

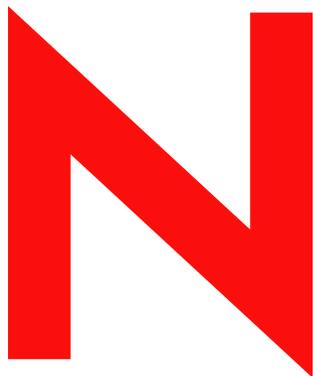
Novell Linux Desktop

9

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DEPLOYMENT GUIDE

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About This Guide

This guide is intended for use by professional network and systems administrators during the actual planning, deployment, configuration, and operation of Novell® Linux* Desktop (NLD) in an enterprise environment. As such, it is solely concerned with ensuring that NLD is properly configured and that requisite services on the network are available to allow it to properly function as initially installed. This guide does not cover the process of ensuring that NLD offers proper compatibility with your enterprise's application software, or that its core functionality meets those requirements. It assumes that a full requirements audit has been done and the installation has been requested or that a test installation, for the purpose of such an audit, has been requested.

This guide contains the following:

- ◆ Chapter 1, “Planning for Novell Linux Desktop,” on page 13
- ◆ Chapter 2, “Deploying Novell Linux Desktop,” on page 21
- ◆ Chapter 3, “Upgrading Novell Linux Desktop,” on page 99
- ◆ Chapter 4, “Novell Linux Desktop Utilities,” on page 105
- ◆ Chapter 5, “Troubleshooting,” on page 109
- ◆ Appendix A, “Using YaST to Configure the Novell Linux Desktop,” on page 125
- ◆ Appendix B, “Linux Authentication Using LDAP and eDirectory,” on page 179
- ◆ Appendix C, “Automatic Linux Installation and Configuration Using AutoYaST,” on page 195
- ◆ Appendix D, “Partitioning,” on page 255
- ◆ Appendix E, “GNOME Configuration for Administrators,” on page 261
- ◆ Appendix F, “KDE Configuration for Administrators,” on page 305
- ◆ Appendix G, “Working with the Shell,” on page 321
- ◆ Appendix H, “GNU Licenses,” on page 341

Audience

This guide is intended for NLD administrators.

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with this product. Please use the User Comments feature at the bottom of each page of the online documentation, or go to www.novell.com/documentation/feedback.html and enter your comments there.

Documentation Updates

For the latest version of this documentation, see the [Novell Linux Desktop documentation \(http://www.novell.com/documentation/lg/nld/index.html\)](http://www.novell.com/documentation/lg/nld/index.html) Web site.

Additional Documentation

For user documentation, see the *Novell Linux Desktop Quick Start* (<http://www.novell.com/documentation/nld/qsnd/data/brmch9i.html>), the *Novell Linux Desktop GNOME User Guide* (http://www.novell.com/documentation/nld/userguide_gnome/data/front.html) and the *Novell Linux Desktop KDE User Guide* (http://www.novell.com/documentation/nld/userguide_kde/data/front.html).

For information on the SUSE[®] Linux Enterprise Server 9 operating system, see the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

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Planning for Novell Linux Desktop

1

This chapter is meant to be read by a systems or network administrator who is responsible for the rollout of Novell® Linux Desktop (NLD) in an enterprise, or for the safe operation of a network where NLD systems will be brought up and operated. It is intended to answer some of the most important questions experienced administrators might ask when told that NLD systems will be added to their areas of responsibility.

To those who aren't familiar with NLD or Linux at all and who come from a Windows*, Macintosh*, NetWare®™, or UNIX background, we suggest evaluating NLD on a single machine before rolling it out to the network. [Chapter 2, “Deploying Novell Linux Desktop,” on page 21](#) provides an overview of the deployment techniques available with NLD and contains a detailed description of the installation procedure (“[Manual Installation” on page 25](#)). By doing a manual install and testing it in lab conditions, administrators can familiarize themselves with NLD and determine how it meets the needs of their network and which deployment method best fits their requirements.

The first question that comes to mind if a new software is to be deployed is “What do I need to run NLD in the enterprise?” Next, experienced network administrators think of such questions as “What will NLD do to my network? What will it want from my network? How will it behave?” Because the answer to the first question determines whether the other questions apply, it is answered first (see “[Hardware Requirements” on page 13](#)).

Some of the more typical discussions that might be expected in an administrator's guide (partitioning, performance optimization, network traffic optimization) have been given short shrift. This is due to NLD's focus as a desktop product as opposed to a server product. As such, rather than discussing fairly common server topics such as RAID levels and RAID system configuration, for example, this documentation instead directs the reader to the appropriate companion documentation for SUSE® LINUX Enterprise Server (SLES) if the NLD component in question is shared with SLES, or to documentation resources available from the Open Source Community (see “[Additional Documentation” on page 19](#)).

1.1 Hardware Requirements

To install Novell Linux Desktop, some minimum system requirements must be met. Make sure your target systems match the following criteria:

- Personal computer with a Pentium* II or higher processor, or any other AMD64 for Intel* EM64T processor, and a bootable CD-ROM drive
- 1 or 2 physical CPUs
- 4 GB hard disk space when installing the default GNOME or KDE desktop but not more than 8 TB.
8 GB is recommended if installing both GNOME and KDE desktops, or additional software selections.
- 128 MB RAM (256 MB recommended, but not more than 64 GB)
- Super VGA display adapter
- Network card (if you are connecting to a network)

- ❑ BIOS and network hardware supporting network boot (if you plan on doing a remote mass deployment)
- ❑ USB, PS/2*, or serial mouse
- ❑ Screen resolution of at least 1024 x 768

NLD can run on a wide range of x86-compatible hardware. As with most desktop operating systems, the requirements vary depending on the anticipated uses of the particular system. However, some general guidelines can be helpful for planning purposes. Seasoned administrators might want to test their own final configurations with particular care to include any third-party applications or network-based services, on a range of available hardware, to ensure that adequate resources are available for each configuration's expected tasks.

Following are some suggested hardware minimums for various typical workstations and their intended uses under NLD. Note that while the product can be installed on hardware of lower performance, sharply reduced responsiveness might result.

Table 1-1 *Suggested Hardware Minimums*

Desktop	Hardware Minimum
Minimum Graphic Desktop (basic GUI, OpenOffice.org, Web browsing with minimal Java*/Flash/multimedia)	Pentium 3 500 MHz, 256 MB RAM, 8 GB hard drive
Standard Graphic Desktop (basic GUI, OpenOffice.org, Web browsing with Java/Flash/streaming media, real-time audio in background, shared folders, occasional graphics manipulation, programming, and compilation)	Pentium 3/4 1 GHz, 512 MB RAM, 20 GB hard drive, 100 MB/sec Ethernet

The original release of NLD was not certified to run on Intel EM64T or AMD64 processors in native 64-bit mode. However, this capability has been implemented for the SP1 release (and later) of NLD. It now runs on these platforms in 32-bit mode as well as in native 64-bit mode.

1.2 Network Services Used by Novell Linux Desktop

NLD is most effectively used as a networked operating system. Although NLD does not require network services in order to function, such as on a standalone workstation or on a disconnected laptop, most users and organizations can realize maximal gains from installing NLD and using it in a networked environment. Therefore, there are several standard infrastructural network services which can increase the performance and usability of your NLD systems. They should be familiar to any experienced TCP/IP network administrator. They are listed below by type, with specific examples of each type given. Usually, only one of each type is required.

1.2.1 Name Resolution Services

Network name resolution is done by Domain Name System (DNS). Most TCP/IP networks have access to DNS services. NLD quite easily uses DNS for name resolution; no special (nonstandard) DNS records or services need to be present for NLD to function. There are some specific configuration tricks on the client side for ensuring that NLD properly retrieves its hostname in a

dynamic address environment, or on a system which frequently changes networks (such as a laptop with wireless networking).

Although no special additions to DNS are required, there are some techniques involving DNS which can be used to make the networked installation of NLD easier, or to make the management of dynamically addressed machines go more smoothly. For more information, see “Section 21.7: DNS—Domain Name System” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

1.2.2 Network Address Services

Dynamic Host Configuration Protocol (DHCP) is a server-based system for allocating network configuration information and more to a host upon startup. NLD can be configured to receive its network address from a DHCP server (either during initial installation or at any point thereafter using the configuration utilities). Allocating network addresses for NLD machines should not differ in any way from allocating TCP/IP network addresses for machines running other operating systems, because it is OS-independent. For information on how to allocate addresses using DHCP, refer to your DHCP server product’s documentation. If you do not have a DHCP server and want to set one up, either for a test installation or for production use, SUSE LINUX Enterprise Server (SLES) contains a fully functional ISC DHCP server and all the documentation required for its configuration. You can also download this server and view or download its documentation from the Internet System Consortium (<http://www.isc.org/index.pl?sw/dhcp>) Web site.

NOTE: The DHCP server is instrumental in setting up a networked install environment using PXEBOOT and AutoYaST. For more information, see [Chapter 2, “Deploying Novell Linux Desktop,”](#) on page 21 and [Appendix C, “Automatic Linux Installation and Configuration Using AutoYaST,”](#) on page 195.

1.2.3 Directory Services

Directory services allow the task of managing user and group information (including account data, group membership information and, optionally, additional information on users such as contact information and corporate administrative information) to be done from a central location. This prevents the need to have such information replicated to each user’s desktop, avoiding the potential for conflicts, out-of-date information, inappropriate access and changes, etc. Some popular directory services include OpenLDAP, NIS, and Novell eDirectoryTM.

Planning for directory services can be complex. While they can make the task of user information management much more streamlined, they can complicate matters immensely if machines travel on and off your corporate network and cannot access your directory servers from outside. You must take care to either make sure that these services are available from all locations or that every machine has a local user information record for those times when it is unable to contact the appropriate services.

NLD is able to interact with many directory services. It is able to do so out-of-the-box using two protocols: LDAP (Lightweight Directory Access Protocol) and NIS (Network Information Service). It should be noted at the outset that its ability to utilize many directory services is dependent on the ability of each server’s ability to respond using one of these two protocols. OpenLDAP (which is also present in SUSE LINUX Enterprise Server) is an open source LDAP-protocol directory server

popular in the Linux community. The eDirectory product is capable of serving directory information in the LDAP format, which is one way NLD is used in-house at Novell.

LDAP

If your organization currently provides directory services, your primary concern will be discovering how to ensure that your current directory can be made available to NLD systems. If you currently use an OpenLDAP or other LDAP v2/3 compatible directory, your primary concern will be making sure that your directory contains enough information, in the correct schema, for NLD to perform lookups and (if necessary) authentication.

For a general jumpstart and reference material, see the documentation available at the [OpenLDAP \(http://www.openldap.org\)](http://www.openldap.org) Web site or turn to the introductory chapter on LDAP in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf). Although experienced LDAP administrators will no doubt want to build or add on to their own custom schemas, a shorthand version of the minimum required information can be expressed as follows: an OpenLDAP server serving the `core.schema`, `cosine.schema`, `inetorgperson.schema`, and `posixAccount.schema` should provide enough information for most organizations' network identification needs. The OpenLDAP documentation referenced above contains fully annotated versions of those schemas. They are also included with OpenLDAP as it is shipped in SUSE LINUX Enterprise Server 9.

Here is a sample LDIF template that provides a one-stop view of all the fields required for basic user information lookup from within NLD:

```
dn: uid=joebloggs,ou=People,dc=mycompany,dc=com
uid: joebloggs
objectClass: organizationalPerson
objectClass: inetOrgPerson
objectClass: posixAccount
objectClass: top
uidNumber: 500
gidNumber: 100
loginShell: /bin/bash
homeDirectory: /home/joebloggs
gecos: Joe Bloggs
sn: Bloggs
cn: Joe
givenName: Joseph
mail: joebloggs@mycompany.com
```

```
dn: cn=staff,ou=Group,dc=mycompany,dc=com
changetype: modify
memberUid: joebloggs
```

```
dn: cn=sales,ou=Group,dc=mycompany,dc=com
changetype: modify
memberUid: joebloggs
```

The first section should be familiar to any LDAP admin. It defines Joe Bloggs as a DN (Distinguished Name) within the OU (Organizational Unit) People of the domain mycompany.com. His userid (UNIX username) is joebloggs. Note that his uidNumber is 500, traditionally the first “regular” user on many Linux distributions; his gidNumber (default Group ID) is 100, traditionally

the first “regular” user group. After this, the path to his preferred login shell (here, `/bin/bash`) and his home directory location are given. His `gecos` information corresponds to the `GECOS` field in Linux’s `/etc/passwd` file; surname, common name, given name, and delivery e-mail address round out the section.

The second and third sections add Joe Bloggs to the usergroups named `staff` and `sales`, respectively. It is assumed that LDAP objects for these groups already exist in the database; these stanzas merely modify them to add Joe Bloggs to their list of members. When the above LDIF is added to the LDAP database (perhaps with the `OpenLDAP` tool `ldapadd`, for example), then any NLD machine pointed at that LDAP directory should recognize the user with UID 500 as Joe Bloggs.

Note carefully that the above LDIF does not contain a password. This section is concerned with directory services, not authentication. Therefore, any attempt to authenticate against this record would fail. Password fields could certainly be added, however. The list of schemas mentioned earlier do, in fact, include encrypted password fields for just this purpose.

eDirectory

If your organization is currently using eDirectory, see [Appendix B, “Linux Authentication Using LDAP and eDirectory,” on page 179](#) for instructions on integrating NLD into your eDirectory infrastructure.

NIS

NIS (Network Information Service) is a database-like service that provides user and group information to all clients on a network. People often refer to NIS as YP, which simply stands for the idea of the network’s “yellow pages.”

For information on NIS, see “Section 21.9: NIS—Network Information Service” in the [SUSE LINUX Enterprise Server 9 Administration Guide](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf) (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

1.2.4 Authentication Services

Authentication services are those network-based systems which allow user credentials to be centrally managed. Some of the most popular examples in the Linux world include LDAP, Kerberos*, and SMB. Although NLD does not require a networked authentication service, it can use them, but planning for them can be complex. If your systems are desktop machines and are always online, there is really no downside to having them be centrally authenticated. However, if you have laptop users, you must consider the situation where they have the machine off your corporate network. There must then be a fallback authentication method by which they can be authenticated via local resources. Usually, this can be accomplished via Linux-PAM (Pluggable Authentication Modules). However, such fallback authentication methods have their own security risks, which should not be ignored.

It is more difficult to offer specific suggestions concerning authentication systems, because they are more prone than directory services to be proprietary or modified for site-specific needs. If your site is currently running a network authentication system, the admin responsible for it will need to determine how to best make it function with NLD. NLD as shipped can authenticate against the three networked services mentioned above; the configuration tools provided allow the administrator or user to configure NLD to authenticate against an LDAP directory containing an encrypted password, a Heimdal Kerberos v5 authentication system (or an MIT Kerberos v5 system), or a

Windows domain controller/Samba server. In addition, it contains tools for users to manage their password information from their local machine for each of these services.

For information, see [Kerberos: The Network Authentication Protocol \(http://web.mit.edu/kerberos/www/\)](http://web.mit.edu/kerberos/www/), the Kerberos chapters in *SUSE LINUX Enterprise Server 9 Administration Guide (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)*, [LDAP Authentication for Linux \(http://www.metaconsultancy.com/whitepapers/ldap-linux.htm\)](http://www.metaconsultancy.com/whitepapers/ldap-linux.htm), and [SMB Proxy Authentication Module \(http://www.hacom.nl/~richard/software/smb_auth.html\)](http://www.hacom.nl/~richard/software/smb_auth.html).

1.3 Network Behavior of Novell Linux Desktop

The first question that most admins might ask when told to support a new installation on their networks is “What will it do to my network?” This section attempts to answer that with reference to a basic installation of NLD. The short answer is this: NLD, like most Linux distributions, integrates smoothly into existing networks. However, it behaves somewhat differently from the average Windows or Macintosh computer and, as such, a quick overview of what can be expected is given here.

Security is a subject on most admins’ minds these days. NLD is no more unbreakable than any other software product out there; however, with a modicum of care and foresight, it can easily be one of the most trouble-free user desktops on your network. Most of the tools necessary for this ship with NLD itself.

From a planning point of view, there are several questions whose answers make deploying the desktop go more smoothly. These questions are not all specific to NLD and are familiar to any experienced admin:

- ◆ Are there any easily defined subgroups which can be isolated by their network use patterns (common file servers, common gateways, common printers)?
- ◆ Are there any network segments behind slow or unreliable network links? (Because of NLD’s heavy use of DNS when networked, these segments might benefit from a dedicated DNS server.)
- ◆ Will NLD users be restricted from using any ports to send packets from their machines? Should they be?
- ◆ Will NLD machines be able to open persistent connections to locations where those connections can be abused?

The first two should certainly be addressed before deployment. The second two will affect how NLD functions on the network and, therefore, should be addressed even before user and machine security policy is discussed or devised.

NLD’s most visible network behavior, absent heavy user network load, is its relatively frequent use of directory services and network name resolution services if it is configured to use them. Several components of the desktop rely heavily on DNS to function properly, and such simple operations as performing a directory listing can cause multiple directory connections if the machine is configured to retrieve user information from a remote server, because it will perform such a lookup in order to properly display the ownership of each file and subdirectory within the listing. It is not uncommon to see NLD machines maintain several open TCP/IP connections to their local directory and DNS servers at all times when in use, performing queries at a fairly rapid rate even if the user is not working in applications that typically would seem to need directory information, such as e-mail clients. Therefore, relatively short and noncomplex paths to these services are essential. If, for example, these services are separated from the NLD machines by a NAT (Network Address

Translation) gateway, ensuring that the number of available NAT sessions is adequate to support multiple sessions per machine is extremely important, or performance can be severely degraded. Similarly, if these services are behind a network bottleneck such as a slow WAN (Wide Area Network) link, performance problems might result.

Perhaps the most important decision the admin can make regarding users and NLD's network behavior is the degree of access users have to root services. Although it is possible and, in some cases, recommended, that users do not have root access to the NLD machine, this setup requires careful planning in the deployment phase in order to ensure that essential tasks such as software upgrades and local machine configuration are still possible without hands-on admin intervention. While local user access to root can make delegating management functions much simpler and, in some cases (expert users, lab machines, developers) necessary, it also allows local users to access the network in more fundamental ways, using privileged TCP ports (below 1024) at will, for example, and should be taken into account when planning network security.

The most effective means at the admin's disposal to ensure that local root access is not used to compromise network security is the same in the case of NLD as it is with any other machine on the network: central security measures. These include but are not limited to firewalls, router ACLs (Access Control Lists), Intrusion Detection Systems, enforced proxy access policies, identity management and access control policies, and zoned defenses. Because this documentation is not intended to serve as a network security primer, here are some additional references we strongly recommend if you want a better starting point:

- ♦ [The Linux Security HOWTO \(http://www.linuxsecurity.com/docs/LDP/Security-HOWTO\)](http://www.linuxsecurity.com/docs/LDP/Security-HOWTO)
- ♦ [The Network Security HOWTO \(http://www.linuxsecurity.com/docs/LDP/Security-HOWTO/network-security.html\)](http://www.linuxsecurity.com/docs/LDP/Security-HOWTO/network-security.html)
- ♦ [TrinityOS: A Guide to Configuring Your Linux Server for Performance, Security, and Manageability \(http://www.ecst.csuchico.edu/~dranch/LINUX/TrinityOS/cHTML/TrinityOS-c.html\)](http://www.ecst.csuchico.edu/~dranch/LINUX/TrinityOS/cHTML/TrinityOS-c.html)

1.4 Additional Documentation

Apart from the specific NLD documentation that is available from the [NLD documentation home page \(http://www.novell.com/documentation/nld/\)](http://www.novell.com/documentation/nld/), check the following resources for additional open source documentation on Linux:

SLES Installation and Administration Guide

This guide offers you indepth information on typical server-related configuration issues. Find it on the [SLES documentation home page \(http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf\)](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

Package Documentation

Almost every package shipped with NLD comes with its own documentation. To check out a package's documentation, always turn to `/usr/share/doc/packages/package_name`. The bare minimum you could expect to find there is a readme file, but most packages ship with quite comprehensive documentation, often even including example scenarios or ready-to-use configuration examples.

Project Home Pages

Check out a project's home page for additional documentation, screenshots, examples, and often even a mailing list for users and developers of the project. Even just browsing the archives of these lists often proves valuable.

The Linux Documentation Project (TLDP)

Volunteers from all over the world and from all kinds of projects through the open source world have contributed to a large database containing various kinds of documentations ranging from mere mini-HOWTOs and quick references to full-blown guides. See the [TLPD web site \(http://www.tlpd.org\)](http://www.tlpd.org) for more information.

1.5 Support for Your Deployment of NLD

Another big issue in industry deployments of any software is where to turn to in case of problems and where to get immediate help. Novell offers several different options to support their NLD customers in every possible way.

If you are looking for more information on the product, or want to discuss the product with peers, turn to the [Novell Linux Desktop Support Community \(http://support.novell.com/products/desktop/\)](http://support.novell.com/products/desktop/). This site offers you the following:

- ◆ A comprehensive search on NLD-related items in any Novell publication, such as documentation, knowledgebase, and articles and tips.
- ◆ Novell support forums, either NLD specific or for all Novell products.
- ◆ The documentation associated with NLD.
- ◆ The latest articles that have been published for NLD.
- ◆ Product-related downloads.

These self-support options are all offered free of charge.

For help with a technical problem related to NLD, turn to the paid support options of [Novell Linux Desktop Installation Support \(http://support.novell.com/products/desktop/installation/\)](http://support.novell.com/products/desktop/installation/) or [Novell Linux Desktop Component Support \(http://support.novell.com/products/desktop/component_support.html\)](http://support.novell.com/products/desktop/component_support.html).

If you want specially trained professionals to help with your deployment of NLD, contact the Novell Consulting Services through the [Novell Consulting Home Page \(http://www.novell.com/consulting/\)](http://www.novell.com/consulting/).

Deploying Novell Linux Desktop

2

There are several different ways to deploy Novell® Linux Desktop (NLD) on workstations. Choose from various approaches to a local install using either physical media or a network installation server or do a mass deployment using a remote controlled, highly customized and automatic installation technique.

This chapter introduces several scenarios either for single installations or potential mass deployments of NLD:

- ♦ “Manual Installation” on page 25
- ♦ “Remote Installation” on page 53
- ♦ “Automated Installation” on page 76

2.1 Deployment Strategies

The following section should help you determine which installation method featured in this chapter best matches your requirements.

2.1.1 Deploying up to 10 Workstations

If your deployment of NLD involves only one to 10 workstations, the easiest and least complex way of deploying NLD would be a plain manual install as featured in “Manual Installation” on page 25.

Manual installation can be done in several different ways depending on your requirements:

Installation Method	Installation Source	Tasks Requiring Manual Interaction	Remotely Controlled Tasks
“Using the NLD CDs or DVD as the Installation Source” on page 25	NLD media kit	<ul style="list-style-type: none">♦ Insert installation media♦ Boot installation target♦ Change media♦ Determine YaST installation scope♦ Configure YaST system.	None.
“Network Installation with OpenSLP” on page 53	Network installation server holding the NLD installation media	<ul style="list-style-type: none">♦ Insert boot disk♦ Provide boot options♦ Boot installation target♦ Determine YaST installation scope♦ Configure YaST system	None, but method can be combined with VNC (see below).

Installation Method	Installation Source	Tasks Requiring Manual Interaction	Remotely Controlled Tasks
"Network Installation through VNC" on page 53	Network installation server holding the NLD installation media	<ul style="list-style-type: none"> ◆ Insert boot disk ◆ Provide boot options ◆ Boot installation target 	<ul style="list-style-type: none"> ◆ Determine YaST installation scope. ◆ Configure YaST system.

2.1.2 Deploying up to 100 Workstations

With a growing numbers of workstations to install, you certainly don't want to install and configure each one of them manually. There are many automated or semiautomated approaches as well as several options to perform an installation with minimal or no physical user interaction.

Before considering a fully automated approach, take into account that the more complex the scenario, the longer it takes to set up. If a time limit is associated with your deployment, you might choose a less complex approach that can be carried out much faster. Automization makes sense for huge deployments and those that are to be carried out remotely.

Installation Method	Installation Source	Preparations	Control/Monitoring	Best Suited For	Drawbacks
"Simple Remote Installation via VNC—Static Network Configuration" on page 54	Network	<ul style="list-style-type: none"> ◆ Set up install source ◆ Boot from install media 	Remote: VNC	<ul style="list-style-type: none"> ◆ Small to medium scenarios with heterogeneous hardware configuration 	<ul style="list-style-type: none"> ◆ Each machine has to be set up individually ◆ Physical access needed for booting
"Simple Remote Installation via VNC—Dynamic Network Configuration via DHCP" on page 54	Network	<ul style="list-style-type: none"> ◆ Set up install source ◆ Boot from install media 	Remote: VNC	<ul style="list-style-type: none"> ◆ Small to medium scenarios with heterogeneous hardware configuration 	<ul style="list-style-type: none"> ◆ Each machine has to be set up individually ◆ Physical access needed for booting
"Remote Installation via VNC—PXE Boot and Wake-on-LAN" on page 55	Network	<ul style="list-style-type: none"> ◆ Set up install source ◆ Configure DHCP, TFTP, PXE boot, and WOL ◆ Network boot 	Remote: VNC	<ul style="list-style-type: none"> ◆ Small to medium scenarios with heterogeneous hardware configuration ◆ Completely remote installs, cross-site deployment 	<ul style="list-style-type: none"> ◆ Each machine has to be set up manually

Installation Method	Installation Source	Preparations	Control/Monitoring	Best Suited For	Drawbacks
“Simple Remote Installation via SSH—Static Network Configuration” on page 56	Network	<ul style="list-style-type: none"> ◆ Set up install source ◆ Boot from install media 	Remote: SSH	<ul style="list-style-type: none"> ◆ Small to medium scenarios with heterogeneous hardware configuration ◆ Low bandwidth connections to target 	<ul style="list-style-type: none"> ◆ Each machine has to be set up individually ◆ Physical access needed for booting
“Simple Remote Installation via SSH—Dynamic Network Configuration via DHCP” on page 57	Network	<ul style="list-style-type: none"> ◆ Set up install source ◆ Boot from install media 	Remote: SSH	<ul style="list-style-type: none"> ◆ Small to medium scenarios with heterogeneous hardware configuration ◆ Low bandwidth connections to target 	<ul style="list-style-type: none"> ◆ Each machine has to be set up individually ◆ Physical access needed for booting
“Remote Installation via SSH—PXE Boot and Wake-on-LAN” on page 57	Network	<ul style="list-style-type: none"> ◆ Set up install source ◆ Configure DHCP, TFTP, PXE boot, and WOL ◆ Boot network ◆ Boot network 	Remote: SSH	<ul style="list-style-type: none"> ◆ Small to medium scenarios with heterogeneous hardware configuration ◆ Completely remote installs, cross-site deployment ◆ Low bandwidth connections to target 	<ul style="list-style-type: none"> ◆ Each machine has to be set up individually
“Imaging” on page 76	Network	<ul style="list-style-type: none"> ◆ Set up NFS server ◆ Boot master and target from install media ◆ Set up master machine ◆ Prepare target machine 	Local	<ul style="list-style-type: none"> ◆ Medium to large scenarios with identical hardware ◆ Exact clones of one machine (if needed) 	<ul style="list-style-type: none"> ◆ Applies only to homogenous hardware setups ◆ Considerable configuration efforts needed ◆ Each machine has to be configured individually ◆ Physical access needed

Installation Method	Installation Source	Preparations	Control/Monitoring	Best Suited For	Drawbacks
"Firstboot Configuration" on page 80	Network	<ul style="list-style-type: none"> ◆ YaST firstboot configuration ◆ Set up NFS server ◆ Boot master and target from install media ◆ Set up master machine ◆ Prepare target machine 	Local	<ul style="list-style-type: none"> ◆ Medium to large scenarios with identical hardware ◆ Exact clones of one machine a (if needed) 	<ul style="list-style-type: none"> ◆ Applies only to homogenous hardware setups ◆ Considerable configuration efforts needed ◆ Each machine has to be configured individually ◆ Physical access needed
"Create Custom Installations Using the control.xml File" on page 84	Network	<ul style="list-style-type: none"> ◆ Create custom control file ◆ Set up server for install media and control file ◆ Set up network boot (DHCP, TFTP, PXE, WOL or ◆ Boot target from install media 	Local or remote: VNC or SSH	<ul style="list-style-type: none"> ◆ Medium to large scenarios with identical or similar hardware ◆ Customized installations are called for ◆ Cross-site scenarios (if remotely controlled) 	<ul style="list-style-type: none"> ◆ Applies only to fairly homogenous hardware setups ◆ Considerable configuration efforts needed ◆ Each machine has to be set up individually

Installation Method	Installation Source	Preparations	Control/Monitoring	Best Suited For	Drawbacks
“Automatic Linux Installation and Configuration Using AutoYaST” on page 195	Preferably network	<ul style="list-style-type: none"> ◆ Create AutoYaST profile ◆ Set up installation server ◆ Distribute profile ◆ Set up network boot (DHCP, TFTP, PXE, WOL) or ◆ Boot target from install media 	Local or remote: VNC or SSH	<ul style="list-style-type: none"> ◆ Large scenarios ◆ Heterogeneous hardware configurations ◆ Completely hands-off (if network boot is used) ◆ Cross-site scenarios 	<ul style="list-style-type: none"> ◆ Considerable configuration efforts needed

2.1.3 Deploying More Than 100 Workstations

Most of the considerations mentioned for medium installation scenarios in [“Deploying up to 10 Workstations” on page 21](#) still hold true for large scale deployments. But with a growing number of installation targets, the benefits of a fully automated installation method outweigh its disadvantages.

