delete Windows Completely*, the Windows partition is marked for deletion and the space is used for the installation of openSUSE.

WARNING: Deleting Windows

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

To shrink the Windows partition, interrupt the installation and boot Windows to prepare the partition from there. For all Windows file systems do:

- Run scandisk

- Run defrag

- Temporarily deactivate the swap file (Windows optimizations)

After these preparations, return to the Linux partitioning setup and select *Shrink Windows Partition*. After a quick check of the partition, YaST opens a dialog with a suggestion for resizing the Windows partition.

Figure 1.10   *Resizing the Windows Partition*
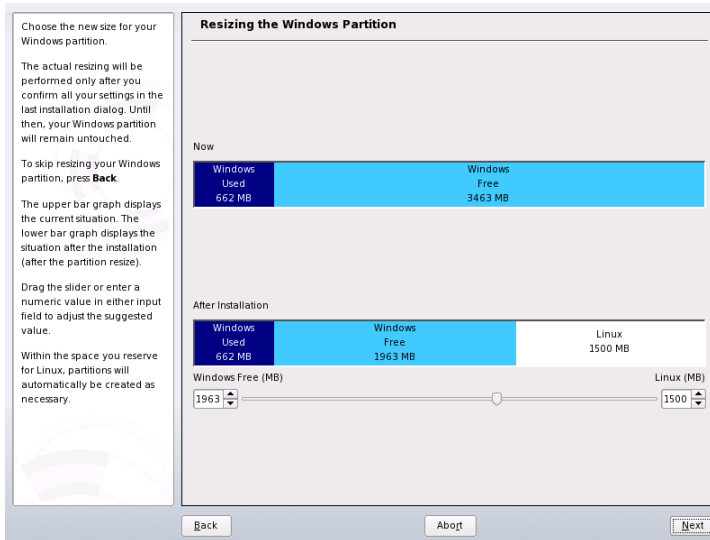
The first bar graph shows how much disk space is currently occupied by Windows and how much space is still available. The second bar graph shows how the space would be distributed after the resizing, according to YaST's current proposal. See Figure 1.10, "Resizing the Windows Partition" (page 19). Accept the proposed settings or use the slider to change the partition sizing (within certain limits).

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 basic write access support to the NTFS file system, but this feature has limited functionality. This means you can read your Windows files from Linux or overwrite them but you cannot extend or remove them.

1.10.2 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 categories from the list in the middle and see the description in the right window. Each category contains a number of software packages that meet most requirements for that category. For more detailed selection of software packages to install, select *Details* to switch to the YaST Package Manager. See Figure 1.11, "Installing and Removing Software with the YaST Package Manager" (page 20).

Of course, you can also install additional software packages or remove software packages from your system at any time later. For more information, refer to Chapter 3, *Installing or Removing Software* (page 45).

Figure 1.11   *Installing and Removing Software with the YaST Package Manager*
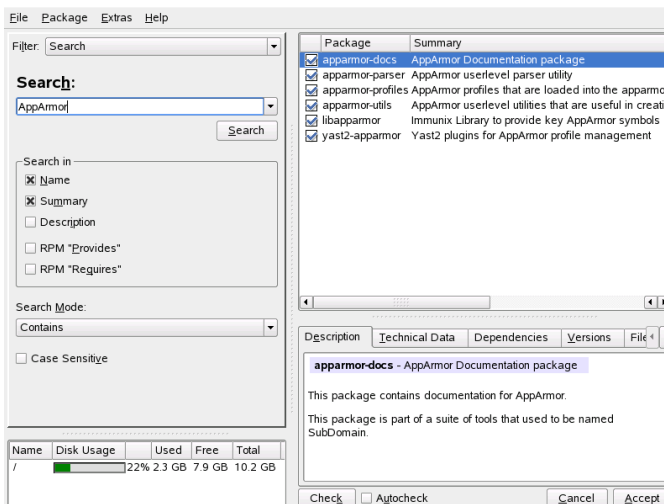
1.10.3 Locale Settings

Here you can change the locale settings. If you want to change the system language or to configure support for secondary languages, select *Language*. To change the keyboard layout, select *Keyboard Layout*.

Language
> Select the language from the list. The primary language is used as the system language. If you want to have support for other languages, but do not want to change the system language, select these languages as secondary languages. For more information, see Chapter 6, *Changing the System Language with YaST* (page 67).

Keyboard Layout
> Select the keyboard layout from the list. By default, the layout corresponds to the selected primary language. After selecting a different layout, 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 Section 2.3, "Setting Up Keyboard and Mouse" (page 33). When finished, click *Accept* to return to the installation settings dialog.

1.10.4 The Expert Configuration

The *Overview* tab in the *Installation Settings* dialog provides only basic options. If you are an advanced user and want to configure booting, change time zone, or default runlevel, select the *Expert* tab. It shows the following additional entries not contained on 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. You may also add PCI IDs to device drivers with this dialog.

Booting
> During the installation, 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, read Section 14.3, "Configuring the Boot Loader with YaST" (Chapter 14, *The Boot Loader*, ↑Reference). The boot method should only be changed by experienced computer users.

Time Zone
>In this dialog, change your region and time zone by selecting them from the lists. Choose between *Local Time* and *UTC* (GMT) under *Hardware Clock Set To*. The selection depends on how the BIOS hardware clock is set on your machine. If it is set to GMT, which corresponds to UTC, your system can rely on openSUSE to switch from standard time to daylight saving time and back automatically. Click *Change* to set the current date and time. When finished, click *Accept* to return to the installation settings dialog.

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 13.2.3, "Configuring System Services (Runlevel) with YaST" (Chapter 13, *Booting and Configuring a Linux System*, ↑Reference) for information about runlevel configuration.

1.11 Performing the Installation

After making all installation settings, click *Accept* in the suggestion window to begin the installation. Confirm with *Install* in the dialog that opens. The installation usually takes between 15 and 30 minutes, depending on the system performance and the software selected. As soon as all packages are installed, YaST boots into the new Linux system, after which you can configure the hardware and set up system services.

Figure 1.12 *Confirm Installation*
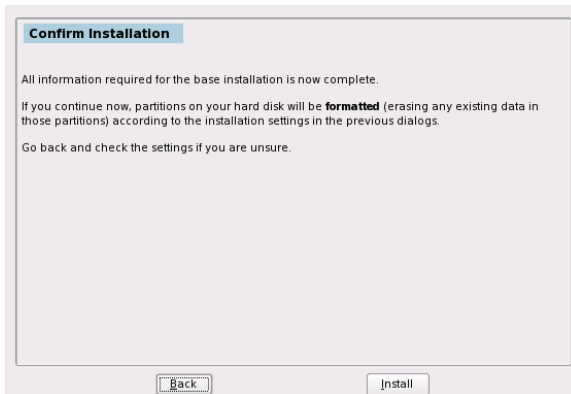
1.12 Configuration

After the installation of the basic system setup and the installation of all selected software packages, provide a password for the account of the system administrator (the `root` user). You can then 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 configure an authentication server for centralized user administration in a local network. Finally, configure the hardware devices connected to the machine.

1.12.1 root Password

`root` is the name of the superuser, the administrator of the system. Unlike regular users, which 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 many 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.

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.

1.12.2 Hostname

The hostname is the computer's name in the network. The fully qualified domain name, needed here, includes the name of the domain to which the computer belongs. Each server and client in the network should have a unique hostname.

If you are located in a local network, you might receive your hostname over DHCP, in which case you should not modify the name. To receive the hostname over DHCP, select *Change Hostname via DHCP*.

1.12.3 Network Configuration

You can now choose whether to use NetworkManager or the traditional method to manage all your network devices. NetworkManager is the new tool enabling automatic connection establishment with minimal user intervention. It is ideal for mobile computing. Also configure the network devices of your system and make security settings, for example, for a firewall or proxy. To configure your network hardware at this stage, refer to Chapter 4, *Accessing the Internet* (page 55) for a checklist which data you should have available. If you want to configure your network connection later, select *Skip Configuration* and click *Next*. Network hardware can also be configured after the system installation has been completed.

NOTE: Network Devices and Update

If you skip the network device configuration, your system will be offline and unable to retrieve any available updates or include them in the installation.

As well as device configuration, configure network accessibility–related settings:

Firewall Configuration
> When you connect to a network, a firewall is started automatically on the configured interface. The configuration proposal for the firewall is updated automatically every time the configuration of the interfaces or services is modified. To adapt the automatic settings to your own preferences, click *Change → Firewall*. In the dialog that opens, determine whether the firewall should be started. If you do not want the firewall to be started, select the appropriate option and exit the dialog. To start and configure the firewall, click *Next* for a series of dialogs similar to those described in Section 37.4.1, "Configuring the Firewall with YaST" (Chapter 37, *Masquerading and Firewalls*, ↑Reference).

VNC Remote Administration
> To administer your machine remotely by VNC, click *Change → VNC Remote Administration*, enable remote administration, and open the port in the firewall. If you have multiple network devices and want to select on which to open the port, click

Firewall Details and select the network device. You can also use SSH, a more secure option, for remote administration.

Proxy

If you have a proxy server in your network to control access to the network, enter the server name and all other required information to enable access to the Internet.

Internet Connection Test

If you have configured an Internet connection, you can test it now. For this purpose, YaST establishes a connection to the openSUSE server and checks if any product updates are available for your version of openSUSE. If there are such updates, they can be included in the installation. Also, the latest release notes are downloaded. You can read them at the end of the installation.

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 of the test. If the test fails, click *Back* to return in the previous dialog and correct the configuration or skip the test. If you need more information about the test process, click *View Logs*.

If you do not want to test the connection at this point, select *No, Skip This Test* then *Next*. This also skips downloading product updates and release notes.

If you have multiple network interfaces in your system, verify that the the right card is used to connect to the Internet. To do so, click *Change device*.

