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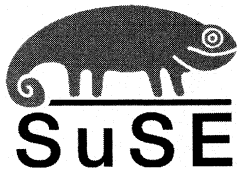
SuSE Linux

Configuration



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Foreword

Configuring SuSE Linux has become easier and easier over the past few years. Many things were simplified, especially first-time installation. However, in the various program packages which help to make the operating system "come alive," there are still many options to customize and optimize. In the following book, appearing in its second edition, SuSE aims to familiarize you with the most important features.

We would like to help you get to know the graphical desktop, KDE, and give tips on customizing the desktop. We will also look at the configuration of special devices, such as modem, ISDN card, sound card and TV card. You will also find a lot of useful information on multiuser administration — one of the strengths of Linux. Additionally, there are guides on subjects such as scanning and burning CDs.

This book also provides a description of the **bash** command interpreter, together with a list of the most important commands. Finally, in the help and FAQ chapters, we introduce the SuSE help system and list the most frequently asked questions concerning SuSE Linux, with answers, so that you can find information quickly and efficiently on other subjects which are not dealt with in this manual.

You will find that nearly all configuration work described here can be conducted directly on a running system. Restarting the system is not necessary. In Linux, this is standard procedure.

Have a lot of fun!

Your SuSE Team

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Thomas Schraitle	KDE2 — The Desktop, Konqueror, KDE2: Configuration

Contents


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1 KDE — The Desktop

1.1 Introduction

The K Desktop Environment (KDE for short) is the standard desktop for SuSE Linux. This chapter assumes that you have successfully installed SuSE Linux and set up the X server correctly. Furthermore, terminology such as root and mounting should not be entirely unfamiliar to you. If you have problems, refer to the relevant sections in the installation handbook. KDE is based on a fully functional X Window System, like all desktop systems in Linux. Thorough configuration saves a lot of frustration in the long run.

1.2 The History of KDE

The story of KDE sounds like a modern fairy tale. To the great agony of a frustrated computer science student from Tübingen, Germany, previous Unix and Linux desktops were lacking in uniformity. For this reason, he developed the most popular graphical user interface for the X Window System: KDE. In those days, MATTHIAS ETTRICH would have never guessed his appeal would spawn a newsgroup. He looked for some volunteers for his project "**K D**esktop **E**nvironment" (KDE) and it met with a lively reaction.

Soon, the first executable version was compiled and KDE became more popular. Improvements followed, bringing the KDE project to a critical mass and allowing it to take off on its own. Today hundreds programmers all over world are involved in developing even more improvements to KDE.

1.3 The First Start

When you start KDE for the first time, a configuration assistant will appear on the screen. First select the country and language, then the system behavior (KDE, Unix, Windows, Apple OS), various effects, and desktop design in five easy steps. Finally, start the control center and further customize KDE to meet your needs. Start it manually by pressing (Alt) + (F2) and entering **kpersonalizer**.

1.4 Help

If, at some point, you are not able to get any farther in KDE, press (F1) or select 'Contents...' under the application's 'Help' menu. The KDE Help Cen-

ter will appear. A panel on the left-hand side has two tabs, 'Contents' and 'Search'.

1.4.1 Contents

'Contents' lists the various documents which belong to the KDE system as well as to the Linux system — man pages and info pages. With a click on 'Application manuals', for example, you will see the same menu structure as in the K menu. You can go on into the submenus as well as see the help documentation displayed in the field to the right.

Browse the traditional Unix "man pages" (from manual) via the item 'Unix man pages'. The structure is historically based. The man pages are split up into nine or ten sections With a click on the corresponding section, the items are displayed. Click on the information you want. You can easily find information about a particular command from a man page by entering the number sign (#) and the name of the command in the URL field.

1.4.2 Setting up a Search and Keyword Index

'Search' looks through the documentation files according to keywords. For this, however, the package htdig from series n (network support) must be installed. If you have the package installed, update your keyword index. Click on 'Update index...'. A dialog window will open where you can enter several additional search paths. Once you have made all the settings, click 'Generate index...' and the search will automatically proceed.

1.5 Operating KDE

In KDE there are various ways to change the configuration and open files and applications. The KDE desktop, the menu bar, title, window, and control panels are available for this purpose. These various options are described in the following subsections.

1.5.1 The KDE Desktop

The desktop is the central switchboard in KDE. You will find various icons on the desktop which enable quick access to CD-ROM disks or hard disks and which allow you to easily save files and set up links to directories and files. Actually, the desktop is only one folder on your hard disk. It is located in your home directory under Desktop. All files stored here will be displayed by KDE on the desktop. If you wish to change this path, refer to Section 2.1.5.

1.5.2 The Menu Bar

As in many other operating systems, you can position a menu bar in KDE on the upper margin of the desktop. Access the menu bar by clicking on the desktop with the right mouse button. In the pop-up menu that appears, you will find the item 'Enable desktop menu' or 'Disable desktop menu'. Activate or deactivate the desktop menu by clicking on this item.

The following list provides an overview of the available items and the options with which you can simplify your work in KDE:

'File' — Execute various commands, start applications, lock your screen, or log out.

'New' — Set up directories, links to FTP files, WWW files, and various applications so you can find them more quickly later.

'Bookmarks' — Manage your bookmarks. This way you will have easy access to frequently visited addresses and files. KDE even automatically manages bookmarks from other browsers as well (currently Netscape and Mozilla).

'Desktop' — Realign and organize your windows and icons and configure the background and desktop as well as deactivate the menu bar.

'Window' — Displays all the desktops along with open applications.

'Help' — Use the help guide and information on KDE as well as report bugs and make requests.

1.5.3 The Title Bar

In the default decoration, KDE2 exhibits the following title bar layout: the window panel menu, the "pushpin" symbol, the respective window name, and the minimizing, enlarging, and closing symbols. Sometimes, a question mark may appear before the minimizing symbol, the “What is that?” symbol.

Figure 1.1: Default Configuration of the Title Bar

Obtain more functions by right-clicking on the title bar. A pop-up menu will open where you can configure the current window or create settings for the layout of all the windows. The pop-up menu contains the following items:

'Move' — The window follows the movement of the mouse until you “drop” it by left-clicking on the mouse.

'Size' — Change the horizontal and vertical dimensions of the window by moving them with the mouse. Confirm with a left-click.

'Minimize' — Minimize the current window. The application remains open, but its window disappears from the desktop and only appears as an icon in the task bar. To reopen the window, click on the icon in the task bar.

'Maximize' — Maximize the current window. The application now occupies the entire screen. By clicking on it again, the window will revert back to its original size.

'Shade' — The current window is reduced to just a title bar.

'Always On Top' — The current window will remain visible on your desktop until you deactivate this function or close the window.

'Store Settings' — Saves your specifications.

'Settings...' — A window will open. Specify the properties and decoration.

'Close' — Close the current window.

1.5.4 The Control Panel

Via the control panel, various applications can be started. It provides the ability to maintain an overview of all your desktops. The following list displays a selection of icons. If you have updated a previous KDE version, your customized configurations will still be recognized, but your control panel may not include all the icons listed here.

The K menu where you can find numerous applications.

The SuSE Quick Menu: Includes a selection of frequently used applications such as GIMP and StarOffice.

Launches Konqueror, containing your home directory.

Start important SuSE tools such as YaST1, YaST2, and SaX.

Includes information about installed packages, help (HOWTOs), configuration themes, and similar items.

The KDE console application.

KDE configurations can be made using the Control Center.

By clicking once with the mouse, place the desktop in the foreground or, by clicking with the mouse one more time, revert it to the background.

In the following sections, we will elaborate on the icons and their meanings.

1.5.4.1 The K Menu

In the K menu, you will find links to various applications. These are organized according to certain criteria, such as applications, Internet, graphics, and games. The following section will provide an overview of the K menu selection items.

> **Tip**
>
> The order of menu items can be changed and new ones added. Section 1.6.1 on page 7 describes how to add new items and columns using the menu editor.

'Find Files' — A dialog will open containing three panels: 'Name/Location', 'Date Range', and 'Advanced'. By making specifications and selections in the panels, accelerate or refine your file search. In the 'Name/Path' panel, select a part of or the entire name of the file you seek along with the directory to browse. In 'Date range', define the date or the time frame when the file was created. In 'Advanced', define the file type, text included in the file, and the file size.

'Help' — Contains a help guide and information about KDE.

'Control Center' — The main control center of KDE.

'Home Directory' — Opens your home directory in a Konqueror window.

'Bookmarks' — For quick retrieval of files, directories, and Internet sites. Edit, view, and access your bookmarks in this menu.

'Recent Documents' — Shows a list of files that were last opened in KDE. 'Clear History' deletes this file list.

'Quick Browser' — Browse various directories, such as your home directory, the KDE directory, and the root directory, without having to open a Konqueror window.

'Run...' — Opens a window where you can enter commands. Access the same command line by entering the key combination Alt + F2.

'Configure Panel' — Enables configuration of the control panel. Use 'Add' to add applets, files, and directories, 'Size' to adjust the size of the panel icons, 'Settings' to define position, appearance, and menus, and 'Menu Editor' to change menu items in the K Menu. 'Help' offers various helpful hints.

'Lock screen' — Click on this item to prevent other users from accessing your computer via mouse or keyboard while you are away from your workstation for a short period of time. The screen will be switched to the preconfigured screensaver and will prompt for the user password before undertaking any actions with the keyboard or mouse.

'Log out...' — Ends the current KDE session.

You can also reposition the control panel. For this, click an open space in the control bar with the left mouse button. Without releasing the mouse button, drag the panel to the desired location. Drop it by letting go of the mouse button.

1.5.4.2 The Applets: Miniprograms

The control panel is capable of more. It provides space for applets which can be embedded into the panel. The time and date are examples of applets.

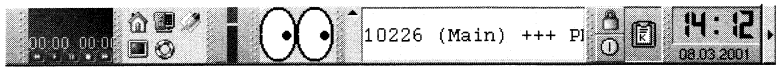


Figure 1.2: Applets

In Figure 1.2, you can see, from left to right: XMMS-KDE, Quick Starter, System Monitor, Eyes, Newsticker, system partition of the control panel, clock.

Add more applets, if desired, from the K menu. For this, select the menu items 'Panel Menu' → 'Add'. All available miniprograms are listed under 'Applets'.

1.5.4.3 The Task Bar

With the help of the task bar, you can quickly and easily switch back and forth between several running applications. For example, sort applications according to workspace or group them into matching windows. Select the menu item 'Look & Feel' → 'Taskbar' and take a look at the different setting options. If you have unsaved data in a KDE application, you will also see a disk icon next to the application icon in the task bar (see Figure 1.3).

Figure 1.3: Task Bar: shows all the windows in the active desktop. Below to the right, a file which has not yet been saved (disk icon).

1.5.4.4 The Switchboard

KDE provides multiple desktops. You can set up to sixteen virtual desktops to which you can also assign names.

Figure 1.4: The Switchboard

The screenshot above shows, from left to right, the switchboard with numerical view, preview, name view. With a right-click, a pop-up menu will open inside

the switchboard. Select either 'Preview', 'Number', or 'Name'. If you activate 'Preview', a small arrow will appear next to it to the left. Click on this and a small window will open that will show a small preview of the desktops. Activate a window by clicking directly in a window.

1.6 Selected KDE Applications

Meanwhile, there are a multitude of KDE applications. Because of limited space, we are not able to introduce all the applications in detail. The selection in the list that follows by no means indicates a comparison of quality.

1.6.1 Menu Editor

All the applications which have to do with either the KDE system configuration itself or with certain aspects of the Linux system in general are summarized according to topic in the 'System' menu (in the K Menu). One of the most important system applications is the menu editor. With it, adjust the K menu according to your preferences. Start it in the K menu under 'System' → 'Menu Editor' or run it with **kmenuedit**.

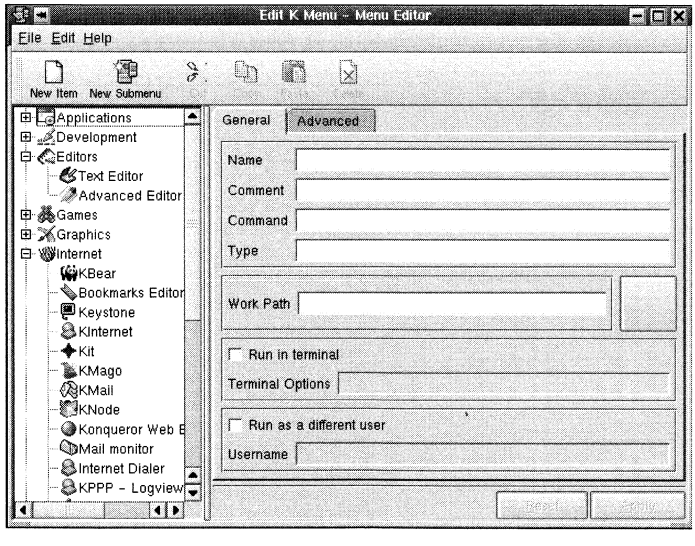


Figure 1.5: The menu editor for the K menu

After starting the menu editor, you will find the same menu structure as the K menu on the left-hand side of the K menu and, on the right-hand side, the various settings for this menu item. In the tab 'General', define the basic settings for your menu item:

'Name' — Give your menu item a name.

'Comment' — Add a note in this entry field.

'Command' — Enter the command to be executed upon selection of the menu item.

'Type' — Defines the type of entry item.

The tab 'Advanced' currently only specifies a key combination with which this menu item can be activated. The button 'Apply' specifies the corresponding combination.

1.6.2 Hard Disk Management

Both kdf and kwikdisk help mount or unmount data media available on your system quickly and easily.

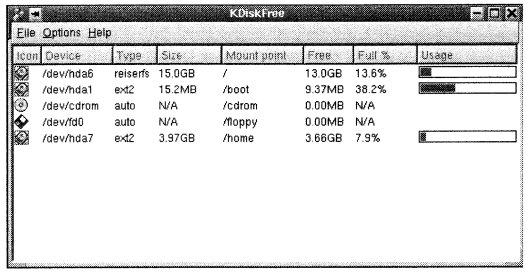


Figure 1.6: Overview of Your Data Media with kdf

- kwikdisk is an applet so it can be integrated into the control panel. When you click on the icon with the right mouse button, a menu opens where you can mount or unmount the respective data medium. If you want a graphical overview, select 'Start KDiskFree'.
- kdf and KDiskFree show an overview of your data media which is obtained from the /etc/fstab file, similar to the **df** command. The window includes the data medium icon, the type, the size, the mount point, the available disk space, percentage of occupied disk space and a graphical representation. This helps maintain an overview.

  If you click on an entry item using the right mouse button, a pop-up menu will open. Integrate the data medium into your system with 'Mount device' or remove it with 'Unmount device'. The menu item 'Open data medium' starts a new Konqueror window listing the contents of the data medium.

1.6.3 Graphics Applications: Pixie, KView and KSnapshot

The graphics application pixie, developed by DANIEL M. DULEY, is included as a KDE image viewer and editor (see Figure 1.7). At first, it displays a small graphic. With the right mouse button, open a window that offers various selection items including a list of all your graphics files.

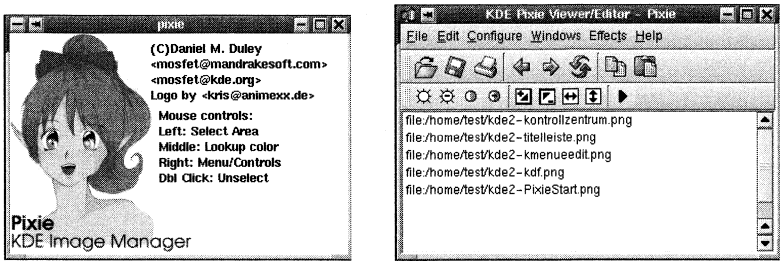


Figure 1.7: Pixie After Starting (left) and the Control Window (right)

Go to the 'File' menu and select 'Open'. Choose the image to be incorporated into the list in the dialog window . You can also save images from Konqueror to Pixie.

Alternatively, there is another program, kview, which can be found in the K menu under 'Graphics' → 'Image Viewer'. If you wish to take a picture of a window or of an entire screen, the application ksnapshot will help. In the K menu, it is under 'Graphics' → 'Screen Capture'.

1.6.4 DVI, PostScript, and PDF Viewers

Among the most important formats in Linux are DVI and PostScript. They can be viewed with ease using the DVI viewer, kdvi, or the PostScript and PDF viewer, kghostview. Both applications are set up intuitively. Figure 1.8 shows the KDvi window.

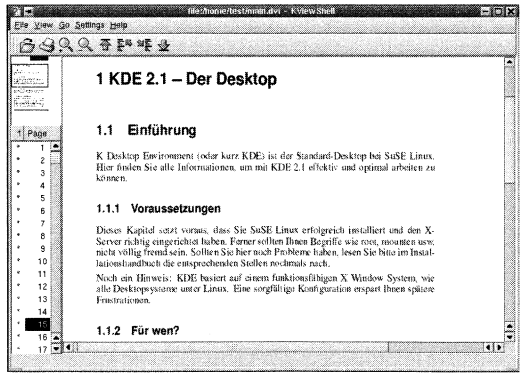


Figure 1.8: KDvi Document Viewer

One of the features of these viewers is that they can be integrated into a Konqueror window. This makes it very easy to display files without having to manually start the necessary application. In kghostview, (see Figure 1.9, page 10) load any PostScript or PDF document and view it. Use the 'File' → 'Open' and select the corresponding document.

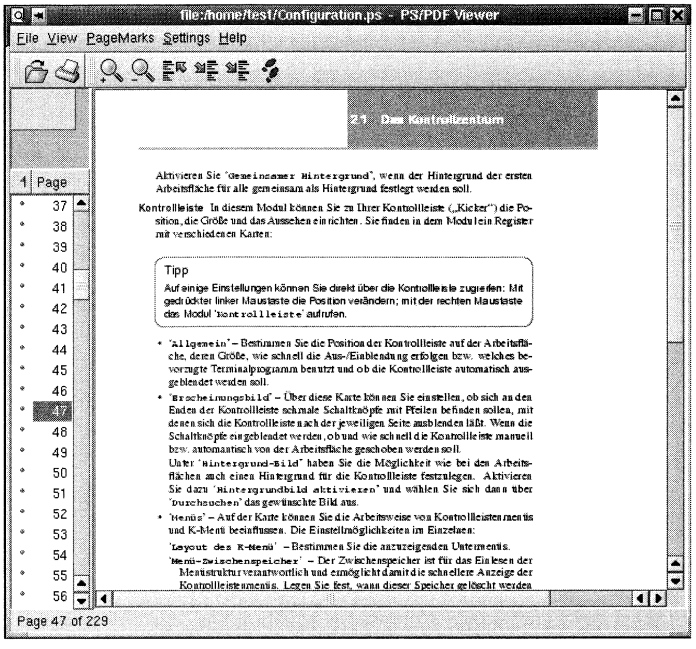


Figure 1.9: KGhostview Document Viewer

In the 'View' menu, choose various displays which automatically show the contents to size. To rotate the image 90 degrees, use 'View' → 'Orientation'.

Setting Appointments with KOrganizer

With korganizer, manage appointments and get easy reminders of birthdays and important events. Define tasks and record your progress.

To set a new appointment, click 'Actions' → 'New Event'. A window will appear in which you can enter general information on the appointment, who will attend, and frequency of recurrence. If an entry is to recur weekly, for example, set this under the 'Recurrence' tab. For this, the 'Recurring Event' box must be checked under the 'General' tab. Under 'General', enter a 'Summary' and set the beginning and ending date along with the start time. You can also be reminded of this appointment. Activate the field 'Reminder' and set the time you want korganizer to remind you of your appointment. In the text field underneath, enter more detailed text.

To organize your appointments, define the categories. Click on the button 'Categories' and a window will open where you can select the corresponding event. If the type of event to schedule is not listed, add the new name in the 'New Categories' column and press (↵). Close the window by clicking on 'OK'.

The following illustrates how you can effectively add a new appointment. To do this, it is best to use 'Actions' → 'New Event'.

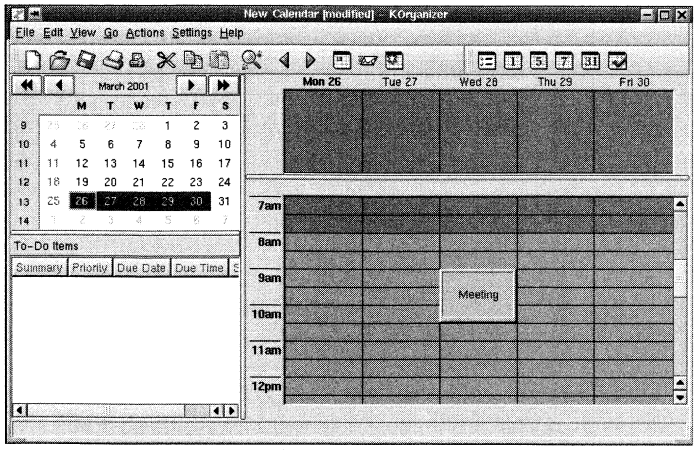


Figure 1.10: KOrganizer: KDE Daily Planner

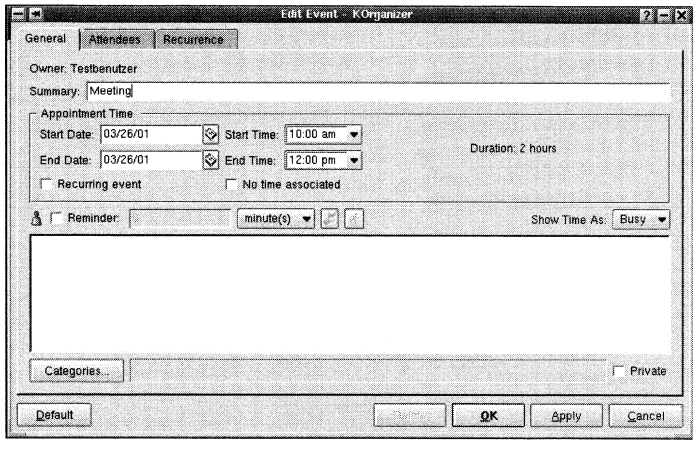


Figure 1.11: Setting a New Appointment

Example

First, schedule a simple appointment. To do this, enter the type of appointment in the '`Summary`' field. Define the date with '`Start Date`' and '`End Date`'. Set a time that makes sense in the selection fields '`Start Time`' and '`End Time`'. If you do not wish to set a time, simply activate '`No time associated`'.

To be reminded of this appointment, activate '`Reminder`'. Now, the entry field next to it is available to set the reminder in minutes, hours, or days. In the text field underneath, enter the particulars through which '`Categories`' will improve the clarity of your entire calender.

To specify other attendees, click on the tab '`Attendees`'. Enter their names and e-mail addresses. Define which role the participant has (such as participant only or organizer) and which status he has (such as needs preparation,

accepted, or confirmed). Select the participant with the button 'Address Book...' and the name and e-mail address will be automatically added.

When you click on 'Apply', your appointment is added to the calendar. This button leaves the window open, so you can still make small changes. To close the window, click on 'OK'.

With KOrganizer, you can not only manage appointments, but also organize tasks. In the 'Actions' menu, find the item 'New To-Do'.

1.6.5 KInternet – the Way to the Web

To surf the Internet or send and receive e-mail, you need to have a modem, ethernet, or ISDN card connected to your computer and configured in SuSE Linux. This takes place with the help of the installation and configuration tool YaST2. When you have configured the device accordingly, use the application KInternet to manage your dial-up Internet connection.

KDE loads KInternet at start-up. The application independently evaluates whether an Internet connection can be established. If so, the application icon will automatically appear in the lower right corner of the KDE panel in the form of a plug. An overview of the icons and their meanings follows below:


No existing Internet connection.


Connection is being set up.


Connection has been established.


Internet connection does not exist, but will be established once the data is retrieved from the Internet.


Data is being transferred either to or from the Internet.

If you right-click the KInternet icon, a menu will appear which will assist in your KInternet configuration and help manage your data connection to your provider. Access configuration to one of your selected providers is easily accomplished with YaST2. Most common providers are preconfigured.

KInternet also offers a series of additional useful features such as the proxy server *WWW-Offle*, a cache for all your web sites (regardless of which web browser you are using). This enables viewing of previously downloaded sites without having to redial the Internet. Web sites requested while offline will automatically be downloaded once you go back online. If you want to make use of these features, install the package `wwwoffle`, series `n` (Network). Also enter the proxy

```
localhost, Port 8080,
```

in your web browser. In Netscape Navigator, this option can be found under 'Edit' → 'Preferences' → 'Advanced' → 'Proxies'.

In Konqueror, select the item 'Configure Konqueror' under 'Settings'. Make your settings under 'Proxies'.

1.7 Frequently Asked Questions and Answers

1. **How can I access a CD or DVD?**

   An icon is located on your KDE desktop with an image of a CD. Insert your CD or DVD in your drive and left-click on the icon. The CD will be mounted and its contents displayed in your Konqueror window.

2. **There isn't a CD icon on my desktop. How do I create one?**

   Right-click on the desktop. Select 'Create new...' → 'CD-ROM Device'. A window will open. Under 'General', rename the icon on the desktop.

3. **Can I place the control panel somewhere else?**

   Yes, of course. Click with the left mouse button on a free space and drag it to any other edge. After you have released the mouse button, the control panel will be placed there.

4. **I want another control panel. Is that possible?**

   Yes. Right-click on an open space in the already existing control panel. Select 'Add' → 'Extension' → 'External Taskbar'. A taskbar will open up. Now you can add files and directories there with the help of Konqueror. Alternatively, right-click on the panel and select the corresponding items under 'Add'.

5. **How do I add programs and other items to the control panel?**

   For this, there are two options:

   a) Click with the right mouse button on a free space in the control panel. A pop-up menu will open. Select 'Add' → 'Button' and you will see the entries as they appear in the K menu. Add your preferred item to the control panel by clicking on 'Add this menu'. You can also select the desired program directly by clicking on it. In both cases, the corresponding icon will appear in the control panel.

   b) Programs and folders can be added by selecting them straight from Konqueror with the left mouse button and, keeping the mouse button pressed, dropping the object into the control panel and releasing the mouse again.

6. **I want to find out more about my system. Where can I obtain this information?**

   There are two options here. The first one is to start the program **ksysguard**. This can be found in the K menu under 'System' → 'KDE System Guard'. Via the so-called "sensor browser" in the left window panel, you can move monitor modules by dragging and dropping them directly into the main window itself. The other options can be found in the Control Center. All the resources and devices associated with your computer are located under 'Information'.

7. **How can I display PostScript or PDF files?**

   In KDE, the program KGhostview serves this purpose. Section 1.6.4 provides more details on this program.

8. **How can I view graphics files?**

   Two programs are included in the basic installation: KView and Pixie. KView can be started in the K menu under 'Image Viewer', Pixie under 'Pixie Image Management System'. Both programs support numerous graphics formats.

9. **Can I play back my WAV, MP3, and other sound files in KDE?**

   Yes, in the K menu under 'Multimedia', there is a menu item for 'KDE Media Player'. It launches the program noatum which can play back several audio formats.

10. **How can I play back an audio CD?**

    Insert the audio CD in the drive and start the program noatum in the K menu under 'Multimedia' → 'KDE Media Player'. You may have to subsequently adjust the volume. This can be done under 'Multimedia' → 'Sound Mixer'.

11. **How can I dial into the Internet?**

    You can either use kppp or kinternet. Kppp can be found in the K menu under 'Internet' → 'Internet Dialer'.

12. **Is there an FTP client for KDE?**

    There is a program called kbear which can be found in the K menu under 'Internet' → 'KBear'. Another option is kmago. You will find it in the the same menu under 'KMago'. It is not an FTP client in the classical sense, but a "download manager". It is excellently suited for managing your downloads and can resume terminated connections this is supported by the server.

1.8 For More Information

If you need more information about KDE, check the following web pages:

http://www.kde.org	*The* KDE page
http://www.konqueror.org	All about the Konqueror application
http://i18n.kde.org	Internationalizing KDE
http://kde.themes.org	All you ever wanted to know about design and other topics related to KDE
http://artist.kde.org	All about icons, clip art, etc., on KDE
http://lists.kde.org	Mailing lists
http://bugs.kde.org	Known KDE bugs

2 KDE — Configuration

2.1 The Control Center

The KDE Control Center enables configuration of KDE according to personal tastes. Unfortunately, we cannot describe every module in detail in this chapter, but we can focus on the main aspects.

The KDE Control Center can be directly accessed via the control panel icon or in the K Menu or SuSE menu under '`Control Center`'. A window will open up, as shown in Figure 2.1.

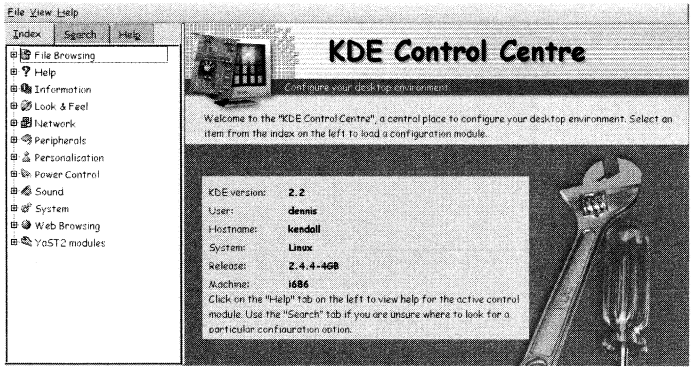


Figure 2.1: The KDE Control Center

The Control Center is divided into a menu bar along with left and right panels. In the left panel, find a list of configuration modules. When you click on a menu, the related modules contained in the right panel will show brief information. If you click again on the module, the settings dialog will start in the panel to the right. Below it, you will find up to four buttons:

- '`Help`' — View a short help text.
- '`Use default settings`' — Restore the default settings.
- '`Apply`' — Confirm changes.
- '`Reset`' — Reverse changes.

The menu bar consists of the following menus:

- '`File`' — Exit the Control Center with '`Quit`'.

- 'View' — Select the layout of the Control Center. In 'Mode', choose whether to work with a structured 'Tree View' or with a simple 'Icon View'. You can specify the 'Icon Size' of the latter.
- 'Help' — View the Control Center help pages via 'Contents' or obtain informational text via 'What is this?' and selecting an icon with the mouse. Also write a 'Bug Report Regarding ...' to the program author or find information about KDE or the Control Center.

2.1.1 Custom Settings

Several modules can be found under this menu item with which you can make custom adjustments to KDE.

Accessibility If you want error messages to be issued by audible or visual signals other than a system bell, set this in this module under the 'Signal' tab. Use the 'Keyboard' tab to set key delay. To navigate the mouse using the number pad, click the item 'Move mouse with the keyboard (using the Num pad)' under the 'Mouse' tab. You will also have the option of setting delays, acceleration, and repetition.

Country & Language In this module, make language, number, and date settings for your region. A click on the corresponding 'Country' is usually sufficient for all additional configurations to be automatically made. Change settings beyond that under 'Numbers', 'Currency', and 'Time & Date'.

Tip

In the module preview, see how the changes made will take effect.

Encryption Make settings for "SSL" and manage certification and certificate sources. For more information, click on 'Help'.

Passwords Decide whether to have nothing or only stars shown when entering a password. In any case, limit the time frame for which passwords are saved.

Spelling Choose the dictionary to use, the character code, and the application to use for performing spell checks, and more. Two supported applications are ASpell (KDE) and ISpell (non-KDE applications).

2.1.2 File Display

This menu contains the modules 'File Manager' and 'File Attributes'.

File Attributes Assign file types to some applications — "MIME" (Multipurpose Internet Mail Extension) types, originally only used as file attachments in e-mail. File attributes include rules for file recognition, descriptions, and icons as well as a list of applications which can be used to open the file type. All file attributes are assigned one of the following types, 'application',

'audio', 'image', 'inode', 'message', 'text', or 'video', and will be listed in a field under 'Known Types'. The function options are:

- To automatically search according to MIME type, enter its description by 'Find filename pattern' (see Figure 2.2). The selection of categories is reduced with each letter entered. Search manually by double-clicking on a type to open it then viewing its attributed MIME types.

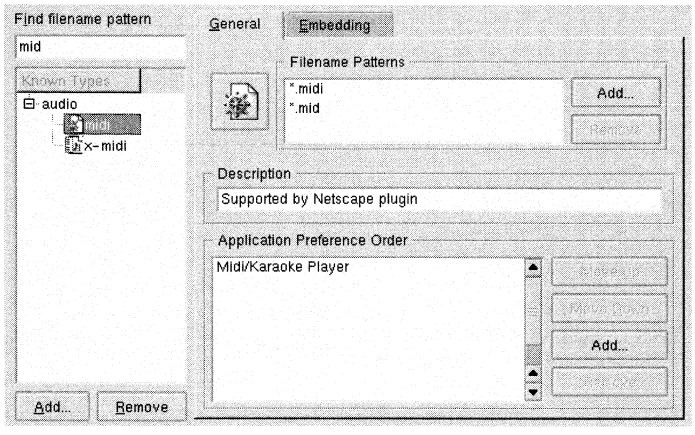
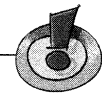


Figure 2.2: Editing a MIME Type

- Add a MIME type by clicking on 'Add...' in the lower left window panel at which point a small dialog box will appear where you can select the appropriate category from the list and enter a name for it under 'Name'. For further settings, read the section "Edit a MIME Type".
- Remove a MIME type by selecting it and clicking 'Remove' in the panel below.
- To edit a MIME type, select the type to modify (see Figure 2.2 on page 17). Select again from the list of available file types. The related changes are then displayed in the window to the right. Make additional settings via the following tabs:

  'General' — Specify MIME type–specific settings:

  1. Choose an icon for a file with this file attribute.
  2. In the 'Filename pattern' section, assign search patterns to find a file's MIME type. This classification is usually based on the file name extension. To reflect only the file ending in your search, enter a star, a period, and the file extension under 'Add...' when adding new file name patterns, as in "*.mp3". Delete existing file name patterns by clicking on the item to remove then 'Remove'.



> **Note**
>
> Note uppercase and lowercase letters when giving the file endings.

3. Enter a short description under 'Description'.
4. If several applications have been attributed to a file type, set the priority of applications to open an associated file in the section 'Application Preference Order'. The application listed at the top has the highest priority. The order can be changed with 'Move up' or 'Move down'. Delete items with 'Remove'.

'Embedding' — In the section 'left-click-action', select whether the file should be embedded in a browser, displayed in a separate window when clicking on it with the left mouse button, or retain the default group settings.
You can select certain plug-in viewers or other preferred applications for opening the file with this ending in the section 'Services Preference Order'. The application located at the top has the highest priority, although the order can be changed with 'Move up' or 'Move down'. Additional applications can also be added or already existing ones can be removed.

File Manager In this module, define the behavior and appearance of directories as well as trash settings. The settings options outlined in detail are:

- Define the 'Behavior' for the file manager home page, whether directories should be opened in separate windows, or if the memory requirements for displaying directories should be reduced.
- Under 'Appearance', set the font size, font color, and some basic formats.
- Under 'Trash', select which deletion methods should request an additional security confirmation.

2.1.3 Help

In this menu, find the module the 'SuSE' module where you can define SuSE Help System sources, which can be extended indefinitely and integrates KDE Help.

Lists the SuSE Help System sources already installed. Making a selection from these sources determines what will be searched.

If you are logged in as 'root', the 'Sources for SuSE Help' will also be activated. Add a source to the SuSE Help by checking the relevant source. Once you have made your selection, confirm with 'Apply' to generate only the modified selection or to generate both the index and database with 'rebuild all databases'.

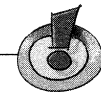
2.1.4 Information

To view information regarding your system, take some time to go through the various modules. Most of the information you see here is taken out of the /proc directory.

- 'Block Devices' — Shows a list of available devices with information such as overall size, mount status, and free or occupied memory.
- 'DMA Channels' — Shows the DMA channels and from which device each channel is used.
- 'I/O ports' — Shows the I/O ports used and by which devices.
- 'Devices' — Lists all plotters and block devices.
- 'Interrupts' — Shows the occupied interrupts and what is using them.
- 'Sound' — Provides sound card information.
- 'PCI' — Provides a summary of all PCI devices found.
- 'PCMCIA' — Provides information about whether PCMCIA controllers or cards are installed.
- 'Partitions' — Find information on the partitions such as mount point, file system type, overall and available memory, and mounting options.
- 'Processor' — Provides processor data such as vendor.
- 'SCSI' — Shows the SCSI controller recognized by the system and its devices along with information about vendor, model, and type.
- 'Samba Status' — If you are using Samba, integrate your Linux network with Windows, view the export and import directories, and view log files and statistics.
- 'Memory' — Gives an overview of how your entire memory is utilized, including physical and virtual memory.
- 'USB Devices' — Obtain information on USB devices recognized.
- 'X-Server' — Shows information pertaining to the X server such as vendor, release, and version number, as well as screen resolution, color depth, and other settings.

2.1.5 Look & Feel

This module provides numerous settings options for your KDE system in terms of desktop, screensaver, background, and key bindings.



Note

Consider the demands any changes to the look and feel might make on your system. If you choose a style featuring many color variations or background images, it will require larger amounts of memory and more machine performance.

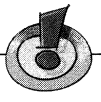
Application Start Display To see that an application is starting, several settings can be made.

- 'Activity display for application start' — Enable notification which can be routed to your mouse pointer. Decide whether this notification should appear with a blinking effect and how long the application start display should remain active.
- 'Window panel display' — Notification that an application has been started can also be output in the taskbar. Here, too, set how long the application start display should remain active.

Background Attribute a common background or various backgrounds or color gradients to your desktops. Select a desktop from the list to attribute a background or color gradient. To the right, see the preview for each one. Underneath, find the following tabs:

- 'Background' — If you are not using a background image, modify the background with color gradients. Select two colors by clicking on the color bars. Next to 'Mode', find several color gradients to try. Choose a 'Pattern' for the display by clicking on 'Setup'.
- 'Wallpaper' — If you prefer 'Single Wallpaper', select any image from the list or load your own background image by clicking on 'Browse'. It provides a dialog to assist with this. If you have chosen a background image, set its display via 'Mode'.

  To be able to switch between several background images, activate the field 'Multiple Wallpapers'. More settings options, such as image selection, image order, and time intervals can be made under 'Setup Multiple...'.



> **Note**
> Consider that the more background images you use, the more demand you are placing on the memory for each desktop.

- 'Advanced' — Enable various effects next to 'Blending' and set the intensity next to 'Balance'. To restrict the cache size, check the box next to 'Limit Pixmap Cache' and define the cache size.

Colors With this module, change the color scheme of your KDE desktop and customize colors (see Figure 2.3). These settings will then be adopted by most KDE applications.

- The window displays the selection of all the available elements in a graphical format and allows quick selection. Click an element to select it for the 'Widget Color' panel.
- The 'Color scheme' section provides a choice of possible schemes that you can subsequently fine-tune with the help of the following panels. The newly created scheme can be saved with 'Save scheme' or an already existing one removed with 'Remove scheme'.

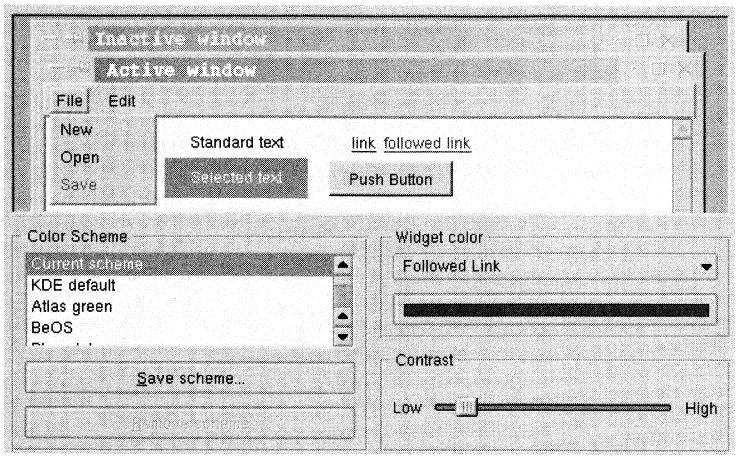
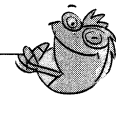


Figure 2.3: Color Adjustments for Your Desktop

- In the 'Widget Color' section, view the color for a given widget. To change the color, click the color bar. A dialog will open where you can make your selection.
- In the 'Contrast' section, a slider adjusts the contrast between the selected colors.

Desktop Find settings under the following divider panels:

- 'Desktop' — Define the vertical alignment of the desktop, display of hidden files, or menu bar activation. View images, HTML files, or text files in a preview window. Specify what should happen when clicking the left, middle, or right mouse button under 'Clicks on the desktop'. Set the paths where the desktop, trash, and autostart files should be stored.
- 'Appearance' — Select the font size, default font, color representation of regular text, and appropriate background color, as well as whether file names should be underlined.
- 'Number of desktops' — Set how many "virtual" desktops with which to work. Up to sixteen desktops are available. Adjust the slider by 'Number of desktops' to the right to increase the number of desktops or to the left to decrease it. The number of active desktops will change accordingly. Optionally, name each desktop by entering the desired name into the respective text field.



Tip

To switch between desktops, press Ctrl and any function key (Fx, where "x" stands for the desktop number) or simply use Ctrl + Tab.

Fonts If the default font settings are not to your liking, adjust the fonts to your individual needs. Select 'Choose' next to the font to change. Set up the font, style, and font size in the dialog and confirm your settings with 'OK'.

Icons This module allows selection of an icon display for your desktop. Specify effects to apply to your icons. You will find two tabs in this frame:

- 'Design' — Decide whether you prefer icons with minimal color display or in rich colors with more variations. Import another design via 'Install New Design'.
- 'Advanced' — Decide whether to apply effects to the icons and the different icon sizes in the various panels and desktops.