It is worthwhile to invest a considerable amount of time to create a sophisticated rule and class framework in AutoYaST to match the requirements of a huge deployment site. Not having to touch each target separately can save you a huge amount of time depending of the scope of your installation project.

2.2 Manual Installation

Manual installation can be done in several different ways. You can either install from a local installation source (such as the NLD CDs or DVD) or get the installation sources from an FTP, HTTP, or NFS server. In any case, this approach requires physical access to the system that is to be installed and user interaction during the installation and configuration procedure.

The installation procedure is basically the same, no matter which installation source or method you use. Understanding the manual procedure can help you to understand the automated installation procedures as well.

2.2.1 Using the NLD CDs or DVD as the Installation Source

Installation can be done from the distribution CDs by inserting *Novell Linux Desktop CD 1* or *DVD* and then booting the workstation. This type of installation requires user interaction.

IMPORTANT: Make sure that the workstation's BIOS has been configured to boot from CD before you start the installation process. Otherwise, you cannot perform an installation because the installer is not able to access the installation media in your drive.

Booting for Installation

Insert the *Novell Linux Desktop CD 1* or *DVD* into the drive, then reboot the computer to start the installation program.

This brings up the installation screen offering the following options for you to choose from.

Boot from Hard Disk

Boots the system already installed on the hard drive (the system normally booted when the machine is started).

Installation

Boots the normal installation.

Installation—ACPI Disabled

If the normal installation fails, it could be because the system hardware doesn't support the Advanced Configuration and Power Interface (ACPI). If this seems to be the case, use this option to install without ACPI support.

Installation—Safe Settings

Boots the system with the DMA mode (for CD-ROM drives) and any interfering power management functions disabled.

Manual Installation

By default, drivers are loaded automatically during the installation. If this appears to cause problems, use this option to load drivers manually. This option does not work if you use a USB keyboard on your system.

Rescue System

If you are unable to boot into your installed Linux system for some reason, you can boot the computer from the CD using this option. This starts a minimal Linux system without a graphical user interface, which lets you access disk partitions for troubleshooting and repairing the installed system. For more information on the rescue system, refer to [“How do I recover a corrupted system?” on page 123](#).

Memory Test

Tests your system RAM by means of repeated read and write cycles. This is done in an endless loop because memory corruption often shows up sporadically and many read and write cycles might be necessary to detect it. If you suspect that your RAM is defective, start this test and let it run for several hours. If no errors are found after a long period of time, you can assume that the memory is intact. End the test by rebooting the system.

IMPORTANT: Some hardware models, mostly fairly aged or very recent ones, require special boot options to be passed on to the kernel at installation time. Use the boot options prompt to pass these on to the kernel. After you determined the right set of options to use, YaST automatically adds them to the boot loader configuration making sure the system boots up correctly. See [Chapter 5, “Troubleshooting,” on page 109](#) for details on this and read “Chapter 8: Booting and Boot

Managers” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf) for instructions on the syntax of the boot loader configuration in NLD.

Use the boot options prompt to enter any additional boot option for the Linux kernel. Options entered here are valid during only one boot process.

The menu bar at the bottom of the screen offers some additional functionality needed in some setups:

Table 2-1 *Installation Menu Bar Options*

Option	Description
F1	Launches a help section on the boot screen.
F2	If the graphical installation mode at a given screen resolution causes any problem, use this menu to either select a lower resolution or switch over to the text mode of the installation program.
F3	Selects the installation source. The default setting is CD-ROM. If network installation sources are available, consider selecting one of the different network installation procedures.
F4	Selects the language used for the installation screen and all of the following dialogs.
F5	By default, the system does not display the log messages of the ongoing installation. By selecting Native, these messages are shown. To get a complete log of the procedure, select Verbose.
F6	If you have a driver update disk that needs to be applied before the actual installation, select this option. You are asked for this disk later in the installation process.

Leave these menus either by selecting one of these options or by pressing Esc.

Then select *Installation* and press Enter. This loads the Novell Linux Desktop installation program and starts the installation in normal mode.

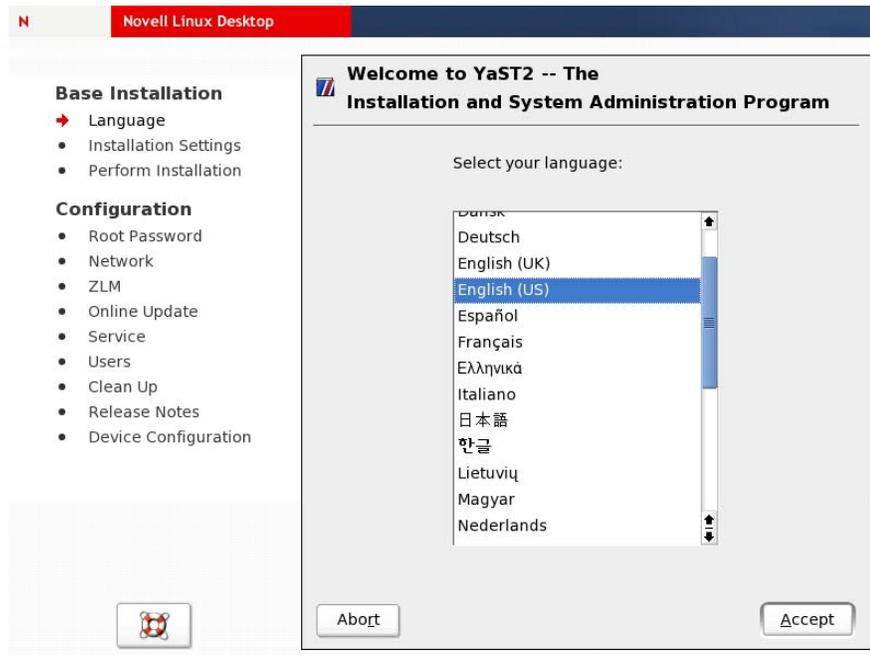
Read the License agreement, then click *I Agree* to accept it and continue the installation.

Language Selection

After you have accepted the licence agreement, set the keyboard language. This setting applies not only to the keyboard layout during installation, but also to the installed system. The settings made here are used by NLD to assume the time zone settings for your workstation.

TIP: If you want to change these settings later on during the installation process, launch the YaST modules for time zone and keyboard from the Installation Settings screen (described in “**Installation Settings**” on page 29). If you want to change these settings in the installed NLD system, start the YaST Control Center and launch the Date and Time and Select Keyboard modules of the System submenu.

Figure 2-1 Language Selection



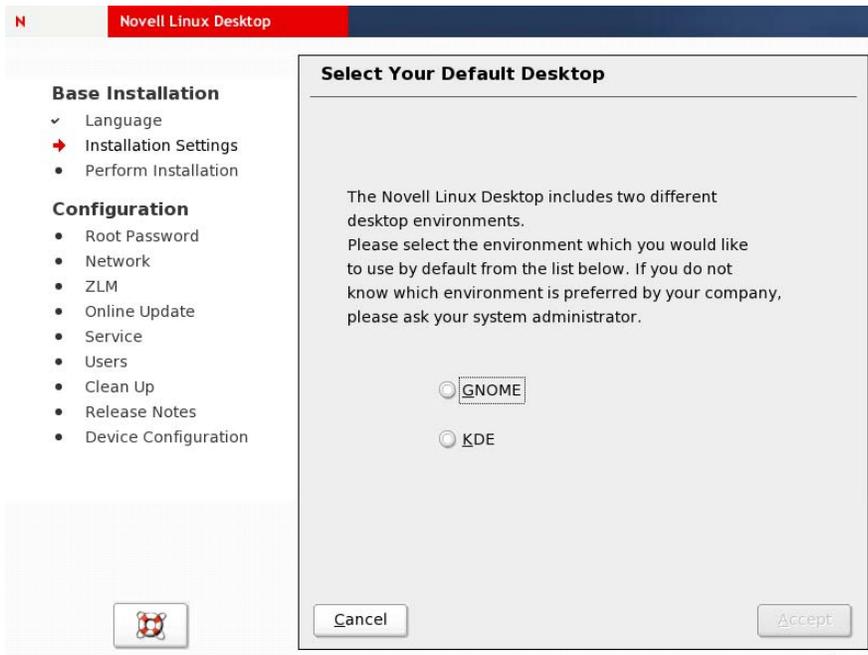
After you have completed the language settings, click *Accept* and proceed with selecting your preferred desktop environment.

Selecting the Desktop Environment

Novell Linux Desktop ships with two fully fledged desktop environments, GNOME and KDE. Selecting one of them at this point limits the scope of your installation to a set of default system packages plus all the packages provided by the desktop of your choice. If you do not know which environment your company prefers, ask your system administrator. For more information on the desktop environments, see the *Novell Linux Desktop GNOME User Guide* (http://www.novell.com/documentation/nld/userguide_gnome/data/front.html) and the *Novell Linux Desktop KDE User Guide* (http://www.novell.com/documentation/nld/userguide_kde/data/front.html).

TIP: If you want to install packages belonging to the other desktop environment because you need a special tool, you can do so later on in the installation process. See “**Software Selection**” on page 34 for information.

Figure 2-2 *Selecting the Default Desktop Environment*



Installation Settings

The Installation Settings screen comprises any information relevant to the installation procedure. You can select any of the following options and configure them in the corresponding dialogs. After your changes have been made, you are always returned to the Installation Settings screen, which is updated accordingly.

System

Detects system hardware and lets you save the results to a floppy or file.

Mode

This version of Novell Linux Desktop only offers the New Installation mode.

Keyboard Layout

Changes the previously selected keyboard layout. By default, the layout corresponds to the selected language.

Mouse

Selects a mouse type other than the one NLD detected automatically. After selecting a mouse type, press Alt+T to test whether the device works correctly without making the selection permanent.

Partitioning

Customizes the partitioning. In most cases, NLD suggests a reasonable partitioning scheme that can be accepted without any change. For more information, see [“Partitioning” on page 31](#).

Software

NLD offers several types of software packages with various installation scopes. Depending on the available disk space and the desktop environment you selected, NLD selects one of the

these predefined systems for you. Use this option to change the selected desktop environment and to add or remove packages and filters. For more information on how the management of software packages is done using YaST, see “Software” on page 127.

Booting

During the installation, NLD proposes a boot configuration for your system. You should normally leave these settings unchanged, but you can use this option if you need a custom setup.

Time Zone

Selects a time zone. You can also set the hardware clock to Local Time or UTC. If you set the hardware clock to UTC, your system can rely on NLD to switch between standard time and daylight saving time automatically. Set the clock to Local Time if you are dual booting.

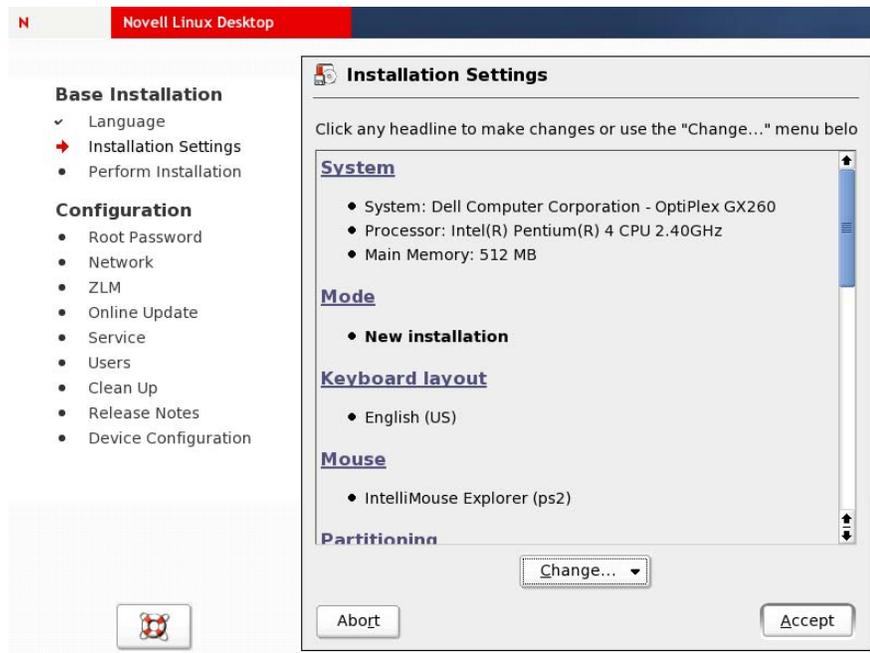
Language

Changes the language you selected. You can also change the language when you log in.

Default Runlevel

Defines how the system is started after booting. Use the default runlevel 5: Full Multiuser with Network and xdm (which prompts you to log in directly under a graphical interface). Do not change the runlevel unless instructed to do so by your system administrator. For more information on the SUSE® LINUX boot concept that is used with NLD, see “Chapter 11: The SUSE LINUX Boot Concept” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

Figure 2-3 Installation Settings Overview

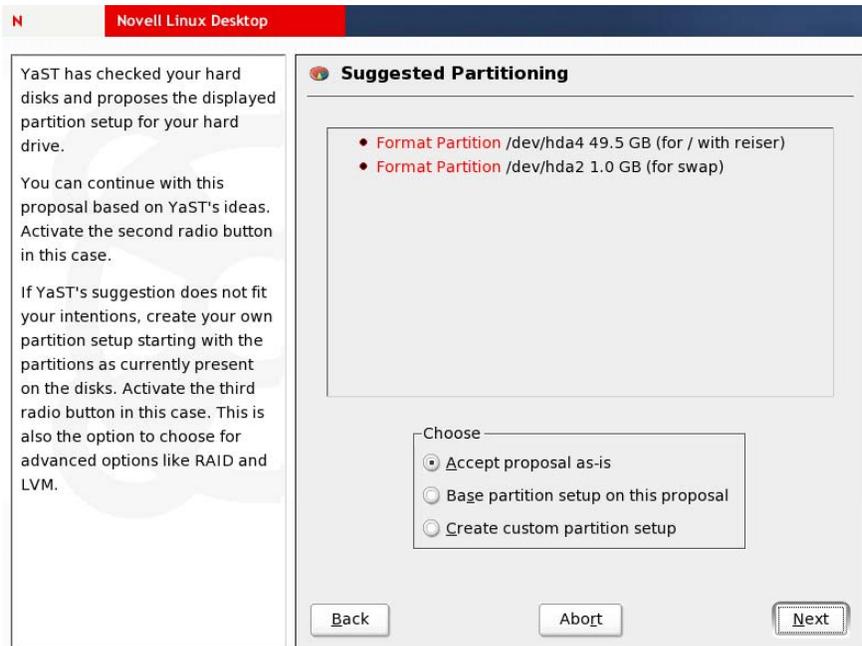


Partitioning

During installation, YaST usually suggests a reasonable partitioning. However, if you want to change the suggested partitioning (for example, add extra partitions for later use or for alternate operating systems), you can customize the partition setup by clicking the *Partitioning* heading in the Installation Settings screen mentioned above.

YaST displays the current partitioning suggestions.

Figure 2-4 Suggested Partitioning



Select from the following options to continue with the partitioning setup:

Accept proposal as-is

Leave the suggested partitioning unchanged and return to the Installation Settings screen.

Base partition setup on this proposal

Refine the proposed partitioning using the Expert Partitioning dialog. Only those partitions and hard disks will be listed that YaST which were included in its initial suggestion.

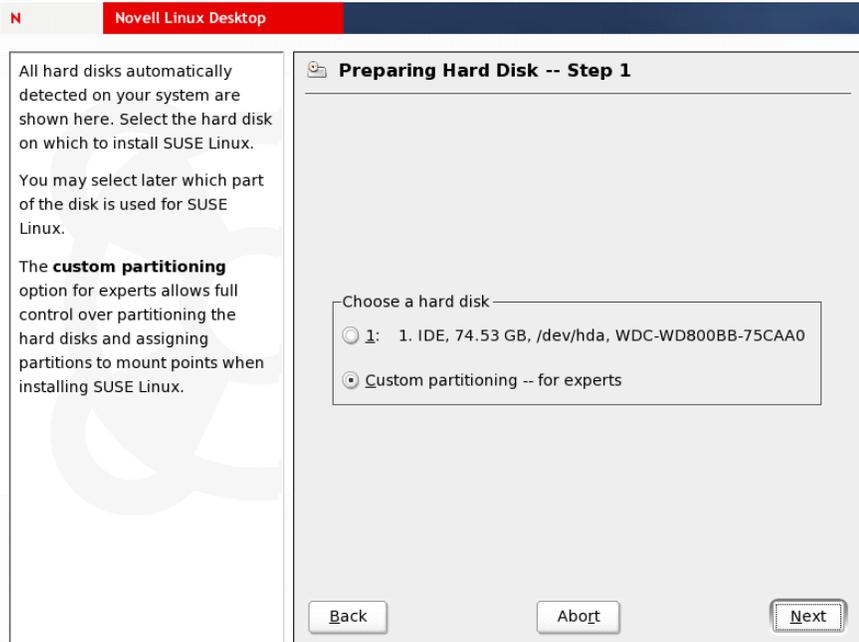
Create custom partition setup

If you want to make changes to the partition setup that go beyond mere fine-tuning of the YaST suggestions, select this option. Any hard disk and partition included in your system then applies.

Select *Create custom partition setup* and click *Next* to create a new partition setup.

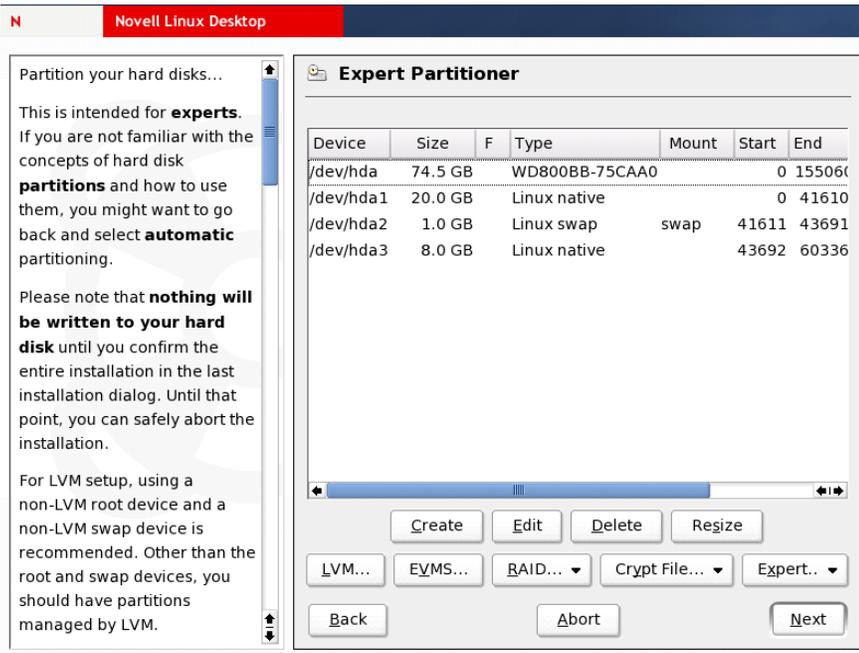
The following dialog lets you select the disks your settings should be applied on.

Figure 2-5 Customizing Your Partition Setup



To create a whole new partitioning setup, select *Custom partitioning — for experts*. The Expert Partitioner appears.

Figure 2-6 Expert Partitioner: Adding, Deleting and Editing Partitions



The Expert Partitioner displays any partition and hard disk included in your system. You can add partitions, edit existing ones, delete partitions, or resize them. Whole disks appear without any

device number. SCSI disks are called `/dev/sdxy`, whereas (E)IDE disks are called `/dev/hdxy`. The *x* represents the disk number; the first disk in a Linux system always appears as “a.” The *y* represents the partition number on a disk. The first partition on the first SCSI disk would, therefore, be addressed as `/dev/sda1`.

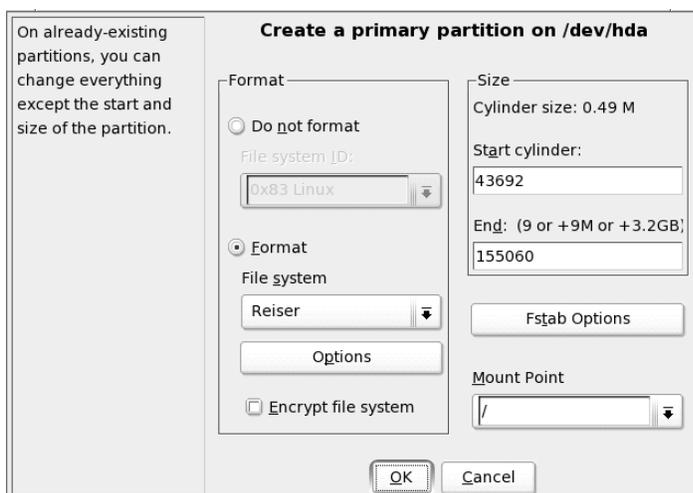
To create a new partition, select *Create*. In the next step, determine the type of partition you want to create. For detailed information on the partition types in Linux, turn to “[Partition Types](#)” on [page 255](#).

Figure 2-7 Determining the Partition Type



To create another primary partition on your first hard disk, select *Primary Partition* and then click *OK*.

Figure 2-8 Creating a New Partition



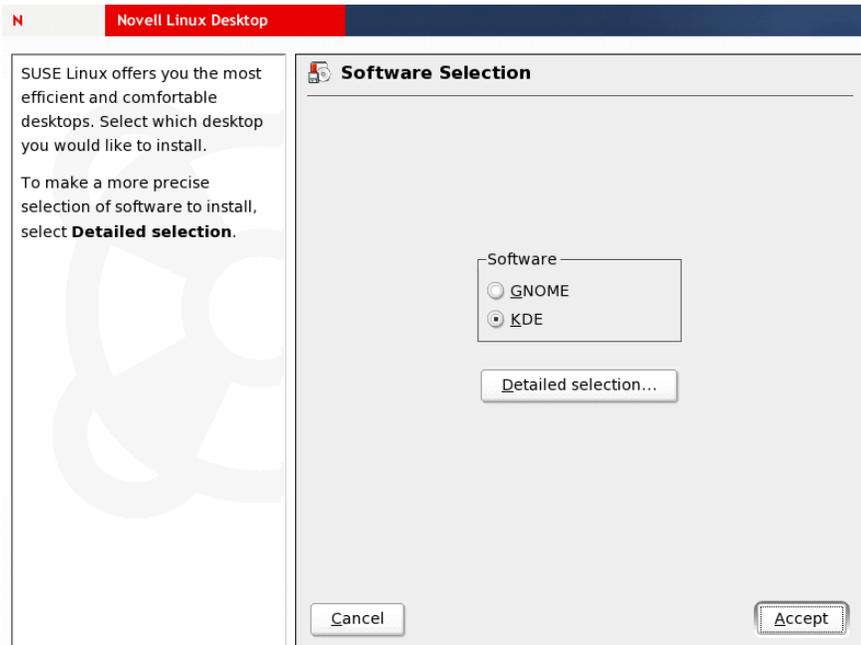
Set the partitioning parameters, such as file system ID, type, size, and mount point. If you are just creating a new Linux partition to hold additional data, select *Reiser* as the file system (the NLD default file system). For the size of the new partition just specify the end point of it; the start cylinder is assigned automatically. Finally, assign a mount point, if the partition is to be mounted into your installed system. If you don't want to include it right now, just omit the mount point. The partition appears in the partition table of the installed system, but it is not mounted by default.

TIP: For detailed information on partitioning, turn to [Appendix D, “Partitioning,”](#) on [page 255](#). For an overview of Linux file systems, see “Chapter 18: File Systems in Linux” of the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

Software Selection

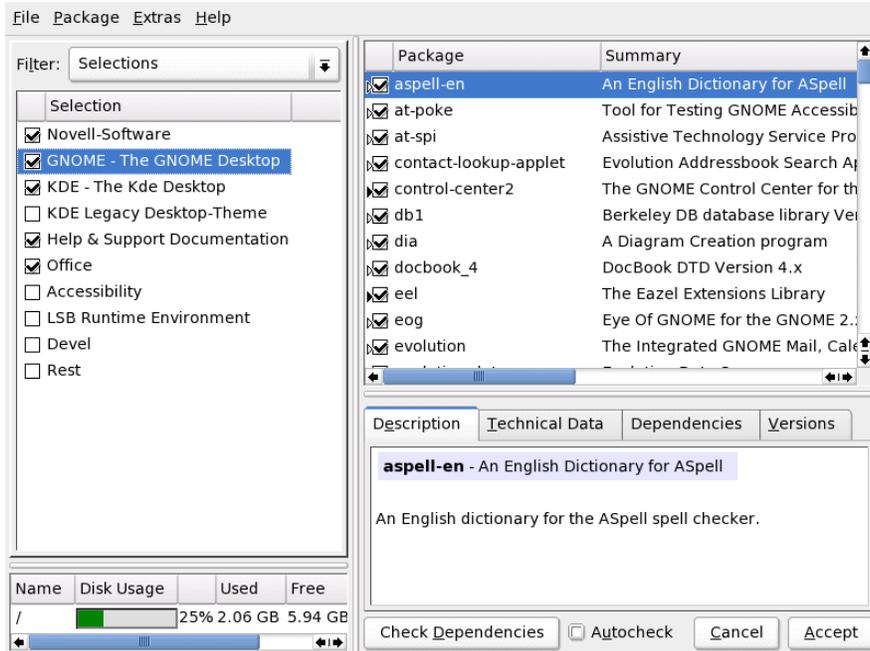
Although you have already selected the desktop environment for your NLD workstation, you might want to refine your selection. To modify the software selection, click *Software*. The Software Selection dialog appears.