1.12.4 Online Update

If the test of the connection to the Internet has failed or you skipped it, the next step is the user configuration. See Section 1.12.5, "Users" (page 27). For detailed instructions how to perform an online update after the installation, see Section 3.5, "Keeping the System Up-to-date" (page 51) or Chapter 3, *Online Update* (↑Reference).

Customer Center

To get technical support and product updates, first register and activate your product. *Novell Customer Center Configuration* provides assistance for doing so. If you are offline or want to skip this step, select *Configure Later*.

In *Include for Convenience*, select whether to obtain some of the necessary information from your system. This simplifies the registration process. If you want to see what is required to register your system or what happens with your data, use *Details*.

Performing an Online Update

If YaST was able to connect to the openSUSE servers, 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.

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.

Additional Installation Sources

Installation media have limited space. In order to install more or different software, you can add additional installation sources for openSUSE. To add an additional source, select the source from the list and click *Yes*. You can select multiple sources at once.

Additional installation sources added during installation are disabled by default after installation. To enable an additional installation source, run YaST and select *Software → Installation Source* module, described in Section 3.3, "Adding Installation Source" (page 49). To install the additional software, use the YaST software management tool. For more information about installing or removing software, refer to Chapter 3, *Installing or Removing Software* (page 45).

NOTE: Additional Sources after Installation

This dialog is available during installation only. If you want to add additional sources after the installation, visit http://en.opensuse.org/ Installation_Sources.

1.12.5 Users

If network access was configured successfully during the previous steps of the installation, you now have the following possibilities to manage user accounts on your system:

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 of another system using `/etc/passwd`, it offers the possibility 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*.

LDAP
> Users are administered centrally on an LDAP server for all systems in the network.

NIS
> Users are administered centrally on a NIS server for all systems in the network.

Windows Domain
> SMB authentication is often used in mixed Linux and Windows networks.

NOTE: Content of the Authentication Menu

If you use the custom package selection and one or more authentication methods are missing from the menu, you probably did not select the packages required for it.

If all requirements are met, YaST opens a dialog in which to select the user administration method. If you do not have an existing network connection, create local user accounts. When needed, you can also add additional user accounts or change the user authentication method at any time later. For detailed information about user management, see Chapter 5, *Managing Users with YaST* (page 59).

1.12.6 Cleanup

This step does not require any user interaction. The installation program launches the SuSEconfig script to write the system configuration. Depending on the CPU and the amount of memory, this process can take some time.

1.12.7 Release Notes

After completing the user authentication setup, YaST displays the release notes. Reading them is advised because they contain important up-to-date information that was not available when the manuals were printed. If you have installed update packages, read the most recent version of the release notes, as fetched from openSUSE's servers. Use *Miscellaneous → Release Notes* to view the release notes after installation.

1.12.8 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 31). To skip the configuration, select *Skip Configuration* and click *Next*.

However, you should configure the graphics card right away. Although the display settings as autoconfigured 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. To test your new configuration, click *Test the Configuration*.

1.12.9 Completing 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.

1.13 Graphical Login

openSUSE is now installed. Unless you enabled the automatic login function, you should see the graphical login on your screen where you can enter your username and password to log in to the system. If automatic login is activated, the desktop starts automatically. For a short introduction on how to get started with the KDE or GNOME desktop environment, 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):

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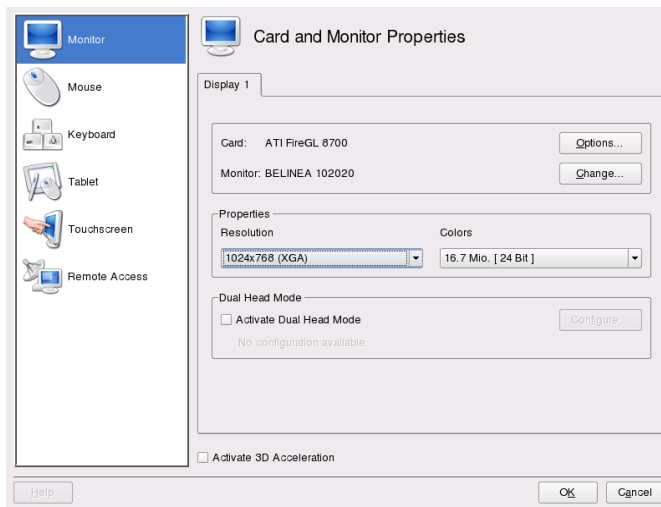
4 Test the new configuration before it is applied to the system. Click *Test* and either *Cancel* or *Save* the configuration.

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 *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.
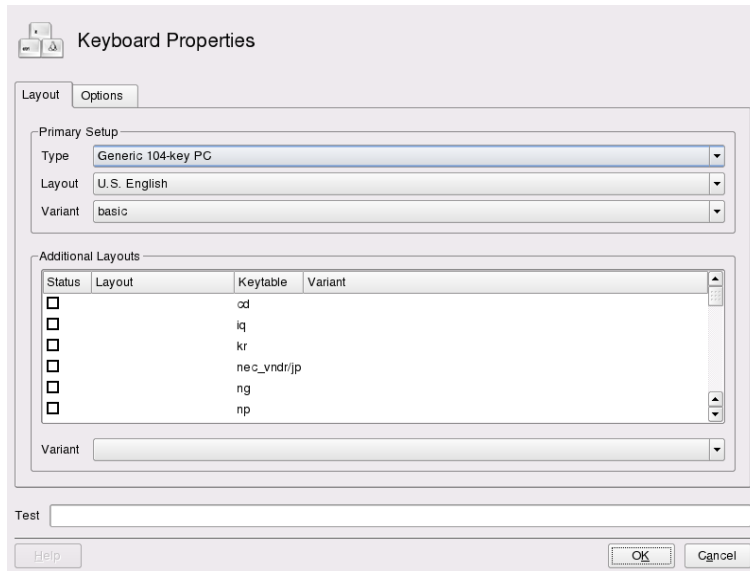
2 Select your keyboard model from the *Type* list.

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.

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 the sequence of them.

Figure 2.1 *Sound Configuration*
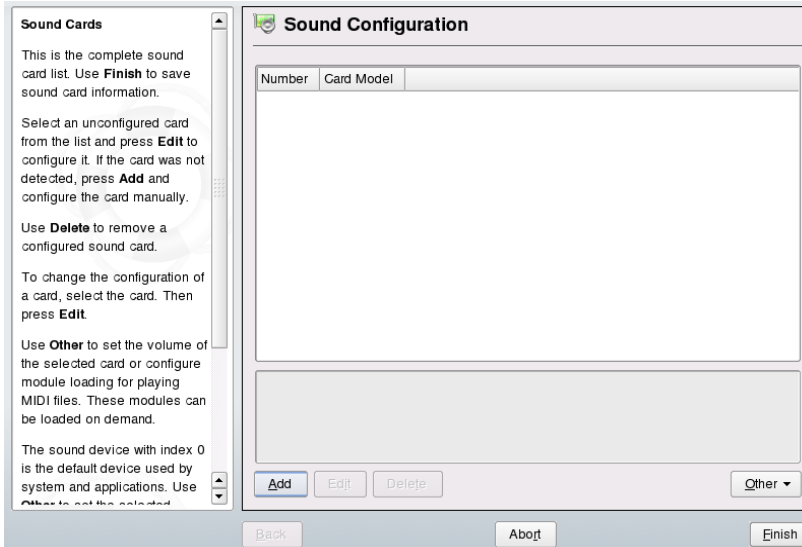
If YaST cannot detect your sound card automatically, proceed as follows:

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/`.

After having made your selection, click *Next*.

2 In *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.

In this dialog, there is also a shortcut to the joystick configuration. Click *Joystick configuration* and select the joystick type in the following dialog, 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 subdialog 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* in the YaST sound module. 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 either configure a local printer that is directly connected to your machine (normally via USB or parallel port) or to set up printing over the network. Further information on printing (concepts, technical details, and troubleshooting) is available in Chapter 7, *Printer Operation* (↑Reference).

2.5.1 Local Printers

If an unconfigured local printer is detected, YaST starts automatically in order 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 YaST uses 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 manually as described below.

- If the manual configuration does not work, communication between printer and computer is not possible. Please check the cable and the plugs to make sure 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.

Manual Configuration

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 (please refer to Section 7.1, "Workflow of the Printing System" (Chapter 7, *Printer Operation*, ↑Reference) for more information about printer 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 the following description of adding a new printer.

In the *Printer Configuration* window you can also *Delete* an existing entry. Clicking on *Other* opens a list with advanced options: By restarting the detection you can 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 default. *CUPS Expert settings* and *Change IPP Listen* are advanced configuration options—please 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 the printer is connected to (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 recede to the previous dialog.

5 The *Queue Name* dialog lets you set up a printing queue. Specifying a *Name for Printing* is mandatory. It is recommended to choose a speaking 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.

6 In the *Printer Model* dialog you can 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 (please refer to your printer's documentation to find out which language your printer understands). If this does not work, please refer to Section "Adding PPD Files with YaST" (page 41) for another possible solution.

7 The *Configuration* screen lists a summary of the printer setup. You will also see this dialog when editing an existing printer configuration in the start screen of this YaST module.

Figure 2.2   *Printer Configuration Summary*
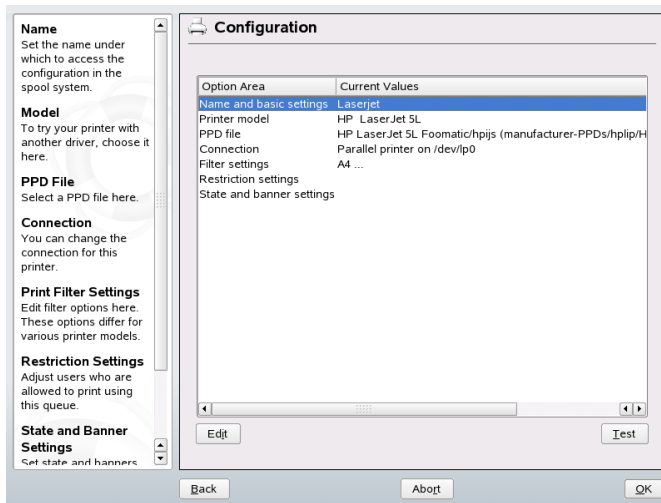
The summary contains the following entries which you can also modify with *Edit*:

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

- Please refer to Section "Choosing an alternative PPD file with YaST" (page 41) for details on *PPD file*.