Key Bindings If the current key configuration does not suit you, redefine various key shortcuts for particular actions and applications in this module under both of the following tabs:

- 'Global shortcuts' — Change the key combination for calling up actions not associated with any particular program and save this in a corresponding layout for later.
- 'Succession key shortcut' — Change the key combination used to switch or move the current window to another desktop and save this for later.
- 'Application shortcuts' — Define a key shortcut for invoking application-specific actions.

To change an existing key combination, select the action and change the 'Key combination for the selected action' in the section below. Decide whether you want 'No key', the 'Default key', or a 'Custom key' to be defined for this action.

Panel In this module, set the position, size, and appearance of your control panel ("kicker"). You will find various tabs under this module:

Tip

Some settings can be accessed directly in the panel itself. Change the position by pressing the left mouse button and open the 'Panel' module with the right mouse button.

- 'Position' — Define the position of the panel on the desktop, height and width (percentage), and the panel style.
- 'Look & Feel' — In the 'Hide Buttons' area, select whether and on which end of the panel small arrow buttons are located and to which side the panel can be hidden. Also, set whether and the rate at which the panel can be manually or automatically moved on the desktop as well as enable automatic hide animation.

- 'Buttons' — In the 'General' area, click 'Enable background tiles' to be able to define backgrounds for the individual tiles in the areas below. 'Enable icon zooming' must be checked if the small icons in the panel should be enlarged when the mouse pointer passes over them. To assign a certain tile to a menu or a button, check 'Enable' next to each tile and select a color from the selection list.

  Under 'Background Image', you have the option of defining a background for the panel as you did with the desktops. For this, check 'Enable background image' then select the desired image by pressing 'Browse'.

- 'Menus' — Influence the way the control menus and the K Menu function.

  'KMenu Layout' — Select the submenus to show.

  'Menu Cache' — The cache is responsible for managing the menu structure and enables the panel menus to appear more quickly. Define when this cache should be cleared to minimize demand on the memory.

  'Browser Menus' — Decide if hidden files should be shown and specify the maximum entries.

  'Max Quick Start entries/ Quick Start section contains' — Define the maximum number of items in the 'Quick Start' menu and whether last used or most frequently used elements should be shown.

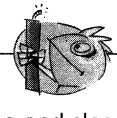
- 'Applets' — Applets extend the functioning of the panel. They are already included in the distribution or can be added later. Starting these programs *internally* has the added advantage of speed, but could compromise the stability of the entire control panel if the applets are poorly programmed. Any applets known to be unstable should be started *externally*.

  The 'List of Trusted Applets' features a list of applets known as reliable in the field to the left and, to the right, all other available applets. Move programs from one list to the other using the arrow buttons located between the two fields. The applets are started via the following options:

  'Load only trusted applets internal' — Applets considered unstable will be loaded externally via a special startup program.

  'Load startup config applets internal' — Only applets loaded at the startup of KDE will be loaded internally. All others will be loaded externally.

  'Load all applets internal' — All applets will be loaded internally, regardless of how they are classified in terms of security.



Caution

For security reasons, only select one of the first two options and classify the applets included in KDE as reliable.

- 'Extensions' — Find a list of 'Extensions' in the left area of the window. Select one then activate the corresponding function in the right area of the window.

Screensaver To activate a screensaver, click the field next to 'Enable screensaver'. This will also activate the list of available screensavers in the 'Screensaver' panel. Next, select the screensaver you prefer. Customize your screensaver under 'Configure'. Review your settings in the enlarged preview on the right side of the window or test it under 'Test'. Pressing (Esc) returns to the settings dialog. More options can be found to the right in the 'Settings' panel:

- 'Wait for' — Set how many minutes to wait before the screensaver becomes active.
- 'Ask for password' — When the screensaver is running, require a password before the desktop can be accessed again by pressing any key or moving the mouse. For this, check the box next to 'Ask for password'.
- 'Priority' — Specify the priority of processor time made available for the screensaver. If the screensaver wobbles, raise the priority.

Style This module includes all settings options relating to the appearance of windows, icons, buttons, and other widgets.

- The section 'Widget style and design' contains a list from which you can select a style to apply to your KDE system. You can also import older "GTK designs". To do this, follow the steps in the dialog.
- Under 'Special display settings', place the menu panel on the upper margin or apply fonts and colors to non-KDE applications.
- Decide whether only icons or text should appear in the tool panel and whether the text should be shown next to or below the icons in the 'Tool panel style options' section. Click 'Highlight buttons under the mouse pointer' or 'Transparent display of tool panel when moving'.
- For 'Effects settings', define whether menus and short infos should gradually appear and how animation styles should be applied.

SuSE Desktop Determine which menu to use as your main menu. All distribution applications are included in the 'SuSE menu', while the 'Default KDE Menu' only contains KDE applications. Another difference is how the applications are sorted in the menus.

Taskbar In this module, decide whether open applications should be shown only on the current desktop or on all desktops at once. You can also have the button for the Taskbar applet in the window bar, group matching windows, or sort open applications on corresponding desktops. 'Display program icons' allows a better overview.

Theme Manager This module enables you to add, create, save, or remove themes (the desktop design). You will find the following tabs under this module:

- Under 'Installation', find the themes included with the distribution, from which to select the one you prefer and adopt it with 'Apply'.
- Under the 'Contents' tab, decide whether you want to retain or remove elements of a previous theme.
- Under the 'About' tab, find information on the module and, after you have chosen a theme, the theme's author and version.

Window Behavior In this module, set window properties by clicking, moving, or adjusting the size of the windows. Further settings options are:

- Under 'Focus', you will find two configuration panels:

  'Focus Policy' — A window is active when you can modify its contents with the mouse or keyboard. Change the active windows by clicking on the window with the mouse or moving the mouse over the respective window. The exact settings can be taken from the list box. If the option 'Click to focus' is activated, the window will move to the foreground when clicked with the mouse. The appropriate delay time can be either specified using the slider or inside the entry field.

  > **Note**
  >
  > If you select too short a delay time, windows could be activated by mistake, even if the mouse pointer has just come into contact with the window margin. Usually, a delay of 100 to 300 ms is sufficient.

  'Keyboard' — Switch between applications on the current desktop using the key shortcut Alt + Tab. Select the method for switching between open applications and whether windows on all desktops should be included.

- Under 'Actions', find the settings for mouse behavior. Set how the KDE window manager should react to mouse activities. You will find the following panels in this module:

  'Titlebar doubleclick' — Define how the window should react to this action. Activate the item 'Maximize' for fullscreen display. To reduce the window to the size of the titlebar, choose the option 'Shade'.

  'Titlebar and frame' — Specify how the window should react to a single-click on the titlebar or on the frame. Note that this action also depends on whether the window is active or inactive.

  'Inactive, inner window' — Set what should result from clicking on the window using the various mouse buttons.

  'Inner window, titlebar and frame' — Set which action should result from simultaneously pressing Alt and a mouse button when clicking inside a window.

- Under 'Advanced', set whether the contents of the window are shown when moving or enlarging the window or, instead, if only a black frame should be shown. In addition, set the minimizing and restoration speed or whether maximized windows can also be subsequently moved or enlarged.

Via 'Placement Policy', define where on the desktop new windows will open. If you want windows to overlap as little as possible, select 'Smart'. For lightly staggered window arrangement, select 'Cascade'. Select 'Random' for random placement.

> **Tip**
> If your computer does not respond properly to maximizing or minimizing a window, deactivate one or both of the options, because they may be using too many system resources.

Window Decoration In this module, make changes to the decoration of the window margins and the positioning of the buttons in the titlebar. Two tabs are available to make these settings:

- Under the 'General' tab, select the decorations already made available in the 'Window decoration' panel. Under 'General settings', adopt the available user-defined position settings for the title bar (if applicable).
- You can only make settings under 'Configure' if you have enabled one of the options "IceWM", "ModSystem", or "Quartz" under the 'General' tab.

2.1.6 Network

All network-related settings can be made here.

Email — In this module, read and modify the data pertaining to the active user's e-mail access. Obtain information on the individual configuration values from your Internet provider (ISP) or your e-mail access provider.

> **Tip**
> The e-mail application only offers added peformance within the particular application itself.

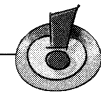
Click on 'New Profile' to add another profile or select one from the list under 'Current Profile'. Further settings dialogs will then be activated for each profile under three tabs:

- 'General' — There are two sections, 'User information' and 'Preferred e-mail client'. In the first section, enter the name of the user, the company, his e-mail (and reply address if e-mail should be sent to a different address). In the second section, choose the e-mail application to use. To do this, enter the respective application name in the corresponding field or select it via 'Browse'. Several e-mail applications can be installed on your system. Check the box next to 'Start in terminal' for text-based mail programs without a graphical interface, such as pine.

- 'Incoming Email' — The server resonsible for receiving e-mail is known as a "POP 3" or an "IMAP" server. Choose the respective e-mail server or 'Local mailbox' if you computer is connected to a local network. Select the corresponding 'Incoming mail settings'. Specify the path of your mailbox if you have a local network.
- 'Outgoing Email' — The server responsible for sending e-mail is often referred to as the "SMTP" server. Select the corresponding 'Outgoing mail settings'. If you have a local network, specify the path of the outgoing mail server.

LAN Browser — With this module, set up the LAN information server LISa. Changes can only be made as 'root'.

NewsTicker — Set up the KNewsTicker applet with this module. Additional settings options are provided under these four tabs:



> **Note**
>
> You will need an Internet connection for the news ticker.

- Under the 'General' tab, configure the sensitivity of your scroll wheel mouse, if you have one, as well as the loading frequency of the news ticker and the ticker display speed.
- Under 'News Sources', find all the previously available Internet sites where news is available. To select one, click on the box in front of the news source. If you want to change any news source settings, such as source file, icon, category, or maximum number of articles, click the 'Edit' button. Click on 'Add' to add a news source.
- The 'Filter' tab allows selection of filter rules such as "if certain keywords appear in the article, this should be shown".
- Under 'Ticker settings', increase the ticker speed, its direction, and make settings for the entire look and feel: font, background, forground, highlight color, and similar settings.

  In the 'Miscellaneous' section, define whether only the most current headlines, icons, endless ticker text, or highlighted headlines should be underscored in the display.

Protocols — Provides a summary of the available protocols — the input and output modules.

Settings — To test how KDE applications behave on the Internet and in networks, make simple network settings here, such as time outs.

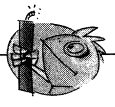
SOCKS — Set up KDE support for a SOCKS server or a proxy with this module.

Talk Configuration — Communicate over the network with others. For this, a talk daemon is needed. Under three tabs, find comprehensive settings options.

- Use the 'Announcements' tab to set the program to provide notification of a talk request and the talk program to be itself. You can also let yourself be informed of talk requests via an acoustic signal.
- To have incoming talk requests leave messages for you when you are not there to receive them, configure your answering machine with your own specifications.
- Under 'Forward', configure talk request forwarding.

Windows Shares — This module allows you to make the settings needed to access available devices and directories on networks. First, verfify your identity before accessing data. Enter the data required.

"Assignment" is the combination of a server with its corresponding authentication. If you access a resource for which an assignment already exists, KDE will automatically take care of this authentication process for you. If you have specified a password, you will not be asked for it again in the future.



> **Caution**
> Refrain from saving passwords if possible for security reasons, especially in security-related networks.

2.1.7 Peripheral Devices

In this menu, find mouse and keyboard configuration modules.

Keyboard Just as the number pad could be globally deactivated when starting previous versions of KDE, it can likewise be activated in the current version via 'Advanced' under 'Block number block when starting KDE'. Further settings options are:

- 'Layout' — Select the keyboard model and configuration with this module. The model is the type of keyboard connected to the computer. The keyboard configuration is different for every language and defines the output of each key. Set a secondary language configuration, useful if you frequently switch between various keybaords.
- 'Advanced' — Set the key repetition rate and the click volume.

Mouse The module provides the following configuration options:

- 'General' — Define left-handed or right-handed mouse or trackball usage, whether files or folders should be opened with a single-click or a double-click, if icons should change when they are touched by the mouse, and if the mouse pointer itself should change when resting over an icon.
- 'Advanced' — This tab includes configuration options for correlation between mouse movements and the movement of the cursor on the screen ('Cursor speed'), how quickly the second mouse click must follow the

first one to be interpreted as a double-click ('`double-click interval`'), how the lines should change when using the scroll wheel of the mouse ('`Mouse wheel regenerates scroll`'), and similar options.

2.1.8 Power Control

With this module, activate your computer's power control functions. Modern computers, for example, can be switched to standby mode after a certain period of inactivity. APM support is required, which is normally already built into today's PCs.

2.1.9 Sound

In this module, define various ettings for your sound card.

Audio-CD — This module is for setting up input and output modules for your audio CDs. You can call it up by entering **`audiocd:/`** in the URL line in Konqueror. Set automatic audio CD recognition, error correction, the file formats "Ogg-Vorbis" and "MP3", and connection to a music database on the Internet.

MIDI — Select the MIDI playback device to use.

Mixer — In this module, change the general settings for kmix (the KDE Mixer) sound card.

In the first section, save the current volume as a default volume. Automatically load stored volumes and selected settings when KDE starts via '`Load volume settings at login`'.

In the section '`Hardware settings`', define, under '`Maximum number of probed mixers`', how many sound cards kmix should search for at startup and, next to '`Maximum number of probed devices per mixer`', how many devices should be detected on each sound card.

Sound Server — With this module, configure the KDE sound server aRts which enables you to listen to system sounds, MP3 files, and other sound files.

System Bell — Instead of system notifications, allow for a system bell to tone instead, for which you can set the volume, pitch, and duration in this module.

System Notifications To be notified when a certain event occurs or to document an event, make these settings under this module. Select one of the applications and categories and open an item by clicking on the '+' symbol until you are presented with the following four options:

- '`Write to log file`' — Saves the notifications in a file without giving any acoustic or visual signal.
- '`Play sound`' — Plays back the sound file set up for this purpose.
- '`Display notification field`' — Displays a message window.

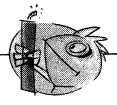
- 'Default error output' — Treats error output as stipulated by the individual program itself.

Select which text or sound file is played back under 'Filename'. Either enter the file name yourself or select it using the directory icon and click it in the ensuing dialog.

Once you have selected a sound file, this can be tested using the play button on the right of the directory icon. The playback volume can be adjusted using the slider next to 'Volume'. If you want to use an external playback application, click the box in front of 'Use external player' and select the corresponding application via the directory icon.

2.1.10 System

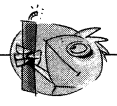
This menu includes modules for defining your system behavior.



> **Caution**
> Since the settings for the modules 'Login Manager' and 'Date & Time' apply to the entire system, you can only make these changes as 'root'.

Date & Time — Define the system date and system time along with time zone.

Login Manager — With this module, set up the graphical login interface in KDE. Modify the appearance of the login screen, set who has access to the login manager, who may shut down, and so on.



> **Caution**
> Because storing passwords represents a security risk, avoid this type of "comfort".

- 'Appearance' — Set up the appearance of the login screen with a greeting text, logo, visual style, and language (independent of the custom language setting), or define a central and precisely specified location for the login manager.
- 'Font' — Select the fonts to use for the login screen and username.
- 'Background' — For a specific background image for your login screen or color gradients, make the relevant settings under this tab.
- 'Sessions' — Specify which session types, such as 'KDE' or 'failsafe', are displayed in the login manager, as well as who may shut down the computer from what location. Define the commands to run at "shutdown" or "restart".
- 'Users' — Set up which existing users are displayed in the login manager.

- 'Comfort' — Specify whether users should be automatically logged in, whether they do not have to enter a password when logging in, and more.

Configuring the Linux Kernel — Offers a graphical interface for the Linux kernel. This customized kernel will be automatically loaded at system startup. If you have made an error in the kernel, load the 'SuSE' default kernel at startup to modify your own 'Linux' kernel configurations.

Console — Set up the KDE terminal program in this module by making global settings or editing color schemes for the console under the following tabs.

- Under the 'General' tab, define which application should be used as your default terminal, define the position of the panels and borders, and specify the basic font layout.
- Under the 'Color scheme' tab, assemble a console using your personal favorite colors. Keep in mind, however, that the text should still be legible.

Printer Administration — View all configured printers and pending print jobs, as well as properties and locations.

Print System — In this module, select a print system.

Session Manager — In this module, set a confirmation prompt to appear after logging out or define whether the settings for the previous session should be restored when logging in again.

2.1.11 Web Browser

This menu contains modules for configuring Konqueror as a web browser.

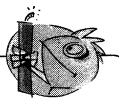
Cookies — These files are for storing and querying information about your computer and yor activities. They can be retrieved from web servers with the help of browsers. For example, these can be helpful if settings are stored there so that certain settings do not have to be made again each time the Internet site is visited. Often, web sites store and fetch informaton about cookies without informing you first about it. This information is used for statistics or to place banner ads especially tailored to your profile. The module allows you to set rules restricting the use of cookies or to allow them only for specific servers.

Enhanced Browsing — Activate two additional functions with this module.

- 'Enable Internet Keywords' helps you find Internet brand names such as companies, celebrities, and organizations. You can simply enter "K Desktop Environment" instead of `http://www.kde.org/` in the URL field of Konqueror. The name entered will then be translated into a URL and the location loaded.
- In the 'Enable Web Shortcuts' section, find shortcuts for calling up certain search engines which can be individually modified. To modify these, enter the shortcut for the search engine in the URL line of Konqueror, separated by a colon and followed by the search object. An example is **`gg:icq`** to search for "icq" via the search engine "google".

Konqueror Browser — Set up Konqueror browser functions in this module. The settings are grouped into several tabs:

- Set up a function which allows you to automatically fill out forms. Also set how often this should occur.
- Choose fonts and their size for web site via 'Appearance'.



> **Caution**
> Active contents such as Java and JavaScript applications may represent a security risk, even if the risk of damage is minimal. Use domain-specific settings.

- Define whether 'Java' applications embedded in web pages should be run. Create domain-specific or application runtime settings.
- Define whether 'JavaScript' programs embedded in web pages should be run.
- Under the 'Plug-Ins' tab, activate these globally.

Netscape-Plugins — Manage your Netscape plug-ins which can also be applied to Konqueror. Plug-ins provide the ability to see the contents of a given browser displayed by other programs such as Flash. Initiate a search for new plug-ins when starting KDE 2.2.

Proxies and Caches — Make settings pertaining to your proxy server and cache with this module.

- Click on 'Use Proxy' to use proxies to save the contents of requested Internet sites to a cache and forward them to you. This reduces the time it takes to load Internet pages and serves to determine who is accessing which Internet pages.

  Specify the HTTP and FTP connections to set up each proxy server, along with their respective port numbers. You can also prevent certain servers from implementing proxys.
- Enable 'Use cache' if you want to save previously visited Internet sites in Konqueror's memory. The advantage is that pages are subsequently loaded faster, because they are read directly from the cache.

Style Standards — CSS files contain information which enables uniform representation of HTML pages. For this, a particular format is attributed to each style element, such as headlines. Define style standards to use under the 'General' tab. To make selections under the 'Custom-defined' tab for the style standards, select the item 'Style standards from the "Custom-defined" menu...'.

User Agent — Once Konqueror has established connection to a web site, some basic identification information is submitted in the form of a "user agent" login. Intelligent web sites evaluate this information to adjust their HTML code to the currently used browser. This is useful because web browsers

function quite differently from one another. Some web servers even refuse connection for "incompatible" browsers so you can fool these web servers by using another "user agent" login.

2.1.12 YAST2

With the help of the 'YaST2' module, extend the hardware and software of your SuSE Linux System as well as make various settings to your network and system services. For more information, read Chapter 4, page 51.

3 GNOME

3.1 What is GNOME?

Along with KDE, FVWM, and Windowmaker, projects were eventually started to make the user interface more uniform, streamlining the various aspects of the look and feel. This includes a lot more than "just" managing the windows in a graphical desktop. Additional components ensure that applications can share data with each other as well as feature a uniform operating concept and help system. Modularization allows reusable program elements to be integrated into other applications so that the wheel doesn't have to be reinvented for each individual scenario. One of these projects, GNOME (GNU Network Object Model Environment), originated in August 1997 with the goal of developing a user interface which is completely based on free software. Thanks to the collaboration of developers around the world, GNOME has become an effective desktop as well as a flexible and sophisticated developer's environment.

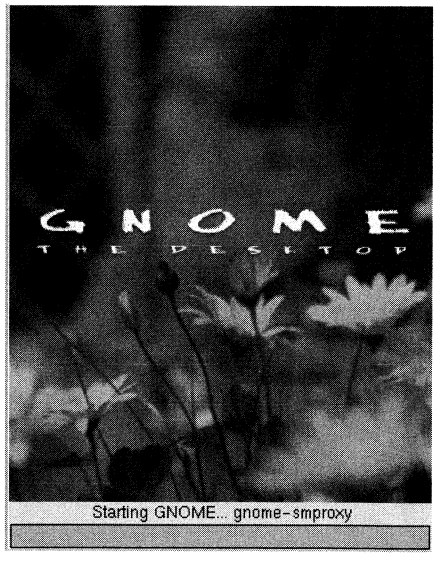


Figure 3.1: The GNOME Splash Screen

3.1.1 Starting GNOME

SuSE makes an effort to keep the GNOME desktop components up-to-date. When you use the GNOME included in your SuSE Linux software package, you are using the most current stable versions of the GNOME project in a practical default configuration.

Start GNOME either by selecting the GNOME session in the graphical login or by calling up the X server with **`startx gnome`**. After that, a splash screen appears that will inform you of the start-up procedure.

3.2 The GNOME Help Browser

The GNOME Help Browser is the main resource center for the documentation saved on your Linux system. Click on 'Programs' → 'Help System'

to run the application. The help browser enables you to view man pages and info pages — both traditional help formats — along with GNOME-specific documents..

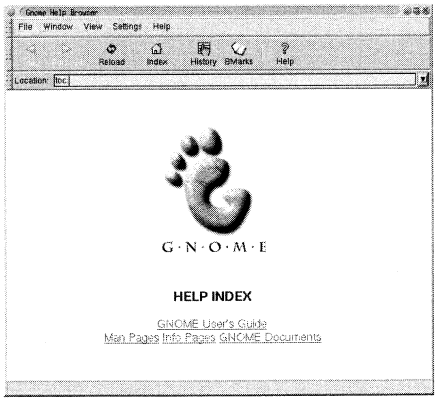


Figure 3.2: The Help Browser

Its usage is similar to that of a web browser. With the help of the toolbar, you can add bookmarks as well as move forward or backward through the pages. If you call up help inside an application, the help browser will be started automatically. In addition, you will still find the 'GNOME User's Guide' selection, a detailed user guide for the GNOME desktop, on the browser's home page.

3.3 The GNOME Panel

The GNOME panel is located at the bottom of your screen when you initially start GNOME. From here, you can start the applications you want to use and control the various workspaces provided by GNOME.

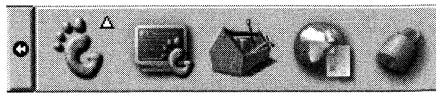


Figure 3.3: A Clip of the GNOME Panel

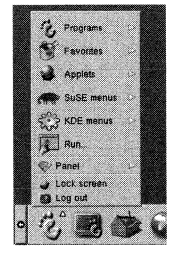
The central element in the panel is the GNOME icon — the foot — which is located at the far left of the panel. Click on it to open the GNOME start menu from which you can start applications and make various settings.

Tip

In most of the panels, a small arrow icon is located on the left and right far corners. Click on one of these arrows to make the panel temporarily disappear.

3.3.1 The GNOME Start Menu

The GNOME start menu is divided into various submenus, the most essential of which we will briefly introduce.



- 'Applications': This selection shows all the GNOME applications available on your system. In the folder 'Configuration', you can customize your GNOME desktop.
- 'Favorites': This folder houses your preferred applications. You can assemble this comfortably using the menu editor.
- 'Applets': GNOME offers an especially large selection of useful applets which you can select and start from 'Applets'.
- 'SuSE menus': This folder includes all the applications installed on your system.
- 'KDE menus': Since the applications on the K Desktop Environment (KDE) are familiar to many users, the GNOME developers have integrated all the menus from KDE. This way you also have the opportunity to access KDE applications quickly, which, of course, run under GNOME as well.
- 'Run': With this, you can quickly start programs and applications.
- 'Lock screen': The currently selected screensaver will start. The GNOME desktop can only be accessed again by entering your user password.
- 'Log out': Exit GNOME. Click on 'Save current desktop' to prompt GNOME to "remember" the window placement and the open applications for restoration next time you start.

3.3.2 Panel Configuration

An especially outstanding feature of the GNOME panel is its customized configuration. It is important to know that there are several types of panels.

- Margin panel — A margin panel always extends from one screen margin to the other. These panels can be positioned vertically on the desktop so they extend from the upper to the lower screen margins or horizontally, left to right. When starting GNOME for the first time, you will find a margin panel at the bottom of the screen.
- Justified panel — This type of panel can be aligned to the edge or center of your workspace. For example, the panel can be justified to the right.
- Sliding panel — These are actually justified panels, but can be positioned at a given distance from the margin.
- Free-floating panel — These panels are no longer bound to a margin. A free-floating panel can be randomly positioned.
- Menu panel — This special panel makes the most important menus available on the upper screen margin as well. With this, you will gain quick access to the application programs as well to the configuration options for the desktop.

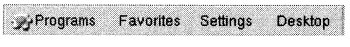


Figure 3.4: Clip of the Menu Panel

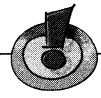
The settings for the specific panel types can be made by right-clicking on an empty part of the panel. A small selection will appear. Click on 'Panel' → 'Properties' → 'All Properties'. You can change your panel to another panel type at any time by choosing 'Type' in the same dialog window.

Tip

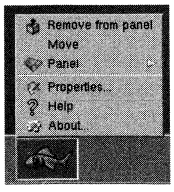
Do you want to navigate several panels at the same time? No problem! You can create a new panel quite easily by right-clicking on an empty surface inside the panel and choosing 'Panel' → 'Create panel'.

3.3.3 Handy Little Helpers — the Panel Applets

For GNOME, there is a large selection of panel applets. Applets are always on hand without using up much space. You can add an applet to the panel by right-clicking on an empty part of the panel and choosing 'Panel' → 'Add to panel' → 'Applet'. We would like to introduce some particularly interesting and also especially important ones.

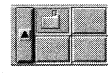


Note



Practically every applet includes its own configuration options and setting dialogs. By clicking with the right mouse button on an applet, you can not only move or remove it from the panel, but also access its configuration dialogs.

- Desktop overview: You can divide the desktop up into several work spaces. The desktop overview applet functions to help you gain quick access to the individual desktops. This also enables you to access an application quickly by clicking on the small arrow in the applet on the left. A list appears with all the desktops and running applications.



- The tasklist: To aid in managing the applications on the currently running desktop, the tasklist displays all the applications as clickable buttons. With a click of the left mouse button, you can define which program is active. With the right mouse button, you can initiate various actions, such as ending the application and minimizing or maximizing.

Figure 3.5: The Tasklist

- Processor and memory load display: This applet displays your system status at a glance. By means of a bar graph, the processor, memory, and swap memory are displayed in three columns.

- GNOME Weather: This applet displays weather data from around the world. A permanent Internet connection is recommended for this.

Already included in the GNOME base system is a large selection of applets for every purpose imaginable. You can download even more applets from the Internet — see Section 3.7.

3.4 Desktop Configuration

The GNOME Control Center enables convenient configuration of all your desktop settings from one centralized location (see Figure 3.6 on the following page).

3.4.1 Workspace

Screensaver Many fascinating screensavers, some with support for hardware-accelerated 3D graphics, are available. If your system has APM (Advanced

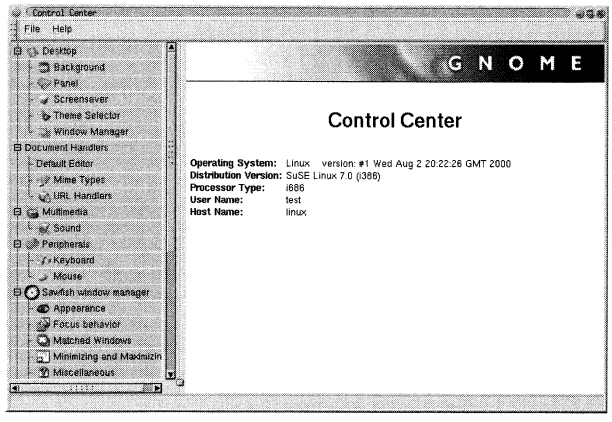
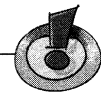


Figure 3.6: The GNOME Control Center

Power Management), prompt your monitor to shut off after a given time with the 'Use Energy Saver Modes' switch. Linux, as a multitasking operating system, can run several processes simultaneously. Set the 'Priority' of how much memory is assigned to the screensaver using the modulator.

Window Manager GNOME is not bound to any particular window manager. In this dialog, you can select a window manager from a list of all the window managers available on your system. Most window managers use the configuration application included which can be started by clicking on the 'Run Configuration Tool' button.



> **Note**
>
> GNOME can be operated on any window manager, but not all support GNOME and its enhanced features. Therefore, we recommend that you use Sawfish, since it is entirely GNOME-compatible. If you prefer, however, you can use one of the other window managers. A good alternative is Enlightenment whose extensive graphical effects make full use of a fast system. One of the sections that follows elaborates more on the configuration of Sawfish.

Background Configure your desktop background. You can select an image and set it in various ways to your background. If the image you are using appears distorted, choose the option 'Scaled (keep aspect)'. Alternatively, select a color gradient for your desktop. To the right in the 'Preview' box, see how the new background will look. For your settings to take effect, click on 'Ok'.

Panel Here you can create settings that affect your entire panel. The range of possible configurations is too extensive for discussion in this chapter. However, we would like to point out the 'Buttons' tab where you can underscore the panel icons with tiles.

Theme The ability to completely change the entire layout of your desktop under "Theme Selector" is a GNOME specialty. We have put together an extensive selection of free layout themes. You can install them with the package `gtkeng` from the series `xwm` (Windowmanager) with the help of YaST. If you are starting GNOME for the first time, a special SuSE layout is preconfigured.

3.4.2 User Interface

Applications These options affect all applications compatible with GNOME. You can configure menu, toolbar, and status bar behavior here. Almost all GNOME menus can be "torn off", meaning you separate the menu or submenu into its own window which remains open.

Dialog Fields Dialogs assist in user interaction. Make all your settings here for every GNOME-compatible application displayed by the dialogs. Under '`Dialogs`', set the positioning of the dialog buttons (right, left, evenly distributed) as well as whether the buttons should be displayed by icons. Under '`Dialog behavior`', set where dialogs will emerge. Either the current window manager makes this decision or GNOME positions the dialogs generally in the middle of the screen or wherever the mouse pointer is at the moment. '`Place dialogs over application windows when possible`' specifies that emerging dialogs will always be opened above the current application window.

GNOME MDI Options The MDI (Multiple Document Interface) options are relevant for applications where several documents are managed simultaneously. By setting '`Notebook`', several documents are combined in a tab located above the current application window. '`Modal`' covers the entire surface area of an application window with the document. In this case, the '`Window`' menu must be used to switch to another document. '`Own window`' opens a new window for every new document.

3.4.3 Multimedia — Sound

Choose '`Enable sound startup`' to start the GNOME sound server. If you do not have a sound card, it does not make sense to activate this button. With '`Sound events`', GNOME monitors the activities of the applications and outputs sounds in certain situations. Define which sounds should be triggered by which events.

3.4.4 Peripherals

Mouse GNOME offers various options for configuring the way the mouse moves. Configure '`Mouse buttons`' if you want to customize the order of the mouse buttons for left-handed or right-handed use. Under '`Mouse motion`', set the acceleration speed of the mouse. The '`Threshold`' slider defines at which minimum speed the mouse accelerates.

Keyboard Set features here such as key repetition rate or how long the keyboard bell rings.

3.4.5 Saving the Session

If you do not want the GNOME login image, the splash screen, to appear at the start screen, deactivate it. The logout screen, which asks if you want to restore the current session, can be deactivated here as well. If you want to save the changes made to the session every time you log out (current desktop status and running applications), click on '`Automatically save changes to session`'.

3.4.6 Working with Documents

GNOME Default Editor If you need a text editor in GNOME, such as when clicking on a text file on the desktop, GNOME will start a certain editor. Here you can set which editor that should be. If the program requires its own terminal window, such as **`vi`**, click '`Run in terminal`'.

MIME Types With the help of MIME types, GNOME can recognize which application should be started for which file format. You can add MIME types or change already existing ones. You can specify a MIME type for each "suffix". This file extension assists in the identification of file types. If you want to prompt LaTeX documents to always open with Emacs, for example, choose the MIME type '`Application/x-tex`' and click on '`Edit`'. In the dialog that appears, set which program should be started. Enter `Emacs %f` to designate the Emacs editor for this file type.

User Feedback If a larger application is loaded into memory, it can take a few seconds until the application window actually appears. To inform the user that this is taking place, GNOME uses four different types of feedback.

- Tasklist: In the tasklist, a new entry appears when an additional application is started.
- Hourglass mouse cursor: The mouse cursor is augmented by a small hourglass while the application is starting.
- Splash screen: A small splash screen is blended in for each program before it starts.
- Animated star: In the upper left of the desktop, an animated star appears while the start process is taking place.

Every visual tool can be individually activated or deactivated. Several tools can be activated at the same time or all shut off completely.

3.5 Configuring Sawfish

Even though GNOME can handle many window managers, Sawfish is especially compatible.

- Little demand on your memory: Sawfish spares the resources a lot of potential stress, as it is an especially "slim" application, also resulting in a faster work speed.
- Layout usage: Sawfish's look and feel can be changed via Layout, including the order of operational elements.
- GNOME compatibility: Sawfish is one hundred percent GNOME compatible. Sawfish can be configured inside the GNOME Control Center.

Sawfish is also be configured using a proprietary configuration tool. You can select this in the GNOME Control Center under '`Desktop`' → '`Window Manager`' and then click on the button '`Run Configuration Tool for Sawfish`' in the page that subsequently appears. Here, however, we will focus our attention on configuration within the GNOME Control Center.

3.5.1 Workspaces

A workspace is divided into lines and columns. For example, if two columns and two lines are selected, the workspace will be divided into four sections. Every one of these sections will be sized to the entire screen. If you were to move a window outside the screen margin, the part that disappears would already be located in the next section.

In this window, set how many workspaces are managed by Sawfish and how many sections are included in each workspace. Likewise, give your workspaces symbolic names and specify whether the workspaces should change when the mouse pointer touches the screen margin.

3.5.2 Appearance

Here you can set the graphical layout for Sawfish. This mostly concerns the window frames and window control elements. In addition, settings can be made to fonts and some complex settings in the monochromatic, single-colored, layout that is supplied with the software.

Tip

With the help of the program **`sawfish themer`** included in Sawfish, you can interactively create layouts for Sawfish.

3.5.3 Focus Behavior

The focus behavior defines how windows are activated. In the setting for '`enter-exit`', a window will come into focus when the mouse pointer is located inside the window area and lose it when the pointer leaves. In contrast, with '`enter-only`', the window maintains the focus even when the mouse pointer

leaves the window area. A new window will come into focus only when the pointer is moved into that window area. With the third setting, 'click', a window comes into focus only when the mouse pointer is located inside the window area *and* when the user confirms that it should have focus by clicking.

Additional setting options such as rolling windows and other focus behavior options are available. If "shade-hover" mode is activated, the rolling windows will automatically be opened when the mouse pointer is located in the title bar.

3.5.4 Sound

In this screen, sound effects can be added to events managed by Sawfish (for example, maximizing or iconifying) The designated sound files must be in the Wave format, bearing the file extension WAV.

3.5.5 Degree of Difficulty

Configuring Sawfish itself can take place at three difficulty levels. For the 'Novice' setting, a series of settings will be phased out which could just confuse a beginner. 'Intermediate', the setting referred to in this manual, offers more configuration options and only leaves out the very specialized settings which are only accessible in the 'Expert' mode.

3.5.6 Placement

When new application windows appear, Sawfish can control where and how they will be placed on the desktop. The default setting is 'best-fit'. Sawfish determines where on the desktop the most empty space is and attempts to place the new window there. Alternatively, there are settings such as 'interactively', which leaves it up to the user to position windows.

3.5.7 Mini-Help Texts

Here, along with various detail functions, the mini-help texts are configured by Sawfish. Mini-help texts are short explanations Sawfish displays by means of small rectangular speech bubbles.

3.5.8 Key Shortcuts

Operating a windows system with the keyboard is much more efficient for experienced users. Here, Sawfish will meet your needs. In this window you can designate a key or key combination for practically any action. Sawfish also divides the actions into different logical groups. The group name states how the action relates to the respective area. In the 'Window' group, for example, actions such as maximizing, moving, or minimizing a window are found.

3.5.9 Minimizing and Maximizing

Configure how you want Sawfish to behave when minimizing or maximizing windows. Additionally, specify whether you can manually change the window geometry into a maximized application window.

3.5.10 Moving and Resizing

You can set the window manager so that only a blank rectangle is shown instead of displaying the contents while moving it. This is a good setting to use, especially for slower computers or lower-performance graphics cards. The exact same setting is also possible for reducing or enlarging window frames. You can also specify several ways to lock or "snap" a window into place. For example, if you set the fixation method to 'magnetism', the frame of the window you are moving will snap right next to another window, as if the window frame were magnetic.

3.5.11 Matched Windows

'Matched windows' allows you to customize your work with applications and make adjustment to the highest precision. Sawfish can uniquely identify applications by way of a title in the window frame. We will use a small example to explain the uses of this powerful function:

- Start the GNOME Control Center and select 'Matched windows' in the Sawfish configuration settings.
- Now start the application GNOME terminal from the GNOME panel.
- Click on the 'Add' button in the GNOME Control Center.
- The left-hand column in the window emerging defines the feature by which a window is to be recognized. 'Name' is a specification here. This instructs Sawfish to recognize an application via the title bar. Click on the 'Grab' button in the window to the right. The mouse cursor then changes into a small crosshair. Drag the crosshair into the title bar of the GNOME terminal and click once. Now 'Terminal' should be in the entry field left of the 'Grab' button.
- Define actions or features below that only relate to the selected application. Since you often need to make keyboard entries in a terminal, it makes sense to change the focus for this application so that it does not come into focus until the mouse is actually located inside the window. For this, set the 'focus-mode' selection to 'enter-exit'. Even if you have set the global focus to 'click', the terminal window exclusively can have this new focus mode.
- Since the terminal application is often needed, we would like to attribute another appearance to it. For this, set the selection 'frame-style' to a random Sawfish layout of your choice. The terminal application will immediately implement this layout, regardless of whether it is a global setting.

- Click on 'Ok' in the GNOME Control Center to apply the changes. The function will take effect on all the terminal applications you start in the future.

3.6 Nautilus — The GNOME File Manager

Nautilus is the new file manager for the GNOME desktop featuring quite a few new features and extensions.

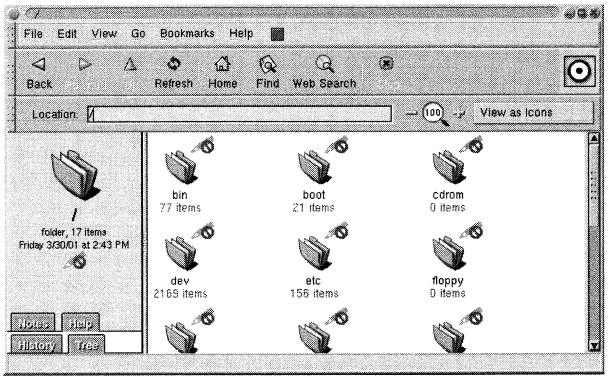


Figure 3.7: Nautilus

3.6.1 First Steps

In the figure above, you can see a standard Nautilus window. The left half of the window shows a directory icon, how many objects (that is, files) are inside it, and when the last change took place. The right half of the window shows the objects inside the directory.

3.6.2 Navigation

In the text entry field "Location", you can see which directory or URL is displayed. If you click on the 'Home' button in the toolbar above the text entry field, Nautilus will transfer you to the folder labeled `Nautilus` that is located in your home directory.

Figure 3.8: The Nautilus Toolbar

Tip

Nautilus will attempt — as much as possible — to automatically complete entries made in the 'Location' field. You will then see the suggested completion in reverse. If the suggestion is correct, simply press Tab.

The 'Forward' and 'Backward' buttons enable you to navigate to the previous or next displays as you would in a normal web browser. The "Up" button switches you to the next directory level upwards. Using 'Refresh' updates the display.

'Find' allows you to search for files located within your local resources: in the text field, enter your search word. The 'Find Them!' button will start your search. 'Web search' launches a search engine which you can use to search for contents on the Internet.

3.6.3 Nautilus as File Manager

Zooming Image and Text Preview and Display The basic approach of displaying files and their contents graphically almost inevitably leads to the question of whether a more *content-oriented* or a more *overview-oriented* display makes the most sense. The variable zoom functions assist in jumping this hurdle.

The file manager basically shows a reduced view of text and image files which indicate how the text file begins or how an image looks. The practical aspect of this is the ability to enlarge or reduce the display: the user decides to which degree. If you double-click on a file icon, the file manager opens the file using the appropriate application. If it is an image file, Nautilus starts the integrated image display module and enlarges the image display. Even here, you can use the zoom buttons to adjust the display size and magnification.

> Tip
> When a text file is displayed as an icon, you can already see the beginning text inside the icon. Now, if you expand the display, you will see more text inside the enlarged icon.

If you click on the magnifying glass between the '+' and '–' buttons, you will always end up with a zoom size of one hundred percent — the original size.

List View Switch to list view via the button 'View as List' (next to the zoom icons), very convenient for many types of files.