Figure 2-9 *Editing the Software Selection*



To open the YaST package management tool, click *Detailed selection*. The YaST package manager allows you to select and deselect single packages as well as entire package groups or package selections and offers an extensive search function.

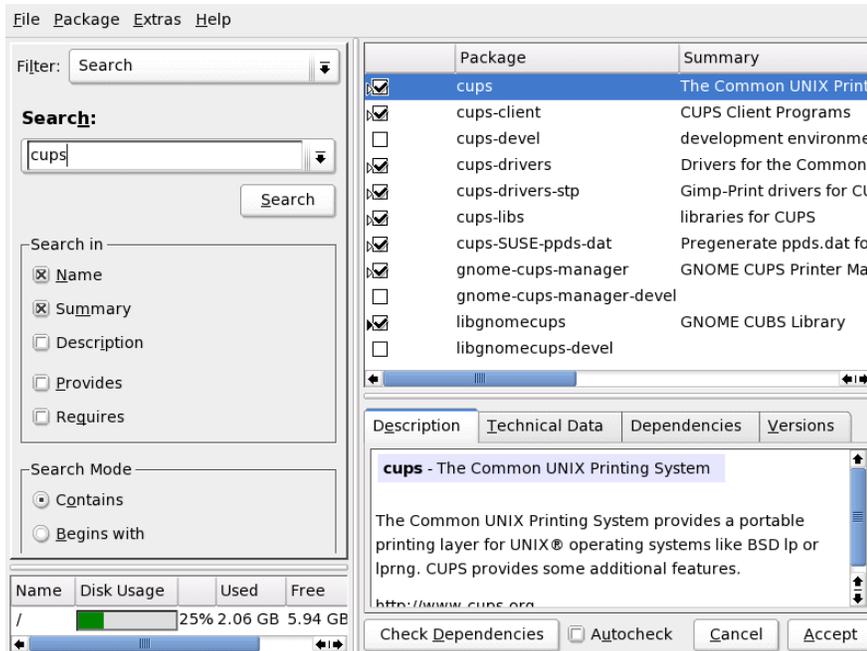
Figure 2-10 *Selecting New Packages*



The right part of the package window displays the list of packages included in the recent selection and an information window on the currently selected package featuring a brief package description, technical data, packages dependencies associated with this particular package, and the package's version. To the bottom left, statistics for the current disk usage are displayed. To select an entire package selection, such as an additional desktop environment or Accessibility software, select (check) the package name in the Selection window on the left.

To search for a particular package, switch the Filter setting from Selection to Search. Determine the scope and mode of your search and type the name of the package you are looking for or a binary or pathname included in this package.

Figure 2-11 Searching for Packages



By default, the list of package names and package summaries are searched for the string you entered. The following options can be selected as well:

Description

Searches through the verbose packages descriptions. These are displayed in the Description tab of the information window.

Provides

Searches through the binaries or capabilities provided by any package. This information is displayed in the Technical Data tab of the information window.

Requires

Similar to the Provides option in that it allows a search for paths and binaries, but it triggers a search over the requirements of a package. This information is displayed in the Technical Data tab of the information window.

The search mode is usually set to *Contains*, which allows a much broader search than if you limited the search method to *Begins with*. *Begins with* comes in handy if you know exactly what you are searching for and need to limit the scope of the search.

For more information about the YaST package manager, see [“Installing and Removing Software” on page 127](#).

After you finish the package selection, click *Accept*. YaST automatically checks for missing packages dependencies or for conflicting packages. In case of a conflict, YaST displays a summary

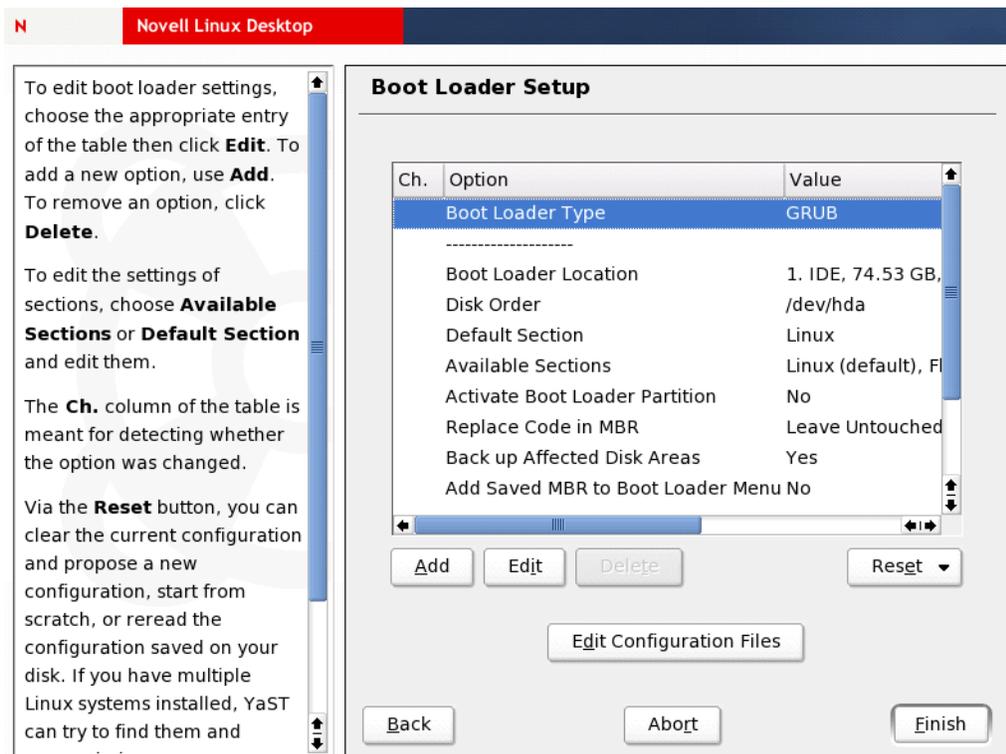
screen showing all package conflicts arising with the current selection and offering possible solutions.

Booting

The default boot loader configuration created during installation works for any default installation of NLD. However, if you want to modify it on your own (for example, add a boot entry for another operating system), you need to modify the boot loader's configuration files.

Click *Booting* on the Installation Settings screen to launch the YaST Boot Loader Configuration module.

Figure 2-12 *Configuring the Boot Loader*

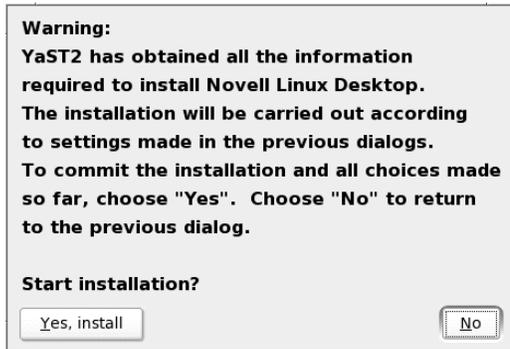


For a detailed description of this module and some background information on GRUB, the NLD boot loader, see “Chapter 8: Booting and Boot Managers” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)

Initiating the Installation

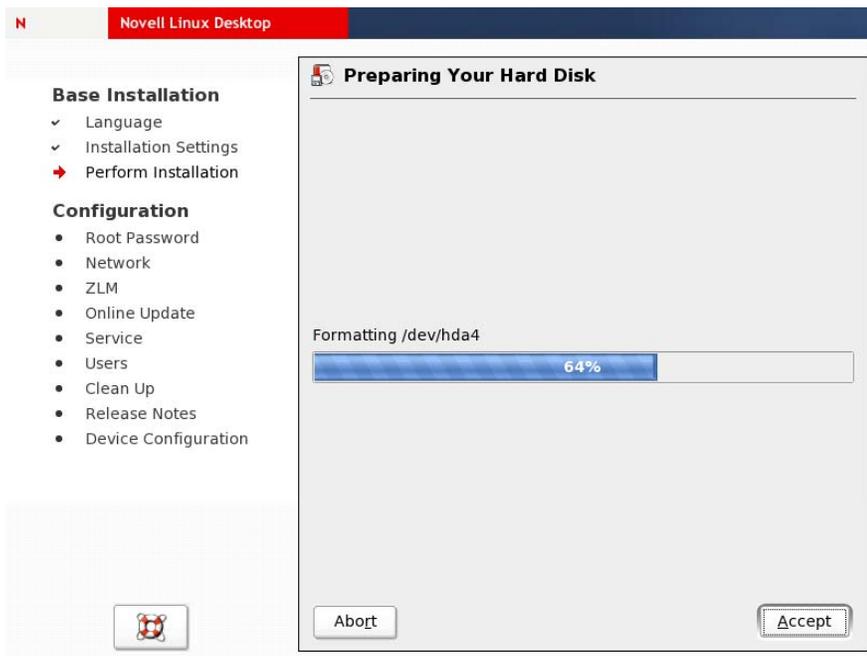
Having finished the package selection (and any optional boot loader configuration), you are returned to the Installation Settings screen. As soon as you have verified all other settings, click *Accept* to launch the installation process. A prompt appears asking you to confirm this action.

Figure 2-13 *Start Installation*



Click *Yes, install* and the installation procedure begins. First, the hard disk is partitioned and formatted according to the settings made in the Partitioning dialog. After that, the actual installation of software begins.

Figure 2-14 *Formatting the Hard Disk Prior to Installation*

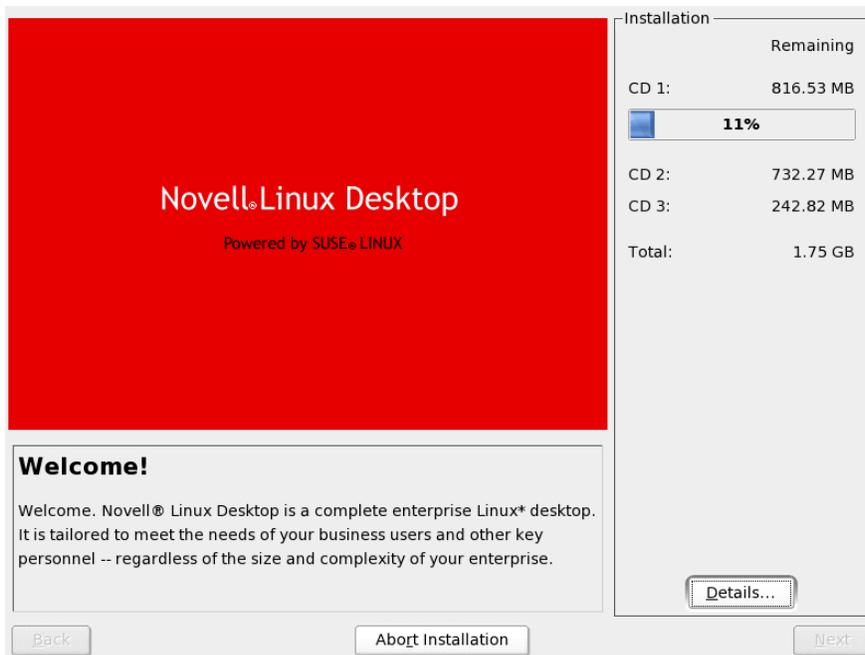


Installing Software

After the hard disk has been partitioned and formatted according to your preferences, YaST installs the software packages. If installing from an NLD DVD, all packages get installed without any

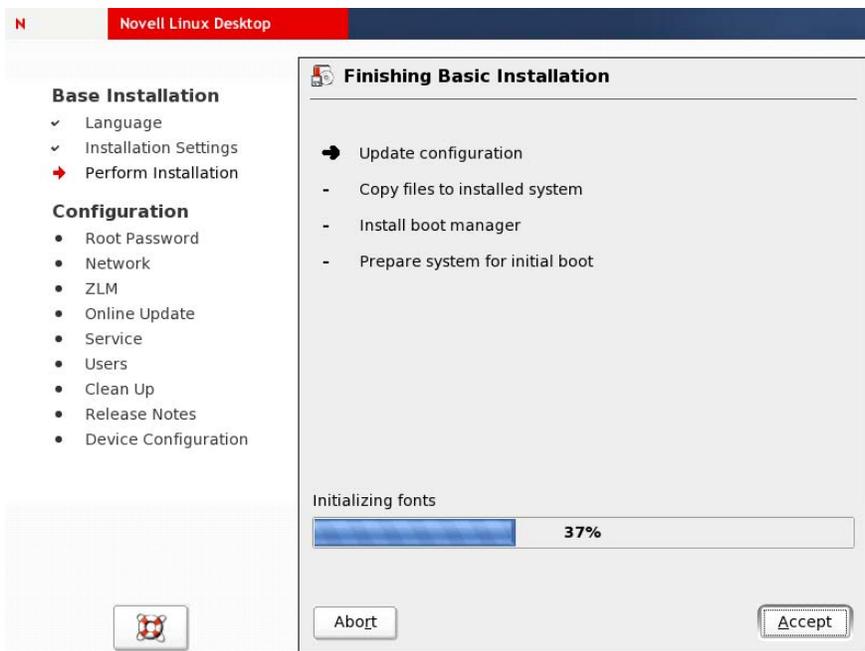
further actions required from your side. If you are installing from a set of NLD CDs, you need to change CDs when prompted.

Figure 2-15 *Installing Software Packages—Opening Window*



During package installation, you are shown a slide show highlighting the most important features of your Novell Linux Desktop system. The right side of the window displays some statistics on the media needed and the amount of data that needs to be transferred onto your hard disk. Click *Details* to view a detailed log of the packages currently being installed.

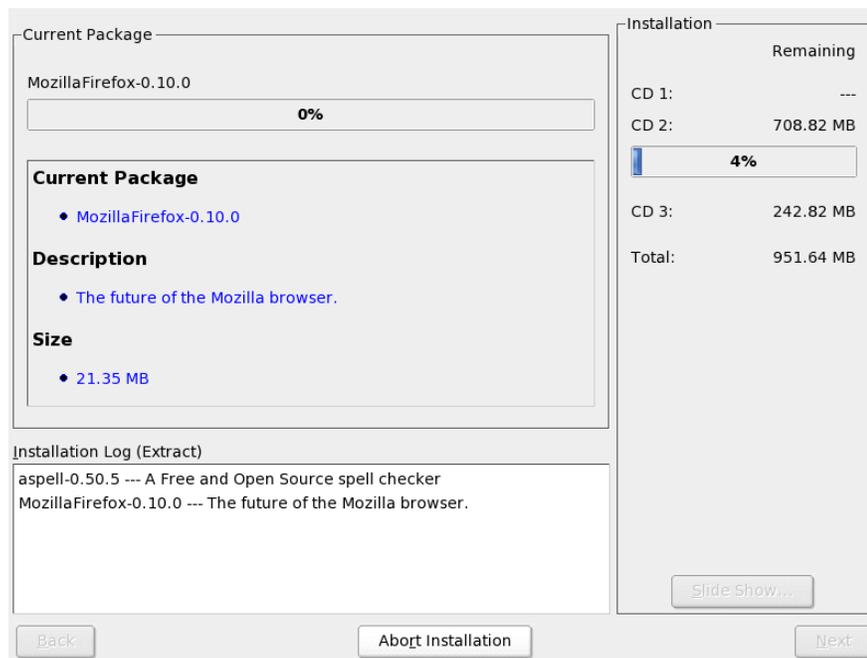
Figure 2-16 *Initial System Boot after Installation of CD1 Has Been Completed*



After all packages (or all packages of the first CD) are installed, the system boots and updates the system configuration and continues with the package installation. When the boot loader comes up, leave the default boot option (*Boot from Hard Disk*) unchanged and wait for the system to boot on its own.

YaST continues with the installation requesting additional CDs or, if you installed from DVD, moves on to the system configuration.

Figure 2-17 *Installing Software Packages Continuation*

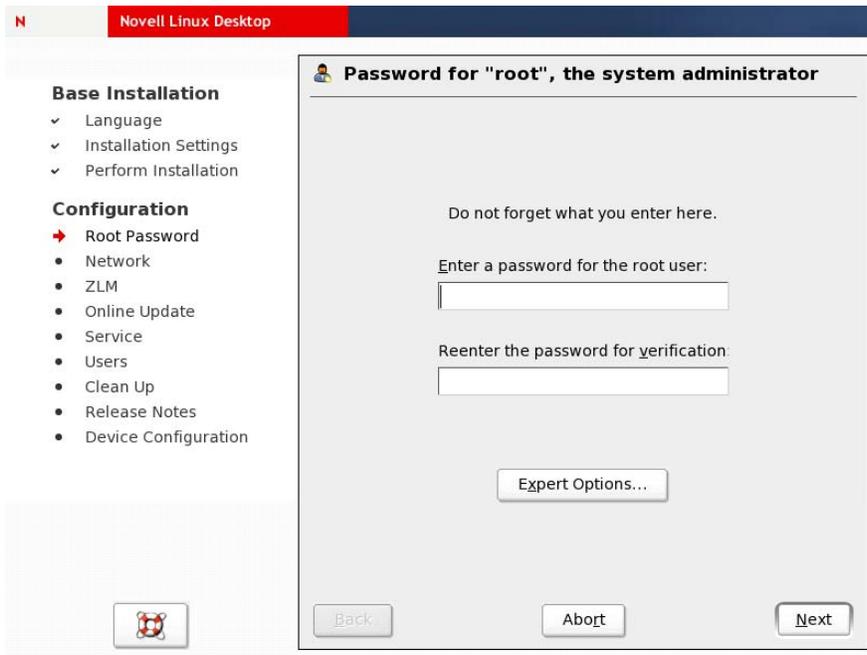


Configuring the System Administrator's Account (root)

After the initial boot of the installed system and after the final packages have been installed, you are prompted to configure the system administrator's account (root). Unlike regular users, which might or might not have permission to do certain things on the system, root has unlimited power to do anything: change the system configuration, install programs, and set up new hardware. If users forget their passwords or have other problems with the system, root can help. The root account should be used only for system administration, maintenance, and repair. Logging in as root for daily work is rather risky: a single mistake could lead to irretrievable loss of many system files.

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

Figure 2-18 Creating the Root Account



For verification purposes, the password for root must be entered twice. Don't forget the root password. When entered, this password cannot be retrieved.

TIP: Make sure your passwords cannot easily be guessed. Use a mixture of digits, capitalized letters, and special keys.

Using the default encryption method of NLD, DES, you can use passwords of five to eight characters in length. However, NLD supports a maximum password length of 72 characters. To use a password longer than eight characters, click *Expert Options* > *Password Encryption* and then select the *Blowfish* encryption option.

Figure 2-19 Determining the Password Encryption Method

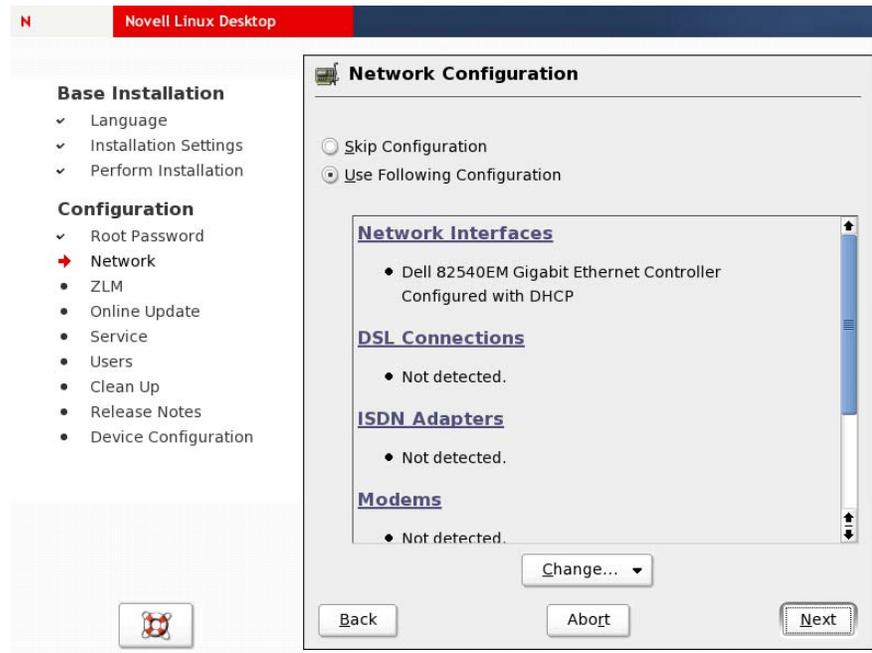


Network Configuration

You can configure any network devices for a connection to the outside world, such as network cards, modems, and ISDN or DSL hardware. If you have such devices, it is a good idea to configure them now, because an Internet connection allows YaST to retrieve any available NLD updates and include them in the installation.

TIP: If your network is set up to support DHCP-based configuration of the network clients, you can just accept the network settings as preconfigured by YaST during installation. DHCP network configuration works out of the box with any NLD installation. If your network doesn't include DHCP services, configure the detected network devices from scratch.

Figure 2-20 List of Available Network Interfaces

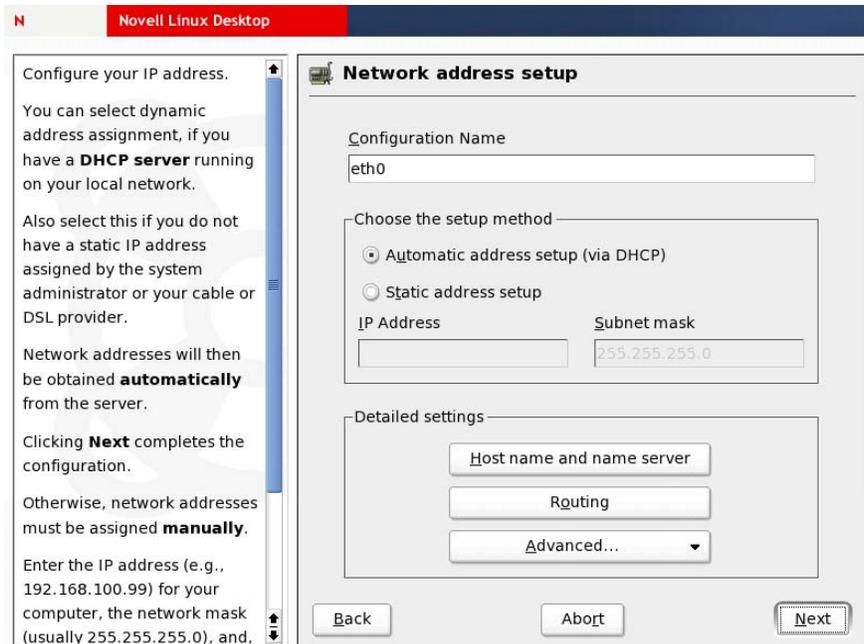


The Network Configuration dialog lists all possible network hardware. If an item has been detected and preconfigured during installation, this configuration appears in the overview screen. To edit any configuration item, click it and a dialog specific to this type of interface opens.

To configure an Ethernet device with a static IP address, click *Network interfaces* on the Network Configuration screen. Then decide whether you want to modify an existing configuration or start from scratch. To modify the preconfigured DHCP-based configuration, click *Edit*.

The Network address setup dialog opens. Don't change the configuration name; it is normally derived automatically during system setup. Select *Static address setup* and specify an appropriate IP address and netmask. If necessary, get these parameters from your network administrator.

Figure 2-21 *Configuring the Network Address*



Detailed settings lets you set up a hostname and name server for this particular machine and configure a default route and some advanced settings, such as the following:

Hardware Details

If your network hardware requires specialized kernel modules, configure them here. This should not be necessary in most cases.

DHCP Client Options

Depending on whether your network device is set up via DHCP, you can do some fine-tuning on the DHCP client side.

Detailed Settings

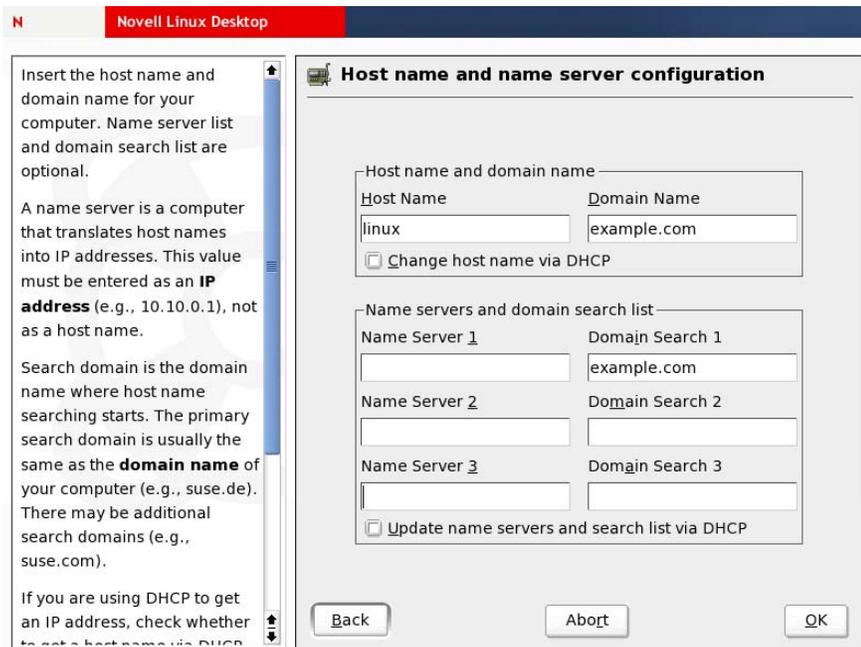
Sets the maximum transfer rate of your network interface and the device activation mode. Because the default setting for the MTU size is reasonable and the device activation is set to *Boot Time*, you hardly ever need to make changes here. Changing the device activation mode to *Manually* or *When Hotplugged* would make sense if your machine contained more than one type of interface and you didn't want all interfaces to be active at the same time.

Virtual Aliases

If you intend to use one and the same network hardware for a set of differently configured virtual interfaces, define these configurations using this option. This option is rarely needed outside very complex network setups.

Unless your setup requires any of this fine-tuning to be performed, proceed with the configuration of the hostname and name server.

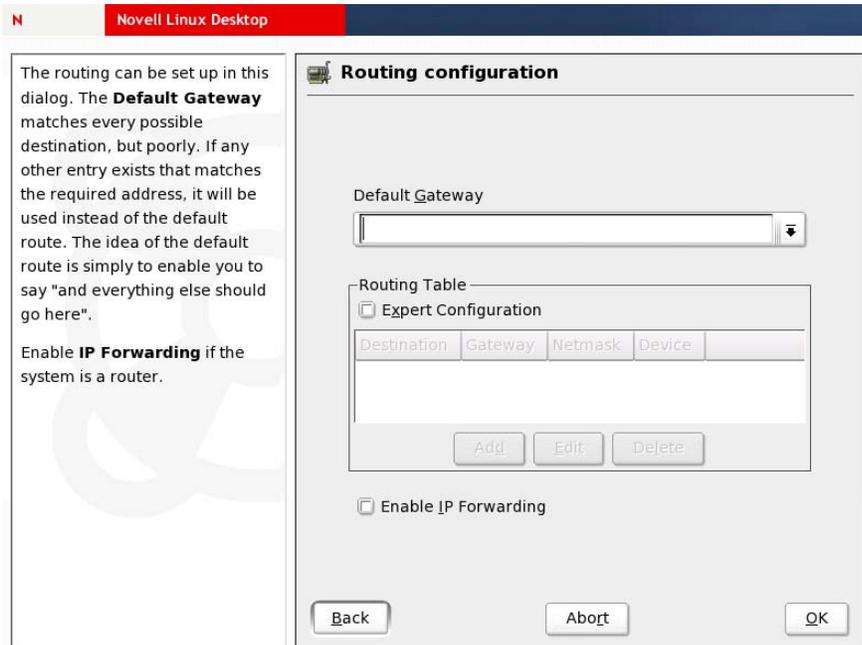
Figure 2-22 *Configuring Host Name and Name Server*



Specify a hostname and a domain name for your machine. If necessary, get this information from your network administrator. Specify an IP address and search domain for at least one name server in your network. If possible, specify more than one to have a fallback server in place just in case the main name server of your network crashes or is offline.