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

- By default every user is able to use the printer. With *Restriction settings* you can either 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 instance deactivate the printer by changing its state and you can specify whether a page with a *Starting Banner* or *Ending Banner* is printed before or after each job (the default is no).

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 7.3, "Installing the Software" (Chapter 7, *Printer Operation*, ↑Reference) for more information about PPD files). With *Add PPD File to Database* you can either add a PPD file from the local file system or from an FTP or HTTP server.

You may acquire PPD files directly from your printer vendor or from the driver CD of the printer (see Section 7.8.2, "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, please keep in mind that it always shows the latest Linux support status, that 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 this printer, select the *PPD file* entry in the *Configuration* screen and click *Edit* (see Figure 2.2, "Printer Configuration Summary" (page 40)).

Normally it should not be necessary to change the PPD file—the PPD file chosen by YaST should produce the best results. But, if you want a color printer to only print in black and white for example, it will be 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 Network Printers

Network printers are not detected automatically, they have to be configured manually using the YaST printer module. Depending on your network setup, you can either print via a print server (which using one of the following protocols: CUPS, LPD, SMB, or IPX) or directly to a network printer (preferably via TCP). Please ask your network administrator for details on how to configure 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 where you can specify further details that should be provided by your network administrator.

See Section 7.4, "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 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 package is available and install it automatically.

3 If your scanner is detected automatically, YaST will show it in the *Scanner Configuration* dialog. Otherwise click *Other → Restart Detection*:

  • To configure the scanner, select the entry and click *Edit*.

  • If your scanner cannot be automatically detected, click *Add* to open the manual configuration dialog:

a YaST shows a list of scanner models. If your scanner has been detected automatically, the appropriate model is preselected. Otherwise select the appropriate model and click *Next* to proceed. Refer to the help text on the left for detailed information.

b YaST will check if an additional scanner driver package is needed and install it automatically. The appropriate driver is activated and should recognize the scanner.

4 The configured scanner appears in the *Scanner Configuration* dialog.

5 To test the scanner, click *Other → Test*.

6 If configuration has been successful, click *Finish* to close the YaST scanner 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

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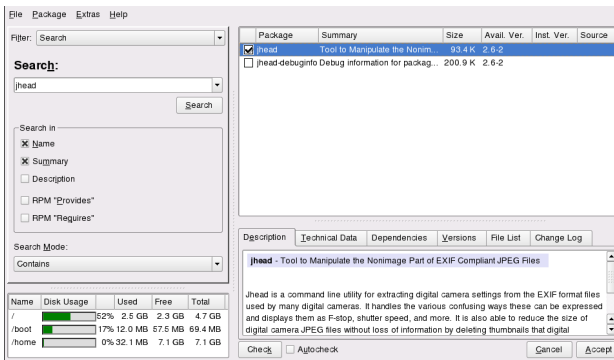
2 In the search field enter the name of the software you want to install(e.g. `jhead`, a tool for manipulating JPEG meta data) and press Enter.

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*.

TIP: Quick Search

In addition to the *Search* filter, all lists of the package manager feature a quick search. Click the respective list to gain focus and enter a letter to move the cursor to the first package in the list whose name begins with this letter.

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, or languages. 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.
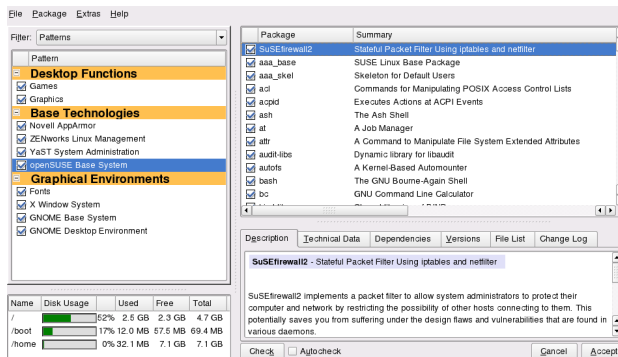
2 From the patterns select one or more patterns you are interested in. If you click on the name of a pattern, for example on *C/C++ Compiler and Tools*, you see the packages it contains, in the right frame. If you activate it, the status markers at the beginning of the line will change: all packages 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.

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 48) 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*
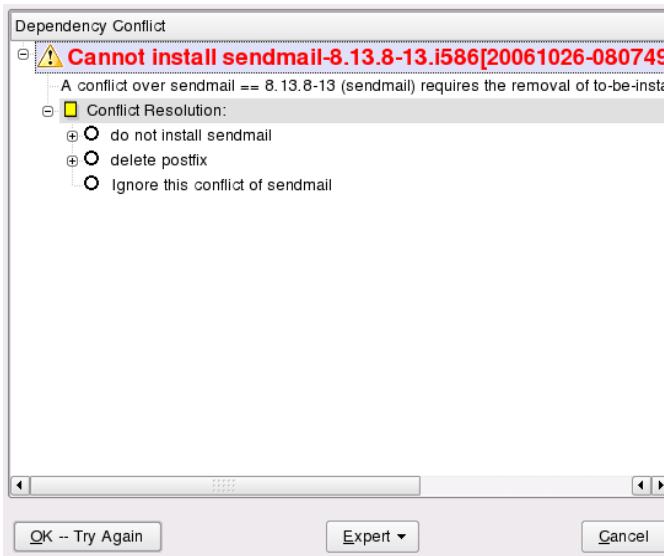
Filtering by languages is similar to filtering by package groups. Using the languages view enables you to select packages like translated program messages, documentation, or special fonts which are needed to support a specific language.

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

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

3.2 Removing Software

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

1 Make use of a search strategy explained in .

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 issue.

3.3 Adding Installation Source

Add additional installation sources to your system to install third-party software. For example, you can add a repository of the openSUSE® Build Server, such as a version of GPhoto: http://software.opensuse.org/download/repositories/GPhoto/.

WARNING: Trusting External Software Sources

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

---

1 Click *Software → Installation Source* to start the YaST installation source management.

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

3 In the *Server and Directory* dialog enter `software.opensuse.org` as the server name and `download/repositories/GPhoto/`*VERSION*`/` as the directory on the server.

4 Click *Ok*. The new installation source is now listed as one of the media containing a software catalog from where you can install additional packages.

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

3.4 Installing Add-On Products

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

3.4.1 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* 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 installation source, select the filter *Installation Sources* and choose the installation source to view. To view packages from a selected add-on by package groups, select the secondary filter *Package Groups*.

3.4.2 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*.

3.5 Keeping the System Up-to-date

openSUSE offers a continuous stream of software security updates for your product. The openSUSE Updater applet informs you about the availability of updates and lets you easily install them with just a few clicks.

The current patches for openSUSE are available from an update software catalog. 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. Alternatively, you can manually add an update catalog from a source you trust with openSUSE Updater (see for more information).

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

The openSUSE Updater applet resides in the system tray (KDE) of your panel or in the notification area (GNOME) as an icon depicting the openSUSE mascot (Geeko), which changes color depending on the availability and relevance of updates:

White Geeko
    No updates available.

Red Geeko
    Security updates available.

Orange Geeko
    Recommended or optional updates are available.

3.5.1 Installing Updates

Whenever the openSUSE Updater shows the availability of updates, left-click on the icon to open the `Available Updates` window. It lists the patches available. Apart from the patch name you will see the *Type* (Security, Recommended or Optional), and the patch version number. Patches are sorted alphabetically by default—change this by clicking on a column headline (*Name*, *Type* or *New Version*). Click *Install* to proceed.

Figure 3.2 *openSUSE Updater: Available Updates*
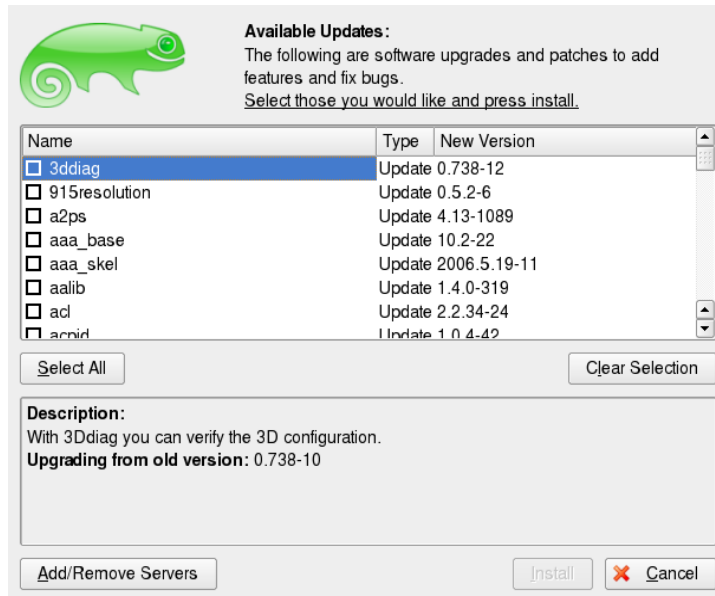
You will be prompted for the `root` password. When proceeding with *OK*, the YaST Online Update window opens. Start the patch installation with *Accept*. Normally no interaction is required, but a few patches, such as kernel updates, require manual interaction—in this case please follow the on-screen instructions. After the installation has been completed, please confirm with *Finish*. Your system is up-to-date now.