Copying, Moving, and Linking Objects Select 'File' → 'New Window' to display a second Nautilus window. You can now cut and paste by moving files with the left mouse button. On the other hand, if you drag the icon using the right mouse button, a small menu will appear at the destination with which Nautilus will ask you whether you want to "move here," "copy here," or "link here." Nautilus also manages the desktop background and icons. You can move or link a file to the desktop as well.

The Nautilus Help System In the left part at the bottom of the Nautilus window, you will see "Help" under the tab. All help and information documentation available on your system is consolidated by Nautilus and brought into

a uniform HTML format. When you select the help tab, a list will appear in the left part of the Nautilus window of the various help topics, sorted in a tree diagram. If you select one of the topics, the contents will be shown in the right panel of the Nautilus window.

Sticky Pad Notes In the partition where the help tab is located, you will find another tab 'Notes'. You can write notes on everything that can be seen on the right: Internet pages, directories, or image files. The notes will always be saved in the same location as the contents shown.

History The history saves every location visited for easy access later. The history is also accessible via the overhead menu item 'Go'. You can also delete the current chronicle ('Forget History').

The File System Tree The tab 'Tree' assists in quickly changing directories or moving files in other directories. It provides a clear display of your data medium structure. As already mentioned in the Section *Copying and Linking Objects*, you can also carry out simple copying operations just by moving the files.

Marking Objects with Emblems All objects in the right half of the window can be assigned emblems. These labels serve to expediently mark a file or a directory. There are icons for "draft," "important," or "personal."

After you right-click on a file or directory and select 'Show properties' in the pop-up menu which emerges, a file properties window will open. Next to the tabs 'Basic' and 'Permissions' is 'Emblems'. Select the label with which you want to mark your object icon. You can even designate multiple labels.

Aligning, Positioning, and Sizing the Icons As opposed to many other file managers, you can individually adjust the visual characteristics of the icons to the display. Normally, Nautilus automatically manages the alignment, positioning, and sizing of the icons with an "automatic layout". As soon as you move an icon inside the file display, the file manager will ask whether you wish to activate the "manual layout". If you click on 'Switch' to confirm this, Nautilus will no longer apply the automatic layout.

A further method of distinguishing certain objects is to change the size of the icon. To this end, right-click on an icon. In the pop-up menu that emerges, select 'Stretch icon'. A four-cornered frame will surround the icon. Now, if you drag one of these corners using the left mouse button, Nautilus will enlarge or reduce the image in real-time. You can revert back to the original icon size at any time by clicking on it again with the right mouse button and selecting 'Restore Icon's Original Size'.

3.6.4 Configuring Nautilus and the Desktop

Nautilus manages the icons inside a window and assumes control over settings for the objects on your desktop. You can also furnish your desktop background with colors and patterns.

Degree of Difficulty Nautilus recognizes three different degrees of difficulty, adjusting itself to the individual needs of the user regarding available options for desktop operation and especially for configuration. Change the current configuration with the menu item to the right of 'Help'. We will focus our attention in the following paragraphs on the 'Intermediate' degree. In the degrees of difficulty labeled 'Beginner' or 'Advanced', you will see respectively fewer or more options displayed.

Preferences In the same menu where you set the degree of difficulty, access the 'Preferences' dialog.

- 'Appearance': Change various settings as to the look and feel of the displays as well as the fonts used by Nautilus. Extremely important: Deactivate the option 'Use smoother (but slower) graphics' if Nautilus is taking up too much processor time on your system. The functions for enlarging images and icons normally work using a complicated algorithm for obtaining higher quality zooming.
- 'Folder views': Specify whether your programs should be started with a single-click or a double-click. If you want a new Nautilus window to open every time you click on an object, activate this function under 'Window behavior'.
- 'Search': This refers to web searches as well as "normal" searches. Set various search speeds here as well as the search engine to use.
- 'Sidebar panels': Set which tabs should appear in the left side of the Nautilus window.
- 'Navigation': Configure your start page for Nautilus. This does not have to be a web site. It could certainly be a directory. If you use a proxy server to access the Internet, enter the corresponding configurations under 'Use Proxy Settings' and activate 'Use HTTP Proxy'. Nautilus offers a series of built-in bookmarks which are linked to some Linux distributors and services. If you wish to deactivate this, deselect 'Don't include built-in bookmarks in the Bookmarks menu'.
- 'Speed Tradeoffs <-> comfort': Nautilus can generate displays for objects such as images, text, or even sound. This requires a lot of processor time. Deactivate the respective functions here if they are unwanted.

Backgrounds and Emblems with Drag and Drop! In a Nautilus window, select 'Edit'→ 'Backgrounds and Emblems' in the main menu. In the dialog that emerges, select 'Patterns', 'Colors', and the 'Emblems', already mentioned, which are located to the left. For instance, you can simply drag the pattern BrushedMetal to the desktop background and just drop it there. These changes can be seen immediately. You can proceed in this manner for nearly every desktop element. A 'Reset' icon can be found in every selection. If you drag this to a desktop element, the element will revert to its original setting. Drag the emblems to files or folders to add them to these elements.

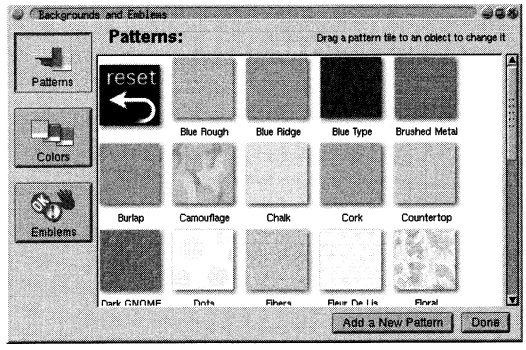


Figure 3.9: Backgrounds and Emblems

Nautilus Themes The optical look and feel of Nautilus can be completely transformed. Nautilus themes include, along with the graphical theme of the operating elements, icons for common objects such as folders and text files. Select 'Edit' → 'Nautilus Themes'. Then a "Nautilus Theme Selector Window" will open up. Click on the themes you want to apply.

Order of Object Data Along with the icons, Nautilus always shows specific information below an object. You may have to enlarge the zoom factor to see it all. Assume you are working with a colleague on a project. It may make more sense to have the file permissions displayed instead of the file size, type, or modification date. If you select 'Edit' → 'Icon captions' in the dialog which appears, you can set the order and the type of information shown.

3.7 Further Information

http://www.gnome.org	The GNOME project home page
http://developer.gnome.org/	Extensive documentation on GNOME-compatible programming
http://www.gtk.org/	GIMP Toolkit (GTK) home page
http://gtk.themes.org/	Huge collection of GTK themes

You will find frequently asked questions and answers about GNOME, GTK, and the GNOME Foundation at http://www.gnome.org/faqs/.

4 YaST2 — Configurations

With the help of YaST2, enhance your SuSE Linux system with additional hardware components, such as a printer or sound card, configure system services and the network, and install or remove software.

Many Paths to YaST2

Via the K Menu, there are several ways of accessing YaST2: via the 'Control Center', via 'SuSE' → 'Administration' → 'Configuration', and via 'Preferences'. Otherwise, change to user 'root' (**su -** then enter the root password) in the shell and enter **yast2**.

In the K menu pop-up menus, directly click on the configuration module needed. YaST2 will open a small dialog once it is loaded. Here, enter the password for user 'root' (the system administrator). The configuration then will be carried out as user 'root', because only root is permitted to make changes to the Linux system files.

If, for whatever reason, you are not able to run YaST2 as described above, there is a slightly more complicated way to do this. Enter the following in a shell on the graphical desktop:

```
xhost +
su -
(enter root password)
export DISPLAY=$(hostname).$(domainname):0.0
yast2
```

After exiting YaST2 switch back to normal user from 'root' with **exit** and then enter **xhost -** to reactivate the access controls for the X server.

To change the language for YaST2 select 'System' then 'Choose language' in the YaST2 Control Center. Select the desired language then exit YaST2 and restart it.

The YaST2 Control Center

Next, the YaST2 Control Center will appear. The area to the left of the screen is divided into 'Hardware', 'Network/Basic', 'Network/Advanced', 'Security/Users', 'software', 'System', and 'Miscellaneous'. If you click one of the icons, the respective contents will be listed to the right. For example, click on 'Sound' and a window will open where you can make configurations for your sound card.

Configuration takes places in several steps. YaST2 guides you through all the dialogs with 'Next'. In the left portion of the screen, a help text is displayed

regarding the respective topic, explaining the entries required. Once you have completed the necessary entries, use 'Finish' to complete the last configuration dialog. The configuration is then saved.

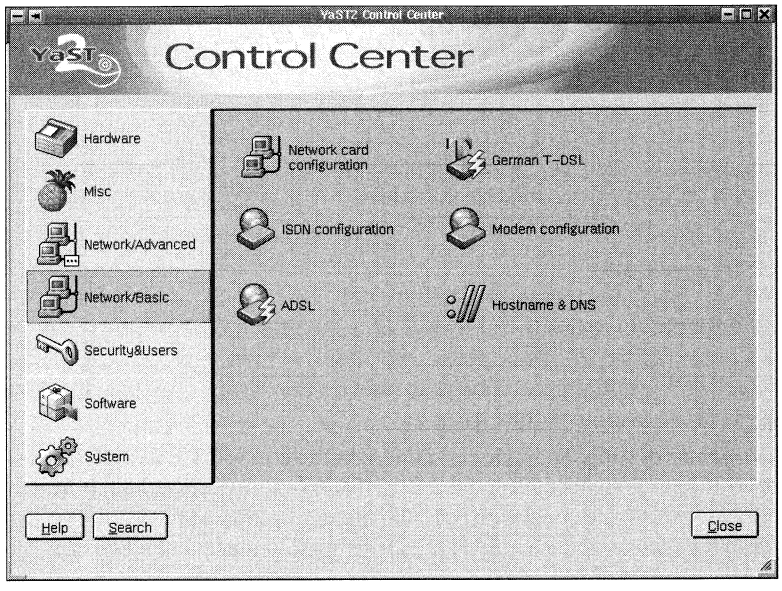
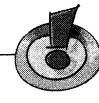


Figure 4.1: YaST2 System Configuration and Administration

4.1 Hardware

Before starting the software configuration for new hardware, the hardware itself needs to be installed. Follow the instructions provided by the vendor. Switch on external devices, such as printers or modems, and open the respective module in YaST2.

Most of the hardware is autodetected by YaST2, so only a few additional settings have to be done manually to get the hardware running. If autodetection fails, YaST2 provides a list of devices from which to select the appropriate device. Consult your hardware documentation if the information printed on the device itself is not sufficient.



Note

Beware of model descriptions. Try a similar description if you do not find your model in the device list.

In some cases, however, exact specifications to the number or letter are absolutely necessary, since more general descriptions cannot always guarantee compatibility. Unfortunately, even similar hardware does not always understand the same language

4.1.1 Printer

See "Printing in Linux", Chapter 9.5 on page 125.

4.1.2 Sound Card

Configuring the Sound Card with YaST2

After the sound configuration tool is opened, YaST2 will attempt to autodetect your sound card. To use multiple sound cards, first select one of the cards to configure. With the 'Configure' button, you will be returned to the 'Setup' menu. Via the 'Edit' button, already configured sound cards can be edited under 'Sound configuration'. 'Finish' saves the current settings and completes the sound configuration. If YaST2 does not automatically recognize your sound card, use the 'Add sound card' button to get to 'Manual sound card selection' in the 'Sound configuration' menu. Here, select a sound card and its corresponding module yourself.

Setup

Under 'Quick automatic setup', you will not be required to go through any of the further steps in configuration and no sound test is performed. The sound card will be completely configured.

'Normal Setup' provides the option of controlling the output volume and playing a test sound in the subsequent 'Sound card volume' menu. Use 'Advanced setup' to adjust individual sound module options. This takes place in 'Advanced options for the sound card'.

Sound Card Volume

In this screen, test your sound configuration. Set the volume with the '+' and '-' buttons. Start at about ten percent to avoid damage to your speakers or hearing. Produce a test sound by clicking on the 'Test' button. If the volume is not acceptable, readjust it. Complete the sound configuration with 'Next' and the volume will be saved.

Sound Configuration

With the 'Delete' option, remove a sound card. Existing entries of already configured sound cards will be disabled in the file /etc/modules.conf. Access the'Enhanced options for the sound card' menu via 'Options'. Here, the options for the various sound modules can be manually adjusted. In the 'Mixer' menu, configure the individual gauge settings for the input and output of each sound card. 'Next' saves the new values and 'Back' resets the default configuration. Under 'Add sound card...', configure additional sound cards. If YaST2 autodetects another sound card, you will be taken to the 'Configure a

sound card' menu. If YaST2 does not detect a sound card, continue to 'Manual sound card selection'.

If you use a **Creative Soundblaster Live** or **AWE**, automatically copy CD-ROM SF2 sound fonts to your hard disk from the original Soundblaster driver with the 'Install sound fonts' option. They are saved in the /usr/share/sfbank/creative/ directory.

The start-up of ALSA when booting the machine can be enabled or disabled via the checkbox 'Start ALSA'. For playback of MIDI files, activate the checkbox 'Start sequencer'. This way, the sound modules required for sequencer support will be loaded along with the ALSA modules.

The volume and configuration of all sound cards installed up until now will be saved when you click on 'Finish'. The mixer settings will be saved to the file /etc/asound.conf and the ALSA configuration data appended to the end of the /etc/modules.conf file.

Configure a Sound Card

If multiple sound cards were detected, select your preferred card under 'List of automatically recognized...'. You will now be taken to the menu item 'Setup' with 'Next'. If the sound card was not autodetected, click the item 'Select from the list' and, with 'Next', proceed to the menu 'Manual sound card selection'.

Manual Sound Card Selection

If your sound card was not autodetected, a list of sound card drivers and models will be shown from which to make a selection. With 'All', see the entire list of supported cards. You may need to refer to your sound card documentation for the information required. A reference list of sound cards supported by ALSA with their corresponding sound modules is available in /usr/share/doc/packages/alsa/cards.txt and at http://www.alsa-project.org/~goemon/. After making your selection, proceed to the 'Setup' menu by clicking on 'Next'.

Advanced Options for the Sound Card

Adjust each sound module option. To do this, highlight each line to change. In the field labeled 'Possible values', find suggested default values for the configuration. Only modify the default values if you are absolutely sure of what you are doing. If not, pass each parameter in the entry field yourself. Values can be given in decimal or in hexadecimal form. In the latter case, start with the value 0x. After entering a value for an option, confirm it with 'Apply'. Pressing 'Reset' erases all the values. A reference list of the required options and the parameters available for the sound chip can be found in the /usr/share/doc/packages/alsa/INSTALL.

4.1.3 Graphical Interface (X11)

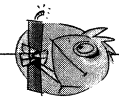
The graphical interface, the X11 System, provides the user with the basis for working in a graphical environment, as the graphical user environment (such as the KDE 2.2 desktop) runs on top of the graphical interface. The X11 settings are saved in files which vary according to the XFree86 version being used:

XFree86 3.x: `/etc/XF86Config`
XFree86 4.x: `/etc/X11/XF86Config`

The graphical interface is usually configured during installation. However, if you still want to improve the values or connect another monitor to a running system, use this YaST2 module. The current configuration with be backed up before changes are made. The start screen will allow restoration of a saved previous X11 configuration. Then, you will be taken to the same dialog as in the SuSE Linux installation. You have the choice between text mode and the graphical interface. The current values will be shown for the graphical interface: the screen resolution, color depth, image repetition rate, vendor and monitor type (if this has been autodetected), and, possibly, an already existing 3D acceleration. Click '`Change`' to configure the monitor. If you have a graphics card with a 3D chip, enable 3D acceleration here. Depending on the hardware you are using, when selecting the color depth, you will have the option of choosing 16, 256, 32768, 65536, and 16.7 million colors at 8, 16, or 24 bits. At least 256 colors is recommended.

Test the settings by clicking '`Test`'. If you click '`Next`' right afterwards, the test runs automatically. If you are not getting a still picture, stop the test immediately with (Esc) and reduce the values. Use the test image to adjust the dimensions and position of the screen display. Test it using the small white squares located in the four corners of the test screen. These should be fully visible without color distortions for an optimal screen position.

If your monitor is not automatically recognized, you will be taken to the monitor selection dialog. Also reach this dialog with '`Set monitor specifications`'. The vendor and device list offers a large selection of models, where you will most likely find your monitor, manually enter the values for your monitor, or choose the default settings, VESA modes.



Caution

Be extremely careful with manually entering the permissible deflection frequencies. The wrong values could destroy your monitor. Look up the values in your monitor manual.

To be safe, choose a standard resolution to start. Highlight the item '`Vesa`' and the values `640x480`. The Vesa mode is, however, limited to a 75-Hz image repetition rate. For modern monitors, anywhere between 75 and 90 Hz is a suitable repetition rate. Sometimes, display errors can be attributed to hardware limitations. Alternatively, you may have the option of using the existing driver disk. To

do this, click on 'Driver floppy', insert the monitor vendor's floppy, and confirm with 'OK'. If this works, the monitor data will then appear in the selection list.

4.1.4 Mouse

With this YaST2 module, improve the performance of your mouse. If the automatic recognition fails, a manual configuration screen will open. Obtain the type description from your mouse documentation. Select this from the list in the YaST2 window. You make changes with the ↑ and ↓ keys. After you have highlighted the correct mouse type, confirm this either with the key shortcut Alt + T or with Tab and then with ↵.

Use Tab to access the 'Test' button and press ↵. Now, the mouse should move on the screen when you move it. If this does not work, you may have selected the wrong mouse type. In this case, choose another mouse type and try again.

4.1.5 Keyboard

The preferred keyboard layout usually corresponds to the selected language. Use the test field to try out the configuration. Make sure that the 'z', 'y', and special characters are correct on your keyboard.

4.1.6 Scanners

If your scanner is connected and activated, it should automatically be recognized by the YaST2 module when it starts. In this case, the dialog for installing the scanner should appear. If no scanner was detected, you will be taken to the manual configuration. If, by chance, you have already installed one or more scanners, an overview chart will appear next, containing a list of the existing scanners which can be changed or removed. Set up a new device with 'Add'.

Next, an installation will take place using the default configurations. If the installation was successful, a relevant message will appear. Now you have the chance to test your scanner by putting in a sample document then clicking on 'Test'.

Scanner is not recognized

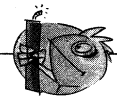
Only supported scanners can be recognized automatically. Even scanners run on another machine in the same network will not be recognized. For manual configuration, a distinction must be made between a USB, SCSI, or network scanner.

- USB scanner: Enter the vendor and the model. YaST2 will attempt to load the USB module. If your scanner is very new, the modules may not be possible to automatically load the modules. In this case, you will be taken to a dialog to load the USB module "by hand". Refer to the YaST2 help text for more information on this.

- SCSI scanner: Specify the device (e.g. `/dev/sg0`). A SCSI scanner may not be connected or disconnected while the system is running. Shut the system down first.
- Network scanner: Enter an IP address or hostname.

You can use either a network scanner or a scanner connected to another computer on the network. To configure a network scanner, read the Support Database article "Scanning in Linux" (`http://sdb.suse.de/en/sdb/html/index.html`, keyword search "scanner"). When choosing the network scanner, the host IP address to which the scanner is connected must be entered in the screen which appears.

If your scanner was not recognized, the device is probably not supported. However, sometimes even supported scanners are not recognized. Manual scanner selection may, in this case, be required. After identifying your scanner in the vendor and module list, click on it. If it is not listed, '`Cancel`'. Information on scanners that work with Linux can be found at `http://cdb.suse.de/cdb_english.html`, `http://sdb.suse.de/en/sdb/html/index.html`, or `http://www.mostang.com/sane`.



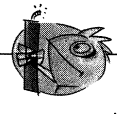
Caution

Only assign scanners manually if you are sure of what you are doing. An incorrect selection could damage your hardware.

Troubleshooting

The following are possible causes of failed scanner recognition:

- The scanner is not supported. Find a list of Linux-compatible devices at `http://sdb.suse.de/en/sdb/html/index.html`.
- Your SCSI controller was not properly installed.
- Your SCSI port has termination problems.
- Your SCSI cable is too long.
- Your scanner has a SCSI Light Controller which is not supported by Linux.
- Your scanner is defective.



Caution

For SCSI scanners, the device may not, under any conditions, be connected or disconnected while the system is running. Shut down your computer first.

Further information on scanning can be found in the Chapter "Scanning in Linux" on page 109.

4.1.7 TV Card

Further information on watching TV in Linux can be found in the "Applications" manual.

After starting and initializing this YaST2 module, the 'Setting Up the TV Card' dialog will appear. If your TV card was autodetected, it will be shown here. Highlight the line with the mouse then click 'Add'. If your TV card was not detected, configure the "other, not recognized" card, at which point, you will be taken to manual configuration. The 'Edit' button allows changes to an existing configuration.

The dialog 'Overview of the TV cards' will appear after clicking on 'Edit' or immediately after starting this YaST2 module, if you have already installed and configured one or more TV cards. In this dialog, individually edit or remove the configuration of each card. 'Add' starts manual configuration.

In the 'Manual Configuration' screen, select your TV card type. If you need to choose a tuner type to obtain a functioning configuration, click 'Select Tuner' and highlight the tuner type. If you are unsure, leave the settings at 'Default (recognized)' for now and see whether it works. If none or not all the tuners can be configured, this could be because the autodetection of the tuner type was unsuccessful or because you selected the wrong type.

'Details' opens expert configuration. Here, custom select the kernel module running as driver for your TV card as well as its parameters. All the TV card driver parameters can be adjusted. To do this, select the parameters to edit and enter the new value. Confirm the new values with 'Apply' or restore the default values with 'Reset'.

In the 'TV card, Audio' dialog, create the settings for watching TV on your computer with sound. Typically, a short cable comes with your TV card with which to set up the sound on the audio output of the sound card. For this, the sound card must already be installed and the external input not on mute. Click 'Yes' in the screen and select a sound card in the next step. Here, you also have the chance to configure your sound card. See also Section 4.1.2 on page 53. You will also be able to directly hook up your speakers to your TV card without a sound card between if you are not receiving your sound from somewhere else (such as from an external SAT receiver). There are TV cards completely without sound functionality like those for CCD cameras. In these cases, audio configuration is not necessary.

4.2 Internet Access

4.2.1 Basic Internet Connection

All the machines on the Internet make up a large network where various operating systems are running with different hardware. The Internet uses a standard communication protocol that can be understood regardless of hardware or software used. This is done by the Internet Protocol (IP), together with the Transmission Control Protocol (TCP), the User Datagram Protocol (UDP), and the

Internet Control Message Protocol (ICMP). These protocols comprise the common "language" used by all machines on the Internet. The abbreviation for this is TCP/IP.

Every machine on the Internet has an ID number, the IP address. It can only be addressed by TCP/IP with this number. Normally, a machine also has a text name, used by application programs to refer to them. The Domain Name System (DNS) is responsible for converting the IP address to a text name. This particular service is offered by name servers. A machine or an application offering a service is called a server (for instance, DNS server) and a machine or application making use of a service is called a client.

Below TCP/IP, there are various standardized protocols for forwarding the appropriate TCP/IP data transfers to the given transmission method. For network connections via a network card, this is the ethernet protocol. For modem and ISDN telephone connections, it is the Point to Point Protocol (PPP), and for ADSL/T-DSL connections, the Point to Point over Ethernet Protocol (PPPoE).

The ethernet, PPP, or PPPoE connection, followed by the TCP/IP connection between your own machine and a machine on Internet provider, must be established before setting up an Internet connection.

On top of TCP/IP, there are various standardized protocols for proper data transfer to the application.

- The HyperText Transfer Protocol (HTTP) serves for the transfer of web sites in HyperText Markup Language (HTML) format.
- The Simple Mail Transfer Protocol (SMTP) is responsible for sending e-mails to another machine and Post Office Protocol (POP3) for downloading e-mails from a mail server.
- The File Transfer Protocol (FTP) is used to transfer files.

For several application programs, such as a web browser and an e-mail program, to use the same Internet connection at the same time, separate TCP/IP connections are used for each application. Large amounts of TCP/IP data are also split up into small packets, so that HTTP packets from the web browser can be sent over its TCP/IP connection while alternating with SMTP or POP3 packet transfers from the e-mail program via other TCP/IP connections.

Since several applications are using the same Internet connection, the IP address, which only identifies the machine, is not enough. A port number is needed to sort out which TCP/IP data belongs to which application.

These standard services are usually provided on their particular server at the following port numbers: DNS on port 53, HTTP on port 80, SMTP on port 25, POP3 on port 110, FTP on ports 20 and 21.

The client can only implement the right service if it addresses the correct port number at the server.

4.2.2 Instructions for all Types of Internet Access

Personal Firewall

The Personal Firewall is especially intended for preventing Internet machines from setting up a connection to your own machine, without much effort in the way of configuration. At the same time, however, connections originating from your own machine to hosts on the Internet are allowed. The Personal Firewall is well-suited and more than sufficient for meeting customary demands. Only the name of the network interface (ppp0, ippp0, eth0) can be configured in the file `/etc/rc.config.d/security.rc.config`, where, in particular, connection requests are denied. YaST2 will take care of this for you if you click on the item '`Enable firewall`' in the corresponding dialogs.

The following will be filtered out by the personal firewall:

- All TCP connection requests. The security is based on the fact that the personal firewall will always block the first incoming TCP packet, prevents a proper TCP connection from being established. Those TCP packets which are not a part of an existing TCP connection and are not TCP connection requests will be discarded in any case.
- All UDP packets, except for those on port 53 from one of the configured name servers (normally only the provider's name server, usually automatically configured when the Internet connection is set up; refer to "Internet Connection and Local Network" on page 60.
- Some of the less conventional ICMP packets.

All filter rules only apply to the configured interfaces, and nothing else. Some services can lead to "side effects". Among these are IRC (CTCP), FTP (PORT mode, passive FTP, used by customary browsers, works), printer services, real audio, real video, cucme, napster, ICQ, and a few others.

Automatic Dial-Up (Dial on Demand)

If you click on '`Dial on demand`' or '`Automatic Dial-in`' in the YaST2 modules, the Internet connection will be made automatically when required, for example, when you enter an external URL in the browser. '`Dial on demand`' is only recommended if you have a flat-rate Internet connection, as processes running in the background, such as frequent e-mail retrieval, require regular dialing into the Internet.

4.2.3 Internet Connection and Local Network

In every Internet connection, there is a normal TCP/IP connection between the localhost and a host at the Internet provider. Normally, use the DNS of your ISP. The network is configured so that the connection to the Internet provider is used for all TCP/IP data not intended for the localhost. This is normally correct,

because the localhost does not usually function as a DNS server and does not have any other network connections, so all TCP/IP data is Internet-related.

There are usually no problems on the network with the TCP/IP connection to the Internet provider, if there is only one localhost. An exception is if, for example, a firewall has been configured so that no data can be transferred at all.

However, if there is a local network with several hosts, the local network configuration cannot conflict with the TCP/IP connection to the Internet provider. Information on configuring a TCP/IP network can be found in the "Network" manual in the SuSE Linux Professional package. Also obtain more information at `http://sdb.suse.de/sdb/en/html/index.html` about our support offerings.

4.2.4 Modem or ISDN Terminal Adapter

Basic Requirements for Operating a Modem

1. Serial Port

Usually, modems are addressed over a serial port. This means that the kernel sends and receives data to and from the modem via a serial device. `/dev/ttyS0` is the device for the first serial port. `/dev/ttyS1` is the device for the second serial port.

A serial device is addressed by the kernel via an I/O port address and an interrupt. For this purpose, the kernel has to recognize the I/O port and the interrupt for which the serial port's hardware is configured. Normally, the following values are set in the BIOS for the first two serial ports:

	`/dev/ttys0`	`/dev/ttys1`
I/O port	`3f8` (hexadecimal)	`2f8` (hexadecimal)
Interrupt	4	3

Usually, the kernel addresses `/dev/ttyS0` and `/dev/ttyS1` by these values. Therefore, these values must also be explicitly stated in the BIOS, so that the first two serial port function properly — "explicitly" also means that the option "PnP OS installed" might need to be set to "no" in the BIOS.

The kernel can typically address two more serial ports by way of the following values:

	`/dev/ttyS2`	`/dev/ttyS3`
I/O port	`3e8` (hexadecimal)	`2e8` (hexadecimal)
Interrupt	4	3

If the serial port's hardware is configured with other values, the hardware will either have to be reconfigured or the kernel informed of the values via the **`setserial`** command.

If an internal modem is operated in the customary manner in Linux, a serial port will also have to exist on the modem card, by which the actual modem can be addressed. If the hardware of these serial ports is configured with the values mentioned above under `/dev/ttyS3`, the internal modem can be addressed over `/dev/ttyS3`.

For this, see, in particular, the Support Database article "Configuration of PCI or ISA PnP Modems", available at `http://sdb.suse.de/en/sdb/html/hoe_pci_modem.html`.

2. AT Command Set

The AT command set, also known as the Hayes command set, has always been the standard language with which a dial application (such as wvdial) sends its instructions to the modem, enabling the modem to set up the phone connection. Therefore, the hardware of a modem conventionally run in Linux has to understand the AT command set. The AT command set's software emulations standard for Microsoft Windows, for example, do not work for Linux. Modems limited to this are referred to as "WinModems". If in doubt, inquire at the vendor as to whether the device's hardware understands the AT command set. Read the Support Database article "WinModem also usable for Linux?" for more particulars on this. The article is available at `http://sdb.suse.de/en/sdb/html/cep_winmodem.html`.

3. ISDN Terminal Adapters

ISDN terminal adapters are mostly addressed as normal modems for analog phone connections, with two distinctions. Consequently, we will refer to "analog modems" and "ISDN Terminal Adapters" as "modems."

1. A normal modem is constructed in such a way that it must be connected to an analog phone port. An ISDN terminal adapter, on the other hand, must be connected to an ISDN port (S0 bus). This can also be any appropriate port on a phone system.

2. Every ISDN terminal adapter has a special AT command with which to initialize it correctly, known as the init string. Find it in the ISDN terminal adapter manual. Otherwise, request one from your vendor.

For more information on this, see Support Database article "ISDN Terminal Adapter", available online at `http://sdb.suse.de/en/sdb/html/hoe_isdn_terminaladapter.html`.

4. USB

USB modems and ISDN terminal adapters must satisfy USB CDC ACM specifications for the kernel to recognize and address the device over the USB system. If you have questions, inquire at the vendor as to whether the hardware satisfies the USB CDC ACM (Universal Serial Bus Communication Device Class Abstract Control Model) specifications (ACM for short).

5. Connection to the Internet Provider

You can easily follow this process by entering **`wvdial`** by hand in a shell. More information on setting up connections is outlined in the `/var/log/messages` file.

- Setting up a physical connection with the dial program wvdial:

  wvdial utilizes AT commands for initializing the modem and dialing the phone number of the receiving party at the Internet provider. If the receiving end accepts the call, the modem will independently negotiate the conditions of the physical connection with the call recipient. If this negotiation process is successful, the modem will issue a "CONNECT" message. wvdial will then start pppd (Point to Point Protocol Daemon). From now on, the modem will only act as a digital data converter. The modem receives and sends this digital data in the form of telephone signals over the serial port or USB.

- Setting up the PPP and TCP/IP connection via pppd:

  The "Point to Point Protocol Daemon" runs through the following protocols, one after another, to establish the connection for the software:

  - The "Link Control Protocol" (LCP) serves to set up the PPP connection.
  - The "Password Authentication Protocol" (PAP) or the "Challenge Handshake Authentication Protocol" (CHAP) is used to perform provider authentication (login).
  - The "Compression Control Protocol" (CCP) sets up the appropriate PPP compression procedure.
  - To complete the connection setup, the TCP/IP connection is set up via the "IP Control Protocol" (IPCP). You will know the latter was successful by the pppd messages pertaining to "local IP address," "remote IP address," and "DNS address," as well as by the closing "Connected..." confirmation. The prerequisite for setting up the PPP and TCP/IP connections is, of course, that the Internet provider uses the PPP protocol, enabling a normal TCP/IP connection.

Finally, a TCP/IP connection between your localhost (with the "local IP address") and the remote host at the Internet provider (with the "remote IP address") is established via serial port or USB and a PPP connection. The name server is the machine with the "DNS address". The modem functions in this vein only as a converter, allowing the data transfer over the phone line.

Troubleshooting Tips

A sample notification of a successful connection setup if **`wvdial`** has been manually run in the shell (summarized):

```
tux@earth:~ > wvdial
ATZ
OK
--> Modem initialized.
ATDT0987654321
CONNECT
--> Carrier detected.  Starting PPP immediately.
--> pppd: Authentication started
```

```
--> pppd: Authentication successful
--> pppd: local  IP address 10.100.200.1
--> pppd: remote IP address 10.100.200.2
--> pppd: primary   DNS address 10.100.200.3
--> Connected... Press Ctrl-C to disconnect
```

Examples of troubleshooting based on the above system message:

1. If the modem does not respond to "ATZ" with "OK", check that the requirements outlined in items 1 to 4 are fulfilled.
2. If "CONNECT" does not appear after dialing the phone number, "ATDT0987654321", the modem cannot reach the receiving party, possibly due to an interposed PBX or a call refusal by the receiving end.
3. If few messages appear after pppd has started and pppd exits again right away, the modem cable may not be completely intact or the Internet provider does not understand the PPP protocol. In contrast to wvdial, pppd requires a completely activated modem cable. If it works in another operating system, it does not necessarily mean that the modem cable switch is completely activated, nor does it mean that the Internet provider understands the PPP protocol. If you have questions, consult your modem vendor as to whether the modem cable supplied is completely switched and ask the Internet provider if it uses the PPP protocol. Also, try the default provider as a test.
4. If "authentication" fails, the receiving party is not accepting the username or the user password. If this works in another operating system with the same user data, it does not mean that the data is that which is required here. Some dial applications, which can be directly obtained from the Internet provider for other operating systems, use modified information. If you have questions, ask the Internet provider about the data it actually anticipates. Try the default provider as a test.
5. Further information is available in the Support Database articles, including "Modem Test", available at `http://sdb.suse.de/en/sdb/html/jsmeix_modem-test.html`.

Configuration Tips with YaST2

In the YaST2 Control Center, find the modem configuration under '`Network/Basic`'. If the autodetection fails, select manual configuration. In the screen which opens, the port is entered by '`Device`' and any name for your modem by '`Modem name`'. If a PBX is interposed, you may need to enter an extra number to dial out of the system if applicable (usually a zero, but you can find this out in the operation instructions for your telephone system). You can also decide between tone and pulse dialing, whether the speaker should be switched on, and whether it should wait for the dial tone. The last option should not be used if your modem is connected to a PBX. Find baud rate and initialization

string settings for the modem under 'Details'. Only make changes if your modem has not automatically been recognized and special settings have to be made for data transfer. This is primarily the case for ISDN terminal adapters.

For an ISP (Internet Service Provider), select either a standard provider for your country or click on 'New' and enter the ISP parameters there by hand: the names of the dial-up and the connection (most sensible would be, for example, the name of the selected provider), the phone number (of the provider), and your username. Under 'Request for password', enter either your password or, if, for security reasons, you want to prevent the password from being saved to your hard disk, select the item 'Always ask for me'. In the next screen, set the provider entered as standard. Note that you can only set up one standard provider. This is also true for providers additionally selected via other access cards such T-DSL or ISDN. You also have the option of enabling the firewall. For more information, refer to page 60.

Configure connection parameters. Optionally, configure Netscape to start every time you dial into the Internet under 'Execute after connect'. You can also choose any other browser such as Konqueror or Lynx. This would then be entered into a separate field. If you are not sure yet which browser you prefer, select 'Nothing' then start the respective application in the shell or menu. Under 'Details', enable other features, such as 'Modify DNS when connected'. Furthermore, define after what period of time the connection should be terminated, if there is no longer any data flow taking place — 180 seconds is recommended for this. Configuration is completed with 'Next' or 'Finish'.

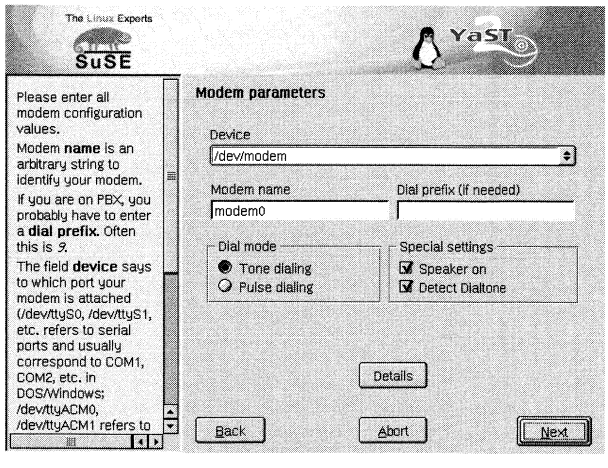


Figure 4.2: YaST2 Modem Configuration

4.2.5 ISDN

ISDN configuration can be found under 'Network/Basic'. If your ISDN card is successfully autodetected, a dialog appears where you can make your 'Selection of ISDN protocol'. 'Euro-ISDN (EDSS1)' is the standard for

this (refer to Scenarios 1 and 2a below) in Europe. '1TR6' is a protocol used by older and larger phone systems (refer to Scenario 2b below). 'NI1' is the standard in the USA. If this automatic recognition fails, choose the correct ISDN card. Then specify the ISDN protocol and go on to 'Next'. In the screen which follows, specify your country and provider. The ones listed here are "Call-by-Call" providers. If you want to use a provider not included in this list, click 'New'. The 'ISP parameters' screen will appear where you can make all the necessary settings pertaining to your preferred provider. 'ISDN SyncPPP' is the standard 'ISDN type'. Specify the provider name for the 'Connection Name' then the provider's telephone number. In the case of an interposed PBX, you might need an additional number in front of the phone number itself to dial out (usually a zero or nine, but it is best to refer to the instructions for your PBX). The entire telephone number may not contain any separators, such as commas or blank spaces. Enter the username and password received from your provider.

Next, proceed to the ISDN connection parameters. The following scenarios require various specification for your 'Phone Number':

1. The ISDN card is connected directly to the phone company's socket. Enter an "MSN," Multiple Subscriber Number, if provided by your phone company. Otherwise, leave it blank and the ISDN card should work.

2. The ISDN card is connected to a PBX:

   a) The telephone system's protocol is Euro-ISDN/EDSS1 (usually for "small" phone systems for households): These phone systems have an internal S0 bus and use internal numbers for the connected devices. In this case, specify the internal number as MSN. Further information can be obtained from your phone system documentation. One of the MSNs available for your phone system should work as long as this MSN is allowed external access. If all else fails, a single zero might work as well.

   b) The phone system's protocol for the internal ports is 1TR6 (mostly the case for "large" corporate telephone systems): the MSN is known here as "EAZ" and is usually the extension. Usually, you only need to enter the last digit of the EAZ for the Linux configuration. If all else fails, try the digits 1, 2, 3, 4, 5, 6, 7, 8, or 9.

Choose a dial mode as follows: 'Manual', 'Automatic', or 'Off'. Look at page 60 regarding the 'Automatic' dial mode. It is best to choose 'Manual', because, afterwards, you can conveniently dial into the Internet using kinternet, for example. Dial in a command line with **/usr/sbin/isdnctrl dial ippp0** and hang up with **/usr/sbin/isdnctrl hangup ippp0**.

You can also configure after how many seconds the connection should be terminated if data transfer is no longer taking place. 60 seconds are recommended for this. Along these lines, when enabled, 'ChargeHUP' also exists to make sure that the connection is not terminated until the next payable unit. However, this does not work with every provider.

It is highly recommended to select the item 'Initialize ISDN System when booting' so that the necessary drivers are loaded. This alone will not set up an Internet connection.

You can also enable the firewall. Refer to page 60 for more information on this. If there is only the one localhost, you do not need to change anything in 'IP settings'. YaST2 will suggest the most appropriate local and remote IP address to accept.

The preselected items 'Dynamic IP Address' and 'Dynamic DNS' ensure that the IP address and name server assigned by the provider are forwarded during the connection, which is usually necessary. Refer to "Local Network" on page 60. Under 'Callback settings', 'Callback off' should be selected, as the other choices are — at least for household use — irrelevant. 'Next' and 'Finish' complete the configuration.

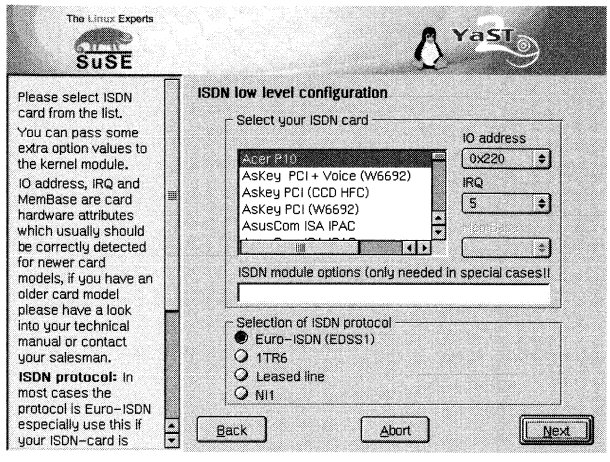


Figure 4.3: YaST2: ISDN Configuration

4.2.6 Network Card

With the help of YaST2, configure your network card for implementation in the local network under 'Network/Basic'. You have the option of deciding between 'Automatic address setup (with DHCP)' and 'Static address configuration'.

- 'Automatic address setup (with DHCP)'
  DHCP (Dynamic Host Configuration Protocol) ensures that a host receives an IP address from a DHCP server. Configuring the network takes place automatically. This function can only be implemented if a DHCP server exists on your network.