Click *OK* to go back to the *Network address setup* dialog and click *Routing* to configure any routing information needed for your machine.

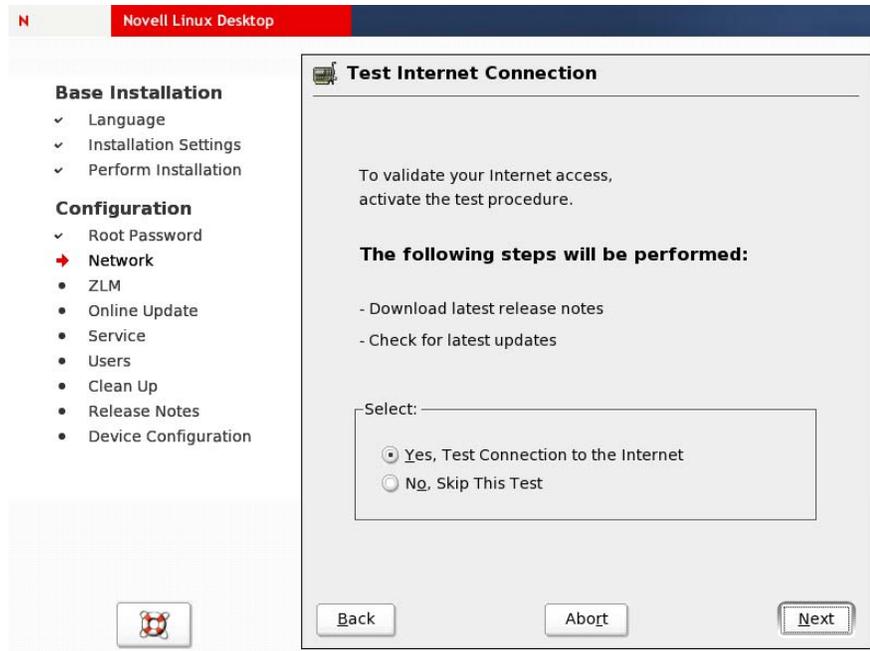
Figure 2-23 *Configuring the Routing*



If you are in a local network that uses one particular host as a gateway to other networks and the Internet, type its IP address in *Default Gateway* (ask your network administrator for details). Select *Enable IP Forwarding* only if you intend to use your NLD machine as a router; otherwise, click *OK* to return to the *Network address setup* dialog. Click *Finish* to complete your network configuration.

After your network has been set up correctly, YaST offers to let you test your Internet access by querying the Novell update server for software updates for NLD. Select *Yes, Test Connection to the Internet* and click *Next* to launch the activation dialog for ZENworks[®]™.

Figure 2-24 Testing the Internet Connection



Other Network Connection Types

The previous sections cover network integration only by means of an Ethernet device. However, ISDN, modem, and DSL connections are supported as well. Detailed instructions on the configuration of these devices can be found in “Section 21.4: Network Integration” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

ZENworks Linux Management Activation and Update

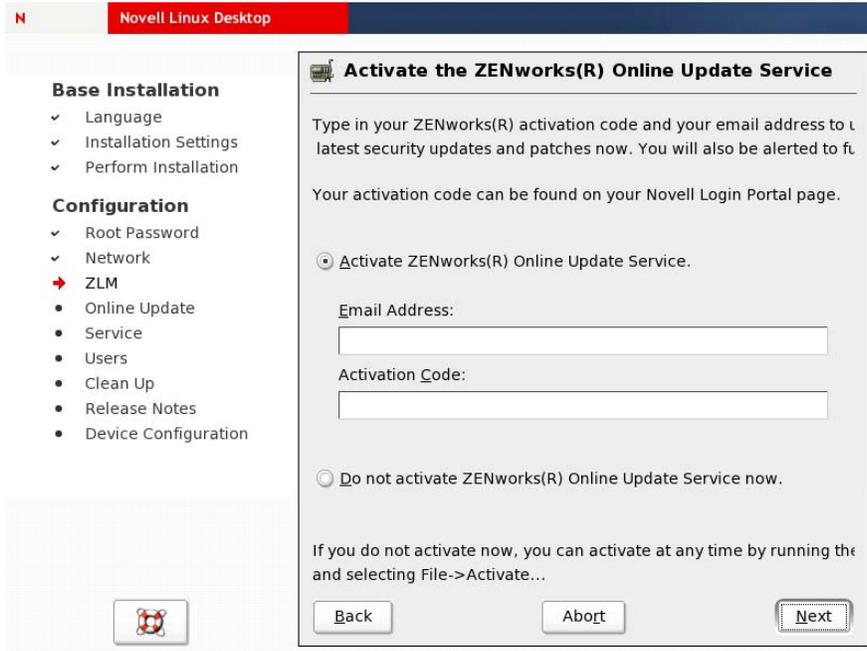
Novell Linux Desktop makes use of the ZENworks Online Update service. Before you can actually receive the patches and updates available for your NLD installation, you must provide the activation data you received upon purchase of NLD and the subsequent registration of your product.

In case you haven't yet registered your NLD with Novell, proceed as follows:

- 1 After purchasing NLD, you received an e-mail containing a URL that took you to the Novell eLogin page. If you already have an eLogin account, enter your username and password to log in. If not, create one using the *Create a Profile* option on the eLogin page.
- 2 Log in providing your authentication data.
This takes you to the registration page containing a serial number and status for your NLD product.
- 3 Make note of the serial number, because it will later serve as the activation code.
- 4 Register the activation code by clicking *Click to Register*.

When the activation code is registered, you can use it for ZENworks authentication.

Figure 2-25 Activating the ZENworks Online Update Service



After you have entered the correct authentication data, the Online Update automatically starts installing the most recent patches and updates on top of your NLD installation.

If you prefer to not run the online update right now, select *Do not activate ZENworks Online Update Service now* and click *Next* to close the dialog.

TIP: In an installed system, activate the update service by starting Red Carpet[®] and clicking *File > Activate*. For more information on ZENworks and Red Carpet, see the *ZENworks Linux Management* (<http://www.novell.com/documentation/zlm/index.html>) and *Novell Red Carpet* (<http://www.novell.com/documentation/ximian/redcarpet.pdf>) documentation.

Managing User Accounts

NLD offers several different methods for user authentication and management. You can choose between network based methods and local authentication:

Local

Local authentication is mostly used on standalone workstations. All user authentication data is stored locally in a file called `/etc/passwd`. Adding or editing user information has to be done locally.

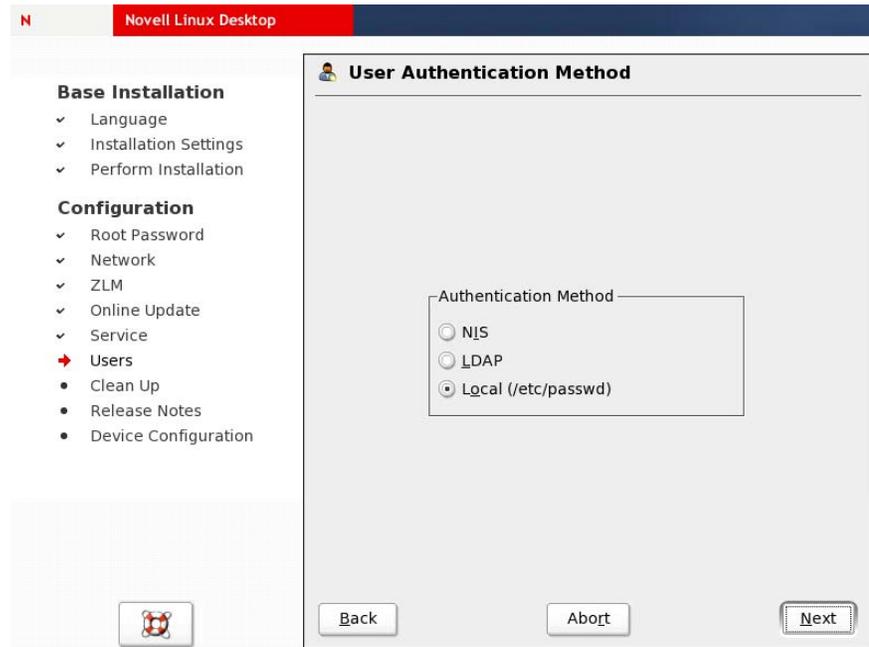
LDAP

If your machine runs in a corporate environment, use a centralized user database instead of a local file. Apart from serving as a user authentication database, LDAP can be used for many other purposes as well. To learn more about LDAP, see “Section 21.8: LDAP—A Directory Service” in the *SUSE LINUX Enterprise Server Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

NIS

Very similar to LDAP, NIS provides a means to distribute user authentication data throughout a network. To learn more about NIS, see “Section 21.9: NIS—Network Information Service” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

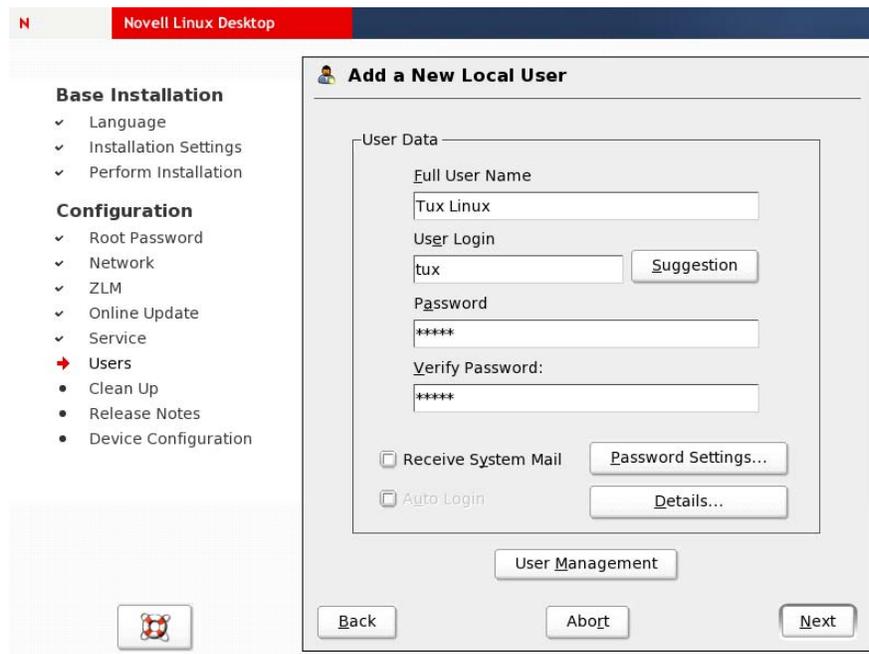
Figure 2-26 *Selecting the User Authentication Method*



Select the appropriate user authentication method, then click *Next*. If you select NIS or LDAP, you are prompted for the server name.

If you select Local, YaST prompts you for the user data of the first local user.

Figure 2-27 Adding a New Local User



Specify the full username, a login name, and a password for the first local user. You can let YaST propose a user login name by clicking *Suggestion*. Password handling is similar to the root user account.

If you want to redirect mail messages generated by your system to this particular user, select *Receive System Mail*. If the local user account you just configured is the only one on this system, you might consider skipping the login procedure for this user and letting them enter the system without any username and password. Select *Auto-Login* if you want automatic login for a single-user system.

WARNING: Enabling auto-login might present a severe security issue. Anybody who can physically access this system will be able to enter it without the need to authenticate himself. When logged in, this person has access to all user data.

Password Settings provides a means to configure parameters like password expiration time and number of retries. *Details* lets you modify the default attributes assigned to a new user account, such as group membership, user ID, and location of home directory.

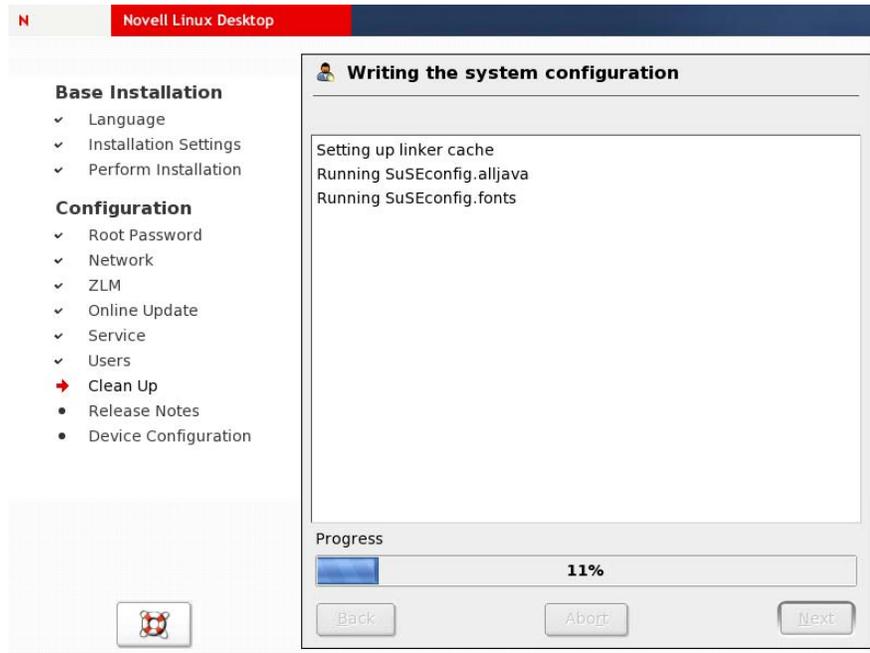
Clicking *User Management* opens the YaST module for user management and creation where you can add several new users, configure user authentication sources, and delete users.

After you click *Next*, the new user is added to the system configuration.

Finishing the Installation

After you have completed the user configuration, the system rewrites the system configuration to make sure all your settings are applied. Wait until the SuSEconfig script is done. Depending on your hardware, this system initialization process might take a long time.

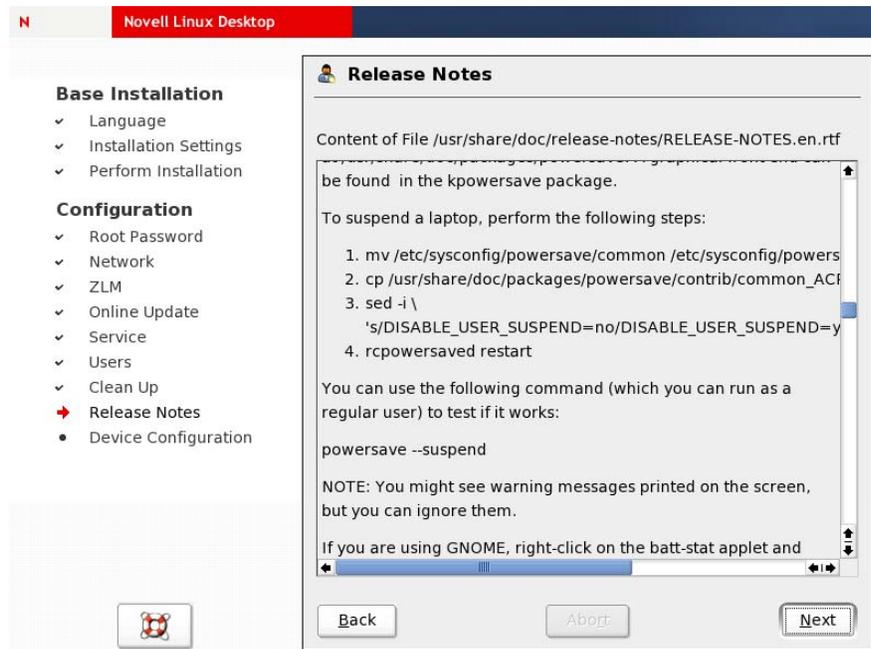
Figure 2-28 *Writing the System Configuration*



After the system configuration has been successfully written to disk, YaST displays the release notes associated with this release of NLD. These notes contain important information that was not

included in any other documentation and that needs to be acknowledged in order to get NLD working properly.

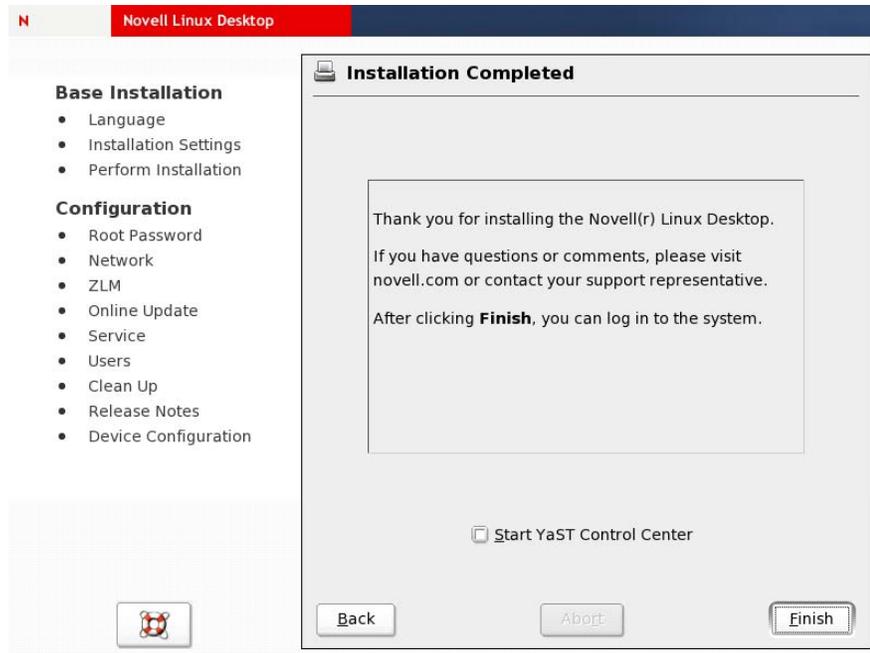
Figure 2-29 Release Notes of Novell Linux Desktop



After you have read and acknowledged the release notes, click *Next* and finish the installation by optionally configuring additional hardware items such as printers, sound devices, or joysticks. These items can always be configured later in the installed system by launching the YaST Control Center and selecting the appropriate modules. See [“The YaST Control Center” on page 126](#) for further information on the configuration modules offered by YaST.

Click *Finish* to end the installation process and switch to your freshly installed system. A graphical login screen appears prompting you for your username and password. When you have successfully authenticated yourself, the system automatically starts the desktop environment of your choice.

Figure 2-30 *Installation Completed*



2.2.2 Using a Network Installation Source

If you want to install manually but prefer a centralized installation source, consider using a network installation server. The procedure is very much the same as described later for remote installations.

Standard Manual Network Installation

To perform a standard manual network installation:

- 1 Set up an installation server as described in “[Setting Up the Server Holding the Installation Sources](#)” on page 58.
- 2 Insert the first CD or DVD of the media kit into the CD-ROM drive and reboot the machine.
- 3 At the boot screen, select *Installation* and use the boot options prompt to give additional information, such as
 - ◆ Location of the installation server.
 - ◆ Network configuration parameters (if your setup doesn't support the network to be configured via DHCP).

Detailed information on the use of boot options at installation time can be found in “[Using Custom Boot Options](#)” on page 72.

- 4 Click *Enter* to boot for installation.

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

- 5 Finish the installation as you would if you had chosen to install from physical media (see [“Manual Installation” on page 25](#)).

Network Installation with OpenSLP

If your network setup supports OpenSLP and your network installation source has been configured to announce itself via OpenSLP (see [“Setting Up the Server Holding the Installation Sources” on page 58](#)), you can simply do the following:

- 1 Set up an installation server as described in [“Setting Up the Server Holding the Installation Sources” on page 58](#).
- 2 Insert the first CD or DVD of the media kit into the CD-ROM drive and reboot the machine.
- 3 At the boot screen, select *Installation*, press F3, and then select SLP.

For more information on the use of the F keys during the initial boot, see [“Using the F Keys” on page 72](#)

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

- 4 Finish the installation as if you had chosen to install from physical media (see [“Manual Installation” on page 25](#)).

Network Installation through VNC

If you want to remotely control the network installation, proceed as described in [“Simple Remote Installation via VNC—Static Network Configuration” on page 54](#) or [“Simple Remote Installation via VNC—Dynamic Network Configuration via DHCP” on page 54](#).

2.3 Remote Installation

There are several different ways to remotely install an NLD workstation. Each method is introduced by means of two short checklists, one listing the prerequisites for this method and the other illustrating the basic procedure. More detail is then provided on all the techniques used in these installation scenarios.

NOTE: In the following sections, the system to hold your new NLD installation is referred to as the *target system* or *installation target*. *Installation source* is used for any kind of source of installation data. This included physical media such as CDs and DVD, as well as network servers distributing the installation data across your network.

2.3.1 Installation Scenarios for Remote Installation

This section introduces the most common installation scenarios for remote installations. For each scenario, carefully check the list of prerequisites and follow the procedure outlined for this scenario. If you need detailed instructions for any particular step, follow the links provided for it.

IMPORTANT: The configuration of the X Window system isn't part of any remote installation process. After the installation is finished, log in as root to the target system, enter `init 3` and then

start SaX2 to configure the graphics hardware as described in [“Configuring the Graphics Card and Monitor” on page 130](#).

Simple Remote Installation via VNC—Static Network Configuration

This type of installation still requires some degree of physical access to the target system to boot for installation. The installation itself is entirely controlled via a remote workstation using VNC to connect to the installation program. User interaction is required as with the manual installation described earlier (see [“Manual Installation” on page 25](#)).

For this type of installation, make sure the following requirements are met:

- Remote installation source (NFS, HTTP, FTP, or SMB) with working network connection
- Target system with working network connection
- Controlling system with a working network connection and VNC viewer software or Java-enabled browser (for example, Firefox*, Konqueror*, Internet Explorer)
- Target system capable of being booted from a physical boot medium (CD, DVD, or custom boot disk)
- Valid static IP addresses already assigned to the installation source and the controlling system
- Valid static IP address to be assigned to the target system

To perform this kind of installation, proceed as follows:

- 1** Set up the installation source as described in [“Setting Up the Server Holding the Installation Sources” on page 58](#).
- 2** Boot the target system using the first CD or DVD of the NLD media kit.
- 3** As the boot screen of the target system comes up, use the boot options prompt to give the appropriate VNC options and the address of the installation source.

This is described in detail in [“Booting the Target System for Installation” on page 71](#).

The target system boots up in a text-based environment, giving you the network address and display number under which the graphical installation environment can be addressed by any VNC viewer application or browser. VNC installations announce themselves over SLP and can be found using Konqueror in `service://` or `slp://` mode.

- 4** At the controlling workstation, open a VNC viewing application or Web browser and connect to the target system as described in [“VNC Installation” on page 74](#).
- 5** Perform the installation as described in [“Manual Installation” on page 25](#).
- 6** Reconnect to the target system after the initial boot (done in the same way as in [Step 4 on page 55](#)).
- 7** Finish the installation.

Simple Remote Installation via VNC—Dynamic Network Configuration via DHCP

This type of installation still requires some degree of physical access to the target system to boot for installation. The installation itself is entirely controlled via a remote workstation using VNC to connect to the installer, but still requires user interaction for the actual configuration efforts.

For this type of installation, make sure the following requirements are met:

- Remote installation source (NFS, HTTP, FTP, or SMB) with working network connection

- Target system with working network connection
- Controlling system with a working network connection and VNC viewer software or Java-enabled browser (for example, Firefox, Konqueror, or Internet Explorer)
- Target system capable of being booted from a physical boot medium (CD, DVD, or custom boot disk)
- Running DHCP server providing IP addresses

To perform this kind of installation, proceed as follows:

- 1** Set up the installation source as described in [“Setting Up the Server Holding the Installation Sources” on page 58](#).

Choose an NFS, HTTP, FTP, or SMB type of network server.

- 2** Boot the target system using the first CD or DVD of the NLD media kit.

- 3** As the boot screen of the target system comes up, use the boot options prompt to give the appropriate VNC options and the address of the installation source.

This is described in detail in [“Booting the Target System for Installation” on page 71](#).

The target system boots up to a text-based environment, giving you the network address and display number under which the graphical installation environment can be addressed by any VNC viewer application or browser. VNC installations announce themselves over SLP and can be found with Konqueror in `service://` or `slp://` mode.

- 4** At the controlling workstation, open a VNC viewing application or Web browser and connect to the target system as described in [“VNC Installation” on page 74](#).
- 5** Perform the installation as described in [“Manual Installation” on page 25](#).
- 6** Reconnect to the target system after the initial boot (done in the same way as in [Step 4 on page 55](#)).
- 7** Finish the installation.

Remote Installation via VNC—PXE Boot and Wake-on-LAN

This type of installation is completely hands-off. The target machine is started and booted remotely. User interaction is needed only for the actual installation. This approach is suitable for cross-site deployments.

To perform this type of installation, make sure the following requirements are met:

- Remote installation source (NFS, HTTP, FTP, or SMB) with working network connection
- TFTP server
- Running DHCP server for your network
- Target system capable of PXE boot, networking, and Wake-on-LAN
- Controlling system with a working network connection and VNC viewer software or Java-enabled browser (for example, Firefox, Konqueror, or Internet Explorer)

To perform this type of installation, proceed as follows:

- 1** Set up the installation source as described in [“Setting Up the Server Holding the Installation Sources” on page 58](#).

Choose an NFS, HTTP, or FTP type of network server.

- 2 Set up a TFTP server to hold a boot image that can be pulled by the target system (see [“Setting Up a TFTP Server” on page 66](#)).
- 3 Set up a DHCP server to provide IP addresses to all machines, revealing the location of the TFTP server to the target system (see [“Setting Up a DHCP Server” on page 64](#)).
- 4 Prepare the target system for PXE boot (see [“Preparing the Target System for PXE Boot” on page 70](#)).
- 5 Initiate the boot process of the target system using Wake-on-LAN (see [“Wake-on-LAN” on page 71](#)).
- 6 At the controlling workstation, open a VNC viewing application or Web browser and connect to the target system as described in [“VNC Installation” on page 74](#).
- 7 Perform the installation as described in [“Manual Installation” on page 25](#).
- 8 Reconnect to the target system after the initial boot (done in the same way as in [Step 4 on page 55](#)).
- 9 Finish the installation.

Simple Remote Installation via SSH—Static Network Configuration

This type of installation still requires some degree of physical access to the target system to boot for installation and to determine the IP address of the installation target. The installation itself is entirely controlled via a remote workstation using SSH to connect to the installer. User interaction is required as with the manual installation described earlier (see [“Manual Installation” on page 25](#)).

For this type of installation, make sure the following requirements are met:

- Remote installation source (NFS, HTTP, FTP, or SMB) with a working network connection
- Target system with a working network connection
- Controlling system with a working network connection and VNC viewer software or Java-enabled browser (for example, Firefox, Konqueror, or Internet Explorer)
- Target system capable of being booted from a physical boot medium (CD, DVD, or custom boot disk)
- Valid static IP addresses already assigned to the installation source and the controlling system
- Valid static IP address to be assigned to the target system

To perform this kind of installation, proceed as follows:

- 1 Set up the installation source as described in [“Setting Up the Server Holding the Installation Sources” on page 58](#).
- 2 Boot the target system using the first CD or DVD of the NLD media kit.
- 3 As the boot screen of the target system comes up, use the boot options prompt to give the appropriate parameters for network connection, location of the installation source, and the SSH enablement.