The YaST Online Update offers advanced features to customize the patch installation. Please refer to Section 3.1, "YaST Online Update" (Chapter 3, *Online Update*, ↑Reference) for more information.

3.5.2 Configuring openSUSE Updater

By default openSUSE Updater is started on login and checks for updates every 99 minutes. To change this behavior, right-click the applet icon and choose *Configure Applet*.

3.5.3 Manually Adding Update Catalogs

Open a pop-up menu by right-clicking the openSUSE Updater applet and choose *Add/Remove Servers* or click *Add/Remove Servers* in the *Available Updates* window. After you have entered the `root` password, the YaST Installation Source module opens. Please see Section 3.3, "Adding Installation Source" (page 49) for further instructions.

3.5.4 Using openSUSE Updater with zmd

By default, openSUSE Updater operates with `libzypp`, the system's central package, patch, pattern, and product management library. It is also possible to use openSUSE Updater as a ZENworks Management Daemon (zmd) front-end. This mode offers additional functionality such as support for further update sources (locally mounted directories, YUM, ZENWorks sources, etc.). It is also possible to install and remove packages with openSUSE Updater in zmd mode.

In order to configure openSUSE Updater to operate in zmd mode, right-click on the applet icon, choose *Configure Applet* from the pop-up menu, and check *Get updates via → Novell ZENWorks* in the configuration menu.

NOTE: For More Information

For more information please refer to `http://en.opensuse.org/KDE_Updater_Applet`.

Accessing the Internet

4

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 21.4.5, "DSL" (Chapter 21, *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 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 21.4.3, "ISDN" (Chapter 21, *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 21.4.2, "Modem" (Chapter 21, *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 21.4.4, "Cable Modem" (Chapter 21, *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 21.4.1, "Configuring the Network Card with YaST" (Chapter 21, *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 1.12.5, "Users" (page 27). 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 73).

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.

Figure 5.1   *YaST User and Group Management*
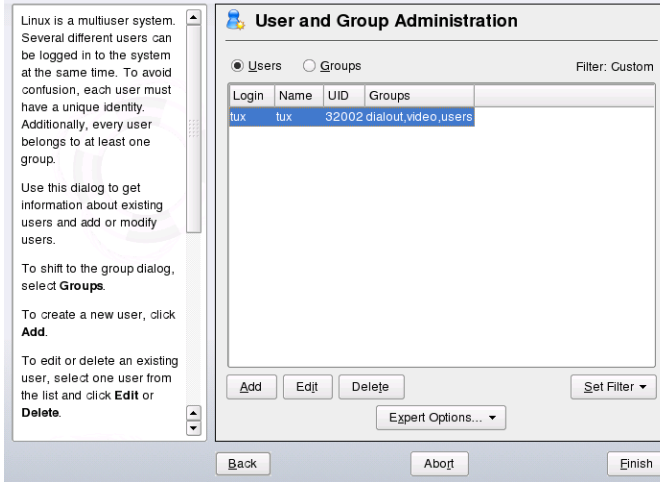
The dialog provides similar functionality for user and group management. You can easily switch between the user and group administration view by choosing the appropriate option at the top of the dialog.

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.

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.

Procedure 5.1 *Adding or Modifying Users*

1 Open the YaST *User and Group Management* dialog in the user 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 Select an entry and click *Edit* to modify options for an existing user.

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.

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.

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.

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.

NOTE: Auto Login

If you use KDE or GNOME desktop environment you can also configure *Auto Login* for a certain user. This causes a user to become automatically logged in to the desktop environment on boot. To activate Auto Login, click *Expert Options → Login Settings*. Select the *User to Log In* and click *OK*.

Enabling *Auto 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.

Procedure 5.2   *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 Managing Groups

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

Procedure 5.3 *Creating and Modifying Groups*

1 Open the YaST *User and Group Management* dialog in the group 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.
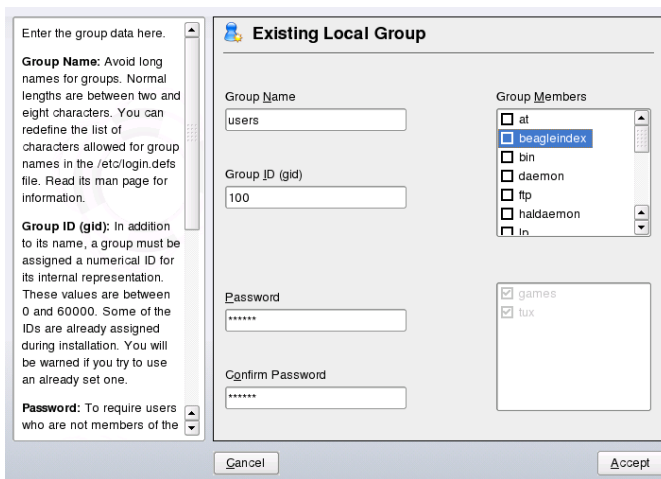
6 To add existing users to a new group or to remove them from the group whose setup you are editing, select them from the list by checking the corresponding box.

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.

5.3 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 26, *Using NIS* (↑Reference).

LDAP
> Users are administered centrally on an LDAP server for all systems in the network. For details about LDAP, see Chapter 27, *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 27.6, "Configuring an LDAP Client with YaST" (Chapter 27, *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 30, *Samba* (↑Reference) and Chapter 28, *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 26.1, "Configuring NIS Clients" (Chapter 26, *Using NIS*, ↑Reference)

LDAP: Section 27.6, "Configuring an LDAP Client with YaST" (Chapter 27, *LDAP—A Directory Service*, ↑Reference)

Samba: Section 30.5.1, "Configuring a Samba Client with YaST" (Chapter 30, *Samba*, ↑Reference)

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

5 Click *Finish* to close the administration dialog.

Changing the System Language with YaST

6

Working in different countries or having to work in a multilingual environment requires your computer to be set up to support this kind of work. Use the YaST language module to install additional system languages. Also use it to change your system language or determine a primary language that you use most often. You can also install secondary languages to to get optional localizations if you need to start applications or desktops in languages other than the primary one.

6.1 Switching the Desktop 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 6.2, "Installing Additional System Languages" (page 68) and Section 6.3, "Switching the System Language" (page 70) 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.

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

6.2 Installing Additional System Languages

The main language was selected during installation (see Section 1.4, "Language Selection" (page 9)) 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*
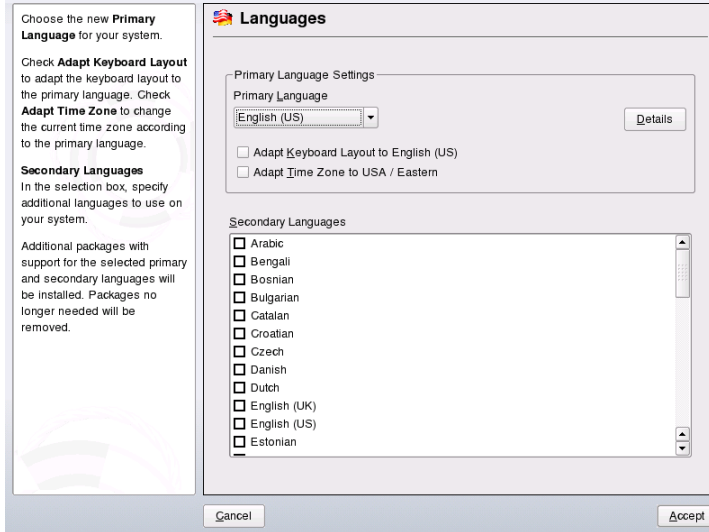
To install an additional language, proceed as follows:

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*:

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

    b 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*.

6.3 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.

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 1.12.5, "Users" (page 27)).

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 95). 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.

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 96).

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 91). 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 partitions 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.

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 85). 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.

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 1.4, "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 88).

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 1.4.3, "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 Section 8.5, "Modifying File Permissions" (page 96).

For more detailed information about file system permissions refer to Section 7.3, "File Access Permissions" (page 82). Apart from the traditional permission concept for file system objects there are also extensions available which handle permissions more flexibly. Read more in Chapter 18, *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.
/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.

Directory	Contents
`/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.

> **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, such as the KDE and GNOME desktop environments, can be found here.

/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. By default, the data stored in /tmp is deleted regularly.

NOTE: Storing Files in `/tmp`

Do not store any files in /tmp that you want to keep. This directory is automatically cleaned up by the system and files are removed in the process.

/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 Operating Systems on the same Computer" (page 132).

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 18, *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 1.4.3, "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 96)).

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 if, for example, 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 20, *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 login. 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:

`tux❶@linux❷:~❸>`

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 `xterm`. 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: ←, →, <— (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 82) 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 75) 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 82).

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 82).

❹ Group assigned to the file or directory. For further information, refer to Section 7.3.1, "Permissions for User, Group and Others" (page 82).

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). 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`:

    a 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.

b To check what happened, now enter

```
ls -l /tmp
```

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

c 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.

---

a 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
```

b 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.

c Enter

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

The new file should appear in the list of contents.

d 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.

e 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` (for super user). 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, you can enter the following command to list the partitions of your hard disk which only `root` is allowed to execute:

```
fdisk -l
```

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.

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 82).

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 ↓.

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 Section 8.3.1, "Examples for Working with Files and Directories" (page 92) 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:

a 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.

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

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

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

This command creates five consecutively numbered files:

```
myfile1.txt,…,myfile5.txt
```

d 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:

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

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

b 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`).

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

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

d 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.

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
```

Part III. Mobility

Mobile Computing with Linux

<div style="text-align:right">**9**</div>

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. How the support for such hardware is implemented in Linux, what needs to be taken into account during configuration, what software is available for the control of PCMCIA, and how to troubleshoot any possible problems is described in Chapter 33, *PCMCIA* (↑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 and about operating the YaST power management module is provided in Chapter 35, *Power Management* (↑Reference).