- 'Static address configuration'
  This is the conventional method. Enter your IP address here. A network interface is already entered under 'Subnet mask', which is normally sufficient. Otherwise, this will have to be modified. Ask your system administrator about this information.

When you click 'Finish', you will be taken to the next screen. Now you will see a display of the port to which your network card is connected as well as the autodetected hardware if you have a PCI card. With ISA and ISA-PnP cards, make your selections manually. You can also edit the settings or delete the configuration of a network card, as well as add additional cards. The configuration is completed with 'Finish'.

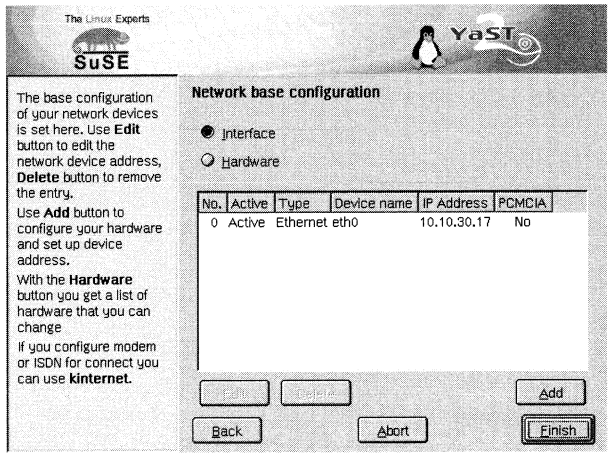


Figure 4.4: YaST2: Configuration of the Network Card

4.2.7 Cable Modem

Following your provider specification, select either 'Automatic address setup (with DHCP)' or 'Static address configuration' for the configuration of your network card. Most providers today use DHCP. A static IP address is generally included in the provider's business packages. In this case, the provider should have assigned a static IP address. For more information on this, refer to the Support Database article "Special configuration for cable modems", available online at http://sdb.suse.de/en/sdb/html/thallma_cmodem_dhcp.html.

4.2.8 ADSL or T-DSL

Your network card must be properly configured to configure ADSL access. With YaST2, you can only set up connections based on the Point-to-Point-over-Ethernet protocol (PPPoE). Automatic IP addressing does not occur with DHCP protocol. You cannot use 'Automatic address setup (with DHCP)'. Instead, use a static "dummy IP address". A good choice might be 192.168.22.1, for example. In the 'Subnet mask' field, enter 255.255.255.0. For a stand-alone system be certain that you do not make any entries in the 'Default gateway' field. Note: The values for the 'IP address' of your machine and 'Subnet mask' are only placeholders. They do

not have anything to do with setting up a connection with ADSL. They are only required for activating the network card.

Enter the shared user ID and your personal password in the screen. Finally, state the ethernet card to which your modem is connected (usually eth0). 60 seconds '`Idletime`' is recommended — the connection will automatically be terminated if there is no longer any data flow. With '`Finish`', this procedure is completed.

To use '`Dial on demand`' (see page 60), if you have a stand-alone system, you will definitely have to configure DNS (name server). Most providers today support dynamic DNS assignment so a current IP address is forwarded to the name server each time the connection is set up. However, a suitable placeholder for a DNS server has to be entered in this dialog for your stand-alone system, such as `192.168.22.99`. If you do not receive a dynamic name server assignment, enter the IP addresses of the name servers for your provider here.

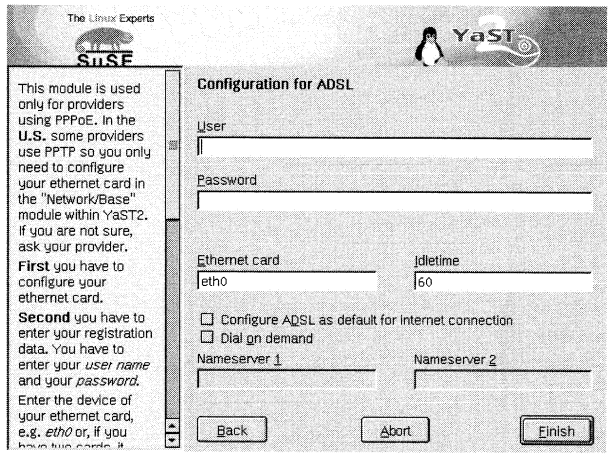


Figure 4.5: YaST2: ADSL Configuration

Proceed for T-DSL as you would for ADSL. To configure your T-DSL, you will need the following data: attachment identification, T-Online number, shared user ID, and your personal password. This information can be obtained from your T-DSL login sheet.

4.2.9 E-mail (Sendmail)

In the configuration dialog located under '`Network/Advanced`', the following items will be listed. Select the right one for you.

- '`Host with permanent network connection (SMTP)`'
  This is normally a "leased line", as is often found at companies or other institutions which work with the Internet. The Internet connection is always running so no dial-up is necessary. This menu item is also meant for members of a local network where no permanent Internet connection exists, but where a central mail server is used for sending e-mail.

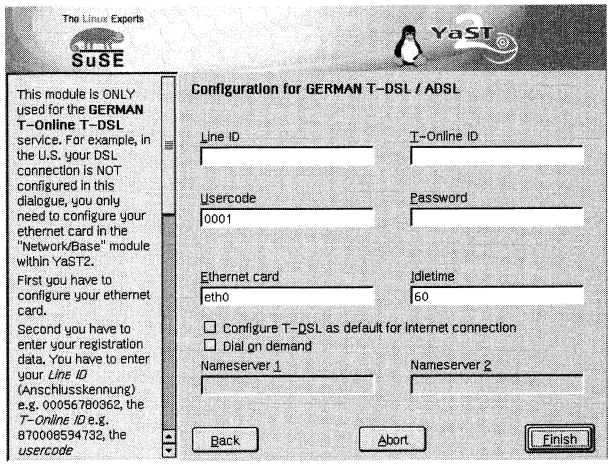


Figure 4.6: YaST2: T-DSL Configuration in Germany

- 'Single user machine without network connection'
  If you do not have an Internet connection and do not belong to a network, you can only send e-mails locally.

- 'Host with temporary network connection (Modem or ISDN)'
  Most home users need this option. It is for computers, not on a local network, that connect to the Internet via modem, T-DSL, ADSL, or ISDN.

- 'Use UUCP to send mail'
  "UUCP" means "Unix to Unix Copy Program". In the past, it was often used for sending e-mails. This protocol is for dial-up connections and is not used as much these days.

- 'Expert mode for sendmail configuration'
  Proceeds to a custom configuration screen for expert settings, with 'Next'.

- 'Do not install /etc/sendmail.cf'
  Select this item if a configuration already exists and it should not be changed.

The file `/etc/rc.config.d/sendmail.rc.config` is key for configuring sendmail. YaST2 configures this automatically according to the items selected. You can only (indirectly) access the contents of this file in the expert mode, where you can make changes to it by hand. The file `/etc/sendmail.cf` is generated with the help of a script read by sendmail. Exit the configuration with 'Finish'.

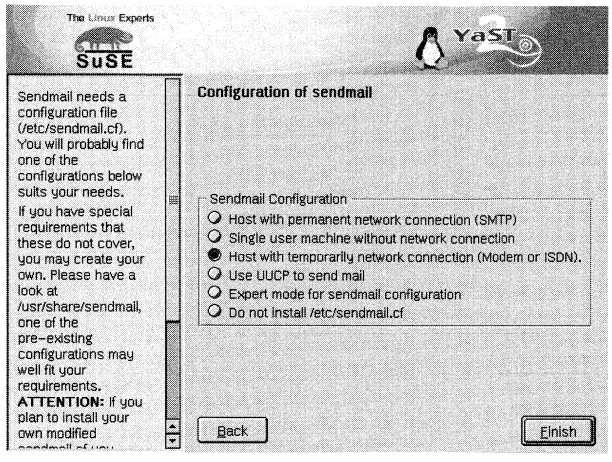


Figure 4.7: YaST2 Sendmail Configuration

4.3 System

4.3.1 Managing Users and Groups

Creating New Users

A basic aspect of Linux is that it is a multiuser system. Consequently, several users can work independently of one another on the same Linux system. Each user has a "user account" consisting of a user and login name and a personal password for logging in to the system. All users have their own home directories where personal files and configurations are stored.

In this module, located under '`Security&Users`', easily add new users by simply filling out the fields as indicated then clicking '`Add`'. New users can log in to the system using their own login names and passwords.

'`Details`' offers several options for specialized settings, which should be left alone if you are not familiar with it. Find a selection list of default groups, the home directory path which can be changed, the user ID, and a list of login shells. Define additional group affiliations below. If a new user is should access to the modem, "dialout" and "uucp" (unix to unix copy program) has to be entered.

Adding and Changing Users

After calling up this configuration tool, a screen will open labeled "Managing users and groups". You will then be able to change users and groups. Group administration is under the "Changing and Adding Groups" module and is described there.

YaST2 provides a list of all users to assist in user administration. To remove a user, simply click on the user in the list, so that the line is highlighted dark blue

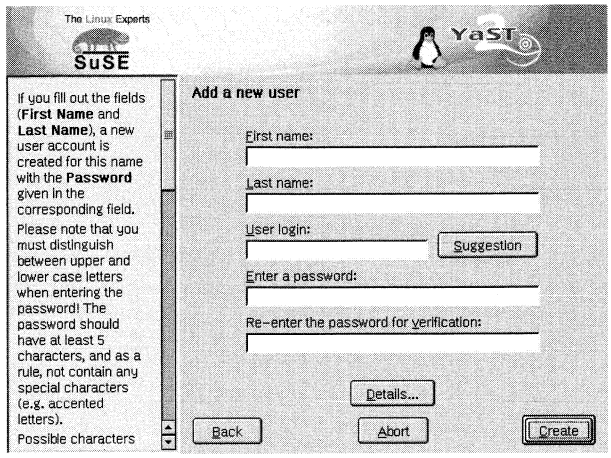


Figure 4.8: Adding new users with YaST2

then click 'Delete'. To 'Add' a user, proceed as described in "Adding New Users". Under 'Edit', find the editing options under 'Details'.

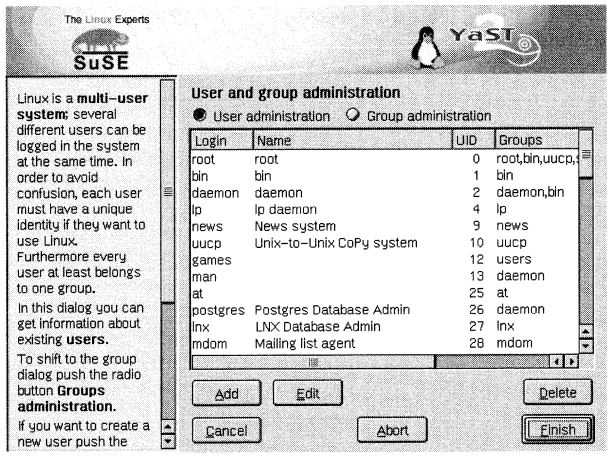


Figure 4.9: User Administration with YaST2

Creating a new group

Adding a new group is easy with YaST2. For more information, read the YaST2 help text. When you specify members of a new group in the field below, be sure not to add any blank spaces before the commas separating the user and login names. YaST2 will suggest a group ID, which you can just accept.

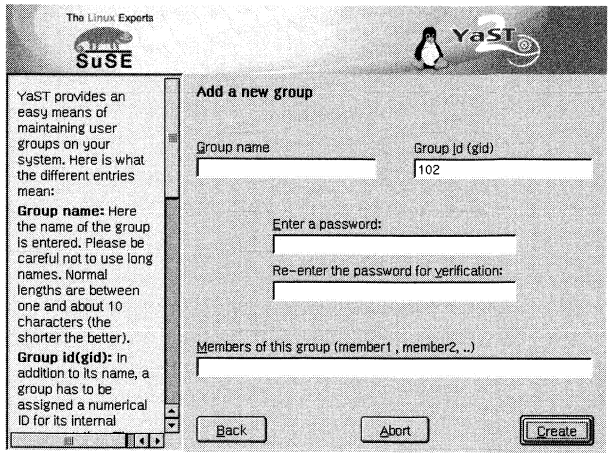


Figure 4.10: Adding a New Group with YaST2

Changing and adding groups

After opening this module, a screen will open: "User and Group Management". You will then be presented with the option of either editing users or groups. User administration is under the "Changing and adding users" module and was described there.

YaST2 offers a list of all groups to assist in group administration. To remove a group, click the group in the list, so that the line is highlighted dark blue, then click on 'Delete'. To 'Add' or 'Edit' a group, proceed as directed in the YaST2 help texts displayed in the left pane.

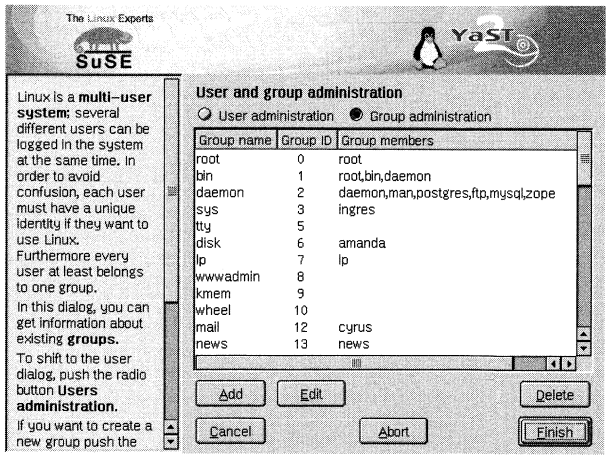


Figure 4.11: Group Administration with YaST2

4.3.2 System Security

In the start screen 'Local security configuration', which can be accessed under 'Security&Users', there are four selection items:

Level 1 is for stand-alone computers (preconfigured), Level 2 is for workstations with a network (preconfigured), Level 3 for server with a network (preconfigured), and custom defined is for your own settings.

If you click one of the three items, you will have the option of incorporating one of the levels of preconfigured system security options. To do this, simply click 'Finish'. Under 'Details', access the individual settings which can modified. If you choose 'Custom settings', you will be taken to the different dialogs with 'Next' automatically. Here, find the default installation values.

1. 'Password settings'

   Define how long the password should be for future users (minimum and maximum length). Five to eight characters is a reasonable number. Set for how long a password should be valid, when it expires, and how many days in advance an expiration warning should be issued (the warning is issued when logging into the text console).

2. 'Boot settings'

   This screen involves two things. First: How should the key combination Ctrl + Alt + Del be interpreted? Usually, this combination, entered in the text console, causes the system to restart. Leave it at that unless your machine or server is publicly accessible and you are afraid that someone could carry out this action without authorization. If you select 'Stop', this key combination will cause the system to shut down. With 'Ignore', this key combination will lose its affect entirely. Secondly: Who is permitted to shut down the system from KDM (KDE Display Manager — the graphical login)? 'Only root' (the system administrator), 'All users', 'Nobody', or 'Local users'? If 'Nobody' is selected, the system can only be shut down via the text console.

3. 'Login'
   Typically, following a failed login attempt, there is a waiting period lasting a few seconds before another login is possible. The purpose of this is to make it more difficult for "password sniffers". In addition, you will have the option of activating the items 'Record failed login attempts' and 'Record successful login attempts'. If you suspect someone is trying to find out your password, check the entries in the system log files in /var/log.

4. 'Add user settings'
   Every user has a numerical as well as an alphabetical user id. The correlation between these is established via the file /etc/passwd and should be as unique as possible. Using the data in this screen, define the range of numbers assigned to the numerical part of the user ID when a new user is added. A minimum of 500 is reasonable for users and should not fall short of this.

5. 'Miscellaneous settings'

   For 'Setting of file permissions', there are three selection options: 'Easy', 'Secure', and 'Paranoid'. The first one should be sufficient for most users. The YaST2 help text will provide information on the three security levels. The 'Paranoid' setting is extremely restrictive and should serve as the basic level of operation for system administrator settings. If you select 'Paranoid', take into account possible disturbances and malfunctions when using certain programs, because you will no longer have the permissions to access various files. Also, in this dialog, define which users can start the "updatedb" program. This program, which automatically runs either on a daily basis or after booting, generates a database (locatedb) where the location of each file on your computer is stored (locatedb can be searched by running the **locate** command). If you select 'Nobody', any user can find only the paths in the database which can be seen by any other (unprivileged) user. If 'root' is selected, all local files will be indexed, since the user 'root', as superuser, may access all directories.

   Another option is to activate the item 'Omit current directory from the path of user root', a reasonable selection. Finally, there is the option 'Disable telnet login for user root'. It is also a good idea to choose this item. If not, any user on the network can log in to your machine as 'root' via telnet, through which the root password is deciphered to plain text.

With 'Finish', this configuration is complete.

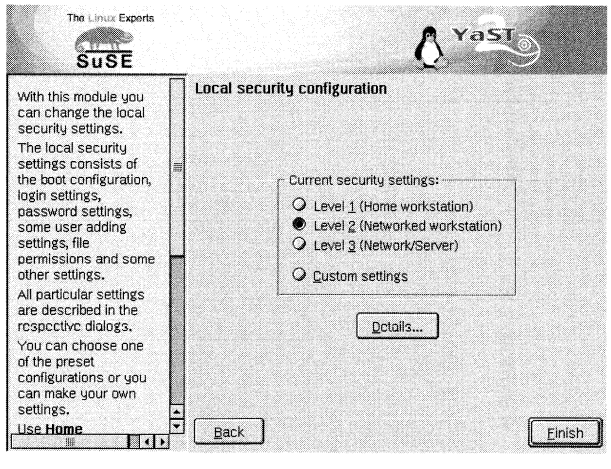


Figure 4.12: YaST2: System Security Configuration

4.3.3 Install and Remove Software

This module enables you to install more software on your machine. In addition, unwanted programs can be removed. To install from a CD, insert the first CD

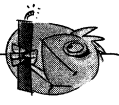
into the drive.

In the dialog, the package series will be shown to the left (commercial packages are often located in the 'pay' series). On the right, all the packages belonging to the series selected are listed. Packages already installed on your computer are marked with 'i'.

Select and deselect a package by double-clicking or by selecting the line then clicking 'OK'. The packages selected for installation are marked with 'X' and ones to remove with 'd'. If a package requires additional packages, these will be automatically selected by YaST2 (label 'a') or you have the option of selecting one of several possible packages.

YaST2 evaluates the memory needed each time you choose an additional package. If the disk space is not sufficient, you will be informed by a warning window and one or more packages will have to be deselected.

If you exit the dialog with 'Cancel', your selection will not be saved and no actions will be carried out. With 'OK', the installation or removal of packages will be initiated. In the installation window, see the actions taking place via the progress bar. Once all packages have been processed, the installation will be completed by SuSEconfig. This can take some time. The hard disk normally becomes very active at this point.



Caution

You have the option of marking installed packages to be removed (these will be labeled with 'd'). Be aware of the warning messages while you are doing this. Do not remove any packages belonging to the Linux base system (series 'a').

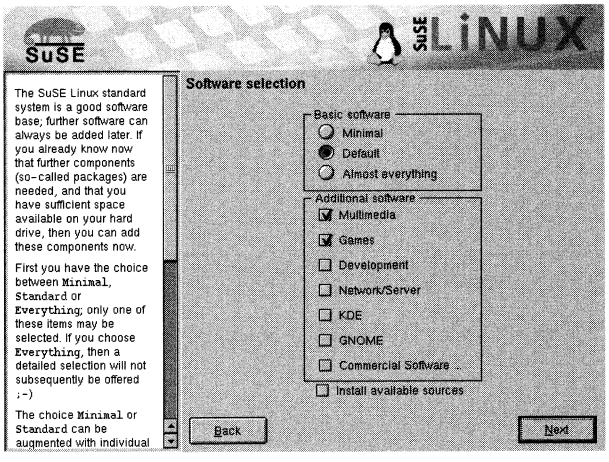


Figure 4.13: YaST2: Installing and Removing Software

4.3.4 Change Installation Source

The installation source is the medium on which the software to be installed is made available. Install from a CD (the usual route), from a network server, or from the hard disk. Read about this in the extensive YaST2 help text. When you exit the module with '`Save and exit`', the settings will be saved and will be applied to the configuration modules '`Install/Remove Software`', '`System Update`', and '`Boot and kernel configuration`'. These modules provide the option of continuing with '`Install`' to install additional packages later or to remove them.

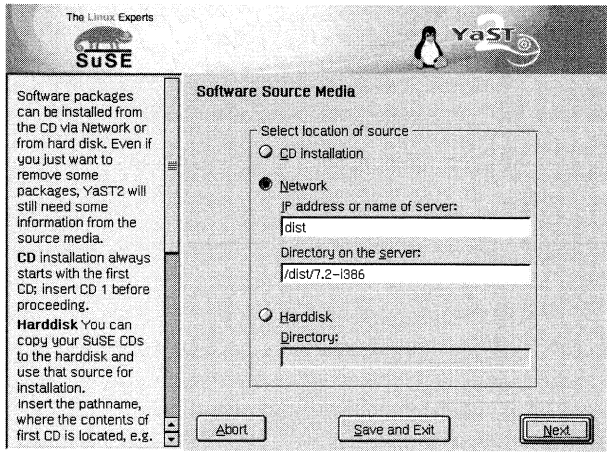


Figure 4.14: YaST2: Changing the Installation Source

4.3.5 Online Update

The YaST Online Update enables installation of important upgrades and improvements. The corresponding "patches" are available on the SuSE FTP server for downloading. The current packages can be installed automatically as well. On the other hand, you have the option of personally specifying which patches to add to your SuSE Linux system via '`Manual update`'.

Click '`Details`' to obtain information about your last update and the available packages. Find out about their contents by clicking on '`Display patch information`'. With '`Next`', reach a list of all the available patches (if you chose '`Manual update`'), from which to make your selection. With '`OK`' or by double-clicking, activate the individual objects. By clicking on '`Next`' or '`Finish`', the Online Update will be completed.

Online Update from the Console

To the benefit of system administrators and command line fans, the Online Update can be started in a shell. As '`root`', load the current patch list and all

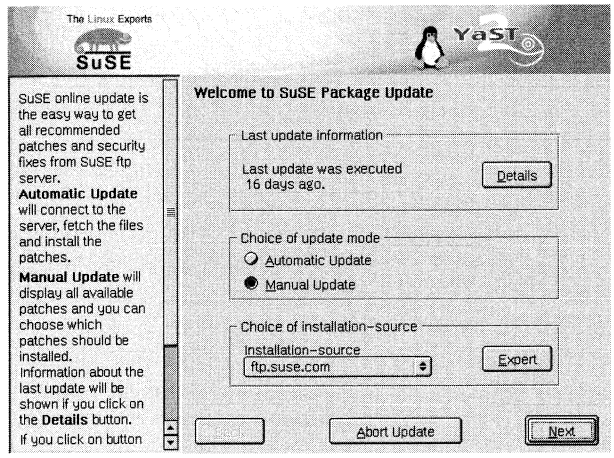


Figure 4.15: YaST2: Online Update

related rpms from the first server in the `/etc/suseservers` list using the command:

```
earth:/root # yast2 online_update .auto.get
```

If you just want to load certain patches, you can add options to the command. Among these options are `security`, `recommended`, `document`, `YaST2` and `optional`. `security` retrieves security-related patches, `recommended` fetches updates recommended by SuSE, `document` provides you with information on the patches, or on the FTP server, `YaST2` fetches YaST2 patches, and `optional` gets minor updates. The command for downloading the security patches, for example, reads

```
earth:/root # yast2 online_update .auto.get security
```

The FTP server list from `/etc/suseservers` is typically loaded when you enter **`.auto.get`**. To disable it, deactivate the function in the `/etc/rc.config`. To do this, set `yes` to `no` in the line

```
earth:/root # YAST2_LOADFTPSERVER="yes"
```

The patches can now be installed with

```
earth:/root # yast2 online_update .auto.install
```

This command installs all fetched patches. To just install a group, use the same options as in **`.auto.get`**.

This method can be fully automated. The system administrator is able to download the packages overnight, for example, and then install the ones he needs the next morning.

4.3.6 System Update

Use this module to update and improve your system. It can be started at different stages in the process. YaST2 recognizes which packages need to be updated or you can decide on your own which package should be updated. However, the

base system itself cannot be updated using this method, but instead, can only be updated by booting from the installation medium, e.g. a CD. Keep in mind that the older the previous version is and the more the package configuration differs from the standard, the more difficult it will be to update it. Under rare circumstances, the old configuration cannot be correctly processed. In this case, configure from scratch. Furthermore, the existing configuration should be backed up before it is updated.

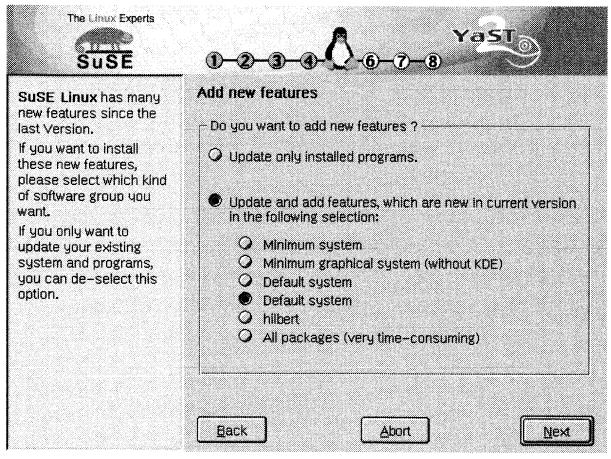


Figure 4.16: YaST2: Updating the System

4.3.7 Boot Mode

The boot mode is normally specified during installation. If you already can boot your SuSE Linux system, you do not need to change anything at this point, unless you have been booting from a floppy and now want to boot from the hard disk. Otherwise, configuring the boot mode on a running system is only relevant for experts (especially to set kernel parameters after installing a new kernel).

In this dialog, under 'System', define where LILO (**LI**nux **LO**ader) should be installed. Four options are available to you:

1. 'Write LILO to the boot disk (MBR)'
   In the MBR (Master Boot Record) of your hard disk (in /dev/hda on IDE systems or /dev/sda on pure SCSI systems)
2. 'Create a boot floppy'
3. 'Do not use LILO (a different boot manager is required)'
4. 'Write LILO to a different partition'

If SuSE Linux is the only operating system on your computer, select Option 1, which installs LILO in the MBR of your hard disk. Also choose this option if you want to use LILO as a boot manager for multiple operating systems. First,

make sure your operating system can be booted by LILO (usually MS–DOS and Windows 9x/Me). If you are using several operating systems, but are not sure whether they can be booted by LILO, or you want to leave the previous start mechanism unchanged, use the option '`Create a boot floppy`'. Thus, you can boot SuSE Linux from the floppy disk.

If you already have a boot manager installed and you want to add SuSE Linux to it, select '`Write LILO to the /boot partition (if you have another boot manager)`'. After installing SuSE Linux, reconfigure the existing boot manager and integrate SuSE Linux into the booting process. The items '`Write LILO to a different partition`' and '`Kernel boot parameters`' are for advanced users. Click on '`Next`' to install LILO.

Tip

To install LILO on a boot disk, you do not need to change anything on your previous boot mechanism and can start SuSE Linux from the floppy disk any time. The option '`Create a boot floppy`' is therefore the best alternative for the implementation of additional operating systems.

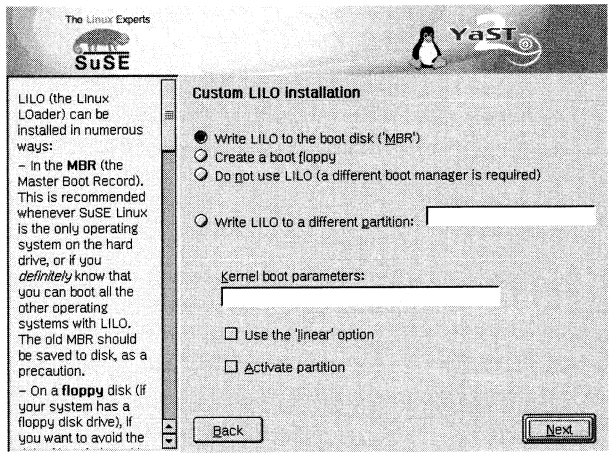


Figure 4.17: YaST2: Configuring the Boot Mode

4.3.8 Creating a Boot, Rescue or Module Disk

Using the YaST2 module (under '`System`'), create two different types of boot disks, a rescue disk, and two kinds of module disks. Both boot disks enable initial installation if you have problems booting from CD. The disks are actually not intended for booting an already installed system. With a little trick, however, you can still use them to boot an already installed system.

- **Boot disks:** The default boot disk is the one found in your SuSE Linux box. Otherwise, create a boot disk for **`i386`** and older Cyrix processors.

- **Rescue disk:** The rescue disk can help you regain control access to your system. A "minimal Linux" will be loaded which contains all the helpful tools needed to resolve most problems.
- **Module disks:** If you need additional modules or drivers for your hardware, for example, for installing over the network, create one of these disks:
  - Modules for SCSI/RAID/EIDE and PCMCIA and old CDROM drivers (not for ATAPI)
  - network modules

Select the corresponding item shown on the screen. Insert a (preferably empty or formatted) disk and click 'Next'. The respective contents will be written to the disk. The above-mentioned boot disks should not be confused with the boot disks used to boot an already installed system. This type of disk will be created, for example, during installation and will start your Linux installed on the hard disk when the floppy is in the drive while your computer is booting.

If all else fails, you can also start an already installed system with the boot disk created above. For this, boot from the floppy disk then, once it asks you to insert the first CD, exit the dialog, to prevent the start of a reinstallation. After making the following language and keyboard entries, you will reach a menu where can choose 'Start installation / system.' In the following window, 'Boot installed system' will appear.

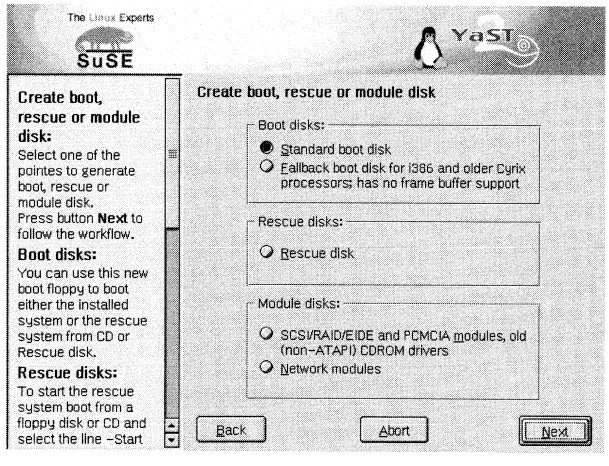


Figure 4.18: YaST2: Creating a Boot/Module Disk

4.3.9 Selecting Time Zone and Language

Time zone selection

Under 'System' in the YaST2 Control Center, find the button 'Hardware clock set to'. The time zone was already defined during installation, but

you can make subsequent changes. Click on your country in the list and select 'Local time' or 'GMT' (Greenwich Mean Time). 'GMT' is often used in Linux systems. Machines with additional operating systems, such as Microsoft Windows, mostly use the local time.

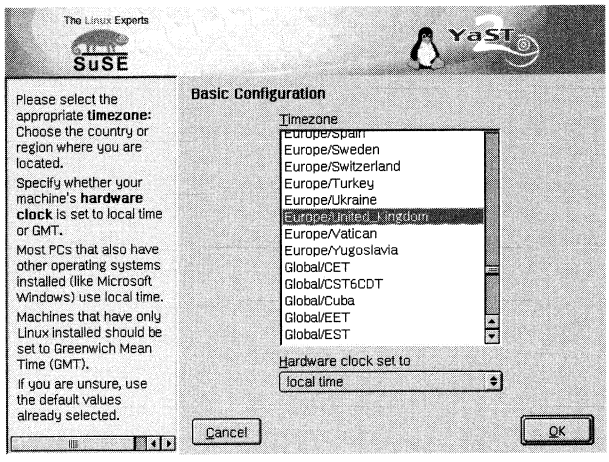


Figure 4.19: YaST2: Selecting the Time Zone

Language selection

Under 'System', find the 'Choose your language' button in the YaST2 Control Center. Here, set the language for your Linux system The language settings made in YaST2 are global — for YaST2, YaST and the KDE 2 desktop.

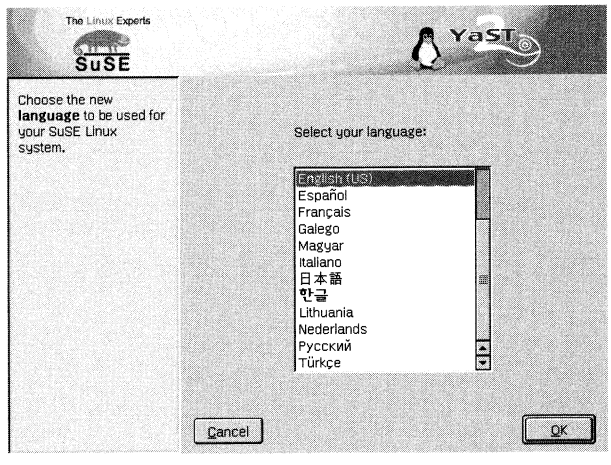


Figure 4.20: YaST2: Language Selection

4.4 Miscellaneous

4.4.1 Hardware Information

YaST2 detects the hardware for the configuration of its components. The technical data it recognizes is displayed in this screen. This is especially useful if you want to post a support request, for instance. You will need hardware information to do this.

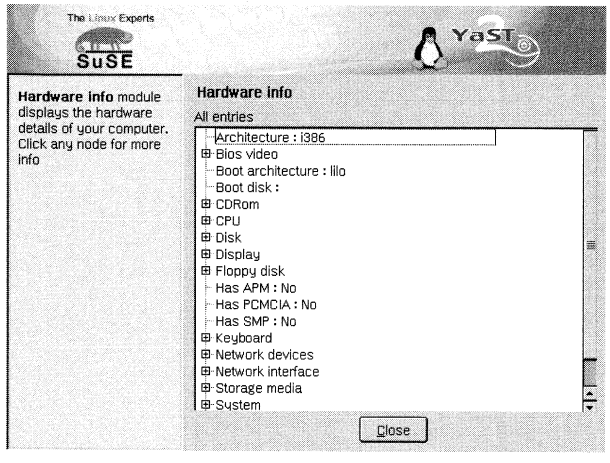


Figure 4.21: YaST2: Displaying Hardware Information

4.4.2 Start Protocol

Start protocol is the screen messages which appear when the system is booting. This protocol is stored in the `/var/log/boot.msg` file. View it easily with this YaST2 module and confirm that all services and functions were started as anticipated.

4.4.3 System Protocol

The system protocol documents the running operation of your computer and is stored in the `/var/log/messsages` file. The kernel messages appear here sorted according to date and time.

4.4.4 Loading the Vendor's Driver CD

With this module, autoinstall the device drivers from a SuSE Linux driver CD.

If you do not need to install your SuSE Linux from scratch, you can load the required drivers from the vendor's CD later with the help of this YaST2 module.

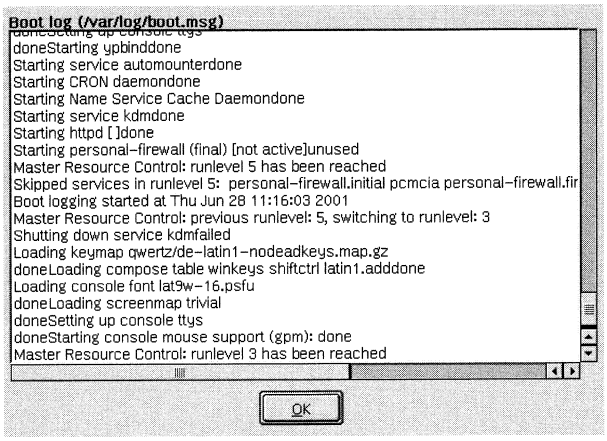


Figure 4.22: YaST2: Displaying the Start Protocol

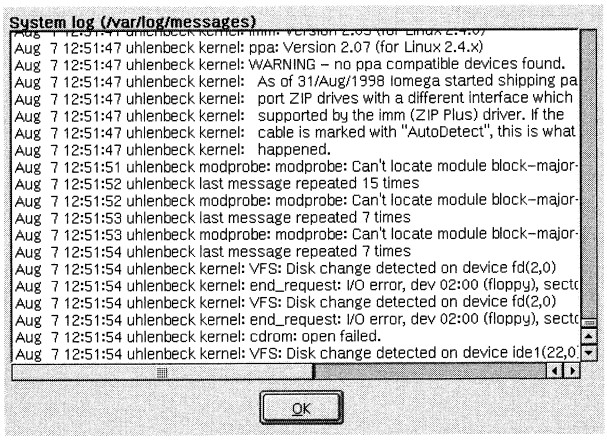


Figure 4.23: YaST2: Displaying the System Protocol

5 Setting Up Your Graphical Desktop with SaX2

The graphical interface, the X11 System, provides the user with the basis for working in a graphical environment. This chapter is devoted to setting up the graphical interface with the help of SaX2.

Differences Between the X Server and the Window Manager

In Linux, a graphical interface is any component which ensures that all necessary hardware components are supported. This service is referred to simply as the *X server*.

The graphical interface, the X server, allows your hardware to communicate with your software. This is how desktops like KDE and GNOME are able to display information on your screen with which the user can interact. These desktops and similar applications are often called *window managers*. In Linux, there are several window managers, which can differ greatly in appearance and performance.

Without a functioning graphical interface — without an activated X server — there would be no graphical user environment. SuSE offers the application SaX2 to ease the setup of your graphical interface as much as possible.

5.1 What is SaX2?

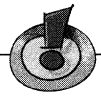
SaX2 stands for *SuSE Advanced X11 Configuration* and serves as a quick and easy setup tool for the graphical interface. Following installation, SuSE Linux finds itself in one of the following states:

- **The system is already in graphical mode**
  In this case, the graphical user interface has already been set up during installation by YaST2. This is possible since SaX2 is a modular system so some parts of the application can be used in other applications. YaST2 uses a module called ISax in the installation for this setup. In this case, SaX2 can be used to adjust the already existing configuration. Before starting SaX2, switch to text mode to avoid any potential conflicts with the already activated X server. You will have the following options:

  1. Switch to a text console using the key shortcut Ctrl + Alt + F1
  2. Log into the system as user `root`

3. Enter the command **`init 3`**. After this command has run, the system will be in text mode.

- **The system is already text mode**
  There are a number of reasons why a graphical interface cannot be started following installation. Perhaps you have installed using YaST1 or did not use YaST to configure a graphical interface at all. In this case, the graphical interface can be set up rather quickly with SaX2.



Note

In the following sections, we assume that your system is in text mode and that you have logged in as user `'root'`.

5.2 Startup and Hardware Recognition

To start SaX2, enter the command **`sax2`**. The application will now start detecting the hardware for the mouse, keyboard, graphics card, monitor, and 3D capabilities. These first four partitions represent the basic components. If these are not set up, the X server cannot be started. 3D capabilities are Linux is still in their developmental phase. If SaX2 detects a card which has 3D capabilities supported by Linux, you will be asked if you want to use these features. More on this topic can be found in Chapter 6.

5.3 Configuration

After SaX2 has finished detecting the hardware, a temporary configuration will be generated which SaX2 uses to run the configuration interface. In many cases, the default settings are sufficient. You will have the following selection options in this first dialog:

- `'Save'` — You are satisfied with the default configuration and want to save it.
- `'Adjust'` — You are satisfied with the configuration, but want to change the position of the screen because it is not exactly in the middle or is too big or too small. More information on adjusting the screen geometry can be found in Section 5.5.
- `'Change configuration'` — You are not satisfied and want to change the configuration.
- `'Cancel'` — Exits SaX2 and returns you to the text console.

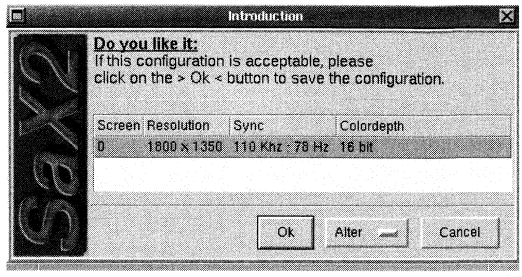


Figure 5.1: Initial Introduction

5.4 Controlling the Mouse with the Keyboard

After SaX2 starts, you will see a field highlighted in white in the lower right sector of the screen, bearing the label: *Is your mouse not working ? -> Press 5 in the number pad....* If you follow these instructions and press (5), a window will appear as such:

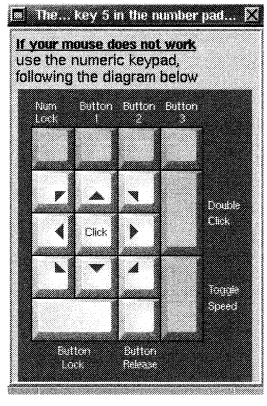


Figure 5.2: Using the virtual mouse

You cannot carry out any actions in this window. This image is only there for informational purposes. It represents the number pad on the keyboard and describes which mouse functions correspond to which keys.

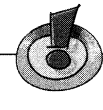
- In the image: **Button 1** corresponds to the (%) key. This key activates the left mouse button.
- In the image: **Button 2** corresponds to the (X) key. This key activates the middle mouse button.
- In the image: **Button 3** corresponds to the (−) key. This key activates the right mouse button.
- In the image: **Click** corresponds to the (5) key. This key triggers a click with the previously activated mouse button. If no mouse button is activated, the

left mouse button will be used. After the click, the button activation will be reset to default.