See [“Using Custom Boot Options” on page 72](#) for detailed instructions on the use of these parameters.

The target system boots up in a text-based environment, giving you the network address under which the graphical installation environment can be addressed by any SSH client.
- 4 At the controlling workstation, open a terminal window and connect to the target system as described in [“Connecting to the Installation Program” on page 76](#).

- 5 Perform the installation as described in [“Manual Installation” on page 25](#).
- 6 Reconnect to the target system after the initial boot (done in the same way as in [Step 4 on page 55](#)).
- 7 Finish the installation.

Simple Remote Installation via SSH—Dynamic Network Configuration via DHCP

This type of installation still requires some degree of physical access to the target system to boot for installation and to determine the IP address of the installation target. The installation itself is entirely controlled via a remote workstation using VNC to connect to the installer, but still requires user interaction for the actual configuration efforts.

For this type of installation, make sure the following requirements are met:

- Remote installation source (NFS, HTTP, FTP, or SMB) with a working network connection
- Target system with a working network connection
- Controlling system with a working network connection and VNC viewer software or Java-enabled browser (for example, Firefox, Konqueror, or Internet Explorer)
- Target system capable of being booted from a physical boot medium (CD, DVD, or custom boot disk)
- Running DHCP server providing IP addresses

To perform this kind of installation, proceed as follows:

- 1 Set up the installation source as described in [“Setting Up the Server Holding the Installation Sources” on page 58](#).

Choose an NFS, HTTP, FTP, or SMB type of network server.

- 2 Boot the target system using the first CD or DVD of the NLD media kit.
- 3 As the boot screen of the target system comes up, use the boot options prompt to give the appropriate parameters for network connection, location of the installation source and the SSH enablement.

See [“Using Custom Boot Options” on page 72](#) for detailed instructions on the use of these parameters.

The target system boots up in a text-based environment, giving you the network address under which the graphical installation environment can be addressed by any SSH client.

- 4 At the controlling workstation, open a terminal window and connect to the target system as described in [“Connecting to the Installation Program” on page 76](#).
- 5 Perform the installation as described in [“Manual Installation” on page 25](#).
- 6 Reconnect to the target system after the initial boot (done in the same way as in [Step 4 on page 55](#)).
- 7 Finish the installation.

Remote Installation via SSH—PXE Boot and Wake-on-LAN

This type of installation is completely hands-off. The target machine is started and booted remotely.

To perform this type of installation, make sure the following requirements are met:

- Remote installation source (NFS, HTTP, FTP, or SMB) with a working network connection
- TFTP server
- Running DHCP server for your network, providing a static IP to the host that needs be installed
- Target system capable of PXE boot, networking, and Wake-on-LAN
- Controlling system with a working network connection and SSH client software

To perform this type of installation, proceed as follows:

- 1** Set up the installation source as described in [“Setting Up the Server Holding the Installation Sources” on page 58](#).

Choose an NFS, HTTP, or FTP type of network server.

- 2** Set up a TFTP server to hold a boot image that can be pulled by the target system.

See [“Setting Up a TFTP Server” on page 66](#).

- 3** Set up a DHCP server to provide IP addresses to all machines, revealing the location of the TFTP server to the target system.

See [“Setting Up a DHCP Server” on page 64](#).

- 4** Prepare the target system for PXE boot.

See [“Preparing the Target System for PXE Boot” on page 70](#).

- 5** Initiate the boot process of the target system using Wake-on-LAN.

See [“Wake-on-LAN” on page 71](#).

- 6** At the controlling workstation, start a VNC client and connect to the target system as described in [“SSH Installation” on page 76](#).

- 7** Perform the installation as described in [“Manual Installation” on page 25](#).

- 8** Reconnect to the target system after the initial boot (done in the same way as in [Step 4 on page 55](#)).

- 9** Finish the installation.

2.3.2 Setting Up the Server Holding the Installation Sources

Depending on the operating system running on the machine you want to use as network installation source for NLD, there are several options for the server configurations. The easiest way to set up an installation server is to use YaST on a SUSE LINUX Enterprise Server 9 machine. On other versions of SUSE LINUX Enterprise Server or SUSE LINUX, set up the installation source manually.

TIP: You can even use a Microsoft* Windows machine as the installation server for your Linux deployment. See [“Managing an SMB Installation Source” on page 63](#) for details.

Setting Up an Installation Server Using YaST on SLES 9

YaST offers a graphical tool to create network installation sources. It supports HTTP, FTP, and NFS types of network installation servers.

- 1** Log in as root to the machine that is to be the installation server.

2 Run *YaST* > *Miscellaneous* > *Installation Server*.

3 Select the server type (HTTP, FTP, or NFS).

The selected server service is started automatically every time the system starts. If a service of the selected type is already running on your system and you want to configure it manually for the server, deactivate the automatic configuration of the server service by selecting *Do not configure any network services*. In both cases, define the directory in which the installation data should be made available on the server.

4 Configure the required server type.

This step relates to the automatic configuration of server services. It is skipped when automatic configuration is deactivated. Define an alias for the root directory of the FTP or HTTP server where the installation data will be located. The installation source is later located under `ftp://Server-IP/Alias/Name` (FTP) or under `http://Server-IP/Alias/Name` (HTTP). *Name* stands for the name of the installation source, which is defined in Step 5. If you selected NFS in Step 3, define wildcards and exports options. The NFS server will be accessible under `nfs://Server-IP/Name`.

Details of NFS and exports can be found in “Section 21.10: NFS—Shared File Systems” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

5 Configure the installation source.

Before the installation media are copied to their destination, define the name of the installation source (ideally, an easily remembered abbreviation of the product and version). YaST allows providing ISO images of the media instead of copies of the installation CDs. If you want to take this route, select this option and specify the directory path under which the ISO files will be found locally. Depending on the product you are going to distribute using this installation server, more add-on CDs or service pack CDs might be required to install the product completely. If you activate *Prompt for Additional CDs*, YaST automatically reminds you to supply these media. To announce your installation server in the network via OpenSLP, select that option.

TIP: Consider announcing your installation source via OpenSLP if your network setup supports this option. This saves you from having to enter the network installation path on every single target machine. The target systems are booted using the SLP boot option and can find the network installation source without any further configuration. For details on this option, see “[Booting the Target System for Installation](#)” on page 71.

6 Upload the installation data.

The most lengthy step in configuring an installation server is the copying of the actual installation CDs. Insert the media in the sequence requested by YaST and wait for the copying procedure to end. When the sources have been fully copied, return to the overview of existing information sources and close the configuration by clicking *Finish*.

Your configuration server is now fully configured and ready for service. It is automatically started every time the system is started. No further intervention is required. You need to configure and start this service correctly by hand only if you have deactivated the automatic configuration of the selected network service with YaST as an initial step.

To deactivate an installation source, click *Change* in the overview to reach a list of all available installation sources. Then select the entry to remove and click *Delete*. This delete procedure relates to the deactivation of only the server service. The installation data itself remains in the chosen directory. However, you can remove it manually.

If your installation server should provide the installation data for more than one product or product version, start the YaST installation server module and select *Configure* in the overview of existing installation sources to configure the new installation source.

Manual Setup of an NFS Installation Source

IMPORTANT: We assume you are using some kind of SUSE LINUX (SUSE LINUX Enterprise Server 9 or SUSE LINUX Professional 9.x) based operating system on the machine that will serve as the installation server. If this is not the case, refer to the other vendor's documentation on NFS instead of completing the following directions.

Setting up an NFS source for installation is basically done in two steps. First, create the directory structure holding the installation data and copy the installation media to this structure. Then export the directory holding the installation data to the network.

To create a directory holding the installation data, proceed as follows:

- 1 Log in as root.
- 2 Create a directory to later hold the entire installation data and change to this directory.
For example:

```
mkdir install/nld/NLD9
```
- 3 For each CD contained in the media kit, do the following:
 - 3a Copy the entire content of the installation CD to the installation server directory by entering:

```
cp -a /media/path_to_your_CD-ROM_drive.
```

Replace *path_to_your_CD-ROM_drive* with the actual path to your CD/DVD drive. Depending on the type of drive used in your system, this can be either *cdrom*, *cdrecorder*, *dvd*, or *dvdrecorder*.
 - 3b Rename the directory to the CD number by entering

```
mv path_to_your_CD-ROM_drive CDx
```

Replace *x* with the actual number of your CD.

To export the installation sources via NFS using YaST, proceed as follows:

- 1 Log in as root.
- 2 Run *YaST > Network Services > NFS Server*.
- 3 Select *Start NFS Server and Open Port in Firewall*, then click *Next*.
- 4 Select *Add Directory*, then specify the path to the directory holding the installation data.
In this case, it is */NLD9*.
- 5 Select *Add Host*, then specify the hostnames of the machines you want the installation data to be exported to.
Instead of specifying hostnames here, you could also use wildcards, ranges of network addresses, or just the domain name of your network. Also specify the appropriate export options or keep the default, which works fine in most setups. For more information on the syntax used in exporting NFS shares, read the manual page (`man exports`).
- 6 Click *Finish*.

The NFS server holding the NLD installation sources automatically starts and is integrated into the boot process.

If you prefer to manually export the installation sources via NFS instead of using the YaST NFS Server module, proceed as follows:

1 Log in as root.

2 Open the `/etc/exports` file, add the following line, then save and exit the file.

```
/NLD9 *(ro,root_squash,sync)
```

This exports the `/NLD9` directory to any host that is part of this network that can connect to this server. To limit the access to this server, use netmasks or domain names instead of the general wildcard (`*`). See `man exports` for details.

3 To add the NFS service to the list of servers started at system bootup, execute the following commands:

```
insserv /etc/init.d/nfsserver
```

```
insserv /etc/init.d/portmap
```

4 Start the NFS server by entering

```
rcnfsserver start
```

If you need to change the configuration of your NFS server later on, modify the configuration file and restart the NFS daemon with `rcnfsserver restart`.

To announce the NFS server via OpenSLP and make its address known to all clients in your network, proceed as follows:

1 Log in as root.

2 Change to the `/etc/slp.reg.d/` directory.

3 Create a configuration file called `install.suse.nfs.reg` containing the following lines:

```
# Register the NFS Installation Server
service:install.suse:nfs://$HOSTNAME/path_instsource/CD1,en,65535
description=NFS Installation Source for NLD9
```

Replace `path_instsource` with the actual path to the installation source on your server.

4 Save this configuration file and start the OpenSLP daemon using the following command:

```
rcslpd start
```

For more information on OpenSLP, see the package's documentation located under `/usr/share/doc/packages/openslp/` or “Section 21.6: SLP Services in the Network” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf).

Manual Setup of an FTP Installation Source

Creating an FTP installation source is very similar to creating an NFS installation source. FTP installation sources can be announced over the network using OpenSLP as well.

1 Create a directory holding the installation sources as described in “[Manual Setup of an NFS Installation Source](#)” on page 60.

2 Configure the FTP server to distribute the contents of your installation directory.

- 2a** Log in as root and install the package `pure-ftpd` (a lean FTP server) using the YaST package manager.
- 2b** Change to the FTP server root directory by entering


```
cd /srv/ftp
```
- 2c** Create a subdirectory holding the installation sources in the FTP root directory by entering


```
mkdir instsource
```

 Replace *instsource* with the product name.
- 2d** Copy the contents of all installation CDs to the FTP server's root directory (similar to the procedure described under [Step 3 on page 60](#)).
 Alternatively, mount the contents of the already existing installation repository into the change root environment of the FTP server by entering


```
mount --bind path_to_instsource /srv/ftp/instsource
```

 Replace *path_to_instsource* and *instsource* with values matching your setup. If you need to make this permanent, add it to `/etc/fstab`.
- 2e** Start `pure-ftpd` by entering:


```
pure-ftpd &
```
- 3** Announce the installation source via OpenSLP (if this is supported by your network setup).
 - 3a** Create a configuration file called `install.suse.ftp.reg` under `/etc/slp/reg.d/` which contains the following lines:


```
# Register the FTP Installation Server
service:install.suse:ftp://$HOSTNAME/srv/ftp/instsource/
CD1,en,65535
description=FTP Installation Source for NLD9
```

 Replace *instsource* with the actual name of the installation source directory on your server. Also note that the `service:` line should be entered as one continuous line.
 - 3b** Save this configuration file and start the OpenSLP daemon by entering


```
rcslpd start
```

Manual Setup of an HTTP Installation Source

Creating an HTTP installation source is very similar to creating an NFS installations source. HTTP installation sources can be announced over the network using OpenSLP as well.

- 1** Create a directory holding the installation sources as described in [“Manual Setup of an NFS Installation Source” on page 60](#).
- 2** Configure the HTTP server to distribute the contents of your installation directory.
 - 2a** Log in as root and install the `apache2` package using the YaST package manager.
 - 2b** Change to the root directory of the HTTP server (`/srv/www/htdocs`) and create a subdirectory to hold the installation sources:


```
mkdir instsource
```

 Replace *instsource* with the product's name.
 - 2c** Create a symbolic link from the location of the installation sources to the root directory of the Web server (`/srv/www/htdocs`):


```
ln -s /path_instsource /srv/www/htdocs/instsource
```

- 2d** Modify the configuration file of the HTTP server (`/etc/apache2/default-server.conf`) to make it follow symbolic links by replacing
- ```
Options None
```
- with
- ```
Options Indexes FollowSymLinks
```
- 2e** Restart the HTTP server by entering
- ```
rcapache2 restart
```
- 3** Announce the installation source via OpenSLP (if this is supported by your network setup).
- 3a** Create a configuration file called `install.suse.ftp.reg` under `/etc/slp/reg.d/` which contains the following lines:
- ```
# Register the HTTP Installation Server
service:install.suse:http://$HOSTNAME/srv/www/htdocs/
instsource/CD1/,en,65535
description=HTTP Installation Source for NLD9
```
- Replace `path_to_instsource` with the actual path to the installation source on your server. Also note that the `service:` line should be entered as one continuous line.
- 3b** Save this configuration file and start the OpenSLP daemon using the following command:
- ```
rcslpd restart
```

## Managing an SMB Installation Source

Using an SMB (Samba) source, you can pull in the installation sources from a Microsoft Windows server and start your Linux deployment even with no Linux machine around.

To set up an exported Windows Share holding your NLD installation sources, proceed as follows:

- 1** Log in to your Windows machine.
- 2** Start Explorer and create a new folder to hold the entire installation tree.  
Name it `INSTALL`, for example.
- 3** Export this share according to the procedure outlined in your Windows documentation.
- 4** Enter this share and create a subfolder called `NLD`.
- 5** Copy each NLD CD to a separate folder and name these folders `CD1`, `CD2`, `CD3`, etc.
- 6** Change to the top directory of the exported share (`INSTALL`, in this example) and copy the following files and folders from `NLD/CD1` to this folder: `content`, `media.1`, `control.xml`, and `boot`.
- 7** Create a new folder under `INSTALL` and name it `yast`.
- 8** Change to the `yast` folder and create the files `order` and `instorder`.
- 9** Open the `order` file and enter the following line:  
`/NLD/CD1 smb://user:password@hostname/NLDCD1`  
Replace `user` with the username you use on the Windows machine or use `Guest` to enable guest login to this share. Replace `password` with either your login password or any other string in case you use guest login. Replace `hostname` with the network name of your Windows machine.
- 10** Open the `instorder` file and add the following line:  
`/NLD/CD1`

To use an SMB mounted share as installation source, proceed as follows:

- 1 Boot the installation target.
- 2 Select *Installation*.
- 3 Press F3 for a selection of installation sources.
- 4 Select SMB and then specify the Windows machine's name or IP address, the share's name (INSTALL, in this example), username, and password.
- 5 Press Enter.

YaST starts and you can now perform the installation.

---

**IMPORTANT:** If you are considering using your SMB server as a source for Service Packs (SPs) later on, follow the procedure as described above, create subfolders holding the SP CDs (see [“Manual Setup of a Network Installation Source” on page 99](#)), and adjust the `order` and `instorder` files accordingly.

---

### 2.3.3 Preparing the Boot of the Target System

This section details the configuration tasks needed in complex boot scenarios. It contains ready-to-apply configuration examples for DHCP, PXE boot, TFTP, and Wake-on-LAN.

#### Setting Up a DHCP Server

There are two ways to set up a DHCP server. For SUSE LINUX Enterprise Server 9 (SLES 9), YaST provides a graphical interface to the process. Users of SUSE LINUX professional and non-SUSE LINUX users should manually edit the configuration files or use the front end provided by their operating system vendors.

---

**IMPORTANT:** The following sections cover only the configuration changes needed to make your DHCP server ready for PXE boot. For more information on the configuration of DHCP, see your operating system vendor's documentation.

---

#### Setting Up a DHCP Server with YaST on SLES 9

To announce the TFTP server's location to the network clients and to specify the boot image file to be pulled by the installation target, add two declarations to your DHCP server configuration.

- 1 Log in as root to the machine hosting the DHCP server.
- 2 Run `YaST > Network Services > DHCP server`.
- 3 Click *Expert Settings*, then click *Yes* when warned about leaving the start-up dialog.
- 4 In the Configured Declarations window, select the subnet where the new system is to be located and click *Edit*.
- 5 In the Subnet Configuration Window, click *Add* to add a new option the subnet's configuration.
- 6 Select `filename` and specify `pxelinux.0` as the option's value.
- 7 Add another option (`next-server`) and set its value to the address of the TFTP server.
- 8 Click *OK > Finish* to complete the DHCP server configuration.

To configure DHCP to provide a static IP address to a specific host, specify the Expert Settings of the DHCP server configuration module ([Step 3 on page 64](#)) and add a new declaration of the host

type. Add the hardware and fixed-address options to this host declaration and provide the appropriate values.

## Manual Setup of a DHCP Server

All the DHCP server needs to do apart from providing automatic address allocation to your network clients is to announce the IP address of the TFTP server and the file to be pulled in by the installation routines on the target machine.

- 1 Log in as root to the machine hosting the DHCP server.
- 2 Add the following lines to your DHCP server's configuration file located under `/etc/dhcpd.conf`:

```
group {
 # PXE related stuff ...
 #
 # "next-server" defines the tftp server which will serve the
 pxelinux image to the PXE clients.
 next-server 192.168.100.1;
 #
 # "filename" specifies the pxelinux image on the tftp server
 which will be served to the PXE clients.
 # The configured tftp server on 192.168.100.1 runs in a "change-
 root jail" to /srv/tftpboot filename "pxelinux.0";

 host Zert120 { hardware ethernet 00:10:dc:95:d7:b7; }
}
```

Replace *ip\_of\_the\_tftp\_server* with the actual IP address of the TFTP server.

For more information on the options available in `dhcpd.conf`, see the manual page (`man dhcpd.conf`).

- 3 Restart the DHCP server by entering

```
rcdhcpd restart
```

If you plan on using SSH for the remote control of a PXE/Wake-on-LAN installation, you need to explicitly specify the IP address DHCP is supposed to provide to the installation target. In order to achieve this, modify the above-mentioned DHCP configuration according to the following example:

```
group {
 # PXE related stuff
 #
 # "next server" defines the tftp server that will be used
 next server ip_tftp_server:

 #
 # "filename" specifies the pxelinux image on the tftp server
 # the server runs in chroot under /srv/tftpboot
 filename "pxelinux.0";

 host test {
 hardware ethernet mac_address;
```

```

 fixed-address some_ip_address;
 }
}

```

The host statement introduces the hostname of the installation target. To bind the hostname and IP address to a specific host, you have to know and specify the system's hardware (MAC) address. Replace all the variables used in this example by the actual values that match your environment.

When you restart the DHCP server, it provides a static IP to the host you specified and thus enables you to connect to the system via SSH.

## Setting Up a TFTP Server

Setting up a TFTP server can be done either with YaST on the recent versions of SUSE LINUX Enterprise Server or SUSE LINUX Professional operating systems or manually on any other Linux operating system that supports xinetd and TFTP. The TFTP server delivers the boot image to the target system when it boots up and sends a request for it.

### Setting Up a TFTP Server Using YaST

- 1** Log in as root.
- 2** Run *YaST > Network Services > TFTP Server*, then install the requested package.
- 3** Click *Enable* to make sure the server is started and included in the boot up routines.  
No further action from your side is required to secure this; xinetd starts tftpd at boot time.
- 4** Click *Open Port in Firewall* to open the appropriate port in the firewall running on your machine.  
If there is no firewall running on your server, this option won't be available.
- 5** Click *Browse* to browse for the boot image directory.  
The default `/tftpboot` directory is created and selected automatically.
- 6** Click *Finish* to apply your settings and start the server.

### Manual Setup of a TFTP Server

- 1** Log in as root and install the `tftp` and `xinetd` packages.
- 2** If unavailable, create the `/srv/tftpboot` and `/srv/tftpboot/pxelinux.cfg` directories.
- 3** Add the appropriate files needed for the boot image as described in [“PXE Boot” on page 67](#).
- 4** Modify the configuration of xinetd located under `/etc/xinetd.d/` to make sure the TFTP server is started on boot.

- 4a** If it doesn't exist, create a file called `tftp` under this directory:

```

touch tftp
chmod 755 tftp

```

- 4b** Open the `tftp` file and add the following lines:

```

service tftp
{
 socket_type = dgram
 protocol = udp
 wait = yes

```

```

 user = root
 server = /usr/sbin/in.tftpd
 server_args = -s /tftpboot
 disable = no
 }

```

**4c** Save the file, then restart xinetd by entering:

```
rcxinetd restart
```

## PXE Boot

For reference, some technical background information as well as PXE's complete specifications are available in the *Preboot Execution Environment (PXE) Specification* (<ftp://download.intel.com/labs/manage/wfm/download/pxespec.pdf>).

**1** Change to the directory of your installation repository and copy the `linux`, `initrd`, `message`, and `memtest` files to the `/srv/tftpboot` directory by entering the following:

```
cp -a boot/loader/linux boot/loader/initrd boot/loader/message
boot/loader/memtest /srv/tftpboot
```

**2** Install the `syslinux` package directly from your installation CDs or DVDs with YaST.

**3** Copy the `/usr/share/syslinux/pxelinux.0` file to the `/srv/tftpboot` directory by entering the following:

```
cp -a /usr/share/syslinux/pxelinux.0 /srv/tftpboot
```

**4** Change to the directory of your installation repository and copy the `isolinux.cfg` file to `/srv/tftpboot/pxelinux.cfg/default` by entering the following:

```
cp -a boot/loader/isolinux.cfg /srv/tftpboot/pxelinux.cfg/
default
```

**5** Edit the `/srv/tftpboot/pxelinux.cfg/default` file and remove the lines beginning with:

- ♦ `gfxboot`
- ♦ `readinfo`
- ♦ `framebuffer`

**6** Insert the following entries in the append lines of the default `failsafe` and `apic` labels:

| Entry                       | Description                                                                                                                                                                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>insmod=e100</code>    | Loads the kernel module for an Intel 100MBit/s network card is on the PXE clients. This entry depends on the client's hardware and must be adapted accordingly. In the case of a Broadcom* GigaBit network card, this entry would read <code>insmod=bcm5700</code> . |
| <code>netdevice=eth0</code> | Defines the client's network interface that must be used for the network installation. It is necessary only if the client is equipped with several network cards and must be adapted accordingly. In case of a single network card, this entry can be omitted.       |

| Entry                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>install=nfs://ip_instserver/<br/>path_instsource/CD1</code> | Defines the NFS server and the installation source for the client installation. Replace <code>ip_instserver</code> with the actual IP address of your installation server and <code>path_instsource</code> with the actual path to the installation sources. HTTP, FTP, or SMB sources are addressed in a similar manner, except for the protocol prefix, which should read <code>http</code> or <code>ftp</code> . |
|                                                                   | <b>IMPORTANT:</b> If you need to give other boot options for the installation routines, such as SSH or VNC boot parameters, add them to the <code>install</code> entry. See <a href="#">“Booting the Target System for Installation” on page 71</a> for an overview of parameters and some examples.                                                                                                                |

An example `/srv/tftpboot/pxelinux.cfg/default` file follows. Adjust the protocol prefix for the installation source to match your network setup and specify your preferred method of connecting to the installer by adding the `vnc` and `vncpassword` or the `ssh` and `sshpassword` options to the `install` entry.

```
default linux
default
label linux
 kernel linux
 append initrd=initrd ramdisk_size=65536 insmod=e100
 install=nfs://ip_instserver/path_instsource/NLD9
failsafe
label failsafe
 kernel linux
 append initrd=initrd ramdisk_size=65536 ide=nodma apm=off
 acpi=off insmod=e100 install=nfs://ip_instserver/
path_instsource/NLD9
apic
label apic
 kernel linux
 append initrd=initrd ramdisk_size=65536 apic insmod=e100
 install=nfs://ip_instserver/path_instsource/NLD9
manual
label manual
 kernel linux
 append initrd=initrd ramdisk_size=65536 manual=1
rescue
label rescue
 kernel linux
 append initrd=initrd ramdisk_size=65536 rescue=1
memory test
label memtest
 kernel memtest
hard disk
label hddisk
 kernel linux
 append SLX=0x202
implicit 0
display message
```

```
prompt 1
timeout 100
```

Replace *ip\_instserver* and *path\_instsource* with the values used in your setup.

The following section serves as a short reference of the PXELINUX options used in this setup. More information on the options available can be found in the documentation of the syslinux package located under `/usr/share/doc/packages/syslinux/`.

## PXELINUX Configuration Options

The options listed here are a subset of all the options available for the PXELINUX configuration file.

**Table 2-2** *PXELINUX Configuration Options.*

| Option                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DEFAULT <i>kernel options...</i>                                   | <p>Sets the default kernel command line. If PXELINUX boots automatically, it acts just as if the entries after DEFAULT had been typed in at the boot: prompt except that the auto option is automatically added, indicating an automatic boot.</p> <p>If no configuration file is present, or no DEFAULT entry is present in the config file, the default is the kernel name "linux" with no options.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| APPEND <i>options...</i>                                           | <p>Adds one or more options to the kernel command line. These are added for both automatic and manual boots. The options are added at the very beginning of the kernel command line, usually permitting explicitly entered kernel options to override them.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| LABEL <i>label</i> KERNEL <i>image</i><br>APPEND <i>options...</i> | <p>Indicates that if <i>label</i> is entered as the kernel to boot, PXELINUX should instead boot <i>image</i>, and the specified APPEND options should be used instead of the ones specified in the global section of the file (before the first LABEL command.) The default for <i>image</i> is the same as <i>label</i>, and if no APPEND is given, the default is to use the global entry (if any). Up to 128 LABEL entries are permitted.</p> <p>Note that GRUB uses the following syntax:</p> <pre>title mytitle     kernel my_kernel my_kernel_options initrd myinitrd</pre> <p>whereas PXELINUX uses the following syntax:</p> <pre>label mylabel     kernel mykernel     append myoptions</pre> <p>Labels are mangled as if they were filenames, and they must be unique after mangling. For example, the two labels "v2.1.30" and "v2.1.31" would not be distinguishable under PXELINUX because both mangle to the same DOS filename.</p> <p>The kernel doesn't have to be a Linux kernel; it can be a boot sector or a COMBOOT file.</p> |
| APPEND -                                                           | <p>Appends nothing. APPEND with a single hyphen as argument in a LABEL section can be used to override a global APPEND.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Option                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LOCALBOOT <i>type</i>  | <p>On PXELINUX, specifying LOCALBOOT 0 instead of a KERNEL option means invoking this particular label and causes a local disk boot instead of a kernel boot.</p> <p><b>0:</b> Performs a normal boot.</p> <p><b>4:</b> Performs a local boot with the Universal Network Driver Interface (UNDI) driver still resident in memory.</p> <p><b>5:</b> Performs a local boot with the entire PXE stack, including the UNDI driver, still resident in memory.</p> <p>All other values are undefined. If you don't know what the UNDI or PXE stacks are, specify 0.</p>                                                                                                                                   |
| TIMEOUT <i>timeout</i> | <p>Indicates how long to wait at the boot: prompt until booting automatically, in units of 1/10s. The timeout is cancelled as soon as the user types anything on the keyboard, the assumption being that the user will complete the command line already begun. A timeout of zero (0) disables the timeout completely (this is also the default).</p> <p>The maximum possible timeout value is 35996; (just less than one hour).</p>                                                                                                                                                                                                                                                                |
| PROMPT <i>flag_val</i> | <p>If flag_val is 0, displays the boot: prompt only if the Shift or Alt key is pressed, or Caps Lock or Scroll Lock is set (this is the default). If flag_val is 1, always displays the boot: prompt.</p> <p><i>F2 filename</i><br/> <i>F1 filename</i><br/> <i>..etc...</i><br/> <i>F9 filename</i><br/> <i>F10 filename</i></p> <p>Displays the indicated file on the screen when a function key is pressed at the boot: prompt. This can be used to implement preboot online help (presumably for the kernel command line options.) For backward compatibility with earlier releases, F10 can be also specified as F0. Note that there is currently no way to bind filenames to F11 and F12.</p> |

## Preparing the Target System for PXE Boot

Prepare the system's BIOS for PXE boot by including the PXE option in the BIOS boot order.