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 Laptop in a Network*
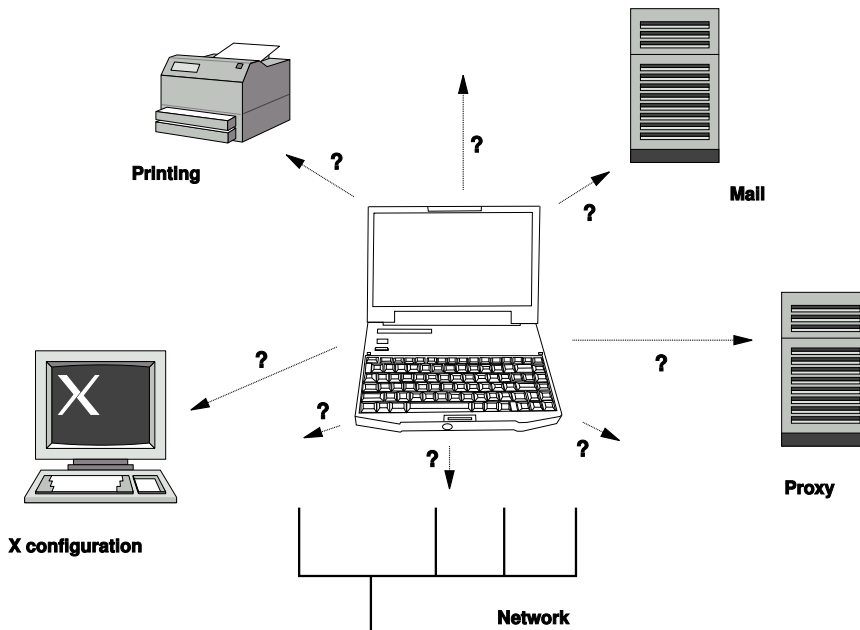
The services affected in the case of a laptop commuting back and forth between a small home network and an office network are:

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
> 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:

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. Find information about SCPM in Chapter 34, *System Configuration Profile Management* (↑Reference). You can use the Kicker applet Profile Chooser in KDE to switch between profiles. The application requires the `root` password before switching.

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, see Chapter 10, *Managing Network Connections with NetworkManager* (page 121) and *KDE User Guide* 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

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

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 22, *SLP Services in the Network* (↑Reference).

The emphasis of SCPM lies on enabling and maintaining reproducible system conditions. SLP makes configuration of a networked computer a lot easier by automating much of it.

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. Use KPowersave to customize your machine's behavior under certain power conditions. Find information about power management and about the corresponding YaST module in Chapter 35, *Power Management* (↑Reference). Find more information about KPowersave as such under `http://www.opensuse.org/Projects_KPowersave`.

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 envi-

ronment. Find more information about this program in its integrated help function or in the openSUSE help pages.

System monitoring in GNOME is provided by the following applications:

GNOME Power Manager
> GNOME Power Manager is a small panel applet that allows you to monitor your machine's power state. Depending on whether your machine is running offline or using AC power the tray icon changes appearance. Use the *Power Management Preferences* option to customize your system's reaction to different power states. Find more information on GNOME Power Manager at `http://www.gnome.org/projects/gnome-power-manager/gpp.html`.

GNOME System Monitor
> GNOME System Monitor is a small application that keeps your system's resources, file systems and processes under close watch. Use the *System* tab to determine what processor and operating system you are using. The *Processes* tab lists the processes currently running on your system. *Resources* tracks your system's CPU usage, memory and swap usage and network traffic. The last tab, *File Systems* displays your system's partitioning layout.

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 *Applications*. 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 Section 11.4.2, "Transferring Files with rsync" (page 135).

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 disjoint 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 36.1, "Wireless LAN" (Chapter 36, *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 36.2, "Bluetooth" (Chapter 36, *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 36.3, "Infrared Data Transmission" (Chapter 36, *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.

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 36, *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 *Eject* feature of either file manager. These are 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 *My Computer* (KDE) or on the desktop (GNOME). 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:/`. The images can then be processed using Digikam or The GIMP. When using GNOME, Nautilus displays the pictures in their own folder. A simple image processing and management utility is f-spot. Do advanced photo processing with The GIMP. For more details on digital cameras and image management, refer to Chapter 16, *Managing Your Digital Image Collection* (↑KDE 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 117). 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 36.2, "Bluetooth" (Chapter 36,

Wireless Communication, ↑Reference) and Section 36.3, "Infrared Data Transmission" (Chapter 36, *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*. The program KPilot as integrated in Kontact is also available as an independent utility. It is described in Chapter 5, *Synchronizing a Handheld Computer with KPilot* (↑KDE 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.suse.com/archive/suse-laptop/`. 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.

In the case of problems with power management with openSUSE on laptops, it is advisable to read the file `README` in `/usr/share/doc/packages/powersave`. This directory often contains last minute feedback by testers and developers, so provides valuable hints for the solution of problems.

Managing Network Connections with NetworkManager

10

If you want to enable or disable NetworkManager during the installation, click *Enable NetworkManager* or *Disable NetworkManager* in *Network Mode* of the *Network Configuration* screen. To enable or disable NetworkManager on an already installed system, follow these steps:

1 Open YaST.

2 Choose *Network Devices → Network Card*.

3 On the first screen, set the *Network Setup Method* option to *User Controlled with NetworkManager* to use NetworkManager. To disable NetworkManager, set the *Network Setup Method* option to *Traditional Method with ifup*.

Figure 10.1   *Enabling NetworkManager in YaST Module*
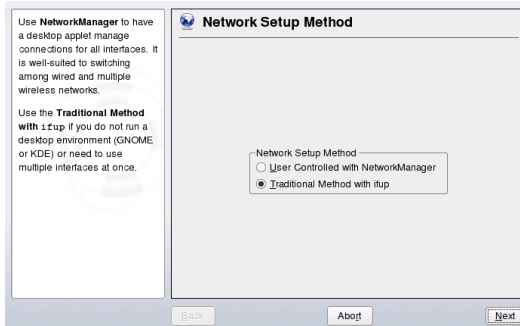
After choosing the method, you can set up your network card using either automatic configuration via DHCP or a static IP address. If you want to use a dial-up connection, configure your modem in *Network Devices → Modem*. To configure an internal or USB ISDN modem, select *Network Devices → ISDN*. To configure an internal or USB DSL modem, select *Network Devices → DSL*. A detailed description of the network configuration with YaST is available in Section 21.4, "Configuring a Network Connection with YaST" (Chapter 21, *Basic Networking*, ↑Reference) and Section 36.1, "Wireless LAN" (Chapter 36, *Wireless Communication*, ↑Reference).

Configure supported wireless cards directly in NetworkManager.

10.1 NetworkManager and SCPM

NetworkManager cannot work together with System Configuration Profile Management (SCPM) if SCPM also manages the network configuration. If you want to use SCPM and NetworkManager at the same time, you must disable the network resource in the SCPM configuration. To disable the network resource in all your SCPM profiles, proceed as follows:

1 Open YaST.

2 Choose *System → Profile Manager*.

3 In *Resource Groups* click *Configure*.

4 In the list of resource groups, select *network* and click *Delete*.

5 Click *OK* .

6 Click *Finish* to close the SCPM configuration.

10.2 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.

If no wired connection is available, NetworkManager scans for available wireless networks. If multiple trusted networks are found, the most recently used is automatically selected. If all are untrusted, NetworkManager waits for your selection.

If the encryption setting changes but the name and MAC address remain the same, NetworkManager attempts to connect, but it first asks you 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. If you want 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 really unassociated.

10.3 Controlling NetworkManager

Both KDE and GNOME have their own applets for NetworkManager. For details refer to *KDE User Guide* and *GNOME User Guide*. An appropriate applet should start automatically with the desktop environment. The applet is then shown as an icon in the system tray. Functions of both applets are similar, but their interfaces are a little different. They can also be used in other graphical environments with standard system tray support.

10.4 Common Tasks

This section describes how to achieve common tasks with NetworkManager, like setting a static IP address or using NetworkManager with VPN.

10.4.1 Setting Up a Static IP Address on an Interface

NetworkManager honors network interface settings made by YaST and saved in the `/etc/sysconfig/network` directory. If you want to use a static IP address with your network card, set the address using YaST.

To set up a static IP address, follow these steps:

1 Open YaST.

2 Choose *Network Devices → Network Card*.

3 Choose *User Controlled with NetworkManager* and click *Next*.

4 Select the network card to configure then click *Edit*.

5 In the *Address* tab, choose *Static Address Setup*.

6 Set your IP address and click *Next*.

7 Click *Next* to finish and activate the static IP address.

10.4.2 Using NetworkManager with VPN

NetworkManager supports several VPN technologies. To use them, first install Network-Manager support for your VPN technology. You can select from:

- OpenVPN

- vpnc (Cisco)

VPN support is included in the packages `NetworkManager-openvpn`, and `NetworkManager-vpnc`.

To configure a new VPN connection with NetworkManager, left-click the NetworkManager applet and follow these steps:

1 Choose *VPN Connections → Configure VPN*.

2 Press *Add* and *Forward* to start a configuration wizard.

3 In the next dialog, choose the type of VPN connection to create.

4 Name your configuration in *Connection name*.

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.

   Alternatively, load settings from a saved configuration file by pressing *Import Saved Configuration* and choosing your saved configuration file in a standard file dialog.

6 Press *Forward*.

After the VPN is configured, you can select it from *VPN Connections*. To close a VPN connection, click *Disconnect VPN*.

Copying and Sharing Files

<div style="text-align: right; font-size: 3em; font-weight: bold">11</div>

Using two operating systems in parallel, you probably have often wondered how to exchange file between them. Different systems may reside on different partitions on the same machine or on different machines across your network. This chapter introduces various approaches to file exchange, including basic instructions and hints on possible pitfalls.