- In the image: **Double Click** corresponds to the (+) key. This key acts like the (5) key, except it triggers a double-click.
- In the image: **Button Lock** corresponds to the (0) key. This key acts like the (5) key, except it triggers a single-click then locks it.
- In the image: **Button Release** corresponds to the (Del) key. This key releases a mouse button that was simulated with the (0) key.
- In the image: **Upper left arrow** corresponds to the (7) key. This key moves the mouse to the upper left.
- In the image: **Up arrow** corresponds to the (8) key. This key moves the mouse straight up.
- In the image: **Upper right arrow** corresponds to the (9) key. This key moves the mouse to the upper right.
- In the image: **Left arrow** corresponds to the (4) key. This key moves the mouse to the left.
- In the image: **Right arrow** corresponds to the (6) key. This key moves the mouse to the right.
- In the image: **Lower left arrow** corresponds to the (1) key. This key moves the mouse to the lower left.
- In the image: **Down arrow** corresponds to the (2) key. This key moves the mouse straight down.
- In the image: **Lower right arrow** corresponds to the (3) key. This key moves the mouse to the lower right.

5.4.1 Change Configuration

If you have selected the item '`Change Configuration`', SaX2's main screen will load. If a configuration is already available, SaX2 will give the option in the first dialog of loading this data. All the necessary information can be found in the `/etc/X11` directory in the `XF86Config` file.



Note

If you are uncertain as to whether you should have the existing configuration read, continue to the next page without having the configuration read.

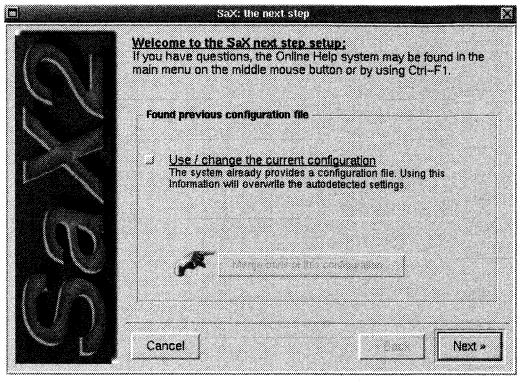


Figure 5.3: Loading the Configuration

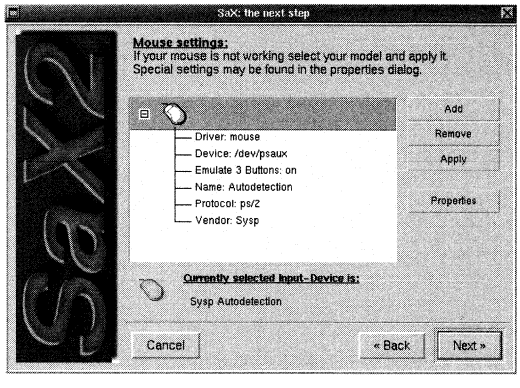


Figure 5.4: Mouse Configuration

5.4.2 Configuring the Mouse

If no configuration exists, SaX2 will start with this dialog page. Otherwise, it proceeds to the mouse configuration right after the dialog page about loading an existing configuration.

If your mouse is working, you will not have to do anything else here. The configuration of special input devices, such as setting up graphics tablets or touch screens, also takes place in this screen, but is addressed in Section 5.7. If the mouse does not function, however, control the cursor using the number pad on the keyboard as described in Section 5.4. If you are familiar with the protocol and mouse connection, the procedure as described in Chapter 12 should be applied.

5.4.3 Keyboard Configuration

In this dialog, take a look at the language settings. If the language is not set the way you want, modify the item accordingly then click on '`Apply`'. Switch to

the 'Velocity' tab and enter some characters in the test field located there. If you cannot enter all the characters, make sure that the appropriate keyboard type has been configured under the 'General' tab. If you have changed the keyboard type, click 'Apply' again so the changes take effect.

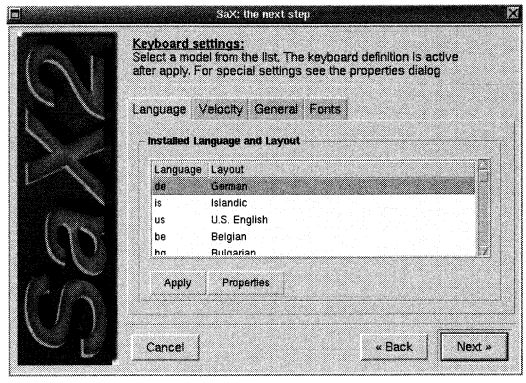


Figure 5.5: Keyboard Configuration

5.4.4 Configuring the Graphics Card

In this dialog, make settings for your graphics card. In this context, it is important that your graphics card is listed and that the right driver has been defined for the card.

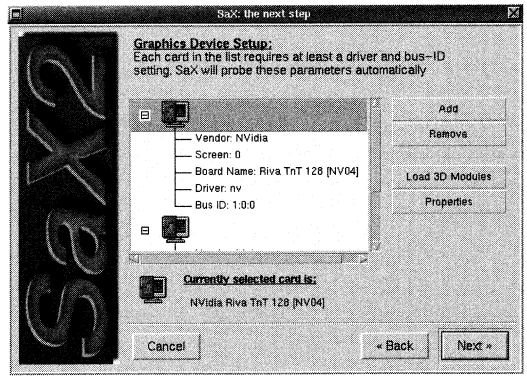


Figure 5.6: Configuration of the Graphics Card

Typically, you do not need to make any changes in this dialog. If you have installed more than one graphics card on your system, but only want to use one particular card, individually select the cards you do not want to use and click 'Remove'.

5.4.5 Configuring the Monitor and Resolution

Essentially, colors and resolution are configured here. Under certain circumstances, it may be necessary to enter specifications pertaining to your monitor, because it is not always detected automatically.

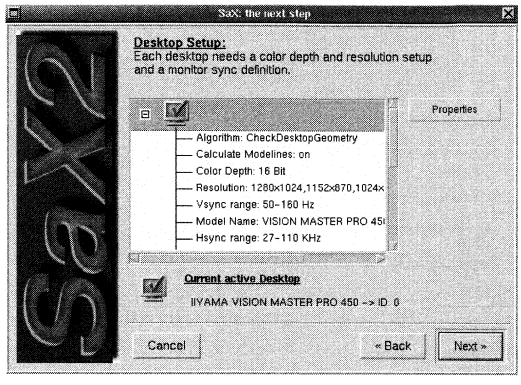


Figure 5.7: Resolution, Color Depth, and Monitor Properties

- **Changing colors and resolution**
  Click on the 'Properties'. In the first tab, find both relevant fields. The uppermost field contains the current color depth. Click on the right arrow and select the desired color depth. Do the same in the resolution field.

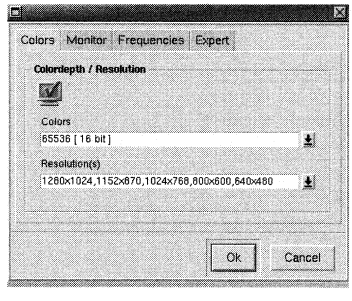
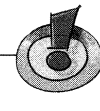


Figure 5.8: Color Depth Selection



Note

Select or deselect several resolutions. The resolutions will be used in the order selected. If you do not want to use a resolution, deselect it.

- **Changing the Monitor Properties**
  After you have selected the colors and the resolution, change to the monitor tab. If the monitor has been detected, it is preselected. If this is the selec-

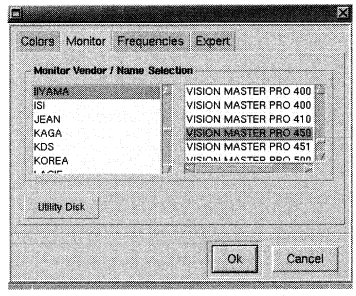


Figure 5.9: Monitor Selection

tion you want, you do not need to do anything else. If no monitor or just a "VESA-compatible monitor" has been selected, select the proper monitor model from the list provided. If the monitor is not included in the list, switch tabs to 'Frequency' and enter the appropriate frequency ranges for your monitor for the *horizontal* and the *vertical* deflection frequency in the corresponding fields. The corresponding frequency values can be found in the

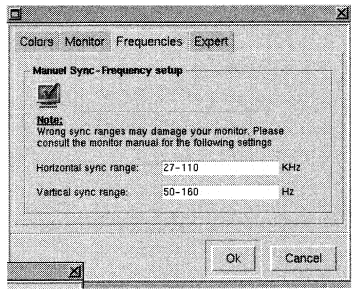


Figure 5.10: Manual Frequency Selection

manual supplied by the monitor's manufacturer. Close the properties window and proceed to the next item.

5.4.6 Testing and Saving the Configuration

After clicking 'Done' in the last dialog, a reference display window will appear where you can make the following selections.

- 'Cancel' — Aborts the changes just made. Returns to the previous screen.
- 'Save' — Saves the configuration. Afterwards, you will be asked if you wish to exit SaX2.
- 'Start' — Starts another X server, applying the new settings, and provides the opportunity to adjust the position and size of the image to the new environment. Refer to Section 5.5

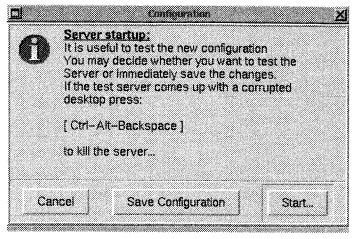


Figure 5.11: Completing the Configuration

If you have modified monitor or resolution settings during the course of configuration, it is recommended to start the test X server to adjust the image if needed. All other settings can applied without restarting the test X server, if no new hardware components were added.

5.5 Adjusting the Image Geometry

SaX2 provides an independent application called XFine2. This application starts whenever the image is modified in terms of position or size. Changes to the

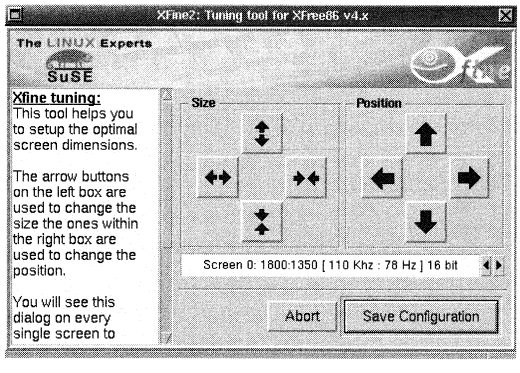


Figure 5.12: Adjusting the Image Geometry

image geometry are incorporated into the current configuration when you click on 'Save'. There are usually two ways you can start XFine2 in SaX2:

- **XFine2 is loaded when the test X server is started**
  In this case, if you click on 'Save' or 'Cancel', the test X server will quit and, depending on your selection, the changes will either be saved to your image geometry or discarded. After exiting the test X server, you will be returned to SaX2. The test X server works *completely independently* of the X server used by SaX2 itself. The properties shown by the test X server will be saved if you have clicked on 'Save', but they will not be transferred to the X server on which SaX2 itself is running.

- **XFine2 is started via the menu item 'Adjust'**
  In this case, if you click on 'Save' or 'Cancel', SaX2 will quit and you will be returned to text mode. The changes made to the image geometry will only be saved if you first click on 'Save'.

To make changes inside the graphical user environment at a later point in its operation, *XFine2* can be invoked manually at any time. To do this, simply enter the command **xfine2**.

5.6 Starting the Graphical Interface

Once you have saved your configuration and exited SaX2, you will find yourself once again in text mode and, from there, can switch to the graphical login level. To do this, use the command **init 5**. Now you can graphically log in to the system. The graphical user environment will automatically be started following this graphical login.

5.7 Further Configurations

The following chapter serves as stimulation and as brief instructions to enhanced configuration in terms of X11. We cannot offer any assistance in the form of free installation support for these configurations.

5.7.1 Automatic Configuration (Notebooks)

If you have a notebook, configuring it is even easier in many cases due to the special hardware properties for notebooks. In the typical scenario, the notebook is operated with its own predesignated internal display, that is, with an LCD/DSTN or TFT matrix display.

SaX2 recognizes the size of the display. Simply enter the command **sax2 -a**. SaX2 will begin hardware detection and automatically create the configuration without requiring any additional entries on your part. Start the graphical environment after this command has run as described in Section 5.6.

5.7.2 Reconfiguration (Fastpath)

The current version of SaX2 allows you to adjust certain aspects of the current configuration from a running graphical user environment. "FastPaths" are made available for this purpose. SaX2 currently implements the following fastpaths:

1. **mouse** Configuration of input devices, in particular, the mouse
2. **keyboard** Keyboard and font configuration
3. **desktop** Color and resolution configuration

4. **layout** Configuration of the arrangement of the various screens (only available for multihead configurations).

To change the mouse configuration from a running session, for example, enter **`sax2 -F mouse`** This will cause SaX2 not to start hardware recognition, but, instead, load the existing configuration and display the corresponding dialog. The X server has to be restarted following any changes for these to take effect.

5.7.3 Multihead

The XFree86 Version 4 addresses more than one graphics card. This is referred to as a "multihead environment". SaX2 automatically recognizes when multiple graphics cards are located on your system and will prepare the configuration accordingly. Configuration is limited to two aspects:

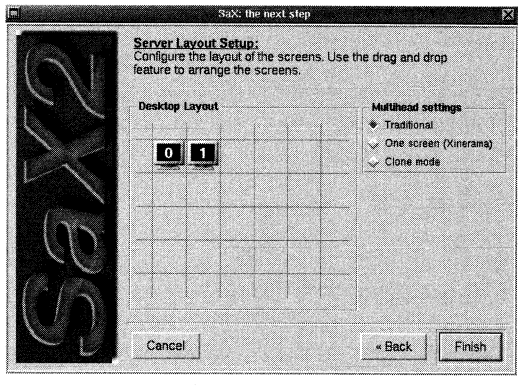


Figure 5.13: Adjusting the Monitor Arrangement

- **Selecting the multihead type**
  SaX2 differentiates between three types of multihead environments
  1. '`Traditional multihead`' — Every monitor is treated as an independent display
  2. '`Xineramafied multihead`' — All monitors are consolidated into one large display
  3. '`Cloned multihead`' — There is one display for which all other displays are identical copies.
- **Defining the multihead layout**
  The layout of a multihead environment is the arrangement and partnerships between the monitors. SaX2 normally creates a default layout following the order in which the graphics cards are detected, which arranges all the monitors in a line, from left to right. Modify this layout by moving the respective screen (depicted as an icon in the layout dialog) to a new position using the left mouse button.

To test your new configuration — by clicking 'Start' after completing the layout dialog — you should be aware that the image geometry can only be modified in the *traditional multihead* since this is the only option where each monitor is independent of one another. The following procedure is advisable:

1. Define the new layout as already described.
2. Set the multihead type to 'Traditional'.
3. Click on 'Done' and then on 'Start'.
4. Adjust the image geometry to fit all the monitors and save this status.
5. Answer the prompt asking you whether SaX2 should be ended with 'No'.
6. Set your preferred multihead type.
7. Click 'Done' then 'Save'.
8. Confirm the question as to whether SaX2 should be ended with 'Yes'.

Linux does not currently feature 3D support in a multihead environment. SaX2 will, in this case, deactivate 3D support.

5.7.4 Graphics Tablets

Currently, only Wacom graphics tablets are supported by XFree86. SaX2 provides USB and serial configuration. Unfortunately, at the moment, automatic detection and setup of a tablet connected to the system is not available. From a configuration perspective, a graphics tablet is viewed as an input device, or, in simpler words, like a mouse. The following procedure is recommended:

1. Start SaX2 and switch to the mouse configuration dialog.
2. Click 'Add' and add a graphics tablet.
3. In the same manner, add the pens to the tablet. Note that the pen and the eraser are considered separate.
4. Test the connection of all the devices added to the serial tablet: `/dev/ttyS0` represents the first serial port, `/dev/ttyS1` the second, and so forth.
5. Save the configuration. Testing the configuration is optional.

5.7.5 Touch Screens

Currently, Microtouch and Elographics touch screens are supported by XFree86. However, SaX2 can only automatically detect the monitor, not the toucher. The toucher is, again, viewed in the same way as a mouse and is therefore configured in the SaX2 mouse dialog. The following procedures are recommended:

1. Start SaX2 and switch to the mouse configuration dialog.

2. Click on the 'Add' button and add a touch screen.

3. Save the configuration. Testing the configuration is optional.

Touch screens feature a multitude of options and usually have to be calibrated first. There is, unfortunately, no tool available for this in Linux. However, you can define the size proportions in SaX2 under the 'Advanced' tab when adding the touch screen. These dimensions depend heavily on the hardware used.

5.8 FAQ and Troubleshooting

1. **How can the installed graphics card be detected ?**
   If you do not know which graphics card is on your system, query a list of all the cards installed and supported on your system with **sax2 -p**.

2. **How can I accelerate the startup of SaX2 ?**
   Provided that the hardware has **not** been modified since SaX2 was last started, significantly accelerate startup using the **sax2 -q** command. In this case, no hardware recognition takes place. This option is known to be quite useful, especially when reconfiguring. If you have started SaX2 via a fastpath, do not give the **-q** option, because the fastpath automatically sets this.

3. **What should I do if the graphics card is not supported?**
   If no driver exists for the card's graphics chipset, you still have the option of using the graphics card's framebuffer. This has the advantage that it functions with almost any modern graphics card and practically any laptop. Since the card's graphics controller has to be circumvented in the absence of a driver, the display is accelerated. The X server simply accesses the framebuffer directly after having already been switched to graphics mode when the kernel starts.

   This works as follows: The Linux kernel loads the card's VGA BIOS at startup and instructs it to switch to a given ☞*VESA* graphics mode. The text console will be displayed in this configured graphics mode. Unfortunately, the VGA BIOS is written in 16-bit code so cannot be loaded in a running Linux system. As a consequence, the video mode determined when booting is retained until shutdown.

   To use this VESA framebuffer, support must be provided by the kernel and the graphics mode selected when booting. The SuSE Linux kernel, of course, includes VESA framebuffer support. Select your desired graphics mode when booting the system. Pass the parameter **vga=x** to the LILO boot prompt, where x stands for a value obtained from Table 5.1 on the next page.

   Alternatively, specifically state this as a vga parameter in the file `/etc/lilo.conf`. This value is not incorporated into the **append** line, but, instead, written directly to the configuration file as **vga=x**.

   After starting the Linux system, log in again as user **root** and start SaX2 as follows:

   ```
   earth:/root # sax2 -m 0=fbdev
   ```

Preferred Color Depth	Resolution in Pixels			
	640x480	800x600	1024x768	1280x1024
256 (8 Bit)	769	771	773	775
32 768 (15 Bit)	784	787	790	793
65 536 (16 Bit)	785	788	791	794
16,7 Mill. (24 Bit)	786	789	792	795

Table 5.1: Available VESA Modes

Note that `0` is a "zero" and not an uppercase "O". This instructs the X server to utilize the driver as framebuffer. Since the resolution, color depth, and image repetition rate are strictly defined, you can — if you are satisfied with your mouse and keyboard settings — have SaX2 instantly save the automatically detected data then exit SaX2 again.

4. **Which file contains the results of the configuration?**
   The entire X11 configuration is stored in a file called `XF86Config`. Find this file under `/etc/X11/XF86Config`

5. **What do I do if the graphics card is supported but not recognized by SaX2?**
   In very rare instances, you may have a graphics card which is supported by XFree86, but not recognized by SaX2. In this case, it will be necessary to specify the name of the driver module which the card supports, using the command **`sax2 -m 0=<driver>`**. The option `-m` assigns a number to a driver name. For example, if you want to assign the module `nvidia` to the primary card which always bears the number 0, the command would read **`sax2 -m 0=nvidia`**. A complete list of all the driver modules can be found at `http://www.xfree86.org/4.1.0/Status.html`

6. **What do I do if SaX2 crashes when testing the X server?**
   In rare cases, SaX2 or even the system can crash when a completed configuration is followed by an X server test. This usually means that the driver is faulty, which is only significant if more than one X server is started at a time. To prevent this, please proceed as follows:
   - Save the configuration *without* testing the X server
   - Start the X11 System via **`startx`** or by logging in graphically
   - If the image geometry is incorrect, start the **`xfine2`** program as user `'root'` and adjust the image.

7. **SaX2 starts YaST2. Why?**
   There are cases when SaX2 recognizes that the configuration requested cannot be performed without updating or installing software. If so, SaX2 will start YaST2 to update already installed software or to install missing software.

8. **Antialiasing does not work in multihead environments**
   Antialiasing support, which mainly affects applications linked to QT li-

braries, can only function in a multihead environment if all the drivers support the RENDER extension. Use the program **xdpyinfo** to find out whether the RENDER extension is activated on all displays.

9. **What should be included in support requests?**
   If you wish to consult support regarding a problem with SaX2, it is of utmost importance that you attach a current log file to the request. This file is generated in the following manner:
   a) Run SaX2 without parameters. If SaX2 starts, exit the application using the key shortcut Ctrl + Alt + ←|.
   b) The current log file will then be located in `/var/log/SaX.log`.

10. **No mouse cursor, just a bar code or a colorful square.**
    It can happen that the mouse pointer is not visible or only displayed as a square, although the mouse is activated. This error can be fixed by entering the following line in the **Device** section in the file `/etc/X11/XF86Config`:

    ```
    Option "sw_cursor"
    ```

11. **Image is too small or compressed. The available monitor settings have already reached their limit.**
    a) The image repetition rate and the `hsync` frequency are set too high, to the monitor's limit. To resolve this, reduce the `vsync` or `hsync` frequencies.
    b) Move the image using the program xfine2. One of the modes may not be quite right here.
    c) Append the parameter `+hsync +vsync` to the mode line and try replacing + with –.

12. **What if the mouse is not working?**
    The mouse is identified by the port to which it is connected to as well as by the protocol which defines the data format. If SaX2 is not able to recognize the mouse, the mouse can be navigated using the emulation on the key pad. Otherwise, run SaX2 and specify the correct data as to the mouse's connection and its protocol. The command for forwarding this data to SaX2 while launching it at the same time is **sax2 -t <protocol> -n <connection>**.The following table shows the various mouse protocols:

    A more exact description of supported mice can be found in the file `/usr/X11R6/lib/X11/doc/README.mouse`.

13. **Using the mouse in X with the GPM**
    The GPM has the capability of functioning as a "repeater". In this case, GPM makes the mouse's data available over the `/dev/gpmdata` device. Enable the repeater option by adding the option **-R** following the GPM parameters in the **GPM_PARAM** variable in the `/etc/rc.config` file. By way of the command **rcgpm restart**, the GPM will now only run as a repeater. To also use the mouse in X over the GPM, start SaX2 using the following command:

Protocol	Mouse Type
`PS/2`	2 or 3 button mouse with PS/2 connection.
`IMPS/2`	ADB mouse, USB mouse, or wheel mouse with 3 or more buttons and one or more scroll wheels connected to the USB port.
`Microsoft`	2 and sometimes 3 button mice, connected to the serial port.
`MouseSystems`	3 button mice on the serial port.
`Intellimouse`	Wheel mouse with 3 or more buttons and with one or more scroll wheels, connected to the serial port.
`Auto`	Automatic detection of the serial mouse.

Table 5.2: Mice and Their Protocols

```
sax2 -g
```

14. **Moving the windows leaves behind hash marks, parts of windows, or other fragments. They do not disappear after I have stopped moving them. I can only get rid of them by refreshing the desktop. What do I do?**

    a) Reduce the image repetition rate or resolution.

    b) Depending on your chipset, apply the relevant options from the `README` files in `/usr/X11R6/lib/X11/doc/`, such as the options `fifo_conservative` or `slow_dram`. This depends on the graphics chipset.

    c) Option `noaccel`, `no_imageblt`, or `no_bitblt` may be sufficient.

15. **"Noise" — image distortions when moving windows or viewing videos, but which disappear when the contents of the image are static.**

    a) Reduce image repetition rate, color depth, or resolution.

    b) Lower the card's clock speed or remove or add a wait state. Sometimes this works with `set_mclk` (but not for all chipsets). Find out more in the `README` directory. *Caution:* this option is risky (the card can be put into overdrive).

    c) The bus may also be in overdrive. Check the bus speed of the PCI/VLB or ISA bus.

16. **The screen goes blank when XFree86 is started.**

    a) Reduce the repetition rate.

    b) Check the BIOS settings of the computer. Deactivate any "optimization settings" of the BIOS. You may need to consult the manual for your mainboard. Common problem factors are the **`Video memory cache mode`** options, **`AGP Aperture size`** and any options which control PCI bus access, such as **`PCI Peer concurrency`**. You will almost always find these settings in a menu labeled **`Advanced Chipset Features`**.

c) Consider other possible causes: Check system for IRQ conflicts (such as PS/2-mouse requires IRQ 12).

6 OpenGL — 3D Configuration

OpenGL and GLIDE are 3D interfaces for 3Dfx Voodoo cards in Linux. Almost all modern 3D applications use the OpenGL interface, so 3D hardware acceleration can only be implemented over the OpenGL interface, even in the case of 3Dfx Voodoo cards. Only older applications still use the GLIDE interface directly. The OpenGL driver for 3DfxVoodoo cards also uses the GLIDE interface. Direct3D from Microsoft is not available in Linux.

6.1 Hardware Support

SuSE Linux includes several OpenGL drivers for 3D hardware support. Table 6.1 provides an overview.

OpenGL driver	Supported hardware
Mesa software rendering (very slow)	for all cards supported by XFree86
nVidia GLX / XFree86 4.x	nVidia Chips: all except for Riva 128(ZX)
DRI / XFree86 4.x	3Dfx Voodoo Banshee 3Dfx Voodoo 3/4/5 Intel i810/i815 Matrox G200/G400/G450 FireGL 1/2/3/4 ATI Rage 128(Pro)/Radeon 3Dlabs Glint MX/Gamma
Utah GLX / XFree86 3.3	ATI Rage Pro nVidia Riva 128
Mesa/Glide	3Dfx Voodoo Graphics 3Dfx Voodoo II 3Dfx Voodoo Rush

Table 6.1: Supported 3D Hardware

If you are installing with YaST2 for the first time, you can even activate 3D support during installation, provided that the related YaST2 support is recognized. nVidia graphics chips are the only exception. For these, the "dummy" driver included will have to be replaced by the official nVidia driver. Use

YaST Online Update (YOU) to update the `NVIDIA_GLX` and `NVIDIA_kernel` packages. If updating with YOU is not an option, download the appropriate RPM packages `NVIDIA_GLX` and `NVIDIA_kernel` from the nVidia web server (`http://www.nvidia.com`), install them with YaST1, and run the script **`switch2nvidia_glx`**. Because of licensing stipulations, we can only offer the "Dummy" nVidia driver packages.

If you have installed your system with YaST1, made an update, or have installed a new graphics cards after configuring your system, 3D hardware support will have to be configured differently. The approach to doing this depends on the OpenGL driver used and will be described in further detail in the section below.

6.2 OpenGL Driver

6.2.1 Mesa Software Rendering

This OpenGL driver will always be implemented if no 3D support was configured during installation or if no 3D support is available for the particular card in Linux.

Mesa software rendering should only be implemented if the 3D driver causes any problems (representation errors or system instability). Make sure that the package `mesasoft` is installed and then run the script **`switch2mesasoft`**. If you have an nVidia card, also run the **`switch2nv`** script so that the nv driver will be used for XFree86 instead of the nvidia driver. With the command **`3Ddiag --mesasoft`**, check to see if the Mesa software rendering has been properly configured.

6.2.2 nVidia-GLX and DRI

This OpenGL driver can be quite easily configured using SaX2. After starting up SaX2, answer "yes" to configuring 3D. If you have an nVidia card and did not update, SaX2 will need to replace the SuSE dummy driver packages with the official nVidia drivers via the Online Update. With the command **`3Ddiag`**, test if the nVidia-GLX and DRI are configured properly.

For security reasons, only users belonging to the group `'video'` may access the 3D hardware. Verify that all users working locally on the machine are entered into this group. Otherwise memory access errors will occur when attempting to start OpenGL applications (nVidia-GLX) and the very laborious *Software Rendering Fallback* of the OpenGL driver will be used (DRI). Use the command **`id`** to check whether the active user belongs to the group `'video'`. If this is not the case, use YaST2 to add the user to the group.

6.2.3 Utah-GLX and Mesa/Glide

This OpenGL driver needs to be manually configured with the help of the information provided by **`3Ddiag`**. Details can be found in Section 6.3.

If you have a Mesa/Glide driver, start OpenGL applications as `'root'`, because only `'root'` can access the hardware. To allow this, the user currently logged in will have to enable <DISPLAY> for `'root'`. This can be done with the command **`xhost localhost`**. The resolution used by the OpenGL application requires GLIDE support (resolutions which can be supported are 640×480 and 800×600). Otherwise the very slow "Software rendering fallback" of the OpenGL driver will be used.

6.3 Diagnosis Tool 3Ddiag

The diagnosis tool 3Ddiag is available for the purpose of verifying the 3D configuration in SuSE Linux. This a a command line tool which must be invoked inside a terminal.

The application will review, for example, the XFree86 configuration to verify that 3D support packages are installed and the proper OpenGL library is being used with the GLX extension. Follow the directions in 3Ddiag if `"failed"` messages appear. Ideally, you will only see `"done"` messages on the screen.

`3Ddiag -h` provides information about admissible options for 3Ddiag.

6.4 OpenGL Test Applications

Games such as **`bzflag`**, **`tuxracer`**, and **`tuxkart`** (from the packages with the same name), along with **`gears`** and **`glinfo`** out of the package `mesa`, are suitable as OpenGL test applications. If 3D support has been activated, they can be played well on a somewhat up-to-date computer. These games, however, are not recommended in conjunction with Mesa software rendering because of the resulting slide show effect.

6.5 Troubleshooting

If the OpenGL 3D test results are negative (the games cannot be effectively played), use 3Ddiag to make sure no errors exist in the configuration (`"failed"` messages). If correcting these does not help or if failed messages have not appeared, take a look at the XFree86 log files. Often, you will find the line `"DRI is disabled"` in the XFree86 4.x file `/var/log/XFree86.0.log`. The exact cause can only be discovered by closely examining the log file, perhaps too advanced an undertaking for a layperson.

In such cases, it is common that no configuration error exists, as this would have already been detected by 3Ddiag. Consequently, at this point, your best bet is the Mesa software rendering OpenGL driver, which does not feature 3D hardware support. Take advantage of Mesa software rendering and forego 3D hardware acceleration to avoid OpenGL representation errors or instability. A familiar example for the latter is the use of DRI and bttv (Watching TV in Linux) with ATI Rage 128 cards.

6.6 Installation Support

Apart from Mesa software rendering, all OpenGL drivers in Linux are in developmental phases and are therefore considered experimental. The drivers are included in the distribution because of the high demand for 3D hardware acceleration in Linux. Considering the experimental status of OpenGL drivers, we cannot offer any installation support for configuring 3D hardware acceleration or provide any further assistance with related problems. The basic configuration of the graphical user interface X11 does not entail 3D hardware acceleration configuration. This chapter answers many questions regarding this topic. If you have problems with 3D hardware support, use Mesa software rendering as already outlined in Section 6.2.1.

6.7 Further Online Documentation

- nVidia GLX: `/usr/share/doc/packages/nv_glx/`, `/usr/src/kernel-modules/nv_glx/README` (packages `NVIDIA_GLX` and `NVIDIA_kernel` from the nVidia server)
- DRI: `/usr/X11R6/lib/X11/doc/README.DRI` (package `xf86`, series `x`)
- Utah GLX: `/usr/share/doc/packages/glx/` (package `glx`, series `x3d`)
- Mesa/Glide: `/usr/share/doc/packages/mesa3dfx/` (package `mesa3dfx`, series `x3d`)
- Mesa general: `/usr/share/doc/packages/mesa/` (package `mesa`, series `x3d`)

7 Joystick Configuration

We will only address the topic of configuring devices on the USB port and of analog devices on the sound card's joystick port. Instructions on configuring additional joysticks can be found in the file `/usr/src/linux/Documentation/joystick.txt` (package `kernel_source`, series `d`).

As of Kernel 2.4, the joystick devices are no longer located in the `/dev` directory, but, instead, can be found in the `/dev/input` directory. It is recommended to create the required symbolic links:

```
earth:~ # ln -sf input/js0 /dev/js0
earth:~ # ln -sf input/js1 /dev/js1
earth:~ # ln -sf input/js2 /dev/js2
earth:~ # ln -sf input/js3 /dev/js3
```

This way, you can be certain that applications accessible to the customary joystick devices also work in Kernel 2.4.

7.1 Analog Joysticks on Gameport Sound Cards

Complete sound configuration before configuring your joystick. To configure an analog joystick on the sound card's gameport, load the corresponding kernel module. This can take place using the following command:

```
earth:~ # modprobe joydev
earth:~ # modprobe ns558
earth:~ # modprobe analog
```

You can automate the module start-up by entering the lines

```
/sbin/modprobe joydev
/sbin/modprobe ns558
/sbin/modprobe analog
```

in the `/etc/init.d/boot.local` file.

For ISA PnP sound cards, initialize the sound cards and the joystick ports before the joystick module can be loaded. This is achieved with the commands

```
earth: # pnpdump -c > /etc/isapnp.conf
earth: # isapnp /etc/isapnp.conf
```

At the next system start, the initialization will take place automatically since the file `/etc/isapnp.conf` already exists.

The program jstest is used for joystick testing. The command:

```
earth:~ # jstest /dev/js0
```

displays the joystick values. These are updated when you move the joystick or press the buttons.

If necessary, calibrate the joystick using the program jscalibrator (`/usr/bin/jscalibrator`). To do this, you will need the package `libjsw`, series `d` and the package `libjsw-calibrator`, series `d`.

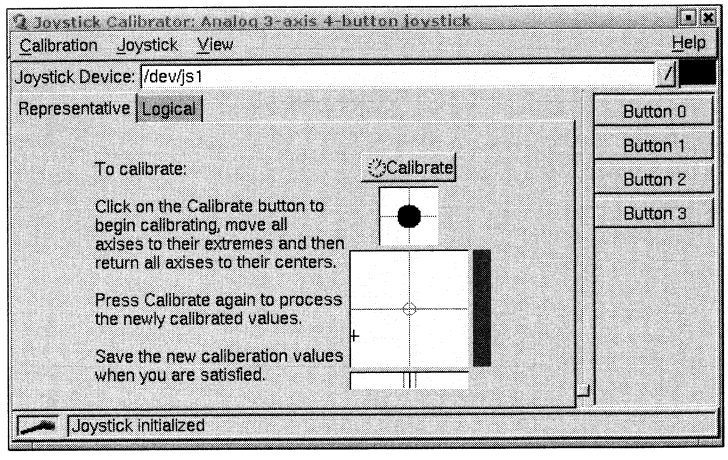


Figure 7.1: Calibrating the Joystick

This should complete the configuration and the joystick should now be ready for use. You might want call up the game clanbomber package `clanbomber`, series `fun`. It supports the joystick as an input device.

If you run into problems, you will find further configuration information (such as options for joystick modules) in the file `/usr/src/linux/Documentation/joystick.txt`, package `kernel_source`, series `d`.

7.2 Joysticks on the USB Port

To operate USB joysticks, the kernel modules `usbcore`, `usb-uhci` or `usb-ohci` (depending on USB port), `input`, `hid`, and `joydev` will have to be loaded. After loading, enter the following lines in `/etc/init.d/boot.local`:

```
/sbin/insmod usbcore
/sbin/insmod usb-uhci
/sbin/insmod usb-ohci
/sbin/insmod input
/sbin/insmod hid
/sbin/insmod joydev
```

You can test the joystick using the jstest and jscalibrator applications.

8 Scanning in Linux

8.1 Introduction

To scan in Linux, a library collection with the name SANE is usually used (Scanner Access Now Easy). When a user scans, the scanner must be notified of the user's request, for example: "Scan an 8.5-by-11-inch page in color".

SANE comes into play by translating the commands issued by an application program into the language of the scanner currently connected. For this purpose, SANE uses different back-ends. Back-ends are translation modules that translate the commands which come from the programs visible to the user for the respective scanner. In practice, back-ends are libraries which contain manufacturer or manufacturer-specific program code.

For this reason, back-ends often include the name of the manufacturer in their file names. Another term frequently used in this context is front-end, the programs with which the user can actually scan. SANE also includes these programs: xscanimage for use with a graphical user interface and scanimage for use from a pure text interface. It should also be noted at this point that SANE can integrate not only scanners into the system, but also video cameras.

The support for scanners connected to the SCSI port is better. Only a few scanners that are connected to the parallel port can be used in Linux. The situation is gradually improving for USB scanners, but has, by far, not obtained the kind of support that exists for SCSI scanners.

The connection of SCSI scanners to a Linux computer will mainly be described.

8.2 Supported Scanners

Currently, SuSE Linux supports all scanners that can be connected to the computer via a SCSI port and for which there is a SANE back-end. A current list of supported models can be found on the Internet at `http://www.mostang.com/sane/sane-backends.html`. The entire list cannot be printed here. Some manufacturers should be mentioned, together with the status of their back-ends:

Manufacturer	Model	Status	
Agfa	Focus, StudioScan, SnapScan models	SCSI	alpha
Artec/Ultima	AT and A6000 models	SCSI	stable
Canon	CanonScan models	SCSI	alpha
Epson	Perfection	SCSI, USB and parallel	stable

HP	HPScanJet models	SCSI	beta
Microtek	Scanmaker models	SCSI	beta
Mustek	MFC, MSF, MFS, SE models	SCSI	stable
Plustek	Plustek OpticPro models, Primax-Compact	SCSI	stable
Sharp	JX models	SCSI	beta
Umax	many models, also for Vobis	SCSI	stable

Table 8.1: Extract from the Available Scanner Modules from Various Manufacturers

This list provides only a brief overview and does not claim to be comprehensive or correct. Development of new software and improvement of existing software is so fast that the list may well have changed since this book went to press. For this reason, refer to the above URL. There you will find a list of back-ends and their assignment to scanner manufacturers and models. Possible limitations or peculiarities of some models are also listed. This is especially true for USB and parallel port support.

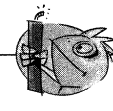
8.3 Connection to the SCSI Port

The scanner must be connected to the computer. This usually occurs via an external ☞*SCSI* port on your system.

SCSI is a bus system for the connection of peripheral devices of various types. It is considered very reliable and fast. For this reason, hard disks as well as scanners are run on the SCSI bus of a computer. The EIDE system for the connection of hard disks and CD-ROM drives has become more common. Check whether your computer is a SCSI or an EIDE system. Looking at the name of the hard disk can help, as you have probably already learned during the installation of your system. With EIDE systems, hard disks in Linux are indicated with the prefix `hd`; `hda` for the first and `hdb` for the second hard disk. With SCSI systems, the hard disks are called `sda` or `sdb`.

8.4 SCSI Systems

If you have a SCSI system, you can connect your scanner to the external connection of your controller.



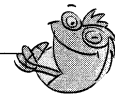
Caution

Several SCSI controllers, especially older ones, are not capable of making both the internal connection to the hard disks and the external port function to other devices simultaneously. Refer to the documentation of your SCSI controller.

8.5 EIDE Systems

EIDE systems are, by definition, unable to operate a SCSI device. Most scanners come supplied with a SCSI adapter. These are plug-in cards for the PC which have an external port outside the slot to connect a cable to the scanner. Unfortunately, SCSI adapters supplied with scanners are only designed to function more or less smoothly with the manufacturers' drivers on other operating systems. With Linux, however, it is not common practice to establish solutions which only work for one single configuration. In this case, the Linux philosophy is to operate a SCSI device, namely a scanner, with a SCSI controller available in the system and not exclusively to support a combination of a specific adapter and a specific scanner.

Whether the card supplied with the scanner works under Linux and, if so, with which driver module depends on the company from which the SCSI chip on the plug-in card originates. The authors of SANE have described their experiences with supplied host adapters (another name for these plug-in cards) in the manual pages of the individual back-ends. If in doubt, refer to these.



Tip

The cost of a SCSI controller card supported by Linux and other operating systems is currently about fifty dollars. If you are still thinking of buying a scanner, include this expense in your calculations and save yourself trouble.

The advantage of buying a controller is that you can connect other SCSI devices, such as a tape streamer. A list of supported hardware can be found in the SuSE Hardware Support Database under `http://cdb.suse.de/cgi-bin/scdb`.

Incidentally, the use of another SCSI controller should not affect the functioning of the scanner with other operating systems. "Genuine" SCSI controllers are also supported and the popular TWAIN scanning software modules recognize the scanner attached. Scanning then often works in a much "smoother" way. However, no guarantee can be given.

8.6 Addressing

Regardless of whether you have a SCSI system or an EIDE system with a SCSI controller added, all SCSI devices attached must have a SCSI ID. This is required because, as previously mentioned, several different devices can be attached to your SCSI bus and must be individually distinctive. To make sure that specific commands to a device actually reach that device, all commands sent on the bus are provided with a unique address. All devices "eavesdrop" on the bus, but only accept commands directed to their address. Other commands are ignored. The address of a device (in this case, the scanner) is usually determined by a small switch on the back or underside of the device.

The choice of SCSI address is important, as double occupancy of an address can lead to a device malfunctioning which can result in data loss. If the scanner

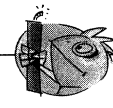
is the only device on the bus, the choice of address is relatively easy. Typical addresses for scanners are 4, 5, and 6. When other devices are already attached to the SCSI bus, you need to know which addresses are already occupied. Just like the scanner, hard disks, CD-ROM drives, and other devices are also capable of adjusting their ID. However, changing the existing addresses should not be necessary. Usual addresses for fast devices such as hard disks are the lower IDs 0–2. This can be determined with the **sgcheck** tool, described in more detail in Section 8.12 on page 120. When a free ID is determined, it must be set on the scanner.

8.7 Termination

A SCSI bus must be terminated, which means that its free end must be electronically "closed" so the signals can be transmitted undisturbed. Termination is implemented by means of a terminator, usually a plug attached to the output of the last SCSI device connected. This is usually the scanner itself.

You will probably have noticed already that the scanner has two cable connection ports: an input and an output, usually indicated with SCSI IN and SCSI OUT or "Computer" and "SCSI bus." When several devices are attached, the bus must be looped through. In practice, this means that the scanner does not necessarily need to be connected to the computer, but can be connected to another external SCSI device. It also means that another additional component, such as a tape streamer, can be connected to the scanner, which is, in turn, connected to the computer via a cable.