Do not place the PXE option ahead of the hard disk boot option in the BIOS. If you do, this system tries to reinstall itself every time you boot it.

## Preparing the Target System for Wake-on-LAN

Wake-on-LAN requires the appropriate BIOS option to be enabled prior to the installation. Also, make note of the MAC address of the target system because this data is needed to initiate Wake-on-LAN.

## Wake-on-LAN

Wake On LAN allows a machine to be powered on via a special network packet that is sent containing the machine's MAC address. Because every machine in the world has a unique MAC identifier, you don't need to worry about accidentally powering on the wrong machine.

---

**IMPORTANT:** If the controlling machine is not located in the same network segment as the installation target that should be woken, either configure the WOL requests to be sent as multicasts or remotely control a machine on that network segment to act as the sender of these requests.

---

Users of SUSE LINUX Enterprise Server 9 can use a YaST module called WOL to easily configure Wake-on-LAN. Users of other versions of SUSE LINUX operating systems can use a command line tool.

### Configuring Wake-on-LAN with YaST

- 1 Log in as root.
- 2 Run *YaST > Network Services > WOL*.
- 3 Click *Add*, then specify the hostname and MAC address of the target system.
- 4 To power on this machine, select the appropriate entry and click *Wake up*.

### Manual Configuration of Wake-on-LAN

- 1 Log in as root.
- 2 Run *YaST > Install and Remove Software*, then install the netdiag package.
- 3 Open a terminal and enter the following command as root to wake the target:

```
ether-wake mac_of_target
```

Replace *mac\_of\_target* with the actual MAC address of the target.

## 2.3.4 Booting the Target System for Installation

Basically, there are two different ways to customize the boot process for installation apart from those mentioned under “[Wake-on-LAN](#)” on page 71 and “[PXE Boot](#)” on page 67.

You can either use the default boot options and F keys or use the boot options prompt of the installation boot screen to pass on any boot options that the installation kernel might need on this particular hardware.

### Using the Default Boot Options

The boot options have already been described in detail in “[Manual Installation](#)” on page 25. Refer to the section called “[Booting for Installation](#)” on page 26 for more information on the individual options.

Generally, just selecting *Installation* starts the installation boot process. If problems occur, the *Installation—ACPI Disabled* or *Installation—Safe Settings* options might come in handy.

## Using the F Keys

The menu bar at the bottom of the screen offers some advanced functionality needed in some setups. Using the F keys, you can specify additional options to be given to the installation routines without having to know the detailed syntax of these parameters as you would need to if you entered them as boot options (see “Using Custom Boot Options” on page 72).

See the following table for a complete set of the available options.

**Table 2-3** *F Keys during Installation*

| Key | Purpose                                           | Available Options                                                                                                                                   | Default Value                      |
|-----|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| F1  | Provide help                                      | None                                                                                                                                                | None                               |
| F2  | Change the screen resolution for the installation | <ul style="list-style-type: none"><li>◆ Text Mode</li><li>◆ VESA</li><li>◆ Resolution #1</li><li>◆ Resolution #2</li><li>◆ ...</li></ul>            | Depends on your graphics hardware. |
| F3  | Select the installation source                    | <ul style="list-style-type: none"><li>◆ CD-ROM</li><li>◆ SLP</li><li>◆ FTP</li><li>◆ HTTP</li><li>◆ NFS</li><li>◆ SMB</li><li>◆ Hard Disk</li></ul> | CD-ROM                             |
| F4  | Select the installation language                  | All supported languages                                                                                                                             | English                            |
| F5  | Display installation log files                    | <ul style="list-style-type: none"><li>◆ Native</li><li>◆ Verbose</li><li>◆ Silent</li></ul>                                                         | Silent                             |
| F6  | Apply driver update disk                          | Driver                                                                                                                                              | None                               |

## Using Custom Boot Options

Using the appropriate set of boot options helps facilitate your installation procedure. Many parameters can also be configured later on using the `linuxrc` routines (described in further detail in “Section 3: Special Installation Procedures” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf))), but using the boot options is easier. In some automated setups, the boot options can be provided via the `initrd` or an `info` file.

The following table lists all installation scenarios mentioned in this chapter with the required boot parameters and corresponding boot options. Just add all of them in the order they appear in the following table to get one boot option string that is handed down to the installation routines. For example (all in one line):

```
install=... netdevice=... hostip=... netmask=... vnc=...
vncpassword=...
```

Replace all the values (...) in this string with the values appropriate for your setup.

**Table 2-4** *Installation (Boot) Scenarios Used in This Chapter*

| Installation Scenario                                                                  | Parameters Needed for Booting                                                                                                                                                                                                   | Boot Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| “Using the NLD CDs or DVD as the Installation Source” on page 25                       | None (system boots automatically)                                                                                                                                                                                               | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| “Using a Network Installation Source” on page 52                                       | <ul style="list-style-type: none"> <li>◆ Location of the network installation server</li> <li>◆ Network setup if DHCP isn't supported</li> </ul>                                                                                | <ul style="list-style-type: none"> <li>◆ <code>install=(nfs,http,ftp,smb) ://<i>path_to_instmedia</i></code></li> <li>• <code>hostip=<i>some_ip</i></code></li> <li>• <code>netmask=<i>some_netmask</i></code></li> <li>• <code>gateway=<i>ip_gateway</i></code></li> </ul>                                                                                                                                                                                                       |
| “Simple Remote Installation via VNC—Static Network Configuration” on page 54           | <ul style="list-style-type: none"> <li>◆ Location of the installation server</li> <li>◆ Network device</li> <li>◆ IP address</li> <li>◆ Netmask</li> <li>◆ Gateway</li> <li>◆ VNC enablement</li> <li>◆ VNC password</li> </ul> | <ul style="list-style-type: none"> <li>◆ <code>install=(nfs,http,ftp,smb) ://<i>path_to_instmedia</i></code></li> <li>◆ <code>netdevice=<i>some_netdevice</i></code> (needed only if several network devices are available)</li> <li>• <code>hostip=<i>some_ip</i></code></li> <li>• <code>netmask=<i>some_netmask</i></code></li> <li>• <code>gateway=<i>ip_gateway</i></code></li> <li>◆ <code>vnc=1</code></li> <li>• <code>vncpassword=<i>some_password</i></code></li> </ul> |
| “Simple Remote Installation via VNC—Dynamic Network Configuration via DHCP” on page 54 | <ul style="list-style-type: none"> <li>◆ Location of the installation server</li> <li>◆ VNC enablement</li> <li>◆ VNC password</li> </ul>                                                                                       | <ul style="list-style-type: none"> <li>◆ <code>install=(nfs,http,ftp,smb) ://<i>path_to_instmedia</i></code></li> <li>◆ <code>vnc=1</code></li> <li>• <code>vncpassword=<i>some_password</i></code></li> </ul>                                                                                                                                                                                                                                                                    |
| “Remote Installation via VNC—PXE Boot and Wake-on-LAN” on page 55                      | <ul style="list-style-type: none"> <li>◆ Location of the installation server</li> <li>◆ Location of the TFTP server</li> <li>◆ VNC enablement</li> <li>◆ VNC password</li> </ul>                                                | N/A (process managed through PXE and DHCP)                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Installation Scenario                                                                  | Parameters Needed for Booting                                                                                                                                                                                                   | Boot Options                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| “Simple Remote Installation via SSH—Static Network Configuration” on page 56           | <ul style="list-style-type: none"> <li>◆ Location of the installation server</li> <li>◆ Network device</li> <li>◆ IP address</li> <li>◆ Netmask</li> <li>◆ Gateway</li> <li>◆ SSH enablement</li> <li>◆ SSH password</li> </ul> | <ul style="list-style-type: none"> <li>◆ <code>install=(nfs,http,ftp,smb)://path_to_instmedia</code></li> <li>◆ <code>netdevice=some_netdevice</code> (needed only if several network devices are available)</li> <li>• <code>hostip=some_ip</code></li> <li>• <code>netmask=some_netmask</code></li> <li>• <code>gateway=ip_gateway</code></li> <li>◆ <code>usessh=1</code></li> <li>• <code>sshpassword=some_password</code></li> </ul> |
| “Simple Remote Installation via SSH—Dynamic Network Configuration via DHCP” on page 57 | <ul style="list-style-type: none"> <li>◆ Location of the installation server</li> <li>◆ SSH enablement</li> <li>◆ SSH password</li> </ul>                                                                                       | <ul style="list-style-type: none"> <li>◆ <code>install=(nfs,http,ftp,smb)://path_to_instmedia</code></li> <li>◆ <code>usessh=1</code></li> <li>• <code>sshpassword=some_password</code></li> </ul>                                                                                                                                                                                                                                        |
| “Remote Installation via SSH—PXE Boot and Wake-on-LAN” on page 57                      | <ul style="list-style-type: none"> <li>◆ Location of the installation server</li> <li>◆ Location of the TFTP server</li> <li>◆ SSH enablement</li> <li>◆ SSH password</li> </ul>                                                | N/A (process managed through PXE and DHCP)                                                                                                                                                                                                                                                                                                                                                                                                |

**TIP:** You can find more information on the linuxrc boot options used for booting a Linux system in `/usr/share/doc/packages/linuxrc/linuxrc.html`.

## 2.3.5 Monitoring the Installation Process

There are several options to remotely monitor the installation process. If the proper boot options have been specified while booting for installation, either VNC or SSH can be used to completely control the installation and system configuration from a remote workstation.

### VNC Installation

Using any VNC viewer software, you can remotely control the installation of NLD from virtually any operating system. This section introduces the setup using a VNC viewer application or a Web browser, alternatively.

#### Preparing for VNC Installation

All you need to do on the installation target to prepare for a VNC installation is provide the appropriate boot options at the initial boot for installation (see “Using Custom Boot Options” on page 72). The target system boots up in a text-based environment and waits for a VNC client to connect to the installation program.

The installation program announces the IP address and display number you need to connect to for installation. If you have physical access to the target system, this information is provided right after

the system boots for installation. Enter these data when your VNC client software prompts for it and provide your VNC password.

As the installation target announces itself via OpenSLP, you can retrieve the address information of the installation target via an SLP browser without the need for any physical contact to the installation itself, provided your network setup and all machines support OpenSLP:

- 1 Start Konqueror (the KDE file and Web browser).
- 2 Enter `service://yast.installation.suse` at the location bar.

The target system appears as an icon in the Konqueror screen. Clicking this icon launches the KDE VNC viewer where you can perform the installation. Alternatively, run your VNC viewer software with the IP address provided and add `:1` at the end of the IP address for the display that the installation is running on.

### Connecting to the Installation Program

Basically, there are two ways to connect to a VNC server (the installation target, in this case). You can either launch an independent VNC viewer application on any operating system you want or connect using a Java-enabled Web browser.

Using VNC you can control the installation of a Linux system from any other operating system, including other Linux flavors, Windows, and Mac OS.

### Connecting via a VNC Viewer Application

On a Linux machine, make sure that the `tightvnc` package is installed. On a Windows machine, install the Windows version of this application, which can be obtained at the [TightVNV home page \(http://www.tightvnc.com/download.html\)](http://www.tightvnc.com/download.html).

- 1 Start the VNC viewer.
- 2 Enter the IP address and display number of the installation target as provided by the SLP browser or the installation program itself:

*ip\_address:display\_number*

A window opens on your desktop displaying the YaST screens as in a normal local installation.

### Connecting via a Web Browser

Using a Web browser to connect to the installation program makes you totally independent of any VNC software or the underlying operating system. As long as the browser application has Java support enabled, you can use any browser (such as Firefox, Internet Explorer, or Konqueror) to perform the installation of your Linux system.

- 1 Launch your preferred Web browser.
- 2 Enter the following at the address prompt:  
`http://ip_address_of_target:5801`
- 3 Enter your VNC password when prompted to do so.

The browser window displays the YaST screens as in a normal local installation.

## SSH Installation

Using SSH, you can remotely control the installation of your Linux machine using any SSH client software.

### Preparing for SSH Installation

Apart from installing the appropriate software package (OpenSSH for Linux and PuTTY for Windows), you need to give the appropriate boot options to enable SSH for installation. See [“Using Custom Boot Options” on page 72](#) for details. OpenSSH is installed by default on any SUSE LINUX based operating system.

### Connecting to the Installation Program

- 1 Retrieve the installation target's IP address.

If you have physical access to the target machine, just take the IP address the installation routines provide at the console after the initial boot. Otherwise, take the IP address that has been assigned to this particular host in the DHCP server configuration.

- 2 At a command line, enter

```
ssh -X root@ip_address_of_target
```

Replace *ip\_address\_of\_target* with the actual IP address of the installation target.

- 3 When prompted for a username, enter `root`.
- 4 When prompted for a password, enter the password that has been set via the SSH boot option. After you have successfully authenticated, a command line prompt appears on the installation target.
- 5 Type `yast` to launch the installation program.

A window opens showing the normal YaST screens as described in [“Using the NLD CDs or DVD as the Installation Source” on page 25](#).

## 2.4 Automated Installation

This section on automated installation comprises several different types of installation that enable you to roll out highly customized installations to a great number of machines. Not all of the scenarios are completely hands-off (not requiring any physical access to the machines), but all of them involve customization of the machine's configuration, software selection, or even the installation procedure itself.

---

**IMPORTANT:** Before considering mass deployment of NLD using any of the following techniques (imaging, firstboot, or control.xml), make sure the roll-out is done to machines of a similar or even identical type and setup. Make sure the amount of disk space and RAM is identical and that the same type of disk is used on all target machines. Otherwise you might end up with unusable installations.

---

### 2.4.1 Imaging

Imaging is the process of installing a default configuration on a workstation, taking a “snapshot” of that workstation, and then duplicating the configuration on other workstations.

## Considerations

Before you start, consider the following issues:

- ❑ Are the master machine and the targets of an identical hardware configuration? If not, this approach isn't suitable for installing NLD in this particular setup.
- ❑ Be aware of the fact that some aspects of the targets' configuration need to be changed manually, especially if you didn't use DHCP network configuration on the master machine. Cloning machines using static network setup would result in conflicting IP addresses and a nonfunctional networking environment.
- ❑ Do not consider imaging using this method on machines with multiple disks. The approach is not suited for complex multidisk environments.
- ❑ To what degree would you like to customize the installation?

Simple imaging just clones the system's basic configuration. If you are aiming for customized cloning of the desktop environment, consider the [“Customizing Novell Linux Desktop” on page 79](#).

## Prerequisites

You need the following items to be able to do imaging:

- ❑ An installed, pristine NLD machine to act as master machine.
- ❑ The original NLD installation CD1 or DVD.
- ❑ An NFS server in the same network as the master and target machines with enough disk space to hold the master machine's disk image.
- ❑ A fully functional network configuration on any machine involved in this setup.
- ❑ A copy of your partition table to determine which disk and which partition need to be imaged. In a system with several disks, always image the one holding the root partition with all the system configuration data.
- ❑ Determine the type of disk used on the master machine. The first SCSI disk would be referred to as `/dev/sda` whereas the first (E)IDE disk would be referred to as `/dev/hda`.

Make sure the target's hard disk is at least of the same size as the master machine's disk. Otherwise, the image would be incomplete, vital functionality could be missing, and the system would be unusable.

## Simple Imaging

Simple imaging is used to just clone the basic system configuration of the master to any target machine you want.

- 1** Boot the master machine from the original installation media (NLD CD1 or DVD).
- 2** Select the *Rescue System* option to boot into the rescue mode of NLD.
- 3** Type `root` to log in.  
A password isn't required at this point.
- 4** Select the language settings to be used in the rescue system.
- 5** Configure the network in the rescue system to be able to connect to the NFS server.
  - 5a** Configure the IP address and netmask, then activate the interface by entering

```
ifconfig eth0 ip_address netmask some_netmask up
```

Replace *ip\_address* and *some\_netmask* with values that fit your network setup.

- 5b** Configure routing (if necessary) by entering

```
route add default gw ip_address_gateway
```

Replace *ip\_address\_gateway* with a gateway address that matches your requirements.

- 6** Mount an NFS exported directory from the NFS server to the `/mnt` directory on the master machine to hold the disk image by entering

```
mount ip_nfs_server:exported_dir /mnt
```

Replace *ip\_nfs\_server* and *exported\_dir* with the actual values in your setup.

- 7** Create an image of your hard disk and store it on the NFS mounted directory by entering

```
dd if=/dev/hda of=/mnt/image.bin bs=16k
```

In the above command, the first (E)IDE disk is imaged. Adjust the command to the requirements of your machine's setup. If you need to image a SCSI disk, use `/dev/sda` instead.

- 8** Boot the target machine from the original installation media (NLD CD1 or DVD).

- 9** Select the *Rescue System* option to boot into the rescue mode of NLD.

- 10** Type `root` to log in.

A password isn't required at this point.

- 11** Select the language settings to be used in the rescue system.

- 12** Configure the network in the rescue system to be able to connect to the NFS server.

- 12a** Configure the IP address and netmask, then activate the interface by entering

```
ifconfig eth0 ip_address netmask some_netmask up
```

Replace *ip\_address* and *some\_netmask* with values that fit your network setup.

- 12b** Configure routing (if necessary) by entering

```
route add default gw ip_address_gateway
```

Replace *ip\_address\_gateway* with a gateway address that matches your requirements.

- 13** Mount an NFS exported directory from the NFS server to the `/mnt` directory on the target machine by entering

```
mount ip_nfs_server:exported_dir /mnt
```

Replace *ip\_nfs\_server* and *exported\_dir* with the actual values in your setup.

- 14** To avoid swapping while transferring the image onto the target's hard disk, identify the swap device currently in use and disable swapping for this device by entering

```
swapon -s
swappoff /dev/output_of_swapon
```

- 15** Enter the following to transfer the disk image from the NFS mounted partition in the rescue system to the disk of the target system:

```
dd if=/mnt/image.bin of=/dev/hda bs=16k
```

Make sure you adjust the disk type used to the disk setup in the target machine (see [Step 7 on page 78](#)).

- 16** Remove the boot (installation) media from the CD-ROM drive, then reboot the target machine.

## Advanced Imaging

For more advanced imaging features, use a third-party, commercial package such as [Symantec\\* Ghost\\*](http://sea.symantec.com/content/product.cfm?productid=9) (<http://sea.symantec.com/content/product.cfm?productid=9>).

## Customizing Novell Linux Desktop

NLD offers several methods for customizing the NLD installation you roll out to the target machines. You can customize NLD with regard to the following aspects:

- ◆ Hardware configuration (if rolled out to a set of identical machines)
- ◆ Disk use and partitioning (if rolled out to a set of identical machines)
- ◆ Default settings for new users
- ◆ Desktop look-and-feel
- ◆ Standard applications

### Customizing NLD Using YaST

Most of the default system settings (like hardware configuration, partitioning and device setup) can be done using YaST. For more information, see [Appendix A, “Using YaST to Configure the Novell Linux Desktop,” on page 125](#).

---

**WARNING:** Make sure both the master and target machine share the same hardware setup. Exporting partitioning schemes, graphics settings, or other hardware configurations to machines that don't match the setup or the master machine might break the installation and render the systems unusable.

---

### Initial Environment

When the home directory for a new user is created, it is initialized with files from the `/etc/skel` directory. As system administrator, you can create files in `/etc/skel` that provide a default environment for users. For example, you might create a `/etc/skel/.profile` file that sets the `EDITOR` environment variable to a text editor that is easy for new users to use.

However, it is usually best to keep `/etc/skel` as small as possible, because it is difficult to update existing users' files. For example, if the name of the friendly editor changes, all existing users would have to edit their `.profile` file. You could try to do it automatically, with a script, but that is almost certainly going to break someone's file.

Whenever possible, it is best to put global configuration into global files, such as `/etc/profile`. This way, it is possible to update without breaking users' personal settings.

### Customizing GNOME

The GNOME desktop configuration is done via a centralized repository that can be edited using the `gconf` editor tool that comes with the GNOME desktop. `gconf` allows you to customize the following aspects of your desktop:

- ◆ Desktop theming (window themes, background images, number of virtual desktops)
- ◆ Panel configuration (allow or disallow certain configuration options)
- ◆ Menu options available in any GNOME/Gtk-based application and on the desktop

- ◆ User actions (log out, lock screen, launch command)

For more information, see [Appendix E, “GNOME Configuration for Administrators,”](#) on page 261.

## Customizing KDE

The kiosk framework of KDE allows you to customize almost any aspect of your desktop. The KDE desktop comes with the kiosk configuration tool offering a graphical interface to all the different configuration tasks. It allows you to customize the following aspects of your desktop:

- ◆ Desktop theming
- ◆ Panel configuration
- ◆ Menu options in any Qt application and on the desktop
- ◆ User actions
- ◆ Internet use (disallow certain URLs in Konqueror)

For more information, see [Appendix F, “KDE Configuration for Administrators,”](#) on page 305.

## 2.4.2 Firstboot Configuration

The YaST firstboot utility (YaST Initial System Configuration), which runs after the installation is completed, lets you configure NLD before creation of the install image so that on the first boot after configuration, users are guided through a series of steps that allow for easier configuration of their desktops.

---

**IMPORTANT:** Because this scenario involves imaging, the concerns and constraints of this technique mentioned in [“Imaging”](#) on page 76 also apply to this approach.

---

### Considerations

Consider using firstboot if you want to

- Customize the installation experience for the users or administrators that will be using NLD.
- Make sure all installations proceed in the same way, which makes maintaining these systems much easier compared to maintaining a lot of different types of machines and installation patterns.
- Use imaging and have a similar software pattern and configuration rolled out to a large number of similar machines.

### Prerequisites

Before using firstboot, make sure the following items are provided and taken care of:

- A master machine where NLD can be installed
- Target machines of the same (or at least a very similar) hardware configuration as the master machine (hard drives, peripherals, graphics, and sound devices)
- A machine acting as the NFS server to hold and distribute the image
- The NLD installation media (CDs or DVD)

- ❑ A working network environment for the master, target, and NFS server machines (including a name service)

## Procedures

A typical firstboot process can be split into three subtasks:

1. **Preparing the master machine**
2. **Imaging the master machine's hard disk**
3. **Configuring the target machine**

### Preparing the Master Machine

The master machine needs to be installed and configured before you can enable firstboot and start the imaging process.

- 1 Install NLD on a master machine, making sure that you install the firstboot package.

Firstboot is disabled by default. The YaST firstboot package is not part of any software selection and has to be installed individually. During the NLD installation, on the Installation Settings screen, click *Software > Detailed Selection*, and then search for and install the `yast2-firstboot` package.

- 2 As root, create a file called `/etc/reconfig_system` by entering

```
touch /etc/reconfig_system
```

- 3 Enable the firstboot service either by using the YaST runlevel editor or by entering the following at the command line as root:

```
insserv firstboot
```

### Imaging the Master Machine's Hard Disk

To export the master machine's configuration, you need to image its hard disk and export this image to the targets.

- 1 Boot the master machine from the original installation media (NLD CD1 or DVD).
- 2 Select the *Rescue System* option to boot into the rescue mode of NLD.
- 3 Enter `root` to log in.  
A password isn't required at this point.
- 4 Select the language settings to be used in the rescue system.
- 5 Configure the network in the rescue system to be able to connect to the NFS server.
  - 5a Configure the IP address and netmask, then activate the interface by entering  

```
ifconfig eth0 ip_address netmask some_netmask up
```

  
Replace *ip\_address* and *some\_netmask* with values that fit your network setup.
  - 5b Configure routing (if necessary) by entering  

```
route add default gw ip_address_gateway
```

  
Replace *ip\_address\_gateway* with a gateway address that matches your requirements.

- 6 Mount an NFS exported directory from the NFS server to the `/mnt` directory on the master machine to hold the disk image by entering

```
mount ip_nfs_server:exported_dir /mnt
```

Replace *ip\_nfs\_server* and *exported\_dir* with the actual values in your setup.

- 7 Create an image of your hard disk and store it on the NFS mounted directory by entering

```
dd if=/dev/hda of=/mnt/image.bin bs=16k
```

In the above command, the first (E)IDE disk is imaged. Adjust this command to the requirements of your machine's setup. If you need to image a SCSI disk, use `/dev/sda` instead.

- 8 Boot the target machine from the original installation media (NLD CD1 or DVD).

- 9 Select the *Rescue System* option to boot into the rescue mode of NLD.

- 10 Enter `root` to log in.

A password isn't required at this point.

- 11 Select the language settings to be used in the rescue system.

- 12 Configure the network in the rescue system to be able to connect to the NFS server.

- 12a Configure the IP address and netmask, then activate the interface by entering

```
ifconfig eth0 ip_address netmask some_netmask up
```

Replace *ip\_address* and *some\_netmask* with values that fit your network setup.

- 12b Configure routing (if necessary) by entering

```
route add default gw ip_address_gateway
```

Replace *ip\_address\_gateway* with a gateway address that matches your requirements.

- 13 Mount an NFS exported directory from the NFS server to the `/mnt` directory on the target machine by entering

```
mount ip_nfs_server:exported_dir /mnt
```

Replace *ip\_nfs\_server* and *exported\_dir* with values matching your actual setup.

- 14 To avoid swapping while transferring the image onto the target's hard disk, identify the swap device currently in use and disable swapping for this device by entering

```
swapon -s
swappoff /dev/output_of_swapon
```

- 15 Enter the following to transfer the disk image from the NFS-mounted partition in the rescue system to the disk of the target system:

```
dd if=/mnt/image.bin of=/dev/hda bs=16k
```

Make sure you adjust the disk type used to the disk setup in the target machine (see [Step 7 on page 78](#)).

- 16 Remove the boot (installation) media from the CD-ROM drive, then reboot the target machine.

## Configuring the Target Machine

After the master machine's configuration has been cloned to the target's hard disk and the target is booted for the first time, firstboot starts and then the user or system administrator needs to complete some final configuration steps.

---

**NOTE:** The Post Configuration Utility (firstboot) expects the X Window System to be configured. If it isn't, firstboot automatically starts in text mode.

---

- 1 Acknowledge the License Agreement.
- 2 Set the date and time to match with your setup.
- 3 Set the machine's root password.
- 4 Create user logins.
- 5 Finish the configuration and exit firstboot.