WARNING: Scenarios for Private Home Networks Only

Do not deploy 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.

The following sections feature several approaches to exchanging data. "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 two identical objects on both the source and the target system.
>
> Synchronizing data is a special flavor of copying data. If you change a file on one computer, it will also be changed automatically on the other computer after the synchronization. Think of a laptop that contains your modified files and you want to have the same contents on your home 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 and 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 a preinstalled operating system by their vendor and run Linux in a separate partition. Please refer to Section 11.3, "Accessing Files on Different Operating Systems on the same Computer" (page 132) for more information.

Different Computers not Connected via Network

> Save the data to any media (CD/DVD, USB flash drive or external hard disk) and connect these to the target machine to apply your backup.

> 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 Different Computers connected via the Same Network (page 128).

Different Computers connected via 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 much more flexible than the above mentioned approaches. If you are looking for a permanent file exchange, choose a client/server-based method. In contrast to the method introduced in Different Computers not Connected via Network (page 128), this method does not impose any limits on the amount of data that can be transferred this way.

Different Computers on different Networks

> This scenario requires connection of different networks and therefore, is beyond the scope of this document.

11.2 Access Methods

The following methods and protocols are featured in this chapter:

FTP
: Use FTP (File Transfer Protocol), if you need to exchange files very often and with different users. There are many graphical client applications available for FTP on Windows*, MacOS and Linux. Depending on how your FTP server is used, enable read, write permissions or both. See Section 11.4.3, "Copying Files with FTP" (page 137) for more details on FTP.

NFS
: NFS (Network File System) is a client/server system. A server exports one ore more directories that can be imported by a client. For more information, see Chapter 29, *Sharing File Systems with NFS* (↑Reference).

Use NFS, if you have to share files very often and for different users. It 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 read, write permissions or both. In general, for a home user it makes sense to allow read and write access.

rsync
: Use rsync to regularly transfer large volumes of data if these do not change heavily. 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 135) for more information.

SMB
: Samba is a client/server system and an implementation of the SMB protocol. Normally it is used in Windows networks. Refer to Chapter 30, *Samba* (↑Reference) for more information about Samba.

Use Samba, if you have to share files very often and with different users. Samba as a Linux-only solution is uncommon, use NFS instead. However, if you want to be compatible with future Windows installations, it may pay off to set up a Samba server. For more information on setting up a Samba server, refer to Section 11.7, "Sharing Files between Linux and Windows with Samba" (page 143).

SSH

> SSH (Secure Shell) allows a secure channel between a local and a remote computer. The SSH suite consists of several commands and uses public key encryption to authenticate users. For more information, see Chapter 38, *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.

Check the following tables to determine which solution best suits your needs.

Table 11.1 *Accessing Files from Removable Media*

Method	Source/Target OS	Refer to
CD/DVD	all	Chapter 18, *Burning CDs and DVDs* (↑KDE User Guide)
USB	all	Section 1.3.2, "Inserting or Connecting Removable Media" (Chapter 1, *Getting Started with the KDE Desktop*, ↑KDE User Guide)

NOTE: Filesystems on USB Sticks

Normally USB-Sticks are formatted with the FAT filesystem that allows for read and write access in Linux. However, it is possible to use other filesystems with USB sticks. If NTFS is used, only read access will be possible. For more information on filesystems, refer to Section 11.3, "Accessing Files on Different Operating Systems on the same Computer" (page 132).

Table 11.2 *Copying Files*

Method	Source/Target OS	Refer to
SSH	Linux/Linux	Section 11.4.1, "Copying Files with SSH" (page 134)
SSH	Linux/Windows	Section 11.5, "Copying Files between Linux and Windows Computers with SSH" (page 138)
rsync	Linux/Linux	Section 11.4.2, "Transferring Files with rsync" (page 135)

Table 11.3 *Sharing Files*

Method	Source/Target OS	Refer to
NFS	Linux/Linux	Section 11.6.1, "Transferring Files with NFS" (page 140)
FTP	Linux/Linux	Section 11.4.3, "Copying Files with FTP" (page 137)
SMB	Linux/Linux	Section 11.6.2, "Sharing Files with Samba" (page 142)
SMB	Linux/Windows	Section 11.7, "Sharing Files between Linux and Windows with Samba" (page 143)

11.3 Accessing Files on Different Operating Systems on the same Computer

New computers generally ship with a preinstalled operating system, mostly Windows. If you have installed Linux on a different partition, you might face the problem of exchanging files between the different operating systems.

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, 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. Take into account, that the size of a FAT partition and even the biggest size of a single file is subject to restrictions based on the FAT version. See http://en.wikipedia.org/wiki/VFAT for more information on FAT filesystems.

NTFS
The NTFS file system is used by Windows NT, Windows 2000, Windows XP, Windows Server 2003 and Windows Vista. Currently it is only possible to *read* partitions of this type. Write access is considered experimental, but will certainly improve over future Linux kernel development.

Depending whether you need read or write access and which operating system you usually work on, 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. KDE mounts your Windows partitions and displays the contents.

Command Line
The installer detects your Windows partitions. After you have started your Linux system, the partitions are usually mounted. Just list the content of `/win` and you

will see one or more directories containing your *Windows drives*. For example, the directory `/win/c` maps to the Windows drive `C:\`.

NOTE: Changing the Accessibility of Windows Partitions

Initially Windows partitions are mounted read-only for normal users to avoid accidental damage to the filesystem. 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 work 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 to have a working network connection, otherwise they will not work. All scenarios rely on a 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 in `/etc/hosts` on all clients.

The following example IP addresses and hostnames are used across this section:

Target Hostname	`sun.example.com`
Target IP	`192.168.0.20`
Source Hostname	`earth.example.com`
Source IP	`192.168.0.1`
User	`tux`

11.4.1 Copying Files with SSH

The following requirements must be met on both server and client:

1. Make sure hostnames of IP addresses of both server and client are known across the network. Each hostname needs to be listed in `/etc/hosts`, for both server and client (see Section " `/etc/hosts` " (Chapter 21, *Basic Networking*, ↑Reference).)

2. If you use a firewall, open the SSH port. 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 a server to a client, you need to know where the files are located on the server. For example, to copy a single file `/srv/foo_file` from the server to the current directory, use the `scp` command (do not forget the dot!):

```
scp tux@sun.example.com:/foo_file .
```

To copy a whole directory structure, use the recursive mode of `scp`:

```
scp -r tux@sun.example.com:/foo_directory .
```

If your network does not provide name resolution, use the server's IP address directly:

```
scp tux@192.168.0.20:/foo_file .
```

If you do not know exactly where your files are, use the `sftp` command. Refer to or see `man sftp`.

Using the sftp Protocol

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@sun.example.com
```

3 Enter your the password of `tux` on `sun.example.com`.

4 Drag and drop your server 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 usage of this protocol is similar to `sftp`, just replace the `sftp` protocol prefix of the URL by `fish`.

11.4.2 Transferring Files with rsync

Before using rsync to synchronize file and directories between different computers, make sure 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 rsyncd is installed on one of the systems.

rsync is useful for archiving or copying data. You only need a remote shell (such as ssh) on the target system. rsync can also be used as a daemon to provide directories to the network (see).

rsync Basic Mode

The basic mode of operation of rsync does not require any special configuration. rsync allows mirroring of complete directories onto another system out of the box. 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 sun:

```
rsync -Hbaz -e ssh /home/tux/ tux@sun:backup
```

Use the following command to apply your backup:

```
rsync -Haz -e ssh tux@sun: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 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":

```
gid = nobody
uid = nobody
read only = true
use chroot = no
transfer logging = true
log format = %h %o %f %l %b
log file = /var/log/rsyncd.log

[FTP]
  path = /srv/ftp
  comment = An Example
```

3 Start the rsyncd daemon as user `root`:

```
rcrsyncd start
```

To automatically start the rsync service upon system boot, call:

```
insserv rsyncd
```

4 List all files located in the `/srv/ftp` directory (note the double colon):

```
rsync -avz sun::FTP
```

5 Initiate the transfer by providing a target directory (in this example the current directory is represented by a dot):

```
rsync -avz sun::FTP .
```

By default, files are not deleted while synchronizing with rsync. To force file deletion, add the `--delete` option. To make sure that the `--delete` does not accidentally remove newer files, use the `--update` option instead. Any conflicts that arise must be resolved manually.

11.4.3 Copying Files with FTP

WARNING: Use Setup for Home Networks Only

The setup featured in the following sections is suited for use in home networks only. Do not deploy it to sites wholly unprotected by firewalls and do not enable world wide access.

To configure an FTP server, proceed as follows:

1 Prepare the FTP server:

    a Install the `vsftp` package.

    b Open a shell, login as `root` and save a backup copy of `/etc/vsftpd.conf`:

```
cp /etc/vsftpd.conf /etc/vsftpd.conf.bak
```

    c Create an access point for anonymous FTP

```
mkdir ~ftp/incoming
chown -R ftp:ftp ~ftp/incoming
```

2 Replace the configuration files depending on the scenario you prefer (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 either the hostname or the IP address of your server. There are many graphical user interfaces available that are suited to browse 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 with using SSH, choose one of the following options:

PuTTY

PuTTY is a suite of different command line tools to work with an SSH server. 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 login and password of the SSH server.