The remaining unused port of the last device in the chain must be terminated. Commercial terminators are available for this purpose which are simply plugged in the output port. Some devices have a built-in terminator, which can be enabled and disabled via a dip switch similar to the ID setting.



Caution

Please ensure that the SCSI bus is correctly terminated since otherwise malfunctions can occur, as with double occupancy of IDs.

However, there are also devices which are "autoterminated" and recognize that they are the last station on the chain. The bus is then terminated automatically by the internal electronics of the device, without having to add a terminator. Many modern hard disks have this property. Look up this topic in the technical documentation of your scanner to avoid unpleasant surprises.

8.8 SCSI Pitfalls

This section will show several pitfalls which can complicate life with SCSI.

1. Different SCSI types: Scanners are usually connected via SCSI-2, while hard disks usually operate via faster SCSI systems for reasons of speed. You can find out which type of SCSI your system is by consulting the documentation of your SCSI controller.

   If you are planning on purchasing a controller, price determines performance. The faster the system, the more expensive the controller. For the scanner, a "slow" SCSI-2 system is sufficient.

2. Maximum cable length: The SCSI bus may not exceed a maximum cable length. Its length may depend on the speed of the SCSI bus. The faster the SCSI bus, the more prone to interference the signals are traveling through the cable. Do not increase the length of the cable unnecessarily. If you do not have many external SCSI devices, there are usually no problems.

3. Forms of plug: In SCSI cable engineering, there is an almost endless number of different forms of plug, depending on the type of SCSI system. However, adapters are commercially available which allow the connection of different forms of plug. If need be, always take a model with you into the shop to check, as there are many versions which look the same, but work in different ways.

8.9 Software Installation

8.9.1 The Low-Level Driver

The lowest layer lies in the Linux kernel area. It is the low-level driver for the SCSI controller.

If your system is a SCSI system and has hard disks on the SCSI bus, the low-level driver for the adapter is already loaded when the system is booted. This is needed to access the hard disks. This similarly applies when EIDE disks are built into the system, but a SCSI controller is also built in, possibly because you are already operating a tape streamer. The correct driver should then have been recognized upon installation of SuSE Linux and be installed in the system. In this case, you need take no further steps for the setup of this driver.

But what if the adapter has been newly added to your existing system and there is no trace of a SCSI controller in the boot messages? You can and should load the driver as a module into the kernel. The Linux kernel is able to load modules for special hardware during operation and make use of these hardware components. This can happen in different ways. The following describes how to ensure that the driver starts automatically after booting.

First, a driver needs to be selected, loaded, and tested. The choice is made according to hardware manufacturer and model. Be sure to consult the SuSE Hardware Support Database or the documentation on the kernel modules. With the name of the module to be loaded, `'root'` can call up the **modprobe** command, which tries to load a kernel module and starts the hardware recognition.

A sample invocation of a Symbios Logic Controller would be:

```
earth: # modprobe ncr53c8xx
```

If **modprobe** remains without comments, the module has been successfully loaded and the hardware is recognized by the system.

The output produced by the module during loading can be seen by changing the virtual console. Provided that you are working in text mode on your system and not under X11, press (Alt) + (F10) to retrieve the driver output. You can also view the file `/var/log/messages`.

In case of failure of hardware initialization, **modprobe** issues error messages such as

```
earth: # modprobe wd7000
 /lib/modules/2.2.14/scsi/wd7000.o: init_module: Device or resource
                                    busy
 /lib/modules/2.2.14/scsi/wd7000.o: insmod
 /lib/modules/2.2.14/scsi/wd7000.o failed
 /lib/modules/2.2.14/scsi/wd7000.o: insmod wd7000 failed
 %
```

In a case like this, it may mean that the module loaded does not support the built-in hardware — the wrong module was selected. Drivers for older ISA cards may have to be given parameters via interrupts or I/O addresses or other indications if the module is correct and loading still fails. To determine which parameters can be used and how they are passed on via **modprobe**, consult the documentation on the kernel modules. To check whether the kernel module is loaded, all loaded kernel modules can be listed. The **lsmod** command executed by `'root'` displays all loaded kernel modules:

```
earth: # lsmod
Module                  Size  Used by
ncr53c8xx              51988   0  (unused)
ppp_deflate            40300   0  (autoclean)
bsd_comp                4020   0  (autoclean)
ppp                    20908   0  (autoclean) [ppp_deflate bsd_comp]
slhc                    4440   0  (autoclean) [ppp]
usb-uhci               17000   0  (unused)
ne                      6508   1  (autoclean)
8390                    6228   0  (autoclean) [ne]
serial                 42612   1  (autoclean)
memstat                 1476   0  (unused)
```

The SCSI module loaded is displayed in the very first line.

If the module test was successful, loading the module can, in the future, take place immediately after the computer has booted. Then, as soon as the computer has booted, the low-level driver will automatically be available. If desired, the modprobe command can be entered in the file `/sbin/init.d/boot.local`.

8.9.2 The Generic SCSI Driver

The second driver layer located in the kernel area represents the generic SCSI driver through which devices such as scanners are accessed. It does not need to

be installed externally, but is automatically loaded if it is specified as a reloadable module in the kernel configuration. This is the case with the default kernel installed with SuSE Linux.

8.9.3 Installation of SANE

The third layer is covered by the SANE libraries. To scan with SuSE Linux using the method described here, use YaST to install the SANE package from the series `gra` (graphics).

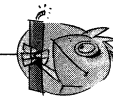
8.9.4 Application Programs

The fourth and final layer, the application programs, are also part of the SANE package and were installed in the previous step. The SANE package includes the programs scanimage, to scan from the command line, and xscanimage. Xscanimage is an X Window program with many configuration options and great application comfort.

In addition, you should also install the package `xsane`, also from the series `gra`, which represents an excellent front-end for scanning and scanner-supported copying and faxing.

8.9.5 Final Configuration

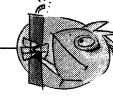
After the hardware has been installed, the scanner is switched on, and the low-level driver of the SCSI adapter has been successfully loaded, the final configuration can take place.



Caution

It is essential that the scanner is correctly connected to the system and switched on **before** loading the low-level driver, so that it will be correctly registered when the driver is in it.

Start YaST1 and select the menu item '`Integrate hardware into system`' then '`Configure your scanner`'. You will then see a selection field where YaST lists the SCSI devices detected. Select the scanner device. Below, you will see the information the device has "reported" which identifies the correct device file. The identifier for scanner is usually "processor" or "SCANNER." Select the proper device file.



Caution

Be sure that you are selecting the proper device file. Otherwise data loss can result.

In the second selection box, you will find a list of scanner vendors from which to select your scanner model.

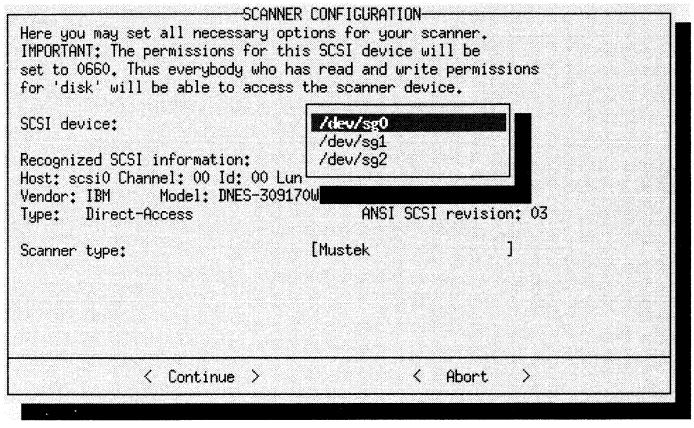
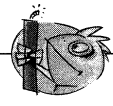


Figure 8.1: YaST Selection Screen

After clicking on the 'Next' menu, YaST will take care of the final configuration.

YaST sets the access permissions for the device file to which your scanner is connected with read and write access for the disk group. SANE needs read as well as write permissions for the device file.



Caution

Be sure that the users authorized to use the scanner are entered in the `disk` group. If you want to allow all users to scan from your machine, allow everyone to have read and write permissions to the device file `/dev/sg?`.

Now, the installation of your scanner should be complete and you can scan in Linux.

8.10 The SANE Package

8.10.1 SANE Front-Ends

With the SANE package, the programs scanimage (command line program) and xscanimage (with X11 interface) are installed. At the start of one of the programs, the SCSI device files are checked. This is how SANE recognizes which type of scanner is connected and dynamically opens the corresponding back-end. You can find out which scanners are recognized by SANE by calling scanimage with the option `-L` (see the output of 8.10.1 on the next page).

```
earth: # scanimage -L
device 'pnm:0' is a Noname PNM file reader virtual device
device 'pnm:1' is a Noname PNM file reader virtual device
device 'mustek:/dev/scanner' is a Mustek ScanExpress 12000SP
flatbed scanner
device 'mustek:/dev/sga' is a Mustek ScanExpress 12000SP
flatbed scanner
```

In this example, the SANE program recognizes a *Mustek* scanner. To scan with this, add the string `mustek:/dev/scanner` together with the `-d` call option when calling scanimage and write the output to the target file `imagefile.pnm`:

```
earth: # scanimage -d mustek:/dev/scanner  >imagefile.pnm
```

At start-up, the X11 program **xscanimage** offers a selection box in which the device to be used can be selected.

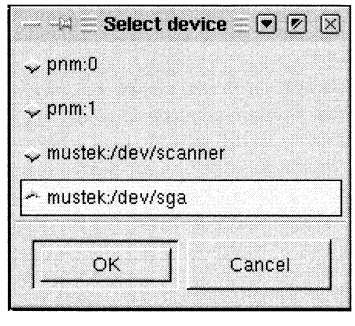


Figure 8.2: Starting xscanimage

Although only one scanner is connected, the selection box displays two entries, one on `/dev/scanner` and one on `/dev/sga`. This is because `/dev/scanner` is a simple link to `/dev/sga`. The `pnm:0` and `pnm:-1` entries allow xscanimage to start in a test mode in which image files are read in pnm format.

8.10.2 Configuring SANE

For every back-end included in the current SANE distribution, you will find a configuration file in `/etc/sane.d/` which bears the name of the back-end. In this file, set the configurations for the device file used and also back-end specific configurations. It is definitely worth taking a glance at your own back-end configuration file. These options are described in the man pages.

The configuration file `/etc/dll.conf` in particular is worth noting. This file can specify if back-ends are to be generally excluded from implementation with SANE on a system. Here, you can find a listing of all the back-ends recognized by SANE. Lines you don't need, such as the test pnm driver, can be commented out in this file with '#' symbols.

8.10.3 SANE Documentation

SANE comes with a a wide variety of excellent man pages. A good starting point is the man page **sane-scsi** for general information regarding the SCSI scanner connection. Furthermore, various man pages exist for the different back-ends, such as **sane-mustek**. A complete list of the man pages can be obtained by entering:

```
earth:/ # apropos sane
```

In `/usr/share/doc/packages/sane`, you will find more information on the package. Perhaps you want to write an additional front-end program for SANE. In `sane.tex`, you will find the TEX source for the complete scanner library documentation. This is not so difficult.

8.11 USB Scanners

USB and parallel port scanners are gradually gaining support in Linux. However, it is still a somewhat adventuresome undertaking to get such a device up and running. It requires a certain enthusiasm for experimentation.

8.11.1 The Scanner on the USB System

First, you must check to see if your scanner is already supported by SANE. Along with the URL of the SANE home page listed above, you may find the USB scanner page at `http://www.buzzard.org.uk/jonathan/scanners-usb.html` interesting. Here you can find useful information on scanning with USB scanners.

The USB device file system must be activated in order to operate USB devices in Linux. This should have been taken care of when you installed SuSE Linux. Once you have mounted the USB system, you will find information on the connected USB devices in several files located in the directory `/proc/bus/usb`.

The USB scanner module requires two parameters to be loaded properly. These are the product and vendor IDs. You can see both of these numbers displayed using the program **usbview**. After starting it, a window will appear where you will see a concise list of all USB devices. Identify your USB scanner under the line `Manufacturer`. Once you have found it, localize the lines beginning with `Vendor Id` and `Product Id` and make a note of the values.

To launch the scanner module, pass these values to the program **modprobe** as in the following.

```
earth:/ # modprobe scanner vendor=0x06bd product=0x0001
```

If you run **lsmod** as user `'root'`, the module **scanner** will also be shown as started. Another way of testing to make sure the module has been loaded is to view the output of the file `/proc/bus/usb/drivers`. For example:

```
earth:/ # cat /proc/bus/usb/drivers
 48- 63: usbscanner
         hub
         usbdevfs
```

Here you can see that the USB scanner driver is loaded.

If the USB driver should be loaded every time you start the system, edit the file `/etc/usbmgr/host` and insert the line as follows:

```
scanner
```

File 8.11.1: Line to be inserted in `/etc/usbmgr/host`

In case the scanner module was only able to be test loaded once the product and vendor ID have been specified, enter both of these parameters into the file `/etc/modules.conf`. To do this, enter the following lines there:

```
options scanner vendor=0x<vendorID>
options scanner product=0x<productID>
```

File 8.11.2: Line to be inserted into `/etc/modules.conf`

With this, your system should load the scanner module the next time you boot.

8.11.2 The Device File

Next, check to see if there is a device file for the USB scanner. It is located, as for SCSI scanners, in the general device file directory `/dev` with the name `/dev/usbscanner`. If this file does not exist, create it by entering the following command as user `'root'`:

```
earth:/ # mknod /dev/usbscannner c 180 48
```

8.11.3 SANE Configuration

Finally, you may need to still specify, in a SANE configuration file, to which device file the scanner is connected. The SANE configuration files are located in the `/etc/sane.d` directory and bear the names of the back-ends used. By default, `/dev/scanner` is usually entered as the device file to be used. This has to be replaced by the device file you are actually using, `/dev/usbscanner`. When making changes, pay close attention to the corresponding configuration file entries, since error tolerance in this regard is negligible.

Tip

In the manual page included, you will obtain further explanations and, if applicable, descriptions of essential back-end parameters.

The correct man page name is easy to find. It is comprised of the prefix `sane-` and the name of a back-end, for example, `sane-agfafocus` for Agfa scanners. By following these steps, your USB scanner should be persuaded to work.

8.12 Troubleshooting

What if it does not work? In this section we will list some information sources which will help tackle errors.

1. **Is the low-level driver correctly loaded?**

   This can be checked by looking at the output of **lsmod**. In addition, a correctly installed driver can be found in the proc file system. This is how you list the content of /proc/scsi:

   ```
   ls /proc/scsi/
   .  ..  ncr53c8xx scsi
   ```

   Besides the SCSI file, there is a directory with the name of the module loaded, here the module for the Symbios Logic Controller. If such a directory is not present, the low-level driver is not loaded.

2. **Does the low-level driver recognize the scanner?**

   Use the **sgcheck** script from the scsi package to check. It lists the recognized SCSI devices with their device files and their SCSI IDs:

   ```
   earth: # sgcheck

   Assignment of generic SCSI devices,
   device host/channel/ID/LUN type(numeric type) vendor model:

   /dev/sg0 0/0/4/0 Scanner SCANNER
   ```

   The example shows a scanner which is connected to the device file /dev/sg0 and has the SCSI ID 4. The scanner should be recognized without any problems.

3. **sgcheck shows the scanner, but it cannot be selected with xscanimage.**

   This is probably because the user has no write access to the device file that represents the scanner. Set the user permissions accordingly.

8.13 Further Information

If you need more information on the topic of scanning, see the following web sites:

http://www.linux-usb.org	All about USB (also for scanners)
http://www.qbik.ch	List of various USB devices
http://www.xsane.org	Home page of the graphical scanning application
http://www.mostang.com/sane/	Information on SANE itself

9 Printing in Linux

9.1 Introduction

First, we will discuss all the printing basics in Linux so that you can subsequently configure your printer to best fit your needs.

Just one type of configuration does not normally apply to all printers, especially the modern color ink jet printers. On the other hand, a default configuration is sufficient for simple black-and-white printers (for most laser printers).

Depending on the applications, various demands are placed on printouts and various configurations are required. Normally, the following configurations are required for modern ink jet printers:

- A default configuration with which the printer will always produce quick and economical black-and-white printouts.
- A color configuration for normal color printing.
- A best configuration for highest quality but slower and more expensive color printing, given that the printer itself is equipped for high resolution color printing.
- A photo configuration, given that the printer is equipped for photograph printing.

It is not possible to cover all aspects with just one configuration, since the goal of printing as quickly and as economically as possible is quite different than producing a best quality printout and also since photo printing requires specific settings.

9.2 Basics of Printing in Linux

In Linux, the printer only responds via "printer queues." The data to be printed is saved to a printer queue by way of the printer spooler and then sent to the printer.

Mostly, the data to be printed is not available in a form which can be sent directly to the printer. A graphical image, for example, normally has to be converted to a format that the printer can actually print out. A printer filter translates it to the printer language..

Examples of default printer languages:

ASCII-Text — Normally every printer can at least print out ASCII text, except for the GDI printers designed for Windows. They can neither print out ASCII text nor print data that is available in the following default printer languages. On the other hand, there are printers which, although they cannot print out ASCII text directly, can be contacted via the following default printer languages.

PostScript — PostScript is the default printer language in Unix and Linux. However, PostScript printers are relatively expensive, so a special filter program (Ghostscript) is used in Linux to convert PostScript data to other default printer languages.

Miscellaneous — PCL3, PCL4, PCL5e, PCL6, ESC/P2, ESC/P and ESC/P dot matrix.

9.2.1 On the GDI Printer Issue

GDI printers do not respond to the printer languages described above, but only to a proprietary protocol and thus cannot normally be used in Linux. You can obtain more information on this at
`http://sdb.suse.de/en/sdb/html/ke_printer-gdi.html`

9.2.2 Print Job Procedure

The following describes the data flow when processing a print job in Linux:

1. The user either generates a new print job using the **`lpr`** command or an application uses the **`lpr`** command.

2. The data to be printed is saved in the printer queue, where the printer spooler (lpd) forwards it to the printer filter (apsfiler) that belongs to this queue.

3. The data to be printed is converted in the first step to the default printer language PostScript via the printer filter (apsfilter), if it is not already PostScript data. Many applications will automatically generate PostScript, but ASCII text, for example, is converted to PostScript via the **`a2ps`** program. If there is no PostScript printer connected, a second step will follow whereby the PostScript data is converted to a format which the printer can directly output. To do this, the Ghostscript program is used along with a Ghostscript driver compatible to the printer model. This means that Ghostscript converts PostScript to the corresponding printer language. Finally, the printer-specific data is sent to the printer via the port to which the printer is connected. The printer will then print accordingly.

4. After the print job is completed, it will be deleted from the printer queue.

9.2.3 Starting a Print Job

Normally you can print by entering

```
lpr filename
```

where `filename` is replaced by the name of the file to print. In this case the default printer queue is used. The `-P` option can define a certain queue. With

```
lpr -Pcolor filename
```

the queue `color` is used, given that a queue with the name `color` has been configured.

Various printer queues are required for the following reasons:

- Several printers are contacted over various printer queues.
- A printer filter can be configured individually for each printer queue. Thus, several printer queues are used for the same printer in order to use various configurations — the default queue for the fastest possible printout as well as an additional queue for the best possible printout.

Queue names in a default configuration with YaST2:

1. lp — print a file over the default queue using

   ```
   lpr filename
   ```

   This is how the apsfilter automatically defines which data type the file contains. The conversion will proceed accordingly to the printer-specific format. There should always be a queue with the name `lp` since this is the traditional name of the default queue.

2. lp-ascii — print a file via the`ascii` queue using

   ```
   lpr -Plp-ascii filename
   ```

   This command tells the apsfilter that the file contains ASCII text and the conversion to the printer-specific format will take place accordingly. The `ascii` queue is needed to force the output of ASCII text for ASCII text files that are not automatically recognized as such by the default queue.

3. lp-raw — print a file over the `raw` queue using

   ```
   lpr -Plp-raw filename
   ```

   The apsfilter will not convert into the printer-specific format, but, rather, the file will be sent to the printer in raw form. Thus, in this case, the file has to already contain data in the printer-specific format. The `raw` queue is needed whenever an application has already generated printer-specific data.

9.3 Commands for Operating the Printing System

1. **`lpq`** lists print jobs that are in a queue, while

   ```
   lpq -Pqueue
   ```

   displays the print jobs in the given queue

2. **lprm** deletes print jobs in a queue and

```
lprm -Pqueue jobnumber
```

deletes the print job from the given queue with the given job number as long as the print job belongs to the user. A print job belongs to the user who started it. This user is listed via the **lpq** command. The job number can also be shown with the **lpq** command.

```
lprm -Pqueue -
```

or

```
lprm -Pqueue all
```

If the user `'root'` uses the **lprm** command, all print jobs are removed from the given queue, regardless of to whom they belong.

3. **lpc** for managing the queues

```
lpc status
```

displays the queue status.

```
lpc down queue
```

shuts down the given queue.

```
lpc up queue
```

enables the given queue.

lpc down and **lpc up** can only be carried out by the user `'root'`.

lpc status produces the following, for example

```
lp-ascii:
        queuing is enabled
        printing is enabled
        no entries
        no daemon present
lp:
        queuing is enabled
        printing is enabled
        2 entries in spool area
        lp is ready and printing
lp-raw:
        queuing is disabled
        printing is disabled
        no entries
        no daemon present
```

thus the queues `lp-ascii` and `lp` are enabled and the `lp` queue contains two print jobs, one of which is being printed. The `lp-raw` queue is disabled.

9.4 Troubleshooting Using the Above Commands

If you encounter communication problems between machines and printers, the printer cannot process the data it received in a sensible manner. Often large amounts of paper are printed out with jumbled characters.

1. If it is an ink jet printer, take out the paper. If it is a laser printer, open the paper trays to stop the printing.
2. Since the print job will only be removed from the queue once it is sent entirely to the printer, it will usually remain in the queue. Even rebooting will not delete the print job from the queue. Verify from which queue printing occurs with **`lpq`** or **`lpc status`** and then remove the print job with **`lprm`**.
3. Some data might still be transmitted to the printer even after the job has been removed from the queue. Using the command **`fuser -k /dev/lp0`** for printers on the parallel port and **`fuser -k /dev/usblp0`** for USB printers, all processes can be stopped which are still accessing the printer.
4. Reset the printer completely by temporarily disconnecting it from the electrical source. Afterwards, reinsert the paper and switch the printer on again. Now your printer should not give you anymore trouble.

9.5 Tips for Configuring a Printer with YaST2

Technical Tips Initially YaST2 checks to see if a configuration already exists. If no apsfilter entry has been found in `/etc/printcap`, an existing `/etc/printcap` will be renamed to `/etc/printcap.YaST2save` and a new configuration will be added. To force a new configuration, the `/etc/printcap` file should be moved with:

```
mv /etc/printcap /etc/printcap.save
```

Required Information In Linux, the required data is needed when installing the printer in YaST: port, queue name, printer model–specific settings (Ghostscript drivers) and hardware-independent settings (layout and country-specific ASCII text coding). See the chapter on YaST2 for more information.

9.5.1 About the Interface

`/dev/lp0`	is the first parallel interface
`/dev/usblp0`	is the interface for a USB printer

For manual configuration, the interface must be specified. For this, a test should be run to see if the printer actually responds via the specified interface. If the printer is not responding, continuing configuration does not make much sense. The test will work best if the printer is connected directly to the first parallel port and if the following settings for the parallel interfaces have been entered in the BIOS:

- IO address 378 (hexadecimal)
- Interrupt is irrelevant (by default, no interrupt is used)
- Mode `normal`, `SPP` or '`output-only`' (other modes do not always work)
- DMA is disabled (should be automatically deactivated in the above mentioned modes)

9.5.2 About the Queue Names

Since you will frequently need to enter the queue name, you should only give the queues short names consisting of lowercase letters and possibly numbers. By default, an additional `ascii` queue is added to each queue automatically. More queues may be automatically added which may or may not be needed (see **`lpc status`**). With **`lpc down queue`**, unnecessary queues can be deactivated.

9.5.3 About Ghostscript Drivers

Since Ghostscript drivers generate printer-specific data for non-PostScript printers, the Ghostscript driver configuration is where the type of printout is defined. First the driver selection then the appropriate driver-specific settings influence the print format. Here, differences between various configurations for the same printer are defined.

If YaST2 automatically recognized the printer model and vendor and the model is entered in the printer database, you should have a sensible default selection of suitable Ghostscript drivers. If the printer model is not entered in the printer database, a selection of generic Ghostscript drivers can be found under '`Generic printers`' for the default printer languages. Ask the vendor which printer language your model understands or which model in the printer database corresponds to your printer's hardware. The printers must be able to understand the same hardware-dependent printer language and not just emulate it via specialized software.

If a Ghostscript driver is to be implemented which is not offered in the default menu, the Ghostscript drivers can be found in the manual configuration under '`Ghostscript Output Devices`'.

Special parameters for the different Ghostscript drivers can frequently be adjusted. The respective correlation between a chosen value and the relevant options of a subselection for this can be seen in the menu items themselves.

Normally, fast black-and-white printing is set by default since this sort of setting is the least complicated. The default configurations should always work.

Not all combinations of individual driver settings you can select work with every printer model — often not in at a high resolution. Printing the YaST2 test page is essential. If, when printing the test page, you just get garbage (such as a lot of almost blank pages), you can normally immediately stop the printout at the printer by taking out all the paper before clicking on the '`Stop`' button. Admittedly, there are cases where no further printouts are possible. Therefore, it is

less complicated just to click on the 'Stop' button and wait until the printer is finished printing.

9.5.4 About Hardware-Dependent Settings

The settings here are not critical since each possible choice should produce an appropriate printout. Here, too, you should test the settings by printing a test page.

9.6 Printing from Applications

Applications also utilize the **lpr** command to print. In most cases, do not set up any new printers in the application itself, but use the queue you already set up in YaST2 and those which you tested by printing the sample page successfully. In an application window, choose the queue name or enter the print command **lpr**.

Sometimes alias queue names are displayed, depending on the application, which can be confusing. The originally configured queue name should always be shown along with the aliases and it should be possible to select it.

If necessary, the document can usually be saved to ASCII or PostScript format as well as printed to a file which can then be printed with **lpr**. If not, Ghostscript may not be able to process the application's PostScript output. Test this in the graphical interface by entering the following command in a terminal window:

```
gs -r60 filename
```

Replace filename with the name of the PostScript file which the application has produced. If the PostScript file is not displayed correctly in a second window, the Ghostscript error messages will appear in the terminal window instead. To end it, press Ctrl + C in the terminal window.

9.6.1 Printer Configuration for StarOffice

Depending on the StarOffice version, the various steps in the configuration process may vary slightly. The basic procedure remains the same, however.

Normally, the default queue is preconfigured in StarOffice and StarOffice prints the document using the **lpr** command. Printing should work in StarOffice without any additional configuration.

If you want to use a queue other than the default:

1. Start StarOffice as the root user.
2. Select 'Printer setup'.
3. At 'Installed printer drivers' select 'Generic Printer' (or possibly 'Generic PostScript Printer') and 'Add as new printer'.
4. Next, the printer 'Generic Printer_1 an Queue default_queue (lpr)' is available under 'Configured printers'.

5. Now select 'Connect' and then 'Available Queues', select the appropriate printer queue, such as color=lpr -Pcolor. Then StarOffice will print the document using the command **lpr -Pcolor**.

   The printer 'Generic Printer 1 an Queue color (lpr -P color)' is now available under 'Configured printers', which you can select later under 'File' → 'Print' as 'Generic Printer 1', in order to print a document via the color queue. Note that there should not be any blank spaces between -P and the queue name so you should have entered **lpr -Pcolor**.

9.6.2 Printing from KDE Applications

Here, following the example of a printout from the KDE text editor:

In KDE, you will need to save the text as a file before printing. Then select 'File' → 'Print' and then 'Print directly using lpr'. The file will be printed via the default queue. If a different queue is used instead, such as ascii then enter the print command **lpr -Plp-ascii**.

9.6.3 Printing from Netscape

If you click on 'File' → 'Print...' in Netscape and only enter **lpr**, Netscape will then automatically print via the default queue. If you want Netscape to print via a different queue, enter under 'Print command' the appropriate command, for example, **lpr -Pcolor** for color.

9.6.4 Photo Printing Directly from GIMP

The package gimp (series gra) is a part of the default installation if you have selected 'Standard system + Office' as the installation. Under this installation, you will also find sample photos in the directory /opt/office52/share/gallery/photos/.

To print directly from GIMP, you will need to configure the raw queue, since GIMP generates printer-specific data on its own. To print an image directly from GIMP, open the file, for example, /opt/office52/share/gallery/photos/mountns1.jpg in GIMP and right-click on the displayed image. Select 'File' → 'Print'. Select the raw queue as printer. Under 'Settings', select your printer model or one that is compatible. You may need to ask the manufacturer which model offered best corresponds to your printer. You can normally use the following as an appropriate command for the raw queue:

```
lpr -Plp-raw
```

The average size is 8-1/2" X 11" in the United States and A4 in Europe. The remaining settings can be viewed in the preview and will enable individual adjustment of the printout for each picture.

Since the resolution is not very high in the above example, the printout will not be especially clear. A considerably better and more popular test image can be found at `http://www.heise.de/ct/ftp/99/21/lady/gesamt.shtml`.

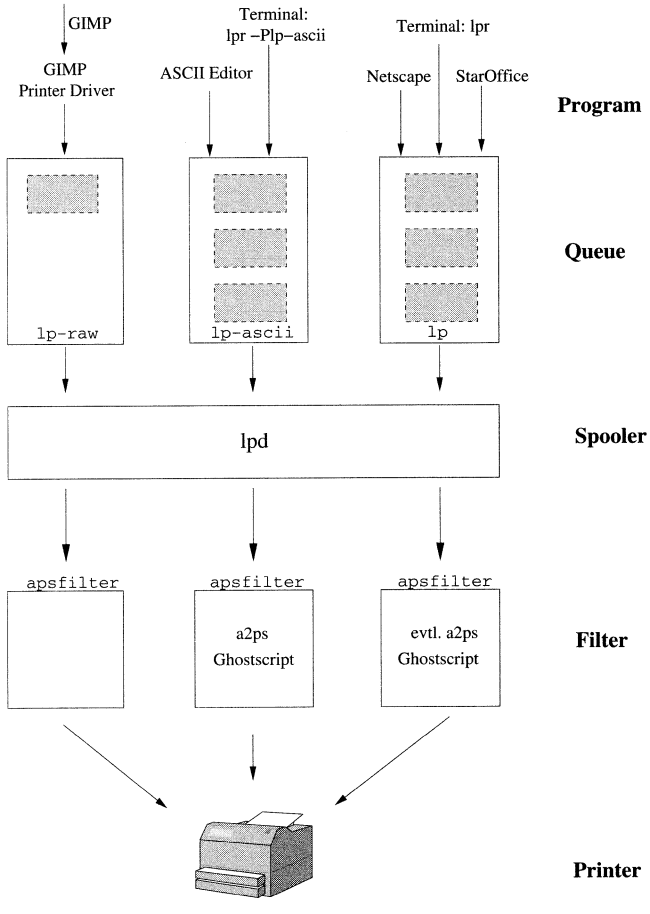
9.7 Additional Information

For additional information on setting up printers with SuSE Linux, consult the support database article "Printer Configuration" which can be found by a keyword search under "configuration", or can be obtained online at

`http://sdb.suse.de/sdb/de/html/jsmeix_print-einrichten.html`

9.8 Visual Illustration

The topics we discussed in the previous sections will be reiterated using a visual illustration.



10 Working With the Shell

Although graphical user interfaces for Linux have recently become more important, a few mouse clicks cannot always cope with all everyday demands. Interfaces and programs are becoming steadily more complex and user-friendly and can now offer a substantial number of choices and options, yet the flexibility of the command line remains unsurpassed.

In the first part of this chapter, you will receive an introduction on how to handle the bash shell. Following that is an explanation of the concept of user rights in Linux. The chapter will conclude with a list of the most important commands.

Even older models of Linux machines which do not have enough resources for "hardware hungry" display systems can be managed by text-based applications such as these. If this is the case, use a virtual console. Six virtual consoles are available in text mode. You can navigate between them by using the key combinations (Alt) + (F1) through (Alt) + (F6). The seventh console is reserved for X11.

10.1 Introduction to Bash

In the KDE taskbar, there is an icon depicting a monitor with a seashell. When you click on this icon with the mouse, a console window will open where you can enter commands. This shell is normally a bash (Bourne again shell). The bash was developed in the framework of the GNU project and is by far the most widely used derivative of the Bourne shell (sh).

Once you have opened the shell, you will see the prompt on the first line. It usually consists of the user and the localhost along with the current path, but can, however, be configured individually. When the cursor is next to this prompt, you can send commands directly to your computer system

10.1.1 Commands

Commands consist of various elements. The command word always comes first and is followed by the parameters or options. One of the most frequently used commands is **ls**, which can be used on its own or with arguments. If you just enter the **ls** command in the console, it will show the contents of the current directory. Commands will only be executed once you press (↵). Until that point, you can edit the command line without any problems — add any other options or correct typos.

Options are marked with a prefixed hyphen. If you enter the command **ls -l**, it will show the contents of the same directory in full. Next to each file name, you

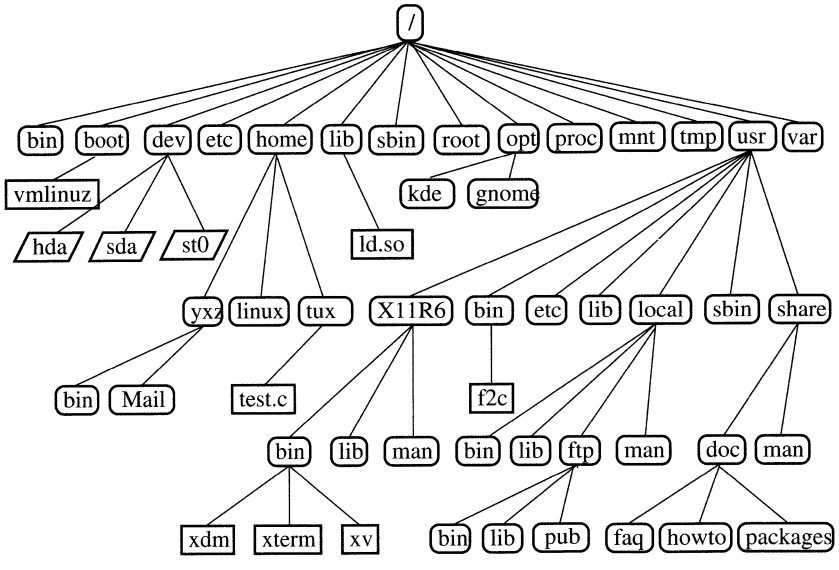
will also see the date when the file was created, the file size in bytes, and further details which will be discussed later.

With the **ls** command, you can also view other directories. For example, enter the command **ls-l Desktop**. Now you can see the contents of the subdirectory `Desktop`. **ls** is the command, **-l** an option for this command, and **Desktop** a parameter which is passed to the **ls** command. One of the most important options which exists for many commands is the **--help** option. For example, if you enter **ls--help**, you will be shown all the options for the **ls** command.

10.1.2 Files and Directories

In order to work efficiently with the shell, you need some knowledge of the file and directory structures in Linux. Directories are electronic folders in which files, programs, and even subdirectories can be stored.

The top level directory in the hierarchy is the root directory, which is accessed with "/". >From here you can reach all other directories. In the `/home` directory, you will find the home directories of the different users. Figure 10.1.2 shows the standard directory tree in Linux, with the home directories of the users `'xyz'`, `'linux'`, and `'tux'`:



Overview of the most important directories

`/`	the root directory, starting point of the directory tree
`/home`	the (private) directories of the users
`/dev`	device files which represent hardware components
`/etc`	important files for system configuration
`/usr/bin`	generally accessible commands
`/bin`	commands which are already needed to boot the system
`/usr/sbin`	commands which are reserved for the system administrator
`/sbin`	commands which are reserved for the system administrator and are needed to boot the system
`/sbin/init.d`	boot scripts
`/usr/include`	header files for the C compiler
`/usr/include/g++`	header files for the C++ compiler
`/usr/share/doc`	various documentation files
`/usr/man`	the help texts (man pages)
`/usr/src`	source texts of the system software
`/usr/src/linux`	the kernel sources
`/tmp`	temporary files
`/var/tmp`	large temporary files
`/usr`	all application programs, can be mounted *read-only*
`/var`	configuration files (e.g., linked from `/usr`)
`/var/log`	log files
`/var/adm`	system administration
`/lib`	shared libraries (for dynamically linked programs)
`/proc`	the process file system
`/usr/local`	local distribution-independent extensions
`/opt`	optional software, larger systems (such as KDE, GNOME, Netscape)

10.1.3 Bash Functions

Two important functions of the shell can make your work a lot easier: the history function and the expansion function. In particular, they cut down on what you have to type and reduce the risk of typing errors. If you wish to repeat a command already entered, press ↑ as many times as needed until the desired command is shown. If you wish to move forward through the list of previously entered commands, press ↓. You can edit a command line if you wish to alter a command because. Use the arrow keys to move to the relevant position and then edit the command.

The expansion function offers additional advantages. It completes a file name after you have entered only a few letters until it is recognized. After this, press Tab. If there are several names beginning with the same letters, pressing Tab twice will list all possible names.

10.1.4 First Example: Handling Files

You now know what a command looks like, which directories exist in SuSE Linux, and how you can simplify your work in the bash shell. Now you should put your knowledge into practice with a small exercise.

- Open a console by clicking on the shell icon.
- Enter the **ls** command. You will see the contents of your home directory.
- Use the **mkdir** command (for make directory) to create a new subdirectory named `test`. Type in **mkdir test**.
- Now view the contents of your home directory again. However, instead of entering the **ls** command again, just press ↑ twice. Now **ls** will be shown at the prompt again and you need only press ↵ to execute the command. Note that the `test` directory is shown in blue.
- Press ↑ to use the command **ls** again. Type a space after it then type `test` and hit ↵. Nothing will appear because the directory is still empty. Now call up the KEdit editor from the K menu at the very top under '`Applications`'. Type a few letters and save the file under the name `Testfile` in your home directory with an upper case T. Linux differentiates between uppercase and lowercase letters. Now enter the **ls** command again. You will now see the new file with the name `Testfile` in black text. Directories appear in blue and files in black.
- This file will now be transferred to the `test` subdirectory by means of the **mv** command (for move). To avoid unnecessary typing effort, use the expansion function. Enter **mv Testf** and press Tab. If there is no other file in this directory that begins with the same sequence of letters, the shell will add the character string `ile`. Put a space behind it and type `test`. When you now press ↵, your file will be moved into the `test` subdirectory.
- If you now enter the **ls** command, the test file will no longer be shown. To check this, enter **ls test**. Alternatively, since you have used it before, you can press ↑ a couple of times until the command is displayed.
- Now, use the **cd test** command (cd for change directory) to change to the `test` directory. If you enter the **ls** command, you will see the contents of `test`.
- Suppose the file is so important that you want a copy of it. If so, use the **cp** command (for copy). Enter **cp Testfile Testbackup**. A call of **ls** now shows you both files.
- Just typing **cd** ↵ returns you to your home directory.

10.1.5 Path Specifications

It is important to use the correct path to the file or directory with which you would like to work. However, you do not always need to specify the complete

(absolute) path to the corresponding file, but can start from the current directory. This is called a relative path. When you are in your home directory and wish to move or copy the file `Testfile` from the directory `test`, you need to address the file with `test/Testfile`. Alternatively, you could use **cd** as in the above example to change to this directory.

You can access your home directory directly with ~. If you are in the test directory and wish to see the contents of your home directory, you can just enter **ls ~**. To view the home directory of one of the other users, you can display this with "~" and the username. A sample user in the structure above would be `'tux'`. The command **ls ~tux** would show you the home directory contents of `'tux'` (assuming you have access permission for that directory). If there are several users registered on your computer, you can test this with the corresponding usernames.

Your current directory is represented by one dot, and the next higher path level with two dots. Enter **ls ..** to see the contents of the parent directory of your current directory. By entering **ls ../..**, the contents of the directory two levels higher in the hierarchy is shown.

10.1.6 Second Example: Dealing With Paths

Another example will illustrate how you can move around the directory structure of your SuSE Linux system.

- Enter **cd** on the console to make sure that you are in your home directory. Here you will find the subdirectory `test`. In addition, you now want to create a directory named `test2`. You already know that you must enter **mkdir test2**. You can delete the directory later with the command **rmdir test2** (rmdir for remove directory). It must, however, be empty.

- Use the command **cd test2** to change to `test2` and create a new directory named `subdirectory`. Changing to this directory, it really makes sense to use the expansion function. Enter **cd su** and press (Tab). The word is now completed.

- You are now in `subdirectory` and want to transfer the previously setup file `Testbackup` to this directory. You do not have to change to the directory `test` first, but only need to specify the relative path of the required file. **mv ../../test/Testbackup .** is your input. Do not forget the dot at the end as your current directory is the destination for the **mv** command. In our concrete example, this is the directory named `subdirectory`. With two dots you move one directory level higher. In this case, **../..** indicates your home directory in which the test directory is located.

10.1.7 Wild Cards

A further convenience of the shell is wild cards. There are four different wild cards in bash.

? Substitutes exactly one arbitrary character.

* Substitutes an arbitrary number of characters.

[set] Replaces exactly one character from the group of characters specified inside the square brackets, which is represented here by the string "set".

[!set] Replaces exactly one character other than those identified in "set"

If your `test` directory contains the files `Testfile`, `Testfile1`, `Testfile2`, and `dates`, the command **`ls Testfile?`** will list the files `Testfile1` and `Testfile2`.