During firstboot, two additional dialogs are displayed (for writing the data and running SuSEconfig) which require no user interaction. For more information on SuSEconfig, see “Section 11.6, SuSEconfig and /etc/sysconfig” in the *SUSE LINUX Enterprise Server 9 Administration and Installation Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

### Customizing YaST Firstboot

The user's experience of YaST and YaST firstboot can be customized to a certain extent. You can set certain actions to be taken in certain situations, add scripts to be executed to further adjust the target machine's configuration, and customize the messages passed on to the user.

The configuration file for firstboot is located in `/etc/sysconfig/firstboot`. The following variables can be used to further customize the firstboot process.

**Table 2-5** *Firstboot Configuration File Variables*

| Variable                                         | Description                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SCRIPT_DIR="/usr/share/firstboot/scripts"        | Specifies the path where all scripts used by firstboot are located. If you want to add your own scripts to further customize the system, store them at the given location or specify another.                                                                                                                 |
| FIRSTBOOT_WELCOME_FILE=""                        | Specifies the location of your own customized version of the YaST welcome message. If left empty, the NLD default welcome message is displayed.                                                                                                                                                               |
| FIRSTBOOT_LICENSE_FILE="/var/lib/YaST2/info.txt" | Provides the license text, or EULA (End User License Agreement), of the product being installed. The default text is taken from the <code>/var/lib/YaST2/info.txt</code> file. If you need to use a custom license agreement, create a text file containing the custom license and specify its location here. |
| FIRSTBOOT_FINISH_FILE=""                         | Specifies the location of your own customized version of the YaST finish message. If left empty, the NLD default finish message is displayed.                                                                                                                                                                 |

**NOTE:** If the referenced files in welcome, license, and finish messages are in plain text, they are shown as such automatically. If they contain any markup language, they are formatted as rich text.

| Variable                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SHOW_Y2CC_CHECKBOX="no"       | Determines whether the <i>Start Control Center</i> option should be displayed as part of the finish screen in firstboot. The default value of <i>SHOW_Y2CC_CHECKBOX</i> is set to NO because further user interaction with the system configuration is not desired.                                                                                                                                                                                          |
| LICENSE_REFUSAL_ACTION="halt" | Specifies which action should be taken if the user does not acknowledge the license agreement. Possible values are <code>halt</code> (the system is halted), <code>continue</code> (continue with firstboot system configuration), and <code>abort</code> (abort the firstboot process and boot into the cloned installation). Because you need all NLD users to formally agree to the license agreement, your default setting should be <code>halt</code> . |

### 2.4.3 Create Custom Installations Using the control.xml File

The product configuration file (`control.xml`) lets you customize the installation by making it possible to enable and disable features of the final installed product during installation. It controls the workflow a user sees during installation.

Besides workflow configuration, other system variables are configurable and can be predefined by the system administrator, including software selection and environment settings such as language, time zone, and keyboard. Any configuration here overrides default variables provided with Novell Linux Desktop.

The idea of having a predefined installation workflow and predefined system settings is the middle ground between manual installation and automated installation.

#### Considerations

Before you start using the `control.xml` file as a tool to install your clients, consider the following:

- ❑ Determine which types of hardware are involved. Different types of hardware need to be addressed differently by any kind of automated installation routine.
- ❑ Be aware of the fact that using the `control.xml` file for installation only represents a semiautomated approach to installation. User or administrator interaction is still required to some degree.
- ❑ If a completely hands-off installation method with no user interaction whatsoever is called for, consider using AutoYaST as described in [Appendix C, “Automatic Linux Installation and Configuration Using AutoYaST,” on page 195](#) or imaging as described in [“Imaging” on page 76](#).

Using AutoYaST, multiple systems sharing the same environment and similar (but not necessarily identical) hardware performing similar tasks can easily be installed in parallel and in a short time.

## Scope of the Control.xml File

The product configuration file is provided in text on the installation media and defines the following settings needed during installation:

**Table 2-6** *Supported Configuration Options*

| Option                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Workflow                                              | <p>Replaces the static workflow list with a configurable list using the product configuration file. Entire sections of the workflow can be skipped.</p> <p>For example, if the IT department wants to force French installations in Quebec, Canada, you can set the language variable in the configuration file so that the Language dialog is skipped during the installation. If the IT department wants to recommend settings but still give the users the ability to change the default settings, the Language dialog could still be shown but with French preselected.</p> <p>If none of the above options is used, the default settings are shown.</p> <p>For more information, see <a href="#">“Workflows” on page 87</a>.</p> |
| Proposals                                             | <p>Are also configurable. For example, certain products would skip some proposals. On the proposal screen, the preconfigured settings can be shown with the possibility of changing them or with inactive links if the configuration is to be forced.</p> <p>For more information, see <a href="#">“Proposals” on page 88</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                    |
| System Variables                                      | <p>Lets the users define system variables such as language, keyboard, time zone, window manager, and display manager. The defined variables are used as defaults in the respective dialogs.</p> <p>For more information, see <a href="#">“Installation and Product Variables” on page 89</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Package Selections and Additional Individual Packages | <p>Defines what base package selection and add-on selections should be used for the installation. Also provides the possibility of defining a list of additional packages. All packages and selections can be selected, depending on the architecture, using a special architecture attribute in the configuration file.</p> <p>For more information, see <a href="#">“Software” on page 89</a>.</p>                                                                                                                                                                                                                                                                                                                                  |
| Partitioning                                          | <p>Integrates flexible partitioning into the configuration file instead of the separate file currently used.</p> <p>For more information, see <a href="#">“Partitioning” on page 91</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Scripting and Hooks                                   | <p>Defines hooks and special slots where the user can execute scripts. For example, scripts can be executed at the very beginning of the installation (after processing the configuration file), in the installation system before the initial boot, in the chroot-ed environment after initial boot, and before/after every step in the workflow. The scripting languages supported during installation are Shell and Perl.</p> <p>For more information, see <a href="#">“Hooks” on page 95</a>.</p>                                                                                                                                                                                                                                 |

## Implementation

The control file is implemented in simple, structured XML syntax, which so far has been used for automated installation. The XML structure used can be mapped easily to YaST data structures, and all data types available in YaST are supported for easy data access and manipulation.

The primary use of the control file is to configure the workflow of the installation. It lets you predefine a certain setup, but it also defines product installation features and other product-related variables.

---

**NOTE:** The control file is not an optional tool to help customize installation. It is required during installation, and installation can fail or lead to unexpected results without the file. YaST provides a general default control file which is always available in the system. The general and product-independent control files are installed by the YaST-installation package in `/usr/share/YaST/control/control.xml`.

---

During installation, `linuxrc` searches for the a file named `control.xml` on the installation medium (for example, CD, NFS, or FTP), copies the file to the installation system, and makes the file available to YaST. YaST then starts and looks for the control file in the following three locations before starting with the installation workflow:

**Table 2-7** *Control File Locations*

| Location                                         | Description                                                                                                                                                                           |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>/control.xml</code>                        | Usually found in the top directory after it has been copied by <code>linuxrc</code> during the initial installation phase.                                                            |
| <code>/var/lib/YaST/control.xml</code>           | After reading the file, and before the second installation phase, the control file is copied from the top directory to this location.<br><br><code>/var/lib/YaST/control.xml</code> . |
| <code>/usr/share/YaST/control/control.xml</code> | The location where YaST-installation installs the file in all products. The file is the same on all products.                                                                         |

One of the main reasons for using the control file is to let non-YaST developers change the installation behavior and customize various settings without the need to change YaST packages.

## Configuration

This section contains information on the following:

- ◆ [“Workflows” on page 87](#)
- ◆ [“Proposals” on page 88](#)
- ◆ [“Installation and Product Variables” on page 89](#)
- ◆ [“Software” on page 89](#)
- ◆ [“Partitioning” on page 91](#)
- ◆ [“Algorithm for Space Allocation” on page 91](#)
- ◆ [“Configuration Options” on page 92](#)

- ◆ “Hooks” on page 95

## Workflows

Using the control file, you can define multiple workflows for different modes and installation stages. The element workflows in the control file evaluates to a list of workflows.

Beside defining which YaST clients should be executed during installation, the workflow configuration also lets you specify the wizard steps and how they should appear during a graphical installation.

A workflow list element is a map with the following elements:

**Table 2-8** *Workflow List Elements*

| Element  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| label    | Label of the workflow as it appears on the left side of the wizard. For example, <code>Base Installation</code> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| defaults | Default arguments to the clients. This is a map element.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| stage    | Defines the stage or phase of installation. Possible values are <code>initial</code> (for the initial), <code>stage</code> , and <code>continue</code> (for the workflow of the installation after reboot).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| mode     | Defines installation mode. Several modes are available; the most important are the following: <ul style="list-style-type: none"> <li>◆ <code>installation</code></li> <li>◆ <code>update</code></li> <li>◆ <code>autoinst</code></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| modules  | The actual workflow. A list of elements describing the order in which the installation should proceed. <p>A module element is a map with the following configuration options</p> <ul style="list-style-type: none"> <li>◆ <b>name:</b> Name of the module. All installation clients and modules have a unified prefix (<code>inst_</code>), which can be omitted here. For example, if the YaST file for the module is called <code>inst_test</code>, then the name in the control file is <code>test</code>.</li> <li>◆ <b>label:</b> Label of the module in the step dialog. This is an optional element. If it is not set, the label of the previous module is used.</li> <li>◆ <b>arguments:</b> Arguments for the module is a comma-separated list which can accept Boolean operators and symbols.</li> </ul> |

The following is a typical installation workflow:

```
<workflows config:type="list">
 <workflow>
 <!-- 'label' is what the user will see -->
 <label>Base Installation</label>
 <!-- default settings for all modules -->
 <defaults>
 <!-- arguments for the clients -->
 <arguments>>false,false</arguments>
```

```

 <!-- allowed architectures "all", "i386",
 "i386,ia64,x86_64" -->
 <archs>all</archs>
 </defaults>
 <stage>initial</stage>
 <mode>installation,update</mode>
 <modules config:type="list">
 <module>
 <name>info</name>
 <arguments>>false,true</arguments>
 </module>
 <module>
 <name>proposal</name>
 <arguments>>true,true,`ini</arguments>
 <label>Installation Settings</label>
 </module>
 <module>
 <name>do_resize</name>
 <update config:type="boolean">>false</update>
 <archs>i386,x86_64,ia64</archs>
 <label>Perform Installation</label>
 </module>
 <module>
 <name>prepdisk</name>
 <!-- Multiple modules with the same 'label' will be
 collapsed to one single user-visible step.
 The step is considered finished when the last
module
 with the same 'label' is finished. -->
 <label>Perform Installation</label>
 </module>
 <module>
 <name>kickoff</name>
 <label>Perform Installation</label>
 </module>
 <module>
 <name>rpmcopy</name>
 <label>Perform Installation</label>
 </module>
 <module>
 <name>finish</name>
 <label>Perform Installation</label>
 </module>
 </modules>
</workflow>

```

## Proposals

Part of the installation workflows are proposal screens, which consist of groups of related configuration settings (for example, Network, Hardware, and the initial Installation proposal).

You can add or modify a proposal, which we do not recommend because of configuration dependencies, by using the control file:

```

<proposal>
 <type>network</type>
 <stage>continue,normal</stage>
 <proposal_modules config:type="list">
 <proposal_module>lan</proposal_module>
 <proposal_module>dsl</proposal_module>
 <proposal_module>isdn</proposal_module>
 <proposal_module>modem</proposal_module>
 <proposal_module>proxy</proposal_module>
 <proposal_module>remote</proposal_module>
 </proposal_modules>
</proposal>

```

The proposal in the above example is displayed in the so-called continue mode, which is the second phase of the installation. The proposal consists of different configuration options which are controlled using a special API.

---

**NOTE:** Proposal names and captions are fixed and cannot be changed. It is not possible to create a special proposal screen. Instead, you should use the available screens: network and hardware.

---

In the workflow, the proposals are called as any workflow step with an additional argument identifying the proposal screen to be started (``net`` for network, and ``hw`` for hardware proposals). The following example shows how the network proposal is called as a workflow step:

```

<module>
 <label>Network</label>
 <name>proposal</name>
 <arguments>>true,true,`net</arguments>
</module>

```

## Installation and Product Variables

It is possible to define some installation variables and force them in the proposal. The user can still change them, however.

The following variables can be set:

- ◆ Timezone (timezone)
- ◆ Language (language)
- ◆ Keyboard (keyboard)
- ◆ Auto Login (enable\_autologin)

Auto Login is not recommended for multiuser environments and server installations.

The following example shows all options listed above:

```

<globals>
 <enable_autologin config:type="boolean">>true<enable_autologin>
 <language>de_DE</language>
 <timezone>Canada/Eastern</timezone>
</globals>

```

## Software

Use this section in the control file to change the software proposal during installation.

An example software section could look like the following:

```
<software>
<delete_old_packages config:type="boolean">false</delete_old_packages>
 <selection_type config:type="auto">auto</selection_type>
</software>
```

By default, the software proposal is generated depending on the available space in the system. If enough space is available, a fairly large number of packages and add-on package groups are automatically selected. This behavior is controlled by the `selection_type` element in the control file.

The default value for `selection_type` is `auto`. To force a selection (which a user cannot change), use the `fixed` value.

If you want a fixed software selection, the fixed selection name must be specified in the control file. This selection must be a base selection. To specify the name of the base selection to be forced, use the `base_selection` element.

The list of base selections can be found on the first CD of the product in the `suse/setup/descr` directory or by using the following command over the NLD-9 repository of your network installation source:

```
for i in `grep -l baseconf CD1/suse/setup/descr/* `; do
 basename $i .sel;
done
```

The above command generates the following output:

```
Gnome
Kde
```

which matches the base selections in NLD.

Additionally, you can configure package updates using the following options:

#### **delete\_old\_packages**

Does not delete old RPMs when updating.

#### **only\_update\_selected**

Updates only packages already installed or upgraded (also installs new packages with new functionality).

You can also use the `software_proposal` element to switch from desktop-based proposals to the normal behavior of software proposals in YaST. Setting the value to `desktop` makes YaST show a dialog with desktops to select from (KDE or GNOME). If this element is not defined, default behavior is assumed.

### **Adding Custom Software**

You can also add additional software by creating custom software selections according to the procedure described in [“Software” on page 218](#) and pulling them in via the software proposal described in [“Software” on page 89](#).

To add a custom selection to your installation scope, proceed as follows:

- 1 Prepare an add-on selection containing the additional software you want to include in the installation of NLD according to the procedure outlined in “Custom Package Selections” on page 218.
- 2 Add the selection to the control file.

The software section of your control file should now read as follows.:

```
<software>
<selection_type config:type="symbol">fixed</selection_type>
<addons config:type="list">
<addon>mysel</addon>
</addons>
<base>Minimal</base>
...
</software>
```

The addons property encloses any additional selections you want to add. Just list any selection here, again enclosed by `addon`, and replace `mysel` with the actual name of your custom selection. The standard NLD selections you want to make are enclosed by the `base` element. A list of packages is added by the following code:

```
<software>
<selection_type config:type="symbol">fixed</selection_type>
...
<packages config:type="list">
<package>package1</package>
<package>package2</package>
...
</packages>
</software>
```

Replace `package1` and `package2` with package names matching your needs.

## Partitioning

If present, the partition proposal is based on the data provided in the control file.

## Algorithm for Space Allocation

Space allocation on a disk happens in the following order:

1. All partitions get the size allocated that is determined by the size parameter of the partition description.
2. If a disk cannot hold the sum of these sizes, this disk is not considered for installation.
3. If all demands by the size parameter are fulfilled and there is still space available on the disk, the partitions which have a percent parameter specified are increased until the size demanded by percent is fulfilled.
4. If there is still available space on the disk (this normally happens only if the sum of all percent values is below 100), all partitions specified with a size of 0 are enlarged as far as possible.
5. If a maxsize is specified for a partition, all enlargement are done only up to the specified maxsize.

If more than one of the available disks are eligible to hold a certain partition set, the disk is selected as follows:

1. If there is a partition allocated on that disk that has its size specified by percent or `size=0` keywords and does not have a `maxsize` value set, the desired size for this partition is considered to be unlimited.
2. If a partition group contains a partition with an unlimited desired size, the disk that maximizes the partition size for the unlimited partitions is selected.
3. If all partitions in a partition group are limited in size, the smallest disk that can hold the desired sizes of all partitions is selected for that partition group.

If there are multiple partition groups:

1. The partition group with the lowest number (which means the highest priority) gets assigned its disk first.
2. The partition group with the next priority gets assigned the optimal disk from the as-yet-unassigned disks.

## Configuration Options

The following elements are global to all disks and partitions:

**Table 2-9** *Configuration Elements*

Element	Description
disk	Specifies which partitions should be placed on which disks if multiple disks are present in the system. All partitions with the same disk value are placed on the same disk. The value after the keyword determines the priority of the partition group. Lower numbers mean higher priority. If there are not enough disks in the system, a partition group with lower priority is assigned to a separate disk before a partition group with higher priority. A partition without the disk keyword is implicitly assigned the highest priority of 0.  Example: <code>&lt;disk&gt;2&lt;disk&gt;</code>
formatopt	Describes the options given to the <code>format</code> command. Multiple options must be separated by spaces. There must not be a space between an option letter and an option value. This entry is optional.  Example: <code>&lt;formatopt&gt;reiser&lt;formatopt&gt;</code>
fstop	Describes the options written to <code>/etc/fstab</code> . Multiple options must be separated by commas (,). This entry is optional.  Example: <code>&lt;fstop&gt;acl,user_xattr&lt;fstop&gt;</code>
fsys	Describes the file system type created on this partition. Possible types are <code>reiser</code> , <code>ext2</code> , <code>ext3</code> , <code>xfs</code> , <code>vfat</code> , <code>jfs</code> , and <code>swap</code> . If no type is given for a partition, <code>reiserfs</code> is used.  Example: <code>&lt;fsys&gt;reiser&lt;/fsys&gt;</code>

Element	Description
id	<p>Enables creation of partitions with partition IDs other than 0x83 (for normal file system partitions) or 0x82 (for swap partitions). This make it possible to create LVM or MD partitions on a disk.</p> <p>Example: <code>&lt;id&gt;0x8E&lt;id&gt;</code></p>
increasable	<p>After determining the optimal disk usage, the partition can be increased if there is unallocated space in the same gap available. If this keyword is set, the partition can grow larger than specified by the maxsize and percent parameters. This keyword is intended to avoid having unallocated space on a disk after partitioning (if possible).</p> <p>Values: <code>true false</code></p> <p>Default: <code>false</code></p> <p>Example: <code>&lt;increasable config:type="boolean"&gt;true&lt;increasable&gt;</code></p>
keep_partition_fsys	<p>Partitions that contain file systems in the list are not deleted even if <code>prefer_remove</code> is set to <code>true</code>.</p> <p>Values: Comma-separated list of <code>reiser, xfs, fat, vfat, ext2, ext3, jfs, ntfs, swap</code></p> <p>Default: Empty list</p>
keep_partition_id	<p>Partitions that have a partition ID that is contained in the list are not deleted even if <code>prefer_remove</code> is set to <code>true</code>.</p> <p>Values: Comma-separated list of possible partition IDs</p> <p>Default: Empty list</p>
keep_partition_num	<p>Partitions that have a partition number that is contained in the list are not deleted even if <code>prefer_remove</code> is set to <code>true</code>.</p> <p>To configure individual partitions and disks, a list element is used with its items describing how the partitions should be created and configured.</p> <hr/> <p><b>IMPORTANT:</b> If there is a space or an equal sign (=) contained in an option value, the value has to be surrounded by double quotes ("). Values that describe sizes can be followed by the letter K (kilobytes), M (megabytes), or G (gigabytes).</p> <hr/> <p>Values: Comma-separated list of possible partition numbers</p> <p>Default: Empty list</p>
label	<p>If the file system can have a label, the value of the label is set to this value.</p> <p>Example: <code>&lt;label&gt;emil&lt;label&gt;</code></p>
maxsize	<p>Limits the maximum amount of space that is allocated to a certain partition. This keyword is useful only in conjunction with a size specification by the percent keyword or by an entry of <code>size=0</code>.</p> <p>Example: <code>&lt;maxsize&gt;4G&lt;maxsize&gt;</code></p>

Element	Description
mount	<p>Describes the mount point of the partition. For a swap partition, the special value <code>swap</code> has to be used.</p> <p>Example: <code>&lt;mount&gt;swap&lt;/mount&gt;</code></p>
percent	<p>Determines that a partition should be allocated a certain percentage of the available space for installation on a disk.</p> <p>Example: <code>&lt;percent&gt;30&lt;/percent&gt;</code></p>
prefer_remove	<p>Values: <code>true false</code></p> <p>Default: <code>true</code></p> <p>If set to <code>false</code>, the partition suggestion tries to use gaps on the disks or reuse existing partitions. If set to <code>true</code>, the partition suggestion prefers to remove existing partitions.</p>
remove_special_partitions	<p>If set to <code>false</code>, YaST does not remove some special partitions (for example, <code>0x12</code> Compaq diagnostics, <code>0xde</code> Dell Utility) if they exist on the disk, even if <code>prefer_remove</code> is set to <code>true</code>. If set to <code>true</code>, YaST removes even those special partitions.</p> <hr/> <p><b>WARNING:</b> Some machines are not bootable when these partitions are removed, so be careful when setting this to <code>true</code>.</p> <hr/> <p>Values: <code>true false</code></p> <p>Default: <code>false</code></p>
size	<p>Determines the minimum size for a partition. A size value of <code>0</code> means that YaST should try to make the partition as large as possible after all other demands regarding partition size are fulfilled. The special value of <code>auto</code> can be given for the <code>/boot</code> and <code>swap</code> partitions. If <code>auto</code> is set, YaST computes a suitable partition size by itself.</p> <p>Example: <code>&lt;size&gt;2G&lt;/size&gt;</code></p>

## Examples of Flexible Partitioning

In the example below, if the machine has three disks, each of the partition groups is put on a separate disk. So one disk holds `/var`; another disk holds `/home`; and another disk holds `/`, `/usr`, and `/opt`.

```
<partitions config:type="list">
 <partition>
 <disk config:type="integer">3</disk>
 <mount>/var</mount>
 <percent config:type="integer">100</percent>
 </partition>
 <partition>
 <disk config:type="integer">2</disk>
 <mount>/</mount>
 <size>1G</size>
 </partition>
 <partition>
 <disk config:type="integer">2</disk>
```

```

 <mount>/usr</mount>
 <size>2G</size>
 </partition>
</partition>
<disk config:type="integer">2</disk>
 <mount>/opt</mount>
 <size>2G</size>
</partition>
</partition>
 <disk config:type="integer">1</disk>
 <mount>/home</mount>
 <percent config:type="integer">100</percent>
</partition>
</partitions>

```

If the machine has only two disks, then /home is on a separate disk (because it has lower priority than the other partition groups) and /, /usr, /opt, and /var share the other disk. If there is only one disk in the system, all partitions are on that disk.

A more complete example with other options is shown below:

```

<partitioning>
 <partitions config:type="list">
 <partition>
 <disk config:type="integer">2</disk>
 <mount>swap</mount>
 <size>auto</size>
 </partition>
 <partition>
 <disk config:type="integer">1</disk>
 <fstopt>defaults</fstopt>
 <fsys>reiser</fsys>
 <increasable config:type="boolean">true</increasable>
 <mount>/</mount>
 <size>2gb</size>
 </partition>
 <partition>
 <disk config:type="integer">2</disk>
 <fstopt>defaults,data=writeback,noatime</fstopt>
 <fsys>reiser</fsys>
 <increasable config:type="boolean">true</increasable>
 <mount>/var</mount>
 <pct config:type="integer">100</pct>
 <size>2gb</size>
 </partition>
 </partitions>
 <prefer_remove config:type="boolean">true</prefer_remove>
 <remove_special_partitions config:type="boolean">>false
</remove_special_partitions>
</partitioning>

```

## Hooks

It is possible to add hooks before and after any workflow step for further customization of the installed system and to perform nonstandard tasks during installation.

Two additional elements define custom script hooks:

### **prescript**

Executes before the module is called.

### **postscript**

Executes after the module is called.

Both script types accept two elements: the interpreter used (Shell or Perl) and the source of the scripts (which is embedded in the XML file using CDATA sections to avoid confusion with the XML syntax). The following example shows how scripts can be embedded in the control file:

```
<module>
 <name>info</name>
 <arguments>>false,true</arguments>
 <prescript>
 <interpreter>shell</interpreter>
 <source>
<![CDATA[#!/bin/sh
touch /tmp/tux
echo anas > /tmp/anas
]]>
 </source>
 </prescript>
</module>
```

## **An Example Installation Scenario Using a Control.xml File**

The following example should outline the basic procedure to install one or multiple targets with a predefined installation scope using a `control.xml` file.

The example assumes the following items are present in your environment and correctly set up:

- ❑ A `control.xml` file that has been modified to match your requirements (see [Section 2.4.3, “Create Custom Installations Using the control.xml File,” on page 84](#) for instructions).
- ❑ A properly working network setup that includes DHCP and name service.
- ❑ A network installation source (FTP or NFS) which provides the installation data as well as the `control.xml` file itself. For details on how to set up a network installation server, see [“Setting Up the Server Holding the Installation Sources” on page 58](#).
- ❑ The original product installation media to boot the targets from or a network and target configuration that allows booting via network (see [“Preparing the Boot of the Target System” on page 64](#)).
- ❑ One or more target machines. Ideally, multiple machines should share the same kind of hardware configuration.

To proceed with the installation, do the following:

- 1** Boot the target machines either using a physical boot medium or via the network.

If using boot media, make sure the location of the network installation source is passed on to the installation routines. See [“Using Custom Boot Options” on page 72](#).

YaST starts up and pulls in the `control.xml` file from the installation server, then the installation proceeds as outlined in the `control.xml` file.

**2** Make the settings the custom workflow requires you to, then complete the installation.

---

**TIP:** Because this procedure closely resembles a standard network installation, any of the techniques mentioned in [“Remote Installation” on page 53](#) can be used to remotely control the installation procedure.

---



# Upgrading Novell Linux Desktop

# 3

This chapter introduces the use of Service Packs for upgrading your Novell® Linux Desktop (NLD) installation. There are several different ways in which you can apply a Service Pack for NLD. You can either upgrade the existing installation of NLD or start a whole new installation using the Service Pack media.

This chapter discusses possible scenarios for upgrading your system and setting up a central network installation source:

- ♦ [“Setting Up a Network Installation Source for Service Pack Media” on page 99](#)
- ♦ [“Installing an NLD Service Pack” on page 100](#)
- ♦ [“Upgrading to an NLD Service Pack” on page 103](#)

## 3.1 Setting Up a Network Installation Source for Service Pack Media

As with the initial installation of NLD, it is much more efficient having a central installation source on your network to serve all clients rather than installing all of them separately using a set of physical media. The setup of this installation server is very similar to the one described in [“Setting Up the Server Holding the Installation Sources” on page 58](#).

### 3.1.1 Configuring a Network Installation Source on SLES 9 Using YaST

Basically, follow the procedure outlined in [“Setting Up an Installation Server Using YaST on SLES 9” on page 58](#). Just add another installation source called NLD-9-SP $x$  (where  $x$  is the number of the Service Pack) and make it available via NFS, HTTP, or FTP.

### 3.1.2 Manual Setup of a Network Installation Source

The procedure for manual setup of a network installation source is very similar to the one described in [“Setting Up the Server Holding the Installation Sources” on page 58](#). A few minor changes have to be applied to the procedures for setting up NFS, FTP, HTTP, and SMB installation sources.