To connect from Windows to Linux with WinSCP, proceed as follows your (on the Windows machine):

1 Start WinSCP.

2 Enter the hostname of the SSH server (in our case `sun`) and username (`tux`).

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 login 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:

    a 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
```

    b Make sure users of the same name exist on client *and* server. Refer to Chapter 5, *Managing Users with YaST* (page 59) for a detailed instruction on how to create and manage user accounts.

2 Prepare the NFS server:

    a Start YaST as `root`.

    b Select *Network Services → NFS Server*.

    c Enable NFS services with *Start*.

    d Open the appropriate firewall port with *Open Port in Firewall*, if you are using a firewall.

3 Export the directories:

    a Click *Add directory* and select `/srv/nfs`.

    b Set the export options to:

```
rw,root_squash,async
```

    c 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 start the NFS server, enter the following command (as `root`):

```
rcnfsserver start
```

To stop the server, enter:

```
rcnfsserver stop
```

To configure the client, proceed as follows:

1 Prepare the NFS client:

    a Start YaST as `root`.

    b Select *Network Services → NFS Client*.

    c Activate *Open Port in Firewall*, if using a firewall.

2 Import the remote file system:

    a Click *Add*.

    b Enter the name or IP address of the NFS server or click *choose* to automatically scan the network for NFS servers.

    c Enter the name of your remote file system or automatically choose it with *Select*.

    d Enter an appropriate mount point, for example `/mnt`.

    e 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 manually start the NFS client, enter:

```
rcnfs start
```

NOTE: Consistent Usernames

If your home network is used by just a small number of users, set up the users manually across the machines. If you, however, need a larger and consistent user base across a larger home network, consider using NIS or LDAP to manage user data. For more information on these, refer to Chapter 26, *Using NIS* (↑Reference) and Chapter 27, *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 to work with Samba shares and there is of course a command line tool for accessing Samba servers.

Accessing Shares with KDE and GNOME

Both desktops, KDE and GNOME, can access Windows shares through their file browsers. To access your Windows share, proceed as follows:

1 Press Alt + F2 and enter `smb://sun.example.com/`*share*.

   The syntax of this URL is:

   `smb://`*HOST*`/`*SHARENAME* where *HOST* represents the hostname (sun.example.com) or IP address, and *SHARENAME* represents the share (see Step 3.b (page 144).)

2 Log in providing username and password. Set the password in Step 4 (page 145) or just hit Enter.

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 be used to display all workgroups in your network and mount them on demand.

Accessing Shares from the Command Line

If you prefer using command line, use the `smbclient` command. To log in to your Samba server, call:

```
smbclient //sun/share -U tux
```

Omit the `-U` option if you are the current user `tux`. After having logged in successfully, use some basic commands like `ls` (list contents), `mkdir` (create directory), `get` (download file), `put` (upload file) and others. Use `help` to display all commands. Refer to the manual page of the `smbclient` command 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
    Do not configure a Linux server. Use the `smb:/` scheme. For more information, see Section "Accessing Shares with KDE and GNOME" (page 142). Make sure your workgroup is identical on both systems and that your directories are shared.

Transferring Files from Windows to Linux
    Configure a Samba server on your Linux computer, see Setting up a Samba Server (page 144).

Transferring Files Between Linux and Windows
    Configure a Samba server. See Setting up a Samba Server (page 144).

TIP: Use Ready-Made Registry Entries for Your Windows System

Some Windows versions (95, 98) require a small change in the registry. Simplify this step by installing the `samba-doc` package and installing the appropriate registry file from `/usr/share/doc/packages/samba/registry`.

Procedure 11.2   *Setting up a Samba Server*

To set up a Samba server, do the following:

1 Prepare the Samba server:

    a Start YaST as `root`.

    b Install the `samba` package.

    c Create a directory, for example `/srv/share`.

2 Create the server configuration:

    a Select *Network Services → Samba Server*.

    b Select one of the workgroups or enter a new one, for example `Penguin`.

    c Check *Primary Domain Controller (PDC)*

    d Set *During Boot*, if the Samba service is to be started every time your computer is booted. Otherwise set *Manually*.

    e Activate *Open Port in Firewall*, if you use a firewall.

3 Create your Windows share:

    a Change to the *Shares* tab and click *Add*.

    b 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.

    c Select your path, for example `/src/share`.

    d Proceed with *OK*.

    e 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             sun
```

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

<div align="right">

12

</div>

openSUSE™ comes with various sources of information and documentation. The SUSE Help Center provides central access to the most important documentation resources on your system in searchable form. These resources include online help for installed applications, manual pages, info pages, databases on hardware and software topics, and all manuals delivered with your product.

12.1 Using the SUSE Help Center

When you start the SUSE Help Center for the first time from the main menu (*SuSE Help Center*) or with the command `susehelp` in the shell, a window as shown in is displayed. The dialog window consists of three main areas:

Menu Bar and Toolbar
> The menu bar provides the main editing, navigation, and configuration options. *File* contains the option for printing the currently displayed content. Under *Edit*, access the search function. *Go* contains all navigation possibilities: *Table of Contents* (home page of the Help Center), *Back*, *Forward*, and *Last Search Result*. With *Settings → Build Search Index*, generate a search index for all selected information sources. The toolbar contains three navigation icons (forward, back, home) and a printer icon for printing the current contents.

Navigation Area with Tabs
> The navigation area in the left part of the window provides an input field for a quick search in selected information sources. Details regarding the search and the

configuration of the search function in the *Search* tab are presented in Section 12.1.2, "The Search Function" (page 151). The *Contents* tab presents a tree view of all available and currently installed information sources. Click the book icons to open and browse the individual categories.

View Window

The view window always displays the currently selected contents, such as online manuals, search results, or Web pages.

Figure 12.1   *The Main Window of the SUSE Help Center*
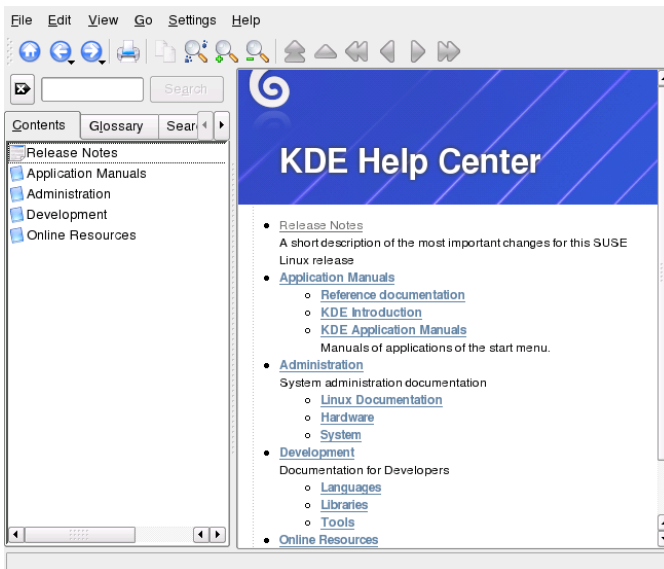
NOTE: Language Selects View

The documentation available in the SUSE Help Center depends on the current language. Changing your language changes the tree view.

12.1.1 Contents

The SUSE Help Center provides access to useful information from various sources. It contains special documentation for openSUSE (*Start-Up*, *KDE User Guide*, *GNOME User Guide*, and *Reference*), all available information sources for your workstation environment, online help for the installed programs, and help texts for other applications. Furthermore, the SUSE Help Center provides access to SUSE's online databases that cover special hardware and software issues for openSUSE. All these sources can be searched comfortably once a search index has been generated.

# 12.1.2 The Search Function

To search all installed information sources of openSUSE, generate a search index and set a number of search parameters. To do this, use the *Search* tab, shown in Figure 12.2, "Configuring the Search Function" (page 151).

Figure 12.2   *Configuring the Search Function*
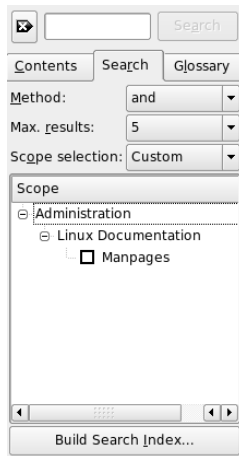
If no search index has been generated, the system automatically prompts you to do so when you click the *Search* tab or enter a search string then click *Search*. In the window for generating the search index, shown in Figure 12.3, "Generating a Search Index" (page 152), use the check boxes to determine the information sources to index. The index is generated when you exit the dialog with *Build Index*.

Figure 12.3   *Generating a Search Index*
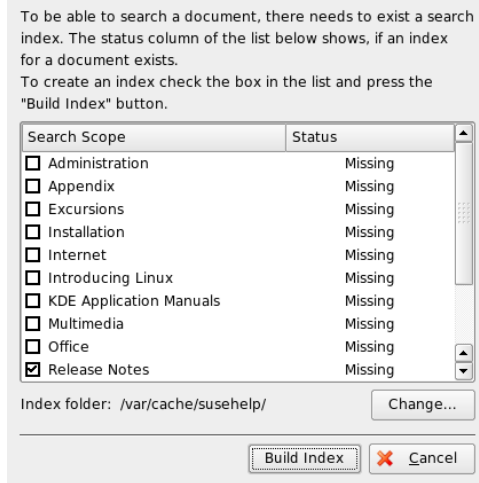
To limit the search base and the hit list as precisely as possible, use the three drop-down menus to determine the number of displayed hits and the selection area of sources to search. The following options are available for determining the selection area:

Default
> A predefined selection of sources is searched.

All
> All sources are searched.

None
> No sources selected for the search.

Custom
> Determine the sources to search by activating the respective check boxes in the overview.

When you have completed the search configuration, click *Search*. The relevant items are then displayed in the view window and can easily be navigated with mouse clicks.

12.2 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 are sorted in categories as shown in Table 12.1, "Man Pages—Categories and Descriptions" (page 153) (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)

Generally, man pages are delivered with the associated command. They can be browsed in the help center or directly in a shell. To display a man page in a shell, use the `man` command. For example, to display the man page for `ls` enter `man ls`. 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. With Q, exit the man page viewer.

Another possibility to display a man page is to use Konqueror. Start Konqueror and type, for example, `man:/ls`. If there are different categories for a command, Konqueror displays them as links.

12.3 Info Pages

Info pages are another important source of information on your system. Usually they are more verbose than man pages. You can browse an info page with an info viewer and display the different sections, called "nodes." Use the command `info` for this task. For example, to view the info page of `info` itself, type `info info` in the shell.