With **`ls Test*`**, the list will also include `Testfile`. **`ls`** shows you all sample files. Use the **`set`** wild card to specifically address files whose last character is a number: **`ls Testfile[1-9]`**.

The most powerful wild card is always the asterisk (*) wild card. By using this, you can save a lot of typing. You could, for example, copy all the files in the `test` directory to the subdirectory of `test` with the command **`cp * subdirectory`**. However, you can also use wild cards for deleting files and here you should always know exactly what you are doing. The command **`rm *date*`** deletes all files in your `test` directory with names in which the character string "date" occurs.

10.1.8 More or Less

Two small programs enable you to view text files directly in the shell. You do not need to start the editor if you wish to read a `Readme.txt` file, for example. To do this, you simply enter **`less Readme.txt`**. You will now be shown the text in your console window. (Space) will always move one page forward, but you can also use the (PgUp) and (PgDn) keys to move forwards or backwards in the text. Terminate the less program by pressing (Q).

Besides less, you can also use the older program more. However, it is less user-friendly as you cannot scroll forwards or backwards. One could say, "you get more" with less. You can use less not only to read text files, but also to show the output of commands, for instance. This will be explained in the following section.

10.1.9 Rerouting

Normally, the standard output of the shell is your monitor, or, to be more precise, the console window and the standard input device is your keyboard. If you now wish to pass the output of a command to a program such as less, you must use a so-called "pipe". Suppose you have a `test` directory with a very large number of files and you would rather view the list with less because then you can simply scroll through it. To do this, enter **`ls test | less`**. Now your console shows the contents of the directory `test` displayed with less. This is, of course, only sensible if the normal output of **`ls`** is large and complex. Try to view, for example, the `dev` directory: **`ls /dev`**. On your screen, you will see only a small

part of the entire contents. If you now enter **ls /dev | less** instead, you can easily leaf through all the files. You can also store the output of commands in a file. In the example above, this would look like **ls test > contents**. After this, you have a new file which contains a list of the files and directories in `test`. With **less contents**, you can view the file.

10.1.10 Archives and Data Compression

Now that you have already created some files and directories, we will turn to the topic of archives and data compression. Supposing you want to have the whole `test` directory packed in one file so that you can save it on a floppy disk as a backup copy or send it by e-mail. For this purpose, use the **tar** command (for tape archiver). With **tar --help**, you can view all the options for the **tar** command, the most important of which are explained here:

-c (for create) create a new archive

-t (for table) display the contents of an archive

-x (for extract) unpack the archive

-v (for verbose) show all files on screen while packing

-f (for file) allows you to choose a file name for the archive file This option must always be specified last, that is, before the name to be given to the archive.

To pack the `test` directory with all its files and subdirectories into an archive named Test.tar, we will definitely need the options **-c** and **-f**. As we wish to follow the progress of the archiving, we also enter the option **-v** which otherwise would not be necessary. First, use **cd** to change to your home directory where the `test` directory is found. Now you enter **tar -cvf Test.tar test**. Then look at the contents of the archive file with **tar - tf Test.tar**. The `test` directory with all the files and directories remains unchanged on your hard disk. To unpack the archive, enter **tar -xvf Test.tar**. Please do not do this yet, as we first want to compress the archive file to save storage space.

For compressing files, we recommend the popular gzip program. Enter **gzip Test.tar**. If you now enter **ls**, you will see that the file `Test.tar` has disappeared and that the file `Test.tar.gz` exists instead. This file is much smaller and, therefore, lends itself to sending via e-mail as well as fitting better on a disk.

Now let us return to unpacking. However, you should carry this out in the `test2` directory you set up earlier. To do this, use **cp Test.tar.gz test2** to copy the archive file into the `test2` directory. Now enter **cd test2**. To "unzip" a .tar.gz file, you use the **gunzip** command. Your input reads **gunzip Test.tar.gz**. You again have a `Test.tar` file. Now the archive must be reconstructed with **tar -xvf Test.tar**. By entering **ls** you will see that you now have a new `test` directory with the same contents as your old `test` directory in your home directory. You can save yourself some work here by leaving out the preceeding "unzipping" and adding **-z** to the tar command options instead. The command would then read **tar -xvzf Test.tar.gz**.

10.1.11 mtools

The **mtools** are a group of commands with which you can work on MS-DOS file systems. This is particularly important when you need to work directly with floppy disk drives. The floppy disk drive can, as is standard with MS-DOS, be addressed as **a:**. The commands are the same as in MS-DOS, but with **m** prefixed:

mdir a: displays the contents of the disk in drive `a:`

mcopy Testfile a: copies the file `Testfile` to the disk

mdel a:Testfile deletes `Testfile` on `a:`

mformat a: formats floppy disks to MS-DOS file system (with the help of the **fdformat** command).

mcd a: changes current directory to `a:`

mmd a:test creates the subdirectory `test` on the disk

mrd a:test deletes the subdirectory `test` from the disk

10.1.12 Cleaning Up

In this crash course, you now have learned the most important foundations for dealing with the shell. Following this chapter, you will find a list of the most important commands and abbreviations. Now it is time to experiment yourself. If you want to "play" around with the test directories and test files some more, you can go straight to the next section. However, if you want to clear up your home directory right now, you have two choices: either try to delete the files and directories yourself, for which you should now have the necessary knowledge, or go through the following steps.

- Enter **cd** to ensure that you are in your home directory.
- When you enter **ls**, you should see both the subdirectories `test` and `test2`. If the directories are not empty, you cannot delete them directly.
- With the **cd** command, change first to `test2`. Here you will find the file Test.tar and the subdirectory `test`.
- If you now enter **rm *** you will receive the error message: "rm: test: is a directory". Only `test.tar` is deleted.
- You must now delete the files and the subdirectory in `test`. For this, enter: **rm test/subdirectory/***.
- `subdirectory` is now empty and can be deleted with **rmdir test/subdirectory**. Note that for the deletion of directories or files you must use **rmdir** or **rm**, respectively.
- Now delete the files in **test** with **rm test/***.

- With **cd** you will once again reach your home directory and can, with **rmdir test2**, delete this directory.
- Following the same procedure, go on to `test`.

Now your home directory should look exactly the same as it did before our little exercise and you can go and set it up as you wish.

Have fun!

10.2 User Permissions

10.2.1 Introduction

Since its inception in the early 1990s, Linux has been developed as a multiuser system. Any number of users can work on it simultaneously. This resulted in some notable distinctions from the Microsoft end-user operating systems Windows.

Indeed the most important distinguishing feature is the necessity for each user to log in to the system before starting a session at their workstation. Each user has his or her own username with corresponding password. This differentiation of users guarantees that unauthorized users cannot see files for which they have no permission. Larger changes to the system, such as installing new programs, are also usually impossible or restricted for normal users. Only the ☞*Root*, or "Super User", has the unrestricted capacity to make changes to the system and has unlimited access to all files.

Whoever makes use of this concept wisely, only logging in with full `'root'` access when necessary, can cut back the risk of unintentional loss of data. Since under normal circumstances only the super user can delete system files or format hard disks, the threat from the "Trojan Horse Effect" or from accidentally entering destructive commands can be significantly reduced.

10.2.2 File System Permissions

Basically, every file in a Linux file system belongs to a user and a group. Both of these proprietary groups, along with "alien users", can be authorized to write, read, or execute these files.

A group, in this case, can be defined as a set of connected users with certain collective rights. We can call a group working on a certain project, `project3`, one group of users. Every user in a Linux system is a member of at least one proprietary group, normally `users`. There can be as many groups added to a system as needed, but only `'root'` is able to add groups. Every user can find out with the command **groups**, of which groups he is a member.

File Access

Take a closer look at the access structure in the file system. We can start with the files.

```
-rw-r-----   1 tux   project3   14197 Jun 21 15:03 Roadmap
```

The output of **`ls -l`** can read like this:

As is shown in the second column, this file belongs to user `'tux'` and is assigned to the group `project3`. In order to discover the user permissions of the `Roadmap` file, the first column must be examined more closely.

-	rw-	r--	---
Type	User permissions	Group permissions	Authorization for other users

This column is comprised of one leading character followed by nine characters grouped in threes. The first of the ten letters stands for the type of listed file system components. The dash (`-`) shows that this is a file. Here a directory (`d`), a link (`l`), and a block device (`b`), as well as a character device, could also be indicated.

The next three blocks follow a standard pattern: The first three characters refer to whether the file is readable (`r`) or not (`-`). A `w` in the middle portion symbolizes that the corresponding object can be edited and a dash (`-`) means it is not possible to write to the file. Furthermore, an `x` in the third position denotes that the object can be executed. Since the file in this example is a text file and not one that is executable, executable access for this particular file is not therefore not needed.

In our example, `'tux'` has, as owner of the file `Roadmap`, read (`r`) and write access (`w`) to it, but cannot execute it (`x`). The members of the group `project3` can read the file, but not change it or execute it. Other users do not have any access to this file.

With these security options, user `'tux'` can make sure that only authorized people (members of the working group) can read the file and that only he can change it, since he is the only member that has write access to it.

Directory Permissions

Let us look at access permissions for directories (those objects which have the type `d`). Here the significance of each type of access is a little bit different than the above example.

An example to illustrate this:

```
drwxrwxr-x   1 tux     project3      35 Jun 21 15:15 ProjectData
```

Here the owner (`'tux'`) and the owner group (`project3`) of the directory `ProjectData` is easy to recognize. In contrast to the file access permissions from 10.2.2 on the page before, the set reading permissions (`r`) means that the contents of the directory can be shown. The write permission (`w`) means new files can be created. The executable permission (x) means that the user can change to this directory. In the above example, this consequently means that the user `'tux'` as well as the members of the group `project3` can change

to the `ProjectData` directory (`x`), view the contents (`r`) and add new files to it (`w`). The rest of the users, on the other hand, are given less access. They may enter the directory (`x`) and browse through it (`r`), but not insert any new files (`w`).

10.2.3 Modifying File Permissions

Changing Access Permissions

The access permissions of a file or a directory can be altered by the owner (and by `'root'`, of course) with the command **chmod** which needs to be entered along with the parameters for the access permissions as well as the names of the files to be modified.

Both parameters are comprised of

1. the categories concerned
   - `u` (*user*) — owner of the file
   - `g` (*group*) — group that owns the file
   - `o` (*others*) — additional users (if no parameter is given, the changes apply to all categories)
2. a character for deletion (`-`), setting (`=`), or insertion (`+`)
3. the abbreviations we are already familiar with
   - `r` — *read*
   - `w` — *write*
   - `x` — *execute*
4. file name or names separated by empty characters

If, for example, the user `'tux'` in example 10.2.2 also wants to grant other users write (`w`) access to the directory `ProjectData`, he can do this by using the command:

```
newbie@earth:~ > chmod o+w ProjectData
```

If, however, he wants to deny all users other than himself write permissions, he can do this by entering the command

```
newbie@earth:~ > chmod go-w ProjectData
```

To prohibit all users from adding a new file to the folder `ProjectData`, enter

```
newbie@earth:~ > chmod -w ProjectData
```

Now not even the owner can write to the file, without first reestablishing write permissions.

Changing Ownership Permissions

Additional commands in this context are **chown** (CHange OWNner) and **chgrp** (CHange GRouP) which control the ownership of individual file system components.

The command **chown** serves to change the ownership of a given file. Only `'root'` can initiate these changes.

Suppose that the file `Roadmap` from Example 10.2.2 should not belong to `'tux'`, but to the user `'geeko'` instead. The appropriate command would be entered as user `'root'` as follows:

```
earth:~ # chown geeko Roadmap
```

chgrp is also fairly self-explanatory — it changes the group ownership of the file. You should remember, however, that the owner of the file must be a member of the new group.

In this way, the user `'tux'` from 10.2.2 can switch the group owning the file `ProjectData` to `project4` as long as he is a member of this new group, by entering

```
newbie@earth:~ > chgrp project4 ProjectData
```

These limitations do not present a problem for `'root'`.

10.3 Overview of the Most Important Linux Commands

In this section, we wish to give the reader insight into the most important commands of your SuSE Linux system. Besides the basic meaning of the individual commands, we will also draw your attention to some of the parameters and, where appropriate, introduce a typical sample application. For instance, if you wish to get more information on commands, you can do so with the **man** program, followed by the command as in:

```
newbie@earth: > man ls
```

In these ☞*Manual pages*, you can move up and down with (PgUp) and (PgDn) and move between the beginning and the end of a document with (Home) and (End). You can end this viewing mode by pressing (Q). You can learn more about the **man** command itself with **man**.

If you are interested in a complete summary of the different command line programs above and beyond what is in our listing, we recommend the O'Reilly publication "Linux in a Nutshell".

In the following overview, the individual command elements will be written in different typefaces.

- The actual command is always printed in **bold**. Without this, nothing can function.
- Options without which the respective program cannot function are printed in *italics*.
- Further details, for example filenames, which must be passed to a command for correct functioning, are written in the `Courier` font.
- Specifications or parameters that are not absolutely necessary are placed in `[brackets]`.

Adjust possible specifications to your needs. It makes no sense to write **ls file(s)**, if no file named `file(s)` actually exists. You can usually combine several parameters simply by writing **ls -la** instead of **ls -l -a**.

10.3.1 File Commands

File Administration

ls [option(s)] [file(s)]

When **ls** is called without further specifications and parameters, the contents of the current directory are listed in a short form.

Options:

-l detailed list
-a displays hidden files

cp [option(s)] *sourcefile targetfile*

Creates a copy of sourcefile in targetfile.

Options:

-i Waits for confirmation, if necessary, before an existing targetfile is overwritten
-r Copies recursively (includes subdirectories)

mv [option(s)] *sourcefile targetfile*

Places a copy of the sourcefile in targetfile and then deletes the original file.

Options:

-b Creates a backup copy of the sourcefile before moving
-i Waits for confirmation, if necessary, before an existing targetfile is overwritten

rm [option(s)] *file(s)*

Removes the specified file(s) from the file system. Directories will not be deleted by **rm**, except when explicitly specified with the parameter *-r*.

Options:

-r Also delete existing subdirectories
-i Waits for confirmation before deleting each file

ln [option(s)] *sourcefile targetfile*

Places an internal ☞*Link* to the sourcefile under a different name. This reference normally points directly to the position of the sourcefile within the file system. However, if **ln** is called with the -s option, a symbolic link is created which only points to the path of the sourcefile and therefore also works across file system borders.

Options:

-s Creates a symbolic link

cd [options(s)] [directory]

Changes the current directory. If only **cd** is entered without parameters, the command carries out a change to the user's ☞*Home directory*. Usually, however, the destination directory is specified. By the way, **cd ..** changes to the next higher directory (parent directory).

mkdir option(s)] *directoryname*

Creates a new directory.

rmdir [option(s)] directoryname

Deletes the specified directory, only if already empty. To delete directories still containing files, the **rm -r** command should be used.

chown [option(s)] username.group file(s)

Changes the owner of a file to the specified username and group.

Options:

-R Changes files and directories in all subdirectories.

chgrp [option(s)] groupname file(s)

Changes the name of the group which owns a given file to groupname. The file owner may only change this value if they are a member of both the previous and new owner group.

chmod [options] *mode file(s)*

Changes access permissions.

The mode parameter has three parts: group, access and access type. group accepts the following characters:

group options:

u user,
g group,
o others

+ and - are accepted by access, whereby access is granted by the + symbol and denied by the - symbol.

The access type is controlled by the following options:

Access type:

r read,
w write,
x eXecute – for executing files or changing to the directory.
s Set uid bit – the application or program is started as if it were being started by the owner of the file.

gzip [parameters] file(s)

This program compresses the contents of files through complicated mathematical procedures without loss of data. The names of the compressed files end in `.gz` and must be uncompressed before being used again. If you want to compress multiple files or entire directories, you will have to also use the command **tar**.

Options:

`-d` decompresses the packed gzip files so that they return to their original size and can be processed normally (like the command **gunzip**).

tar *options archive name file(s)*

tar normally combines one or more files together in one archive which can then, for example, be compressed. **tar** is a quite complex command which makes a number of options available. The most frequently used options will be briefly introduced here.

Options:

`-f` Writes the output to a file and not to the screen as is usually the case
`-c` Creates a new tar archive
`-r` Adds files to an already existing archive
`-t` Outputs the contents of an archive
`-u` Adds files, but only if they are newer than the files already contained in the archive
`-x` Unpacks files from an archive ("extraction")
`-z` Packs the resulting archive with **gzip**
`-I` Compress the resulting archive with **bzip2**
`-v` Outputs the names of all edited files

The archive files created by **tar** end with `.tar`. If the tar archive was also compressed using **gzip**, the ending is `.tgz` or `tar.gz`. If it was compressed using **bzip2**, `tar.bz2`.

Sample applications can be found in Section 10.1.10 on page 137.

locate *pattern(s)*

With locate, you can find out in which directory a specific file is located. You can also make use of ☞*Wild cards*. The program works very quickly as it is not searching slowly through the file system itself, but through a database specifically created for this purpose. This is also the main problem with this very fast command. No files created after the last update of this database can be listed.

The database can be generated by `'root'` with **updatedb**.

updatedb `[options(s)]`

This command allows the database needed by locate to be easily brought to the most up-to-date state. In order to register the largest possible number of files, the program should be called by `'root'`. It also makes sense to place it into the background by appending an ampersand (**&**) so you can

immediately continue working (**updatedb &**).

find [option(s)]

With the **find** command, you can look for a file in a certain directory. The first argument represents the directory from which the search is to start. The option **-name** requires a string search where ☞*Wild cards* are also permitted. Unlike locate, **find** actually searches the directory specified, not just in its own database.

Contents Commands

cat [option(s)] file(s)

The **cat** command outputs the contents of a specified file without interruption.

Options:

-n Numbers the output on the left margin

less [option(s)] file(s)

This command allows you to "browse" through the contents of specific files. For example, you can move half a page up or down with (PgDn) and (PgUp), and a whole page forward with the spacebar. You can also move to the beginning or end of a document with (Home) or (End). You can end the output mode with (Q).

grep [option(s)] searchword file(s)

grep is designed to find a certain searchword in the given file[s]. If successful, it displays the line in which the searchword was found as well as the name of the file.

Options:

-i Ignores upper/lower case spelling
-l Only displays the names of the respective files, but not the text lines
-n Additionally displays the numbers of the lines in which it found a hit
-l Only lists the files in which *searchword* does **not** occur

diff [option(s)] file1file2

The diff command was created to compare the contents of any two selected files and display them in the form of a list of modified lines.

This is frequently used by programmers who need only send their program alterations in this way, and not the entire source code.

Options:

-q Only reports **whether** the two given files differ

File Systems

mount [option(s)] [<device>] mountpoint

Any data medium can be "mounted" in the file system using this command. Mounting means the integration of hard disks, CD-ROMs and other drives in a directory of the Linux file system.

Options:

-r mount read-only

-t filesystem Specifies the file system. The most common are: ext2 for Linux hard disks, msdos for MS-DOS media, vfat for the Windows file system and iso9660 for CDs.

For hard disks which are not defined in the file /etc/fstab, the device type must also be specified. In this case, only 'root' can mount. If the file system should also be mounted by other users, enter the option user in the appropriate line in the /etc/fstab file (separated by commas) and save this change. Further information is available in manpage for **mount** (**man mount**).

umount [option(s)] mountpoint

This command removes a mounted drive from the file system. Before you remove a data medium from the drive, please call up this command. Otherwise you may run the risk of data loss! Only 'root' can **mount** and **umount**. Exception: When the option user is given permissions for the drive in the /etc/fstab file.

10.3.2 System Commands

Information

df [option(s)] [directory]

The **df** (disk free) command, called without options, displays statistics about the entire disk space, disk space used, and disk space available on all the mounted drives. If a directory is specified instead, the drive on which it is located will be shown in the statistics.

Options:

-H shows the number of occupied blocks in gigabytes, megabytes, or kilobytes — in "human readable" format

-t Type of drive (ext2, nfs, etc.)

du [option(s)] [path]

When called without parameters, this command shows the total disk space used by all files contained in the current directory. If subdirectories exist, their total sizes will be listed as well.

Options:

-a Displays the size of each individual file

`-h` Output in human-readable form
`-s` Displays only the calculated total size

free `[option(s)]`

free displays the sum of the total and the working memory being used as well as the swap space.

date `[option(s)]`

This small program displays the current system time when called. As `'root'` you can also use this command to change the system time. Details can be found in the man page.

Processes

top `[options(s)]`

top displays a quick overview of the currently running ☞*Processes*. By pressing (H), a page of the most important options with explanations is displayed, allowing the program to be adapted to the individual needs of the user.

ps `[option(s)] [process ID]`

When called without options, this command returns a table of all "your own", that is user-started programs or processes. Please note that **no** prefixed hyphen should be used with the options to this command.

Options:

`aux` Displays a detailed list of all processes, independent of the owner.

kill `[option(s)] process ID`

Though the Linux system itself may be considered fairly stable, there are unfortunately always (mostly poorly programmed) programs which do not close down in the normal way. With the **kill** command, nearly all process "corpses", identified by their process IDs (see top and ps), can be "killed". It sends a so-called "TERM" signal which instructs the program to shut itself down. If this does not help, there is one more useful parameter...

Options:

`-9` Sends a "KILL" signal instead of a "TERM" signal, whereby the process really is "annihilated" by the operating system. This brings the specific processes to an end in almost all cases.

killall `[option(s)] processname`

This command functions similar to **kill**, but, instead of a process ID, the specification of a process name is sufficient to "kill" all processes of that name.

Network

ping `[option(s)] hostname or IP address`

ping is strictly a means of examining TCP/IP networks for their basic functional efficiency. The tool sends a small data package to another computer with the instruction to send it back immediately. If this works, ping displays an appropriate message that the network is essentially up and running.

Options:

`-c number` Determines the total number of packages to be sent and ends after they have been dispatched. By default, there is no limitation set.

`-f` "flood ping"; sends as many data packages as possible. A popular means, reserved to `'root'`, to test networks.

`-i value` Specifies the interval between two data packages in seconds; default: one second

nslookup

The "Domain Name System" converts domain names to IP addresses. This tool allows queries to be made to the corresponding information services (DNS servers)

telnet `[option(s)] hostname/IP address`

Telnet is actually an Internet protocol which enables you to work with other computers across a network. Telnet, however, is also the name of a Linux program which interprets exactly the same protocol and enables you to work with other computers without having to physically sit at the respective console.

Please take care, however, not to use telnet via a network on which third parties can "eavesdrop." Particularly on the Internet, you should use encrypted transfer methods, such as **ssh**, to avoid the risk of malicious misuse of a password (see the man page for **ssh**).

Miscellaneous

passwd `[option(s)] [username]`

Every user can change their own password at any time with this command. Also the super user `'root'` may use it to change the password of any user.

su `[option(s)] [username]`

su allows you to change user login during a session. Called without further parameters, the command prompts you for the root password and, if you enter it correctly, grants supervisor rights. Also, after entering a username and the correct password of a user, you can use the environment of that user. Incidentally, as ☞*Root*, you do not need to enter this password. With supervisor permissions, you can simply assume the identity of every user.

halt `[option(s)]`

To avoid the risk of data loss, you should always shut down the computer with this program.

reboot [Option(s)]

Functions in the same way as the **halt** command, but the computer is immediately rebooted.

clear

From time to time, the console may become cluttered with text lines to the point that a "cleanup" is required. This command does not have any options.

10.4 The vi Editor

Operating the **vi** editor takes some getting used to. For many, it is the preferred editor because, for one, it is available on any UNIX-like operating system and is included in default Linux installations. Also, if nothing else works, **vi** will.

The short instructions which follow should enable you to edit various configuration files, among many other types of files, with the help of **vi**.

Concept:

vi recognizes 3 operating modes:

- *Command mode:* Keys are interpreted as command elements.
- *Insert mode:* Key are interpreted as text entries.
- *Last line mode:* For more complex commands which are edited in the last line.

The most important commands in command mode are:

i	Changes to insert mode (characters will appear at the current cursor position).
a	Changes to insert mode (characters will appear *after* the current cursor position).
A	Changes to insert mode (characters will be added at the end of the line).
R	Changes to command mode (overwrites the old text).
r	Changes to insert mode and overwrites *each* character.
s	Changes to insert mode (the character where the cursor is positioned will be replaced by the next entry you make).
C	Changes to insert mode (the rest of the line is replaced by the new text).
o	Changes to insert mode (a new line will be inserted *following* the current one).
O	Changes to insert mode (a new line will be inserted *preceding* the current one).
x	deletes the current character.
dd	deletes the current line.
dw	deletes up to the end of the current word.

`cw`	Changes to insert mode (the rest of the current word is overwritten by the next entries you make).
`u`	undoes the last command.
`J`	joins the following line with the current one.
`.`	repeats the last command.
`:`	changes to last line mode.

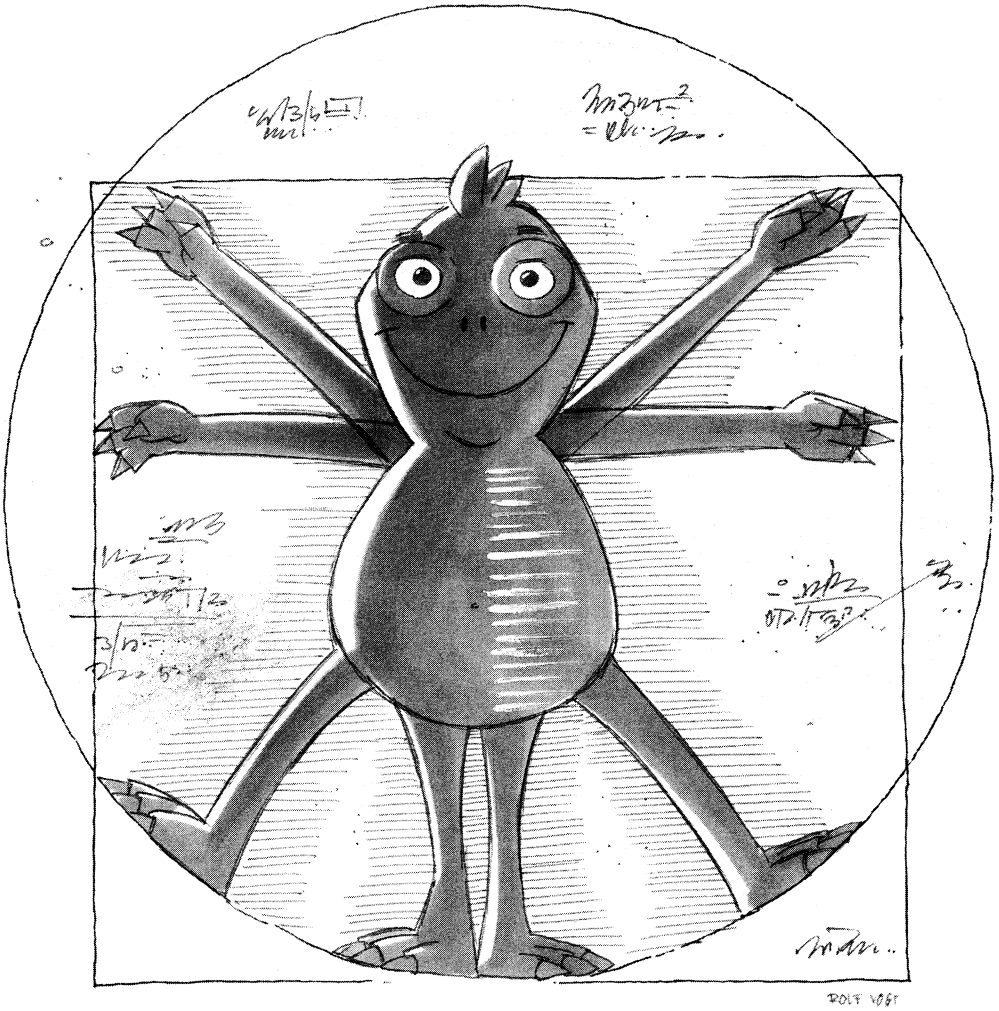
A number can be added to the front of each command which will specify the number of objects the command should affect. Thus, you can delete three words at once by entering `'3dw'`. By entering `'10x'`, you can delete ten characters after the cursor position, `'20dd'`, the last 20 lines.

The most important commands in last line mode are:

`:q!`	exits vi without saving any changes
`:w <filename>`	saves at <filename>
`:x`	saves the modified file and exits the editor
`:e <filename>`	edits (loads) <filename>
`:u`	undoes the last edit command

Table 10.2: Complexe commands in the vi editor

You will switch to command mode by pressing (ESC).



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11 Ergonomics in the Workplace

The source literature for this text about "ergonomic workplace layout" is not a substitute for studying the respective standards. This literature will not be individually cited. To preserve readability, literature references are completely omitted. The author has made an attempt to summarize the latest research findings in a short and concise manner, however, much will remain unmentioned. The items referred to in each section are mostly gathered from German literature and are almost always based on regulations and policies in the Federal Republic of Germany. These are often valid in a similar form in all of Europe in the scope of the unification of European and international standards.

This issue especially becomes relevant as the health protection and safety regulations for monitor devices go into effect (Monitor and Screen Provisions). These regulations were developed based on EU guidelines and stipulate the minimum safety requirements for designing monitor workstations. In the Federal Republic of Germany, older workstations had to be brought up to these standards as of 12 December 1999. However, as of yet, these changes may still not have taken place in many work sites.

11.1 Practical Ergonomics for Everyday Use

11.1.1 The Working Environment

If ergonomics specialists examined the home workstations of computer users systematically, they would probably burst into tears at the sight of the most curious constructions. Unfortunately, no standard has yet prevented individual users from buying so-called "special computer tables". The low-priced metal-tube frames with "practical rollers" (little stability), "ergonomically retractable keyboard tray" (no wrist pad), "integrated PC case holder and printer stand with paper mounting" (little stacking space and sometimes little legroom), "swiveling mouse pad" (unstable and insufficient working space), and "good view of the screen" (too close, too high) allow you to use a computer for a short time only. They should not be used at professional terminal workstations as they hardly meet any criteria of the corresponding standards. You will not find much of this kind of computer furniture in professional computer equipment catalogs, because manufacturers indirectly keep an eye on the employees' health by observing the minimum standards of computer workstations. Note that the term "minimum standards" means that they could be improved.

11.1.1.1 The Right Desk

A table at the wrong height strains arm and back muscles. The resulting cramped posture especially strains the spine. Apart from this, too little leg room can force an unnatural body posture and cause disorders to the blood supply.

Choosing the right table is very easy. It should be as wide and deep as possible. An individual adjustment of the table height would be optimal. Working tables at which you can change between sitting and standing by turning the table board into a writing stand, often just at the push of a button, are a luxury, but changing between a sitting and standing position brings relief.

- The flexible arrangement of working materials requires a table board of at least 160 x 80 cm.
- Workstations made of several interlinked boards are recommended.
- Tables that cannot be vertically adjusted must be 72 cm high, tables which are vertically adjustable must be between 68 and 76 cm high. An adjustable height is not stipulated in Germany, although this would be ergonomically useful.
- The DIN standard requires even more width for certain working tasks such as CAD workstations. When changing between screen work and other kinds of work, at least 200 cm is required.
- There should be at least 60 cm leg room. Previous experience has shown, however, that leg room stipulated by standard is too little.
- When using large screens, tables should be 100 or even 120 cm deep.
- The table surface should not be in bright colors and should have only little reflection. A lot of office furniture is available in a subdued grey only.

11.1.1.2 Sitting Correctly on the Right Working Chair

Sitting in a working chair makes you sit in a static posture rather than in a slouching position, such as in an easy chair. Constant sitting in the wrong position, such as bending forward or twisting to the side can harm the respiratory and digestive organs. This leads to premature fatigue, circulatory disturbances, and backache resulting from overstraining the spine and the vertebrate disks. In extreme cases, years of sitting in the wrong position can lead to muscular and skeletal illnesses.

Correct sitting means a frequent change of posture. Different parts of the body are then constantly being used. Basically, it is a question of the correct adjustment. The height of your working chair is best when your forearms lying on the table are at right angles to your upper arms. You should be able to place your feet completely on the floor and your thighs and lower legs should also be at right angles. Gymnastic balls and balancing chairs offer an alternative to conventional seating arrangements

Unfortunately, a good chair, constructed according to ergonomic criteria, is relatively expensive, but the investment in your health is worth it.

Important features of a good chair include:

- a backrest reaching to the shoulder blades and the kinetic resistance of which is individually adjustable
- support for the lumbar spinal column
- a seat which is also adjustable and can be tilted forwards or backwards
- automatic regulation of backrest and seat to retain an ideal angle
- springs which softly cushion the weight when sitting down
- stability provided with the help of at least five foot legs with rollers which are restrained when you stand
- adjustable height of the seat (according to standards, 42 to 53 cm) and backrest
- individual adjustment of arm rests, if there are any (luxury)
- a footrest, if your feet do not reach the floor

11.1.1.3 Good Lighting for Productive Work

Generally speaking, workplace lighting does not come close to the intensity of light outdoors. This difference is unnoticed because the human faculty of perception is very flexible. The influence of lighting conditions on our own efficiency is often underestimated. If the light is too bright, you cannot see what is on the screen. If it is too dark, sharpness of vision decreases. The wrong lighting thus overstrains our visual system and, eventually, causes symptoms of fatigue and stress.

It is assumed that a combination of general lighting and individual workstation lighting is best. For the workstation at home, the combination of a high-powered ceiling lamp (500 watts, preferably with a dimmer) and one or two workplace lamps is recommended. The fluorescent lamps usually found in offices for general lighting should be supplemented by individual workstation lamps. The lighting should, however, not be too intense and be individually adjustable. Stark contrasts should be avoided. Be careful with strong desk lamps. Here again, good illumination is, unfortunately, very expensive and the minimum requirements of lighting can also be fulfilled with cheaper illumination layouts.

However, individual sources of light are often problematic. If they are too strong, the contrast with the general lighting will be too apparent. Harmonizing, flowing transitions are considered more pleasant.

Keep the following points in mind when planning workstation lighting:

- First of all, it is important that you are exposed to daylight. A view outside is important.
- General lighting is considered to be pleasant if is not below 250 lx (usually 500 lx is required, 1000 lx for an open plan office).
- 500–750 lx should be emitted by the individual workstation lighting.

- The lighting should not flicker. In the case of worn-out fluorescent lamps, a flickering can sometimes be noticed from the corner of the eye.
- Avoid dark shadows.
- Ceiling lights should emit light diagonally from above. Lighting strips should be set perpendicular to the screen table. The line of sight at the screen table should thus run parallel to the lighting strips.
- Whether the lighting is considered to be pleasant or not depends on the color temperature and light color of the lamp type. Warm white or neutral white is recommended.
- The light requirement depends not only on the working task, but also on one's age: older people need more light. The fact that older people often have only a small lamp in their homes has nothing to do with their light requirement, but rather with the fact that they wish to save electricity.
- A screen workstation near daylight requires optimum shielding against direct and reflex glare, especially when the line of sight is directly out the window or at a 45° angle to it. The built-in antiglare facilities should be variable. Under no circumstances should artificial illumination cause reflex glare on the screen.

11.1.1.4 Optimum Climate

The room climate determines our well-being to a great extent. Problems arise more often if it is too cold, too warm, too drafty, or too dry. Low relative humidity can lead to burning eyes, dry mucous membranes, skin irritations, and increased susceptibility to colds. Things get complicated when people who work in the same room are accustomed to different basic temperatures.

For your well-being, it is important to observe the recommended basic values for temperature and humidity and to avoid strong air movement. The working material itself should not contribute to the increase of temperature.

- For activities in a sitting position or simple work, a room temperature of 20 to 22 °C is recommended. In summer, the temperature should be 26 °C at the most. This value should only be exceeded for a short time when the outdoor temperature is higher.
- Keep in mind that a lot of equipment, as well as people, emit heat and influence room air conditions. This should be reduced as much as possible.
- Humidity should be between 40 (sometimes 50) and 65 percent and should be checked. This value is especially influenced by central heating.
- Draft (possibly from open windows and doors or air conditioning) should not exceed 0.1 to 0.15 m/s. Draft on individual parts of the body should be avoided.
- An air conditioner should be individually adjustable. It should be serviced regularly.

- The windows should be able to be opened and have sunshades to avoid glare effects. Sunlight can heat up the room temperature considerably. Sunshades attached to the outside of the building provide the best protection.

- Plants can improve room conditions and are therefore recommended in all cases. They increase the relative humidity and filter pollutants from the air.

11.1.1.5 Too Much Noise Causes Stress

Noise is a physically powerful stress factor. Even though it is often played down, too much noise makes you ill. Apart from health impairments, such as defective hearing, vegetative disorders, and psychic changes, noise affects our efficiency by impairing our ability to concentrate. Furthermore, discontent can reduce working motivation. The fact that proper noise abatement can possibly cost a lot of money is also problematic.

A calm working environment improves efficiency. Work at terminal workstations is often characterized as "mental activity". Therefore the maximum load value for scientific work or programming is 55 dB (A). The dB (A) represent a weighted evaluation of the acoustic pressure. The A-filter curve most resembles human perception. An increase of the sound level by 10 dB (A) is normally perceived as a duplication of volume.

- Since mainly mental work is done at terminal workstations, quiet working materials should be used from the start.

- The maximum limiting value for office work is 55 dB (A). With especially high mental demands or necessary communication of language, as low as 35–45 dB (A) is required. This is the case, for instance, for specialized work, scientific work, or programming.

- Furthermore, the evaluation level of a maximum of 55 dB (A) is important. If 70 dB (A) is measured for a quarter of an hour, the noise in the remaining time should be less than or equal to 55 dB (A).

- Workstations can be equipped with dividing walls, sound-absorbing floors, appropriately wallpapered walls, curtains, and other sound-dampening devices.

- Loud working equipment, such as matrix printers needed for copies in some companies, should be installed in sound-absorbing cases. The permissible noise levels for office equipment are determined in the DIN standards.

- An air conditioner should not increase the normal noise level.

- Strain caused by excessive noise can also be reduced by an organizational restructuring of work.

11.1.2 Office Equipment

11.1.2.1 Buying a Screen

If you already have poor sharpness of vision, low-quality screens can make things even worse. Apart from eye problems, tenseness, fatigue, and many other disorders can be caused.

The latest technological developments are triniton, or black-matrix screens as well as TFT flat screens. Unfortunately, flat screens are still relatively expensive. There are extensive standards which regulate the readability of the depicted information. Good screens have a GS-seal in Germany and additionally meet other — not absolutely stipulated — standards like TCO 99 (low-radiation). When buying a screen, it is recommended that you study the extensive standards in order to avoid a wrong purchase. One thing is certain: a good screen is usually expensive. The normal tube screens do not last for ever. They only retain their focus and contrast for a few years.

- All depicted characters should be sharply defined and clearly legible up to the edges of the screen, a positive representation (dark characters on a light background, such as in a book) is recommended.
- As the depicted characters must be large enough, a 17-inch monitor is recommended, at least for graphical user interfaces (like KDE). For the processing of CAD, layout, and graphics, it should be 21 inches.
- It is especially important that the screen does not flicker. In concrete terms this means with 15-inch monitors the minimum sync frequency should be at least 73 Hz. However, 85 Hz are recommended. For larger screens, such as 21-inch, 100 Hz.
- Luminosity and contrast should be variable. The focus of the characters should not differ with adjustments of brightness or contrast.
- The image should be free from distortion and show no color errors.
- To avoid reflex glare, a good antireflective coating of the screen surface is recommended.
- The screen should be rotatable and inclinable. A vertical adjustment is recommended.
- Color representation leads to a better intake of the information shown. However, the display of colors can also overstrain the eyes because different colors are broken up differently by the lenses. For red colors we are farsighted and for blue colors we are nearsighted. Older screens often have convergence errors, the three beams of the screen tube are no longer justified exactly, so colored edges form around letters, for example.
- Electromagnetic radiation emitting from the screen should be kept to a minimum. The observance of the Swedish standard MPR II is recommended. TCO 99 is the strictest standard at the moment for this.

11.1.2.2 Screen Location

A screen put up in the wrong place leads to a cramped posture at work, which, as we have seen, can cause illnesses.

A work table that has insufficient depth often prevents the screen from being placed reasonably. The natural position of the head and arms is designed for work that lies in front of us. Ergonomics specialists have developed their own guidelines for the so-called "vision and gripping area." These reject placing the screen on the side. An exception is only when the screen is rarely used. A reason for this placement is the fact that even the required minimum 80 cm worktable depth is insufficient with a large screen and the use of working documents. Often the screen is placed — as shown in many PC manual pictures — on top of the computer case. This also leads to an unnatural posture. Observe yourself while you are reading. Are you looking straight ahead or slightly down?

- Shoulder, keyboard, and screen should be in one line so you always look directly at the screen. This rule that does not necessarily have to be observed all the time.
- Ultimately the workstation should be individually adapted to the person and the working task. Flexibility is the key. Easily movable, rotatable, and, ideally, screens that retract into the table are encouraged.
- A comfortable visual distance varies individually. At least 50 cm is required. Some people need considerably more.
- It is a good idea for users to look away from the screen from time to time. In this way, their eyes can adapt to a different distance.
- If a document is being typed in, it should be at the same distance as the screen to avoid frequent changes of focus.
- The difference in luminance between the direct working area, the screen, and the immediately surrounding areas, such as the screen case, should not be more than three to one. For this reason, computer cases in offices are not black. The difference between the working area and the surroundings should not be more than ten to one. Shiny areas create large differences of luminance. This is why office furniture is not available in bright colors and has a matt surface.
- In order to minimize the reflex glare on the screen, the screen and the keyboard should be arranged in such a way that the line of vision is parallel to window panes. The further the screen is away from the window, the better.
- The screen should not be directly under a lighting strip, but to the side of it. The line of vision should be parallel to the lighting strip.