For more convenience, use the Help Center or Konqueror. Start Konqueror and type `info:/` to view the top level. To display the info page for `grep`, type `info:/grep`.

12.4 The Linux Documentation Project

The Linux Documentation Project (TLDP) is run by a team of volunteers who write Linux and 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.

12.4.1 HOWTOs

HOWTOs are usually a short, informal, step-by-step guide to accomplishing a specific task. It is written by experts for nonexperts in a procedural manner. For example, how to configure a DHCP server. HOWTOs can be found in the package `howto` and are installed under `/usr/share/doc/howto`

12.4.2 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.

12.5 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 visitors can edit articles, which gives the danger of vandalism, but this does not repel visitors. With over four hundred thousand articles, find an answer for nearly every topic.

12.6 Guides and Books

A broad range of guides and books are available for Linux topics.

12.6.1 SUSE Books

SUSE provides detailed and informative books. We provide HTML and PDF versions of our books in different languages. The PDF file is available on the DVD in the directory `docu`. For HTML, install the package `opensuse-manual_LANG` (replace *LANG* with your preferred language.) After the installation, find them in the SUSE Help Center.

12.6.2 Other Manuals

The SUSE help center offers additional manuals and guides for various topics or programs. More 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. Install books and guides with YaST.

12.7 Package Documentation

If you install a package in your system, a directory `/usr/share/doc/packages/packagename` is created. You can find files from the package maintainer as well as additional information from SUSE. Sometimes there are also examples, configuration files, additional scripts, or other things available. Usually you can find the following files, but they are not standard and sometimes not all files are available.

AUTHORS
> The list of the main developers of this package and usually their tasks.

BUGS
> Known bugs or malfunctions of this package. Usually also 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
> Procedures for installing this package in your system. Normally you do not need it, because you have the package installed already.

README, README.*
> General information such as how to use it and what you can do with this package.

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.

12.8 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/`.

12.9 Standards and Specifications

There are various sources that provide information about standards or specifications.

`http://www.linuxbase.org`
> The Free Standards Group 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 certainly 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/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

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 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 11, *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 instal-lation from external CD or DVD drives.

Network Boot via PXE
If a machines lacks a CD or DVD drive, but provides a working ethernet connection, perform a completely network-based installation. See Section 1.1.3, "Remote In-stallation via VNC—PXE Boot and Wake on LAN" (Chapter 1, *Remote Installation*, ↑Reference) and Section 1.1.6, "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.

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 168). 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 181).

- 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 181).

- 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 19, *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 179) and Section 13.4.4, "Login Successful but KDE Desktop Fails" (page 180).

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 179) or Section 13.4.4, "Login Successful but KDE Desktop Fails" (page 180).

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 179) and Section 13.4.4, "Login Successful but KDE Desktop Fails" (page 180).

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 or .

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.

---

a 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.

b 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 23, *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.

c 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.

d 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 netork connectivity, narrow it down as described in (page 181). 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 Network Manager:

```
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 Network Manager in `/var/log/NetworkManager`.

For more information about Network Manager, refer to Section 21.5, "Managing Network Connections with NetworkManager" (Chapter 21, *Basic Networking*, ↑Reference).

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:

    a Select *Profile Management* → *Add*.

    b Enter a name for the archive.

    c 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.

    d Determine the archive type and click *Next*.

    e 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 displayed 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.

f 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.

SUSE Linux offers a graphical front-end for system repair. The following section introduces the YaST System Repair module.

SUSE Linux Enterprise 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 severeness 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 189).

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 191).

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 192).

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 Boot the system with the original installation medium used for the initial installation (as outlined in Chapter 1, *Installation with YaST* (page 3)).

2 In *System Analysis*, select *Other → Repair Installed System*.

3 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 . 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*
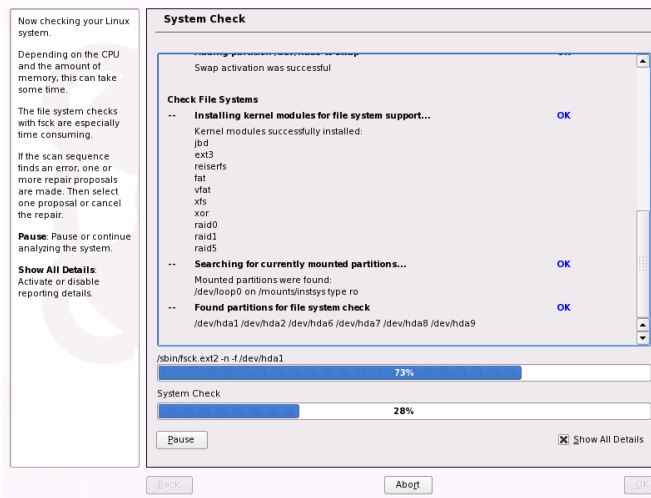
Partition Tables of All Hard Disks
    Checks the validity and coherence of the partition tables of all detected hard disks.

Swap Partitions
    The swap partitions of the installed system are detected, tested, and offered for activation where applicable. The offer should be accepted for the sake of a higher system repair speed.

File Systems
    All detected file systems are subjected to a file system–specific check.

Entries in the File /etc/fstab

The entries in the file are checked for completeness and consistency. All valid partitions are mounted.

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.

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.

4 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.

5 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 Boot the system with the original installation medium used for the initial installation (as outlined in Chapter 1, *Installation with YaST* (page 3)).

2 In *System Analysis*, select *Other → Repair Installed System*.

3 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.

4 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.

5 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 Boot the system with the original installation medium used for the initial installation (as outlined in Chapter 1, *Installation with YaST* (page 3)).

2 In *System Analysis*, select *Other* → *Repair Installed System*.

3 Select *Expert Tools* and choose one or more repair options.

4 After the repair process has been terminated successfully, click *OK* and *Finish* and remove the installation media. The system automatically reboots.

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 14.3, "Configuring the Boot Loader with YaST" (Chapter 14, *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 become 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

Your Linux system 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:

1 Insert the installation medium into your CD or DVD drive.

2 Reboot the system.

3 At the boot screen, choose the *Rescue System* option.

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 SUSE 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.

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 189) 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`, `jfs`, `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 .

2 Check whether the following files are correctly configured according to the GRUB configuration principles outlined in Chapter 14, *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. 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 by phone or Web for unregistered, expired, or download versions. Nearly all common customer problems can be eliminated quickly and competently.

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/hda` or `/dev/hdb`) 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.

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 12:00 p.m. to 6:00 p.m. EST)

- Germany: Phone: 0180 500 36 12 (12 Cent/min) (Monday through Friday from 13:00 to 17:00 CET)

- Austria: Phone: 0820 500 781 (14.5 cent/min) (Monday through Friday from 13:00 to 17:00 CET)

- Switzerland: Phone: 0848 860 847 (costs depend on provider) (Monday through Friday from 13:00 to 17:00 CET)

- UK: Phone: +44-1344-326-666 (Monday through Friday from 13:00 to 17:00 GMT)

- France: Phone: +33 1 55 62 50 50 (Monday through Friday from 13:00 to 17:00 CET)

- Spain: Phone: +34 91 375 3057 (Monday through Friday from 13:00 to 17:00 CET)

- Italy: Phone: +39 02 2629 5555 (Monday through Friday from 13:00 to 17:00 CET)

- Czech Republic: E-mail: `support@suse.cz` (Monday through Friday)

- All other countries (English only): Phone: +44-1344-326-666 (Monday through Friday from 12:00 to 18:00 CET)

For the most recent contact information, refer to `http://support.novell.com/products/suselinux/contact.html`.

Important Notes

1. Only customers with a valid, activated registration code are entitled to free support. 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.

4. We can provide support only for hardware supported by openSUSE. Refer to our Component Database at `www.novell.com/usersupport/hardware` for information about supported hardware components.

Contact Recommendations

Misspelled commands, links, or directory names often cause frustrating problems and are particularly common during phone conversations. To help prevent this problem, please send us a brief description of your question or problem by opening a service request on `http://support.novell.com/eService`. You will receive a reply soon after that provides a practical solution.

13.7.2 Advanced Support

Qualified support is available at transparent rates. If your question is not covered by the scope of the free service, you do not have a valid support claim, your installation support has expired, or you are using a download version, you can take advantage of our Advanced Support Program. You can reach us by phone:

- United States and Canada: Phone: +1-800-796-3700, Price: $25 including tax, Monday through Friday from 09:00 a.m. to 06:00 p.m. EST or 06:00 a.m. to 03:00 p.m. PST

- Germany: 0900 111 2 777 (1.86 €/minute)

- Austria: 0900-47 01 10 (1.80 €/minute)

- Switzerland: 0900-70 07 10 (3.13 SFr/minute)

- All other countries: Phone: +44-1344-326-666, Price: € 25 including VAT, Monday through Friday, 12:00-18:00 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 10.2. 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

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. In most cases, even problems that seem more difficult to solve are covered in the comprehensive documentation included with openSUSE. The SUSE Help Center on your desktop provides additional information about installed packages, the vital HOWTOs, and info pages.

You can access the latest Support Database articles online at `http://www.novell.com/usersupport`. The Support Database, one of the most frequently used databases in the Linux world, offers our customers a wealth of analysis and solution approaches. You can retrieve tested solutions using the keyword search, history function, or version-dependent search.

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Version 2, June 1991

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```

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```
Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details
type `show w'. This is free software, and you are welcome
to redistribute it under certain conditions; type `show c'
for details.
```

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called some-

thing other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

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```
Yoyodyne, Inc., hereby disclaims all copyright
interest in the program `Gnomovision'
(which makes passes at compilers) written
by James Hacker.

signature of Ty Coon, 1 April 1989
Ty Coon, President of Vice
```

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Version 1.2, November 2002

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