11.1.2.3 The Keyboard and the Wrists

It has been well-known for some time that the keyboard arrangement derived from the typewriter is not necessarily ergonomic. During typing, the fingers,

hands, arms, and shoulder-area are strained. This leads to tenseness. All the strain caused by a keyboard of inferior quality adds up over time. Unfortunately the micromovements produced while typing are very difficult to measure. The RSI syndrome is a risk.

The keyboard is, without doubt, the input device of the computer which is used most. Therefore it must be especially well constructed. Ergonomic specialists are always criticizing the fact that (Shift ⇧) keys and (Enter) keys are too small. Another basic problem is the cable which is often too short, preventing a comfortable individual placement. The question arises why so many people are willing to spend a thousand dollars on a PC, but only twenty dollars on an appropriate keyboard. You should actually also buy an extension cord along with your keyboard.

- The keyboard should be separate from the screen. It should also be inclinable, but set in a stable position (sufficiently large and rubber-coated feet).
- The middle key row should not be more than 30 mm above the surface of the table.
- There should be room to rest your hands in front of the keyboard. If there is no built-in wrist pad, get one.
- The marking must contrast with the color of the plastic and be easy to read. The keyboard should have no intense color and a satin-matt finish. For the keyboard legend, a dark script on a light background is recommended. Black keys are not ergonomic.
- The form of the keys should enable light and accurate typing. The lift of key should be 2–4 mm and the working point should be distinctly felt. Here 50–80 g is recommended as the force of the key depression stroke.
- Those who type a lot should take regular breaks.
- Learning the touch system helps because the workload is distributed across all fingers.
- Split or individually separable keyboards are something to which you have to get accustomed, but nevertheless are an alternative worth considering. They have been constructed according to the latest ergonomic findings and are already recommended in some standards. They prevent wrist strain to the side.
- The keyboard of a notebook or laptop cannot correspond to the standards because of the crowded keys. A notebook should therefore not be used as workstation equipment unless it is linked to an external keyboard and mouse.

11.1.2.4 Liberating the Mouse

Due to the advance of graphical user interfaces, one is practically forced to use a mouse nowadays. The intensive use of the mouse can cause not only fatigue,

but also disorder in the hand-arm-shoulder area. An example of this is RSI. The danger increases when a "bad" mouse is used.

No proper standards yet exist for an ergonomic mouse. Often a PC is sold with the standard mouse. This should certainly be looked at considered closely. Is the mouse really suitable or should it be replaced by a better one? Have the dealer unpack several mice for you to try. In any case, the cable is probably too short. Ask the dealer to give you an extension.

Evaluate your own mouse use. Can you be retrained? Professional programs with a lot of interaction do without any mouse clicks. First you have to learn how to use shortcuts to operate programs, but you can work up to four times as fast. Often a combination of mouse and keyboard operation is recommended.

- The ergonomic mouse feels good in your hand. The keys should not be too close or too small. There are even mice for children's hands.
- Your fingers should be able to rest on the keys in a relaxed position.
- The mouse should be next to the keyboard. Left-handed users have an advantage because the keyboard has several function keys and the numerical key block between letter keys and a mouse on the right side. These extend the gripping distance. If you are left-handed, get a mouse for left-handers.
- Learning keyboard codes reduces the workload on the complete arm. And an arm-shoulder area strengthened by the appropriate physical training can deal better with overstrain for a short time.
- The cable should be long enough. If necessary, an extension has to be purchased. A wireless mouse is a luxury, of course.
- The mouse needs a proper base to function well. Get a good mouse pad.
- Pay attention to the mouse driver. Good mice have mouse drivers with a multitude of functions. You can, for example, adjust the cursor movement exactly according to your requirements or allocate special instructions to the different mouse keys. The double-click might be placed on the middle key with the mouse driver.
- Make sure you adjust the acceleration and double click adjustment of the mouse to your own preferences. Some people work with the mouse from the hand joint. Others prefer moving their complete forearm.
- An alternative to the mouse is a trackball. Here, you move a ball inside a stationary casing to control the mouse pointer. In contrast to the mouse, the trackball reduces the movements in the hand and arm area.

11.2 Links and Literature

A great manual for staff members and superiors with many checklists and questionnaires, taking the mental strain into account:

Burmester, M., Görner, C., Hacker, W., Kärcher, M. and others (1997). The SANUS-manual. Screen work EU-conform (- research - FB 760). Berlin: Series of the Federal Office for Work Protection and Work Medicine. [SANUS: Safety and health protection at terminal work on the basis of international standards]

A clear and well-structured guide for analysis and work protection tasks around the terminal workstation:

Richenhagen, G., Prümper, J. & Wagner, J. (1998, 2nd edition). Handbuch der Bildschirmarbeit (trans: Manual of terminal work). Neuwied: Luchterhand.

An extensive collection for work and health with all important information on the latest German or international standards. Highly recommended, but unfortunately only in German: `http://europe.osha.eu.int/`


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12 Help and Documentation

You probably have a number of questions concerning your SuSE Linux system. An answer is already available for most of these questions. You can find a wealth of documentation in the classical formats: man pages, info pages, HOWTOs, READMEs, FAQs, and more. SuSE Help combines all these formats within one system and makes them more systematic. Together with comprehensive search performance, this should provide the answers to your questions. This chapter introduces SuSE Help and provide an overview of the traditional documentation sources.

12.1 SuSE Help

SuSE Help can be started with the lifesaver icon (the one with the integrated Geeko) in the control panel on the KDE desktop or via the '`SuSE Help`' item — depending on what is installed — in the K Menu or in the SuSE menu.

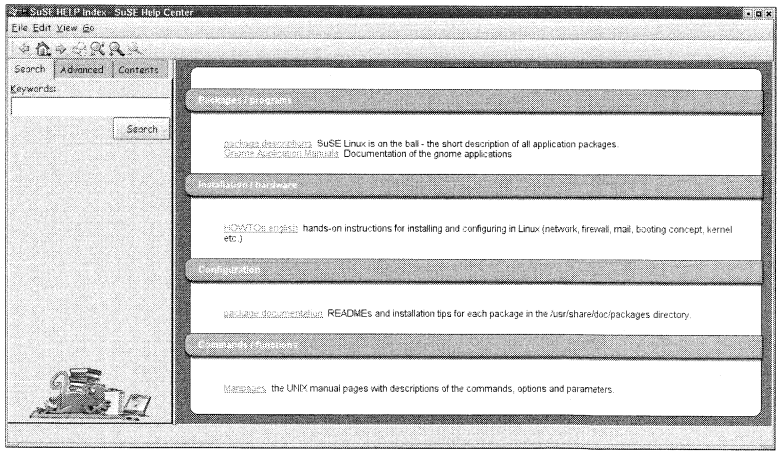

Figure 12.1: The SuSE Help Home Page

Users of other desktops can view SuSE Help in any browser. To this end, the package `apache`, series `n` will have to be installed. See Section 4.3.3 on page 75.

Start SuSE Help outside KDE by entering **`help`** in a console or with the URL `http:/localhost/hilfe/index.html.en` in a browser.

Note

package `inf2htm`, series `doc` is required to display SuSE Help as "documentation server" in HTML format. Instructions for configuring your help system as a documentation server on an intranet can be found at `/usr/share/doc/packages/susehelp/README`.

12.1.1 Working with SuSE Help

Individual search settings are made in the left window panel. View the search results in the right panel in the form of a list of links to the documents found. This list is normally restricted to ten entries per documentation source and ordered according to priority. Refer to Section 2.1.3 on page 18 to configure SuSE Help.

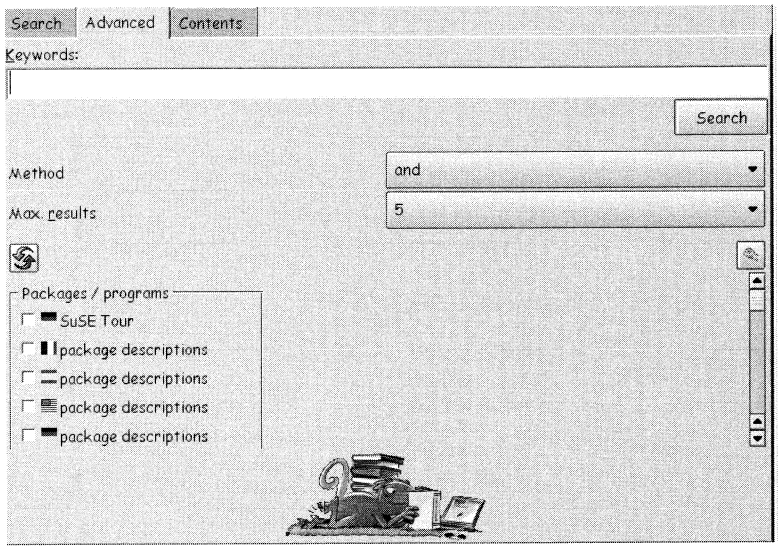

Figure 12.2: Advanced Search

Home page After starting SuSE Help, you will see an overview in the right window panel of the subject categories described in the following under which the installed documentation sources are categorized. Open a listed documentation source by clicking on it. Access the summary page at any time by clicking on the '`Home`' button.

Packages / Applications

- '`Package Descriptions`' — Find short descriptions of each application package in SuSE Linux, regardless of whether it is installed. Obtain a summary of all the available packages and their related information, such as the hard disk space required.

- 'SuSE Applications' — Obtain an introduction to applications designed for daily tasks on your PC (office, e-mail, graphics, and others) — the SuSE *Applications Manual* in html format.
- 'KDE Applications' — Provides information on all KDE applications.
- '/usr/share/doc/packages' — The classic Linux documentation directory containing documentation on application packages.

Installation / Hardware

- 'SuSE Reference' — Provides basic instructions on installation, network configuration, graphical user interfaces, and more — the SuSE manual in electronic form.
- 'SDB' — This link points to the locally installed support database and provides solutions to known problems (see Section 12.3).
- 'HOWTOs' — Offers hands-on installation and configuration instructions for Linux.

Configuration

- 'SuSE Configuration' — The configuration manual for KDE and SuSE Linux includes modem, sound, TV card, scanner configuration, and more. It also provides information about system administration.
- 'SuSE Network' — Basic configuration instructions for networks: intranet, Internet, server services (Apache and proxy), and security solutions.
- 'KDE Help' — Find everything you need to know about KDE. For example, find information about installation or configuring the graphical user interface.

Commands / Functions

- 'Man Pages' — UNIX system "manual pages" describe commands as well as options and parameters (see Section 12.4).
- 'Info Pages' — These help pages provide explanations and examples for using complex Linux commands and libraries. They describe the utilization of these items (see Section 12.5).

Searching documents In the left window panel, find the tabs 'Search', 'Advanced', and 'Contents' (see Figure 12.2).

- 'Search' — For basic searches, enter the search word and click 'Search'. Normally, as long as they are installed and you have not specifically disabled the setup of the search database (see page 18), the package descriptions, all SuSE manuals (Reference, Network, Configuration, Applications), KDE Help, and the Support Database (SDB) will all be searched.

  The label of the 'Search' button will change to 'Next' after you click on it. When you click again, any remaining data sources will also be searched.

- 'Advanced' — This tab allows a refined search using several options. If you have entered at least two keywords, select via 'Method' if both ("and") or at least one of ("or") the keywords should appear in the document. 'Max. results' limits the display to one entry per source for the purpose of obtaining an additional summary of the found entries or lets you view all the finds for each documentation source at once. For example, select "5" to only see the five most important entries for each documentation source. Reverse your selection using the button containing the two arrows.

  The list shown can be expanded or restricted for further documentation sources by adding or removing index databases via the tool button; see page 18. The little flags symbolize the language of the documentation texts. Select the language from the list of available sources to be searched for the keyword by checking the box in front of the corresponding source.

  Once you have completed the settings, click 'Search'. The search results are displayed to the right, ordered according to subject categories.

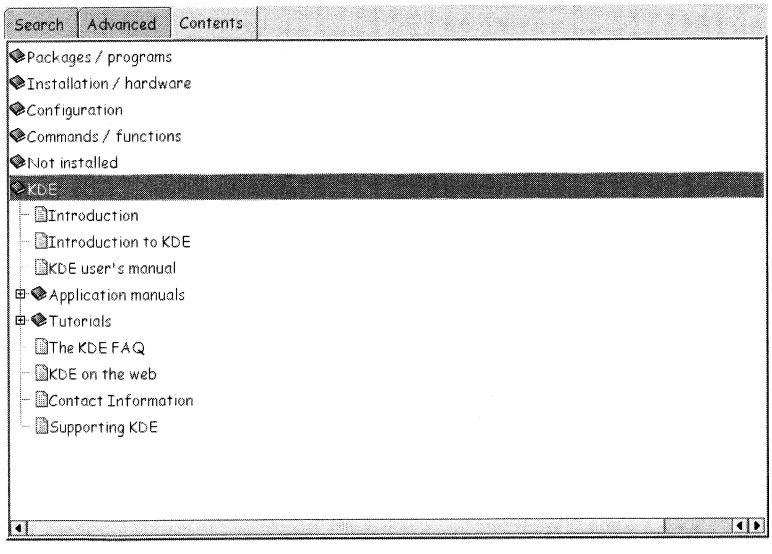

Figure 12.3: The Content Search in SuSE Help

- 'Contents' — The subject categories of the start page can be seen listed here (see Figure 12.3 on the facing page). View the documentation sources belonging to each subject category by clicking on the subject area with the mouse. Click again and the subject category will close. If you click on the documentation source, the corresponding text will appear in the right-hand window.

  In addition, this provides the only access to the KDE 'Tutors', which help you learn the KDE terminology and makes it easier to use KDE Help.

  To install additional documentation sources, click on 'Non-installed documentation' and select the corresponding documentation package from this list.

12.2 KDE Help

KDE Help contains information on KDE and its applications, as well as on configuring the graphical desktop. It is completely integrated with SuSE Help. See Figure 12.3 on the preceding page. If you prefer the original "KDE Help Center", start it with the lifesaver (without the Geeko) or under 'Help' in the 'K Menu'.

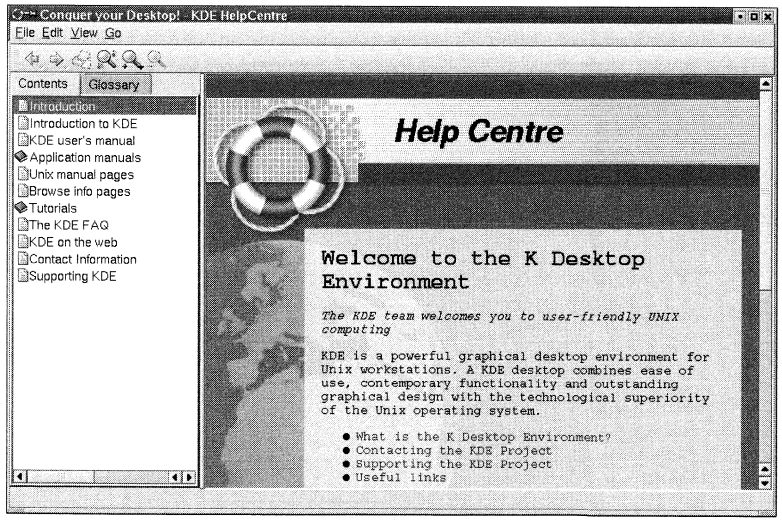

Figure 12.4: The KDE Help Home Page

The search function of the "KDE Help Center" can only be used after a keyword directory is generated. To do this, you may also need to install an additional package: package htdig, series n. Following that, click on the button 'Update keyword directory' under the 'Search' tab.

12.3 Support Database

We have already found answers and solutions to many potential problems. These are available online in the numerous articles located in our Support Database: `http://sdb.suse.de/en/sdb/html/index.html`. You can also find the contents of the Support Database in the package `sdb_en`, series `doc`, included on the SuSE Linux CDs. Read the articles using any browser.

Tip

Enter the command **`sdb:`** in the URL field in Konqueror followed by the keyword to start the Support Database and search quickly.

12.4 Manual Pages

Manual pages are the traditional way to access descriptions of application usage and commands (such as C functions) in UNIX. All parameters and options which specify the command will be included.

Man pages are divided up into the following categories, given when calling up the manual pages:

1. User commands
2. System commands
3. C functions
4. File formats, device files
5. Configuration files
6. Games
7. Miscellaneous
8. System administration
9. Kernels
10. New commands

Access man pages in the following ways:

Console Use the sequence **`man <category> <command>`** to access man pages in a console or terminal. Use the option "-k", such as **`man -k <command>`**, to display the command from all categories.

Konqueror Enter **`man:/<command>(<category>)`** in the URL field.

SuSE Help Browse the various man pages according to category or keywords. Find them in the subject category '`Commands / Functions`' under '`Man Pages`'.

12.5 Info Pages

Info pages have become standard for more complex commands. They not only describe options and parameters, but also offer a more in-depth explanation of how the commands are used and applied. These explanations are mostly accompanied by related examples.

Normally, info pages are accessed with either the file viewer Emacs or the Infoviewer (**info**).

Console You have three basic options:

- **info** shows a list of the available info pages.
- **info -apropos <command>** shows info pages relating to "command"
- **info <command>** opens Emacs with a description of the "command".

Konqueror Enter: **info:/<command>** in the URL field. Click the links in the browser as usual.

SuSE Help In SuSE Help (see Section 12.1), find the info pages relating to the subject category 'Commands / Functions'. The home page is a summary of all info pages, shown here in HTML format.

12.6 HOWTOs

HOWTOs are detailed, practice-oriented installation and configuration instructions for Linux located in the /usr/share/doc/howto/ directory. For the HTML version, use package howtoenh, series doc.

In the docu/howto directory of the first CD, you will find the current versions of the most important HOWTO files as of the CD release. It may benefit you to take a look at this directory, since these files are not compressed and can already be easily viewed, even prior to installation.

Console View the HOWTO text in a console with the **less** command, even if the text is compressed. If you want to view the HOWTO text regarding Linux installation, for example, enter the following:

```
less /usr/share/doc/howto/en/Installation-HOWTO.txt.gz
```

SuSE Help Read the HOWTO texts in a more user-friendly environment via SuSE Help and perform searches.

12.7 Kernel Documentation

For problems with the kernel itself, the /usr/src/linux/Documentation directory is an extensive information source which is only available if the kernel sources (package linux and package kernel-source) have been installed. You will also find several valuable tips in the individual subdirectories of the kernel sources, as well as in the kernel sources themselves (for the extremely intrepid and curious).

12.8 Free Books

The package `books`, series `doc` (Documentation) contains some books in PostScript format which can be viewed with package `gv`, series `gra` or printed out. Before printing them, consider whether it may actually be more economical to purchase the book.

A The SuSE Linux FAQ

Here we will try to answer the most *Frequently Asked Questions*.

1. **Following installation, I always get an error message "`login:`" What am I doing wrong?**

   You are not doing anything wrong. The installation is complete and you may log in to the computer with your username and password.

2. **I am the only person using my computer. Why do I always need to login?**

   Linux is a multiuser system. Giving a username and a password is necessary so that Linux knows who is working with it. Only login as '`root`' if you want to make changes to your system (installing software or configuration changes). For everyday use, create a regular user. This prevents accidental damage to the installation.

3. **Where can I get more information about SuSE Linux?**

   As far as installation or SuSE Linux–specific matters are concerned, from the handbook. Documentation on the programs can be found in `/usr/share/doc/packages` and introductions in the "HOWTOs" in `/usr/share/doc/howto/en`. They can be read, for example, with

   ```
   less /usr/share/doc/howto/en/DOS-to-Linux-HOWTO.txt.gz
   ```

4. **Where can I get special tips or help?**

   Enter the path `/usr/share/doc/sdb/en/html/index.html` in Konqueror. There you will be able to view our SDB database which includes numerous tips and help entries. If the path does not yet exist, first install the packages `sdb` and `sdb_en` (series `doc`). On the Internet, our support database has the most recent updates at `http://sdb.suse.de/sdb/en/html/`.

5. **How can I enter commands in KDE?**

   Click on '`K`', '`Tools`' then '`Terminal`'. Alternatively, press (Alt) + (F2) and then enter **`xterm`**. This opens a "terminal" in which you can enter commands.

6. **I can't find many programs in KDE.**

   You can start all programs from a terminal window (**`xterm`**, see above) by entering the program name and pressing (↵).

7. **What is a mirror? Why should I not get these things from `ftp.suse.com`?**

Since there are many users who need to retrieve things from the server at the same time, it would be overburdened quite quickly it everyone used the same server. There are a number of other FTP servers which contain a duplicate of the SuSE server. A server such as this is called a "mirror". You should always access a mirror which is geographically near you — in the same country or a nearby area — so that it is quicker to download. You can find a list of mirrors at `http://www.suse.de/en/support/download/index.html`.

8. **I cannot find any `.exe` files. Where are all the applications?**

   In Linux, executable files normally do not have file extensions. Most programs are located in `/usr/bin` and `/usr/X11R6/bin`.

9. **How can I recognize executable files?**

   Using the command **`ls -l`**, you can see all the executable files in the directory `/usr/bin`, for instance, in red. You can also recognize them by the `'x'` in the first column.

   ```
   -rwxr-xr-x   1 root   root      64412 Jul 23 15:23 /usr/bin/ftp
   ```

10. **I want to remove Linux. How does this work?**

    With **`fdisk`**, the Linux partitions are deleted. You may need to run **`fdisk`** in Linux. Afterwards, you will need to boot from the MS-DOS disk and run the **`fdisk /MBR`** command in DOS or Windows.

11. **I need firewall, masquerading, mail, and a WWW server. Will your installation support help me with this?**

    No.

    The installation support will assist you in getting Linux up and running. For concerns extending beyond this, there are good books available at your local book store as well as excellent documentation which can be found in `/usr/share/doc/packages`, `/usr/share/doc/howto/en/NET-3-HOWTO.gz`, and`/usr/share/doc/howto/en/NET3-4-HOWTO.gz`

12. **How can I access my CD?**

    You must first mount the CD with the **`mount`** command. Information about this command can be found in Section 10.3.1 on page 146

13. **I cannot get my CD out of the drive, what should I do now?**

    First you will have to unmount the CD. This is done with the **`umount`** command. More information about this can be found in Section 10.3.1 on page 147. In KDE, you only need to right-click on the CD-ROM icon and select 'Unmount Drive'.

    If YaST is running on your computer, exit it.

14. **How can I find out what space is available in Linux?**

    With the **`df -hT`** command, also see Section 10.3.2 on page 147.

15. **Can I "copy and paste" in Linux?**

    Yes.

    If you want to "copy and paste" in the text mode, you must have gpm running. In the X Window System and in the text mode: *mark* the text block by clicking and dragging with the left mouse button then *insert* with the middle mouse button. If you do not have a middle mouse button, achieve the same effect by pressing both buttons at the same time. The right mouse button has a special function in most programs and applications.

16. **Do I need to be afraid of a virus in Linux?**

    No.

    In Linux, there have been no serious viruses found. Also, viruses can not cause any serious damage if they are *not* activated by root. The only virus scanners which are available in Linux serve to search e-mails for Windows viruses (if Linux is being used as a router or server).

17. **Do I need to compile a kernel myself?**

    No, this is usually unnecessary.

    The kernel is currently so extensive that there are about 800 options to consider when configuring them! Since it is almost impossible to master all the possible configurations and their effects, we strongly discourage inexperienced users from recompiling the kernels. If you still proceed with this, you are doing so at your own risk. We do *not* provide any installation support in such cases.

18. **Where can I see system reports?**

    Enter the following command in a terminal window as `'root'`:

    ```
    earth: # tail -f /var/log/messages
    ```

    Additional interesting programs relating to this one are **top**, **procinfo**, and **xosview**.

    The boot messages can be displayed with

    ```
    earth: # less /var/log/boot.msg
    ```

19. **I cannot log in to my computer with `telnet`. I always get the answer `"Login incorrect."`**

    You are probably trying to log in as `'root'`. For security reasons, this is not possible via telnet by default.

    With YaST, set up a normal user account. Log in with this username. Then change to the user root, with **su**. It is much better and safer, however, to use the program ssh instead of telnet. The ssh program uses encoded, secure connections. You can find this program in the series `sec` series.

20. **How do I get connect to the Internet in Linux?**

    Chapter 1.6.5 on page 12 in the manual provides information on this.

21. **Where is StarOffice?**

    You can find *StarOffice* as the selection package `so_base` in the series `pay`. Use YaST for installation.

22. **I found a bug in SuSE Linux. Where should I report it?**

    First, ascertain whether it is actually a bug in the program, or just an error in operation or faulty configuration settings. Also read the documentation in `/usr/share/doc/packages` and `/usr/share/doc/howto`. The bug may have already been discovered. Check it at `http://sdb.suse.de/sdb/de/html/` in the support database. Enter a keyword or work your way forward or backward via the "History" link.

    If it is genuinely a bug, can send a description of it by e-mail to feedback@suse.de.

23. **How can I install applications?**

    Applications included in the SuSE Linux CDs are best installed with YaST or YaST2. Note that larger applications ("demos") can be found in the series `pay`.

24. **I "only" have an application in source code. How can I install it?**

    Some "know-how" is required with some applications. Find more information in a good Linux book — see `http://www.suse.com/us/products/retailers/#top`.

    Briefly, decompress the archive with **`tar xvzf name.tar.gz`**, read the `INSTALL` or `README` files, and follow the instructions. Usually, the following commands will need to be executed: **`./configure; make; make install`**.

    We cannot offer any installation support for the phases of compilation or for self-compiled programs.

25. **Is my hardware supported?**

    It is best to refer to the component database at `http://hardwaredb.suse.de` or `http://cdb.suse.de`

    Also, **`less /usr/share/doc/howto/en/Hardware-HOWTO.gz`** can provide some information.

26. **How can I defragment my hard disk?** Linux has an intelligent file system. This file system makes defragmentation superfluous, because it prevents fragments from occuring. Note that your partitions should not be occupied by any more than 90 % (**`df -h`**).

27. **I just read something on partitioning. What is it?**

    Partitioning means dividing up the hard disk in multiple sections. Windows and *MacOS* also are located in their own partitions. SuSE Linux requires, for the default configuration, three partitions (one for the boot files, one for Linux itself, and one swap partition).

28. **How much space do I need for Linux?**

    This depends on how many and which packages you install. A default installation with Office requires about 1 GB. 2 GB are recommended if you want to have space for your own data as well. If you want to install just about everything, you will need 3 GB to 6 GB, depending on the version.

29. **I need more space Linux. How can I add another hard disk?**

You can integrate free hard disks or free partitions of hard disks into a Linux system at any time to make more space available. If you need more space, for example, in `/opt`, you will need to "mount" an additional hard disk partition there. The exact procedure is:

a) Install your hard disk and start Linux. Pay attention to the instructions specific to the hard disk.

b) Log in as user `'root'`.

c) Partition with **fdisk**, in this example, `/dev/hdb1`.

d) Format the partition with **mke2fs /dev/hdb1**.

e) Enter the following commands:

```
earth: # cd /opt
earth:/opt # mkdir /opt2
earth:/opt # mount /dev/hdb1 /opt2
earth:/opt # cp -axv . /opt2
```

Check thoroughly to see whether all the data has been copied. Afterwards, you can move the old directory and add a new one, an empty ☞ *mountpoint*:

```
earth:/opt # mv /opt /opt.old
earth:/opt # mkdir /opt
```

Add the new partition using an ☞*Editor* to the `/etc/fstab` file. This could appear as in the file A.0.1.

```
/dev/hdb1       /opt      ext2      defaults   1   2
```

File A.0.1: Excerpt from `/etc/fstab`: Additional Partitions

Now you should shut down the computer and reboot.

f) Once you have rebooted the computer, please be sure that `/dev/hdb1` has actually been mounted in `/opt` using the command **mount**. If everything is working as you want it to, you can now remove the old data in `/opt.old`:

```
earth: # cd /
earth:/ # rm -fr opt.old
```

30. **My computer crashed. Can I just press the Reset button without risking anything?**

If your computer is no longer reacting to your mouse or keyboard, it does not necessarily mean that your whole machine has crashed. It can be that one program is blocking the mouse or the keyboard, but all other programs are still running. If your machine can be accessed remotely (serial terminal, network), login elsewhere and abort the respective program with **killall <program or application name>**. If this is not possible,

try to get into another console using Ctrl + Alt + F2 to be able to kill the interrupting process there. However, if the computer is not reacting to any of the keys, wait at least ten seconds before pressing the Reset button.

31. **Why is Linux taking up my entire memory?**

Enter the command **free -tom** in a shell. It will output a list of occupied memory in megabytes:

```
             total       used       free     shared    buffers     cached
Mem:           125         92         33         11         22         45
Swap:          133          1        133
Total:         258         93        165
```

In the first line (total, used, ...), a description is listed for each column. The value 33 is shown in the second column under "free". Only 33 MB of memory appears to be available. However, this is only the "unused" memory. All the RAM not used by applications functions as disk cache, 45 MB in this example (under "cached", same line). The **shared** entry indicates the memory shared by multiple applications and libraries (here, 11 MB).

The "swap" line shows the swap memory which has an overall size of 133 MB (under "total"). 133 MB of this is available. The last line finally shows how much memory you have under "total" (here 258 MB), how much of it has been used under "used" (here 93 MB), and how much is still available under "free" (here 169 MB).

B Glossary

We have limited our glossary to *UNIX* and Linux specific terms, because a complete introduction to electronic data processing is beyond the scope of this book. The reader of this glossary should already be familiar with terms such as *bits* and *bytes*.

access permissions
The account is defined by the user name or login name and the password. The access permissions are generally set by the ☞*system administrator*. The access permissions define to which user group the new user is assigned and the resulting permissions.

account
see ☞*access permissions*.

ADSL Asymmetric Digital Subscriber Line
Transmitting procedure that transmits data about one hundred times faster than ISDN in the telephone network.

AGP
Accelerated Graphics Port, a high-speed slot for graphics cards. Based on PCI but offers a larger ☞*bandwidth*. Furthermore, AGP graphics cards can revert directly back to the ☞*Random Access Memory* and ☞*main memory* in contrast to PCI models (without routing around the processor) to swap graphics data there.

ATAPI
ATAPI is a type of CD-ROM drive that is connected to an (E)IDE controller. Apart from ATAPI drives, there are SCSI CD-ROM drives, handled by a SCSI controller, and proprietary CD-ROM drives that use their own controller or are connected to a sound card.

backup
Backups should be done regularly, especially the important files.

bandwidth
Maximum load capacity of a data channel.

BIOS
Small component which takes on the initialization of important hardware processes. This essential procedure is complete when ☞*LILO* appears on the screen.

bookmark
A mostly personal collection of interesting web page references, directly accessible in the browser.

booting
The sequence of computer operations from power-up until the system is ready for use.

browser
Program which searches and displays contents. Today it is mostly used for programs that graphically display contents of ☞*World Wide Web* pages.

cache
In relation to the ☞*main memory*, it is rather small, but still a fast memory buffer. For example, open files are saved to the cache to spare the hard disk next time the file is reloaded.

client
Workstation in a computer network operated by a ☞*server*.

command line
Characterizes the position of a text-based ☞*shell* where commands can be entered for the ☞*operating system*.

console
In former times, this was synonymous with *terminal*. In Linux, you have *virtual consoles*. This enables you to use one screen for many independent, but parallel running sessions.

CPU Central Processing Unit
☞*Processor*.

cursor
The cursor is normally a block character which marks the place for input on a computer screen. This term also often refers to the symbol representing the location of the mouse in graphical interfaces.

DDC
Communication standard between the monitor and the graphics card, which transmits various parameters, such as monitor name or resolution to the graphics card.

daemon
A daemon ***D**isk **a**nd **e**xecution **mon**itor* is a program that monitors in the background and comes into action when required. Such daemons answer FTP or HTTP requests, for example, or control activity in the PCMCIA slots.

directories
Directories are electronic folders in which files, programs, and even subdirectories can be stored. They build a ☞*file system* structure, which is standardized in Linux.

DNS
A system that converts ☞*WWW* addresses to ☞*TCP/IP* addresses and vice versa.

driver
A program between the operating system and the hardware that "translates" the communication between these two layers.

EIDE
Improved ☞*IDE* standard that even allows hard disks with a size of over 512 MB.

e-mail electronic mail
The means of transporting mail electronically between registered users via a network. Similar to "normal" mail (often referred to as "snail mail"), the address has to be entered. In e-mail, it is in the form "sender@sender's-domain" to "recipient@recipient's-domain". E-mail not only lets you send text, but also sound files or pictures. It has many advantages: it is quite cheap and mail usually reaches its destination within minutes.

environment
A ☞*shell* normally provides some kind of environment where you can temporarily set options, such as paths of programs, the user name, the current path, and the appearance of the prompt. This data is stored in an ☞*environment variable*. These variables can be assigned, for example, by the shell's configuration files.

environment variable
A storage location in the ☞*environment* of the ☞*shell*. Every variable consists of a name (usually written in capital letters) and a value (such as path name).

ethernet
Popular standard for less expansive computer networks.

EXT2
Second Extended File system, EXT2 is the native file system used by Linux.

file system
A file system is a system for structuring files. There are many file systems available which differ (sometimes quite extremely) in performance and power.

firewall
Connects a local network to the Internet using various security measures.

free software
see ☞*GNU*.

FTP file transfer protocol
A ☞*protocol* based on ☞*TCP/IP* for transferring files.

GNU
GNU stands for *GNU is Not Unix* and is a project of the *Free Software Foundation (FSF)*. The aim of the "GNU Project", with which the name of RICHARD STALLMAN (RMS) is closely linked, is to create a "free" operating system compatible with Unix. "Free" here means less *free of cost* than free in the sense of *freedom* — having the right to access, modify, and use software. To guarantee the freedom of the *source* text, the program code in each case, every modification must also be *free*: in particular, software may not be compromised in the sense of this freedom by modifying or adding to the program code. How this should be guaranteed is explained in many aspects by the classical GNU Manifesto (`http://www.gnu.org/gnu/manifesto.html`). GNU software is legally covered by the GNU General Public License, in short, "GPL" (`http://www.gnu.org/copyleft/gpl.html`) and in the GNU Lesser General Public License[1], "LGPL" (`http://www.gnu.org/copyleft/lgpl.html`).

In connection with the "GNU Project", all Unix help programs are being newly developed and, in part, provided with more or enhanced functionalities. Even complex software systems, such as Emacs or the glibc, are integral components of the "Project".

The ☞*Linux* kernel, subject to the GPL, profits from this "Project" (especially from the tools), but should not be seen as the same thing.

GPL
see ☞*GNU*.

home directory
Your own private directory in the Linux file system. This belongs to a specific user (usually in `/home/<username>`). Only the user has full access rights in his home directory, except for user ☞*root*.

host name
Name of a machine in Linux, usually name by which it can be reached on the network.

HTML
The most important language used in the ☞*World Wide Web* for designing the contents. The layout commands made available by HTML define how a document looks and how it is displayed in a ☞*browser*.

HTTP
A protocol used between the ☞*browsers* and Internet servers to transmit ☞*HTML* pages over the ☞*World Wide Web*.

IDE
Integrated Drive Electronics, a widely used hard disk standard in low-grade and middle-grade PCs.

[1] previously known as the "GNU Library General Public License".

Internet
World-wide computer network based on ☞*TCP/IP*, which is used by a very large population.

IP address
A numerical 32 bit Internet address, appearing in four decimal series separated by periods (for example, 192.168.10.1), which are uniquely assigned to a machine connected to ☞*TCP/IP* networks.

IRQ
Interrupt Request, a request to the ☞*operating system* carried out by a hardware component or a program to assign it processor capacity.

ISDN
Integrated Services Digital Network, a popular digital standard for high-speed data transferral over the telephone network.

KDE
A popular graphical interface for Linux. KDE is the default graphical interface in SuSE Linux.

kernel
The kernel is the central core of the Linux operating system. It manages memory, contains the drivers that enable communication with the hardware, and handles processes and tasks. Applications run on top of the kernel.

LAN local area network
A LAN is a local ☞*network* and is usuallly rather small.

LILO
Small program installed in the boot sector of the hard disk that not only can be started by Linux, but by other operating systems as well.

link
A link is a pointer to a file, just as widely used in the Internet as in the Linux file system. In Linux, there is a distinction made between "hard" and "symbolic" links. While "hard" links refer to the exact position in the file system, the symbolic link only points to the respective name.

Linux
High performance UNIX-like operating system core distributed freely under the GPL (☞*GNU*). The name is an acronym ("Linus' uniX") and refers to its "creator", LINUS TORVALDS. However, although the name, in a strict sense, only refers to the kernel itself, the popular understanding of the term "Linux" usually entails the entire system.

login
Authentication of a user by user name and password to gain access to a computer system or network.

logout
The procedure of closing down an interactive Linux session and getting back to the ☞*login* prompt where you enter your user name and password.

main memory
Physical memory of limited capacity that can be accessed rather quickly. This is often referred to as RAM, Random Access Memory.

man pages
Traditionally, the documentation for Unix systems lies in the "man pages", which can be read using the command **man**.

MBR
The first physical sector of the hard disk from which the content is loaded to the main memory and executed by the ☞*BIOS*. This code then loads either the operating system from a hard disk partition or a more sophisticated bootloader such as ☞*LILO* .

mounting
This describes the "insertion" of file systems into the directory tree of the system.

mount point
A mount point is the directory where a partition or another device is attached to the Linux file system.

MP3
Very efficient compression procedure for audio files that reduces the size by a factor of ten in contrast to an uncompressed audio file.

multitasking
Operating systems that can invoke more than one program simultaneously are called multitasking systems.

multiuser
Enables more than one user to work simultaneously on the same system.

network
The pooling together of several computers, accomplished normally using ☞*servers* and ☞*clients*.

NFS
Network File System, a ☞*protocol* for accessing a ☞*file system* shared over a network.

NIS
Network Information Service, a centralized data administration system in networks. User names and passwords can be simultaneously managed network-wide by the NIS.

operating system
The operating system is a process running permanently in the background, controlling the basic operation of the computer.

partition
Logically-independent section of a hard disk, each possibly containing different file systems. In Windows, also known as "drives".

path
Unique description of a file's position in a file system.

plug and play
Automatic hardware component configuration technology. Resources, such as IRQ and DMA, are configured and managed separately from the system.

PC *Personal Computer*
In contrast to mainframes, a "personal" computer is a small one. Since the early 1980s, this has usually meant a small computer from *IBM*, based on the Intel x86/88 processor — although the first machine of this kind was an *Apple* — the name is now making a comeback in the form of the *PowerPC*.

process
In Linux, started programs or executable files run as processes, often referred to as tasks. Processes can be controlled by commands like `top` entered in the ☞*shell*.

processor
The processor is the "brain" of every computer, working through and performing commands given by a user or a program in machine language. The processor has control over the entire system and is responsible for the actual performance of the computer.

prompt
See ☞*command line*.

protocol
Standard specifically defined for regulating communication for hardware, software, or networks. There is a multitude of these standards. The most common examples are ☞*HTTP* and ☞*FTP*.

proxy
Most commonly used cache implemented by Internet providers that stores frequently requested contents in a database in order to accommodate other machines requesting those pages directly from there. This process not only reduces the time it takes to automatically download this information, but also conserves the available bandwidth.

RAM *Random Access Memory*
See ☞*main memory*.

root
The user undertaking the configuration and maintenance of a complex computer system, such as a network. This system administrator is usually the only person who has access to all parts of the system (root permissions).

root directory
The directory at the top of the file tree, at the beginning of the ☞*file system*, which, unlike other directory, is not a subdirectory. The root directory is denoted in *UNIX* with a `'/'`-symbol.

SCSI
Small Computer Systems Interface, hard disk standard implemented in servers and other high-level machines because of its high-speed performance. See ☞*server*.

server
A server is usually a rather powerful computer that offers services, such as http, dns, and ftp, or data to other machines connected via a network. There are also programs called servers like the ☞*X server*.

shell
An especially flexible command line often equipped with its own specific programming language. Examples of shells are bash, sh, and tcsh.

SMTP
Simple Mail Transfer Protocol, ☞*protocol* for transferring ☞*e-mails*

SSL
Secure Socket Layer, encryption procedure for transferring ☞*HTTP* data.

system administrator
see ☞*root*

task
See ☞*process*.

TCP/IP
Internet communication protocol finding increased usage as well in local networks, known as "intranets".

telnet
Telnet is the ☞*protocol* and command for communicating with other hosts. Normally, the user only sees telnet as a means for logging into a remote system.

terminal
Previously the description of a keyboard and monitor combination connected to a central computer. This combination, when connected to a multiuser machine, does not have its own computing power. This term is also used to describe programs that emulate an actual terminal.

UNIX
UNIX is an operating system that is widely distributed, above all on workstations in networks. Since the beginning of the 1990s, there has been a freely available version for PCs: Linux.

URL
Uniform Resource Locator, unique Internet address that contains the type (e. g.`http://`) as well as the name of the host (e. g., `www.suse.de`).

VESA
Video Electronics Standard Association industrial consortium that defines, among other things, important video standards.

wild cards
Placeholder for one (symbol: `'?'`) or more (symbol: `'*'`) unknown characters, most often used in commands (especially search commands).

window manager
A window manager is the layer that interacts between the ☞*X Window System* and the user. It is responsible, among other things, for your desktop display. There are a wide variety of window managers available, one of the more popular ones being kwm for ☞*KDE*.

WWW
World Wide Web, based on the ☞*HTTP* protocol, is a hyperlinked collection of documents, files, and images that can be viewed with a web browser.

X11
see ☞*X Window System*

X Window System
The X Window System is the standard for graphical interfaces in Linux. In contrast to other operating systems, it is simply the middle layer between the hardware and the preferred ☞*window manager*, such as KDE or GNOME.

YP
see ☞*NIS*

B Glossary

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