When copying the installation media, proceed as follows:

- 1 Log in as root.
- 2 Change to the directory that is already holding the original installation media of NLD (in this example, `/install/nld`) by entering  

```
cd /install/nld
```
- 3 Create a new subdirectory called NLD-9-SP $x$  (replacing  $x$  with the number of the SP) by entering  

```
mkdir NLD-9-SP x
```
- 4 Copy the contents of each CD to their own subdirectory.
- 5 Create the following symbolic links:

```
ln -s NLD-9-SPx/CD1/boot boot
ln -s NLD-9-SPx/CD1/content content
ln -s NLD-9-SPx/CD1/control.xml control.xml
ln -s NLD-9-SPx/CD1/media.1 media.1
```

- 6** Create a subdirectory called `yast` and then change to this directory by entering

```
mkdir yast
cd yast
```

- 7** Create a file called `order` which determines which media (original source vs. Service Pack) should be searched for and installed first.

A valid `order` file for NLD would look like the following example:

```
NLD-9-SPx/CD1
NLD-9/CD1
```

Replace `x` with the actual number of the Service Pack. This order file tells the installation routines to first install the original NLD sources and then apply the SP sources on top of that.

- 8** Make the sources available via NFS, FTP, or HTTP as described in “[Manual Setup of an NFS Installation Source](#)” on page 60, “[Manual Setup of an FTP Installation Source](#)” on page 61, “[Managing an SMB Installation Source](#)” on page 63, or “[Manual Setup of an HTTP Installation Source](#)” on page 62, respectively.

## 3.2 Installing an NLD Service Pack

---

**NOTE:** To update an existing NLD 9 system to an NLD 9 SP, see “[Upgrading to an NLD Service Pack](#)” on page 103.

---

Installing an NLD Service Pack is very similar to installing the original NLD media. As with the original installation, you can choose between a **manual** or a **network** installation.

### 3.2.1 Manual Installation

- ♦ “[Prerequisites](#)” on page 100
- ♦ “[Procedure](#)” on page 100

#### Prerequisites

Before starting a new installation of an NLD SP, ensure that the following items are available:

- The original NLD installation media (CDs or DVD)
- All of the Service Pack installation CDs

#### Procedure

- 1** Insert *NLD SP CD 1* and boot your machine.

A boot screen similar to the original installation of NLD 9 is displayed.

- 2** Select *Installation* to boot the SP kernel from CD.

The kernel loads and the following message appears:

```
Make sure that CD number 1 is in your drive.
```

- 3 Insert the original *NLD 9 CD 1*, then click *OK* to run the regular installation.
- 4 Accept the license agreement, then select a language, default desktop, and other installation settings.
- 5 Click *Yes, Install* to start the installation.
- 6 Insert *NLD 9 SP CD 1* when prompted, followed by *NLD 9 SP CD 2*.
- 7 When prompted, insert the original *NLD 9 CD 1* again, followed by the original *NLD 9 CD 2* and *CD 3*.
- 8 Continue as usual with the installation (entering a password for root, completing the network configuration, testing your Internet connection, activating the ZENworks<sup>®</sup>™ Online Update Service, selecting the user authentication method, and entering a user name and password).

For instructions on installing NLD, see the *Novell Linux Desktop Quick Start* (<http://www.novell.com/documentation/nld/qsnld/data/brmci5h.html>) or *quickstart-en.pdf* at the root of the Novell Linux Desktop CD 1 or DVD.

---

**TIP:** If you get an error message during the media installation indicating that a certain file couldn't be installed, skip that file and continue to the end. Then run the update again. During the reinstall, only the skipped packages are installed.

---

## 3.2.2 Network Installation

- ♦ “Prerequisites” on page 101
- ♦ “Procedures” on page 101

### Prerequisites

Before starting a network installation of an NLD SP, make sure that the following requirements are met:

- A network installation source set up according to “Setting Up a Network Installation Source for Service Pack Media” on page 99.
- A working network connection both on the installation server and the target machine that includes a name service, DHCP (optional/needed for PXE boot), and OpenSLP (optional).
- The *NLD SP CD1* to boot the target system *or* a target system set up for PXE boot according to “Remote Installation via VNC—PXE Boot and Wake-on-LAN” on page 55.

### Procedures

- ♦ “Network Installation—Boot from CD” on page 101
- ♦ “Network Installation—PXE Boot” on page 102

#### Network Installation—Boot from CD

To perform a network installation using the SP CD1 as the boot medium, proceed as follows:

- 1 Insert *NLD SP CD 1* and boot your machine.

A boot screen similar to the original installation of NLD 9 is displayed.

- 2 Select *Installation* to boot the SP kernel from CD, then use the F3 key to select a type of network installation source (FTP, HTTP, NFS, or SMB).
- 3 Provide the appropriate path information or select *SLP* as the installation source.
- 4 Select the appropriate installation server from what the installation program offers or use the boot options prompt to provide the type of installation source and its actual location (as in [“Using Custom Boot Options” on page 72](#)).

YaST starts up.

- 5 Accepting the license agreement, then select a language, default desktop, and other installation settings.
- 6 Click *Yes, Install* to start the installation.
- 7 Continue as usual with the installation (entering a password for root, completing the network configuration, testing your Internet connection, activating the ZENworks™ Online Update Service, selecting the user authentication method, and entering a user name and password).

For detailed instructions on installing NLD, see [Chapter 2, “Deploying Novell Linux Desktop,” on page 21](#).

---

**TIP:** If you get an error message during the media installation indicating that a certain file couldn't be installed, skip that file and continue to the end. Then run the update again. During the reinstall, only the skipped packages are installed.

---

## Network Installation—PXE Boot

To perform a network installation of an NLD Service Pack via network, proceed as follows:

- 1 Adjust the setup of your DHCP server to provide the address information needed for PXE boot.  
See [“Setting Up a DHCP Server” on page 64](#) for more information.
- 2 Set up a TFTP server to hold the boot image needed for PXE boot.  
Use the first CD of your NLD Service Pack for this and otherwise follow the instructions in [“Setting Up a TFTP Server” on page 66](#).
- 3 Prepare PXE boot and Wake-on-LAN on the target machine as described in [“PXE Boot” on page 67](#).
- 4 Initiate the boot of the target system and use VNC to remotely connect to the installation routine running on this machine.  
See [“VNC Installation” on page 74](#) for more information.
- 5 Accept the license agreement, then select a language, default desktop, and other installation settings.
- 6 Click *Yes, Install* to start the installation.
- 7 Continue as usual with the installation (entering a password for root, completing the network configuration, testing your Internet connection, activating the ZENworks™ Online Update Service, selecting the user authentication method, and entering a user name and password).  
For detailed instructions on installing NLD, see [Chapter 2, “Deploying Novell Linux Desktop,” on page 21](#).

---

**TIP:** If you get an error message during the media installation indicating that a certain file couldn't be installed, skip that file and continue to the end. Then run the update again. During the reinstall, only the skipped packages are installed.

---

## 3.3 Upgrading to an NLD Service Pack

You need access to the original NLD 9 CDs or DVD in order to complete the upgrade.

- 1 In a running NLD system, insert *NLD SP CD 1* into your CD drive, then click *Yes* when the hardware detection notice appears.

If the CD isn't autodetected, try reinserting it. If autodetect continues to fail, select *System > Administrator Settings > Software > Patch CD Update*.

- 2 If you are not logged in as root, enter the root password when prompted.

The YaST Online Update dialog appears.

- 3 Click *Next* to begin the update process.

The Download and Installation log tracks the update progress.

---

**TIP:** If you see a patch installation error message at any time during the update, click *Skip Patch*, complete the update, and then repeat the update process to install the skipped packages. Only the skipped packages are installed when the process is repeated.

---

- 4 When prompted for the *YOU Patch CD CD2*, insert *NLD SP CD2* and then click *OK*.

This prompt does not appear if you are updating from a DVD.

- 5 Click *Finish* when you see *Installation Finished* reported near the end of the progress log.

- 6 If you skipped patches, repeat this update procedure



This chapter contains information on the following utilities:

- ♦ “Using Red Carpet to Update Novell Linux Desktop” on page 105
- ♦ “Using the NCP Utilities to Mount NetWare Volumes” on page 106
- ♦ “Using CIFS to Mount an SMB Filesystem” on page 107
- ♦ “Installing VMware” on page 108

## 4.1 Using Red Carpet to Update Novell Linux Desktop

ZENworks<sup>®</sup> Linux Management lets you manage any number of client machines from a central server located within your firewall. Using the Web interface or the command line tool, you can create groups of individual machines and channels of software, and then distribute the software to the machines. You can delegate authority to multiple administrators, follow progress with the built-in reporting system, and maintain your network.

Individual users can use the Red Carpet<sup>®</sup> client to manage the software they have on their computers. It can help them install, update, and remove programs without making them keep track of dependencies and conflicts themselves.

To install, update, or remove software, you must enter your system’s root password. If you do not have root privileges, you can only view the software installed on your system.

For more information on ZENworks Linux Management, see the *Novell ZENworks Linux Management Administrator's Guide* (<http://www.novell.com/documentation/zlm/index.html>).

For more information on Red Carpet, see the *Novell Red Carpet Administration Guide* (<http://www.novell.com/documentation/ximian/redcarpet.pdf>).

### 4.1.1 Subscribing to a Red Carpet Channel

To receive updates through Red Carpet, you must subscribe to a Red Carpet channel. To access a Red Carpet channel, you need an activation code.

There are two kinds of activation codes: registered and non-registered. Evaluation codes (good for 30 days worth of updates, but with no Support services) are preregistered and can be used right away. Purchased activation codes are not preregistered and must go through a registration process. To receive an evaluation access code, see *Novell Linux Desktop 9 Evaluation Download* (<http://www.novell.com/products/desktop/eval.html>). To purchase a regular activation code, see *How to Buy Novell Linux Desktop 9* (<http://www.novell.com/products/desktop/howtobuy.html>).

After your activation code is registered, you can activate your desktop by adding a service and entering your e-mail address and activation code.

- 1 Start the Red Carpet client:

GNOME: Click *System > Software Update*.

KDE: Click **N** > *System* > *Configuration* > *Red Carpet*.

- 2 If you are not logged in as root, enter the root password, then click *OK*.
- 3 Click *Edit* > *Services* > *Add Service*.
- 4 Specify the URL of the service you want to add (for example, <https://update.novell.com/data>), then click *OK*.
- 5 Click *File* > *Activate*.
- 6 Specify your e-mail address and the activation key, then click *Activate*.
- 7 On the Red Carpet toolbar, click *Channels*.
- 8 Select the Subscribed check boxes you want, then click *Close*.

The workstation is now configured to receive updates for NLD.

### 4.1.2 Getting Software Updates

An update notice is shown only for software you already have installed that is in a channel to which you are subscribed, and for which there is a newer version than what you already have.

- 1 Start the Red Carpet client:

GNOME: Click *System* > *Software Update*.

KDE: Click **N** > *System* > *Configuration* > *Red Carpet*.

- 2 If you are not logged in as root, enter the root password, then click *OK*.
- 3 On the *Updates* tab, select one or more packages in the list of available updates.
- 4 Mark the selected packages for installation by clicking *Mark for Installation*.
- 5 Click *Run Now* to perform the update.

When the update is finished, the Update tab will show that your system is up-to-date.

## 4.2 Using the NCP Utilities to Mount NetWare Volumes

ncpfs is a Linux file system that understands the NCP protocol (the protocol NetWare clients use to talk to NetWare<sup>®</sup> servers).

The following NCP utilities let you mount and unmount volumes from a specified NetWare file server:

- ♦ “[ncpmount](#)” on page 107
- ♦ “[ncpumount](#)” on page 107

ncpmount, when invoked with all appropriate arguments, attaches and logs in to the specified server and mounts all volumes (or one volume or subtree) from the server under the specified mount point. When invoked without any arguments specifying the fileserver, user ID, and password, ncpmount checks the file `$HOME/.nwclient` to find a file server, a username, and possibly a password to use for the specified mount point.

To enable mounting without root privileges, use the following commands:

```
chmod 4755 /usr/bin/ncpmount
chmod 4755 /usr/bin/ncpumount
```

All NCP connections are available to all users.

## 4.2.1 ncpmount

```
ncpmount -S server_name -A server's_DNS_name -U userid.context -V vol1
/your_favorite_mount_point
```

Example (with root privileges):

```
ncpmount -S server1 -A server1.mycompany.com -U
user123.local.mycompany -V vol1 -c 1000 -u 1000 /home/user123/server1
```

Example (without root privileges):

```
ncpmount -S server1 -A server1.mycompany.com -U
user123.local.mycompany -V vol1 ~/server1
```

---

**IMPORTANT:** All commands are supposed to be entered as one line.

---

## 4.2.2 ncpumount

```
ncpumount mount_point
```

Example:

```
ncpumount ~/server1
```

## 4.3 Using CIFS to Mount an SMB Filesystem

CIFS (Common Internet File System) lets multiple clients access and update the same file while preventing conflicts with file-sharing and locking semantics. These mechanisms also permit aggressive caching and read-ahead/write-behind without loss of cache coherency. CIFS also supports fault tolerance in the case of network and server failures.

CIFS is an enhanced version of Microsoft's open, cross-platform Server Message Block (SMB) protocol, the native file-sharing protocol used by Windows 95, Windows NT, and OS/2 operating systems. It is the standard way that PC users share files across corporate intranets. CIFS is also widely available on UNIX, VMS, and other platforms.

### 4.3.1 Enabling Mounting with Root Access

Use the following commands to mount

```
smbmount //server.name/volume /your_favorite_mount_point -o
username=ID_on_remote_system,uid=uid_of_local_user
smbmount mount_point
```

For example:

```
smbmount //server1.mycompany.com/vol1 ~/server1 -o
username=user123,uid=1000
```

```
smbmount ~/server1
```

### 4.3.2 Enabling Mounting Without Root Access

To enable mounting without root access, use the following commands:

```
chmod 4755 /usr/bin/smbmnt
chmod 4755 /usr/bin/smbmount
```

## 4.4 Installing VMware

VMware Workstation lets you run different operating systems in a virtual machine on your desktop. Use the following steps to install VMware Workstation on Novell Linux Desktop 9. To get the latest version of the VMware package, see the [VMware Download Center \(http://www.vmware.com/download\)](http://www.vmware.com/download).

- 1 Make sure that you have the following packages installed on your system.

- kernel-source
- gcc
- make

If you need to install these packages, see “[Installing and Removing Software](#)” on page 127 for more information.

- 2 Make sure that the version of your kernel-source package is the same as the version of your running kernel.

You will have kernel-default if you have a uni-processor machine, and kernel-smp if you have a multiprocessor machine or if hyperthreading is turned on.

- 3 After you have verified that the two kernel pieces are the same, recompile the new kernel with the following commands:

```
cd /usr/src/linux;
make cloneconfig; make prepare-all
```

---

**NOTE:** You must do this every time you update a kernel. This will not cause you to lose your VMware configurations.

---

- 4 Install VMware and run `vmware-config.pl` (the VM ware configuration script).

For more information, see [Installing VMware Workstation \(http://www.vmware.com/support/ws5/doc/install\\_ws.html\)](http://www.vmware.com/support/ws5/doc/install_ws.html).

Every time you update a kernel, repeat [Step 3 on page 108](#), then run `vmware-config.pl` again. This will not cause you to lose your VMware configurations.

# Troubleshooting

# 5

This chapter addresses a range of common problems which might arise with Novell® Linux Desktop (NLD), covering as many of the various types of potential problems as possible. If your precise situation isn't listed here, there might be one similar enough to offer hints as to the solution.

## 5.1 Where to Look for Information

One of the benefits of Linux is that it logs things in a fair amount of detail. Thus, when things do go wrong, there is usually some information as to what happened; and even if the logs don't tell you why (although they do, sometimes), you can at least get a head start on figuring it out. There are several places to look when you have problems with an NLD system—most of which are standard to Linux systems in general, and some of which are peculiar to SUSE®/NLD systems.

The following is a list of the most commonly checked log files on an NLD machine and what they typically contain.

**Table 5-1** NLD Log Files

Log File	Description
<code>/var/log/boot.msg</code>	Messages from the kernel during the boot process.
<code>/var/log/mail.*</code>	Messages from the mail system.
<code>/var/log/messages</code>	Ongoing messages from the kernel and system log daemon during runtime.
<code>/var/log/rcd/</code>	Directory containing Red Carpet® log information.
<code>/var/log/samba/</code>	Directory containing Samba server and client log messages.
<code>/var/log/SaX.log</code>	Hardware messages from the SaX display and KVM system.
<code>/var/log/warn</code>	All messages from the kernel and system log daemon deemed to be of WARNING level or higher.
<code>/var/log/wtmp</code>	Binary file containing user login records for the current machine session.
<code>/var/log/XFree86.*.log</code>	Various startup and runtime logs from the X Windows system; handy for debugging failed X startups.
<code>/var/log/YaST2/</code>	Directory containing YaST's actions and their results.
<code>/home/user/.xsession-errors</code>	Messages from the desktop applications currently running. Replace <i>user</i> with the actual username.

Linux comes with a great number of tools for system analysis and monitoring. See “Chapter 28: System Monitoring Utilities” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)) for a selection of the most important ones used in system diagnostics.

The remainder of this chapter contains information about the following:

- ♦ “Installation Problems” on page 110
- ♦ “Boot Problems” on page 113
- ♦ “Login Problems” on page 114
- ♦ “Network Problems” on page 118
- ♦ “Data Problems” on page 121

Each scenario begins with a heading describing the problem, followed by a paragraph or two offering suggested solutions, available references for more detailed solutions (some problems are familiar to the Linux community and have been well documented online), and cross-references to other scenarios that might be related.

## 5.2 Installation Problems

Installation problems are situations where a machine fails to install NLD. It might fail entirely or it just might not be able to start the graphical installer. This section highlights some of the typical problems you might run into and offers possible solutions or workarounds for this kind of situation.

### 5.2.1 The installation fails and the machine fails to boot.

Some hardware types, mainly fairly old or very new ones, fail to install NLD. In many cases this happens due to missing support for this type of hardware in the installation kernel or due to certain functions included in this kernel (like ACPI, for example), which still cause problems on some hardware.

If your system fails to install using the standard Installation mode from the first installation boot screen, try the following:

- 1 With CD1 still in the CD-ROM drive, reboot the machine with Ctrl+Alt+Del or using the hardware RESET button.
- 2 When the boot screen appears, use the arrow keys of your keyboard to navigate to *Installation — ACPI Disabled* and press Enter to launch the boot and installation process.  
This option disables the support for ACPI power management techniques.
- 3 Proceed with the installation as described in [Chapter 2, “Deploying Novell Linux Desktop,”](#) on page 21.

If this fails, proceed as above, but in [Step 2 on page 110](#) select *Installation — Safe Settings* instead. This option disables ACPI and DMA support. Most hardware should boot with this option.

If both of these options fail, use the boot options prompt to pass any additional parameters needed to support this type of hardware on to the installation kernel. For more information on the parameters available as boot options, see the kernel documentation located in `/usr/src/kernel_version/Documentation/kernel-parameters.txt` and “Chapter 3: Special Installation Procedures” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

After you have discovered the right combination, YaST automatically writes them to the boot loader configuration to make sure that the system boots up properly next time.

## 5.2.2 The machine fails to launch the graphical installer.

After you insert CD1 into your CD-ROM drive and reboot your machine, the installation screen comes up—but when you select *Installation*, the graphical installer does not start.

There are several ways to deal with this situation:

- ♦ Try to select another screen resolution for the installation dialogs
- ♦ Select *Text Mode* for installation
- ♦ Do a remote installation via VNC using the graphical installer

To change the screen resolution for installation, proceed as follows:

- 1 Boot for installation.
- 2 Press F2 to launch a menu from which you can select a lower resolution for installation purposes.
- 3 Select *Installation* and proceed with the installation as described in [Chapter 2, “Deploying Novell Linux Desktop,” on page 21](#).

To perform an installation in text mode, proceed as follows:

- 1 Boot for installation.
- 2 Press F2 and select *Text Mode*.
- 3 Select *Installation* and proceed with the installation as described in [“Deploying Novell Linux Desktop” on page 21](#).

To perform a VNC installation, proceed as follows:

- 1 Boot for installation.
- 2 Enter the following text at the boot options prompt:  

```
vnc=1 vncpassword=password
```

Replace *password* with any password you want to use for the installation.
- 3 Select *Installation* and press Enter to launch the installation, then select *DHCP* for network configuration when prompted to do so.

Instead of starting right into the graphical installation routine, the system continues to run in text mode and then stops, displaying a message containing the IP address and port number under which the installer can be reached via a browser interface or a VNC viewer application.

- 4 Do one of the following:
  - ♦ If using a browser to access the installer, launch the browser, type the address information provided by the installation routines on the future NLD machine, and then press Enter.

For example:

```
http://ip_address_of_NLD_machine:5801
```

---

**IMPORTANT:** Installing NLD via VNC works with any browser under any operating system, provided Java support is enabled.

---

Enter the VNC password when prompted.

- ♦ If using any kind of VNC viewer on your preferred operating system, enter the IP address and password when prompted to do so. A window opens, displaying the installation dialogs.

5 Proceed with the installation as described in [Chapter 2, “Deploying Novell Linux Desktop,”](#) on [page 21](#).

### 5.2.3 The machine boots, but it comes up with a minimalistic boot screen. How do I proceed?

You inserted the first CD into the drive, the BIOS routines finished, but the system does not start up with graphical boot screen. Instead, it launches a very minimalistic text-based screen interface. This might happen on any machine not providing sufficient graphics memory for the rendering of a graphical boot screen.

Although the text boot screen looks minimalistic, it provides nearly the same functionality as the graphical one:

**Table 5-2** *Text Boot Screen Functionality*

Function	Description
Boot options	Unlike with the graphical interface, the different boot options can't be selected via the cursor keys of your keyboard. The boot menu of the text mode boot screen offers you some keywords to be entered at the boot prompt. These keywords map to the options offered in the graphical version. Enter your choice and press Enter to launch the boot process.
Custom boot options	After you select a boot option, enter the appropriate keyword at the boot prompt or enter some custom boot options as described in <a href="#">“The installation fails and the machine fails to boot.”</a> on <a href="#">page 110</a> . To launch the installation process, press Enter.
F keys	Use the F keys to determine the screen resolution for installation. If you need to boot in text mode, press F2.

### 5.2.4 After installing from CD1, the system does not boot and request a second CD. Instead it seems to stop, displaying a minimal GRUB screen.

The system installs from CD1, but after it shuts down installation for the initial boot, it stops in a minimal GRUB and neither continues to boot nor continues with the installation (prompting for the second installation CD).

Unlike the normal installation version of GRUB, this version needs some user interaction to proceed with the installation. Select `hddisk` and press Enter to proceed with the boot process for the installation.

## 5.3 Boot Problems

Boot problems are situations where your NLD system does not boot properly (that is, does not boot to the expected startup runlevel and Welcome screen).

### 5.3.1 The machine loads the BIOS properly but fails to load the GRUB boot loader properly, producing an error message or nothing at all.

If, in fact, the hardware is functioning properly, it is possible that the boot loader has become corrupted and NLD cannot start up on the machine. In this case, it is necessary to reinstall the boot loader. This can be done using the CD-ROM install media for NLD and the AutoYaST install program, or via a network boot system which brings up AutoYaST.

Insert the Installation CD-ROM, make sure the machine's BIOS is set to check the CD-ROM before the hard disk, then reboot using the RESET button. When the initial boot screen is shown, select *Rescue System*. The rescue system is described in more detail in [“How do I recover a corrupted system?” on page 123](#).

Other reasons for the machine not booting up might be BIOS-related:

- ◆ BIOS settings

Check your BIOS for references to your hard drive. GRUB might not be started up if the hard drive itself cannot be found with the current BIOS settings.

- ◆ BIOS boot order

Check whether your system's boot order includes the hard disk. If the hard disk option wasn't enabled, your system might install properly but fail to boot when access to the hard disk is required.

### 5.3.2 The machine loads the GRUB boot loader but, after selecting a Linux kernel, it produces error messages during the boot process which result in the machine hanging during the loading of Linux. No login screen or prompt is ever reached.

This behavior typically occurs after a failed kernel upgrade and it is known as a *kernel panic* because of the type of error on the system console that sometimes can be seen at the final stage of the process. If, in fact, the machine has just been rebooted following a software update, then the immediate goal is to reboot it using the previous, known-good version of the Linux kernel and associated files. This can be done in the GRUB boot loader screen during the boot process, as follows:

- 1 Reboot the computer using the hardware RESET button.
- 2 When the GRUB boot screen becomes visible, select the *Linux - Failsafe* option and then press Enter.

The machine should boot using the previous version of the kernel and its associated files.

If *Linux-Failsafe* option does not boot the computer properly, boot the computer using the install media.

- 3 After the boot process is completed, remove the newly installed kernel (preferably using the tool which installed it, such as YaST or Red Carpet) and, if necessary, manually modify `/boot/grub/menu.lst` to indicate the previous kernel as the default option.

For detailed information on the syntax used in this configuration file, see “Section 8.4: Booting with GRUB” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf))

Updating this file might not be necessary, as automated update tools usually modify it for you during the rollback process.

- 4 Reboot.

### 5.3.3 The machine loads the GRUB boot loader properly and boots Linux, but presents a text-based console with a login prompt rather than a graphical desktop login manager.

If the machine comes up but doesn't boot into the graphical login manager, anticipate problems either with the choice of the default runlevel or the configuration of the X Window system.

To check the runlevel configuration, log in as the root user and check whether the machine is configured to boot into runlevel 5 - graphic desktop. A quick way to check this is to examine the contents of `/etc/inittab` by entering

```
nld-machine:~ # grep "id:" /etc/inittab
id:5:initdefault:
nld-machine:~ #
```

The returned line ideally indicates that the machine's default runlevel (`initdefault`) is set to 5 and that it should, in fact, boot to the graphics desktop. If the runlevel is set to any other number, use the YaST Runlevel Editor module to set it to 5.

---

**IMPORTANT:** Do not edit the runlevel configuration manually. YaST or, rather, SuSEconfig overwrites these changes on its next run. If you need to make manual changes here, you can disable the SuSEconfig overwrites by setting `CHECK_INITTAB` in `/etc/sysconfig/suseconfig` to No.

---

If the runlevel is set to 5, you might have corruption problems with your desktop or X Windows software. Examine the logfiles at `/var/log/XFree86.*.log` for detailed messages from the X server as it attempts to start. If the desktop fails during startup, it might log error messages to `/var/log/messages`. If these error messages hint at a configuration problem at the X server, try to fix these issues. If the graphical system still does not come up, it might be time to consider reinstalling the graphical desktop.

The `startx` command should force the X Windows system to start with the configured defaults if the user is currently logged in at the console. If that does not work, it should log errors to the console.

## 5.4 Login Problems

Login problems are those where your machine does, in fact, boot to the expected Welcome screen or login prompt, but refuses to accept the proper username/password, or accepts them but then does not behave properly (fails to start the graphical desktop, produces errors, drops to a command line, etc.).

### 5.4.1 Users cannot log in; the NLD machine refuses to accept any valid username/password combinations.

This usually occurs because NLD is configured to use network authentication or directory services and, for some reason, is unable to retrieve results from its configured servers. The root user, as the only local user, is the only user that can still log in to these machines. The following are some common reasons why an NLD machine might appear functional but be unable to process logins correctly:

- ♦ The network is not working. For help with, see “[Network Problems](#)” on page 118.
- ♦ DNS is not working at the moment, which prevents GNOME or KDE from working and NLD from making validated requests to secure servers. One indication that this is the case is that NLD takes an extremely long time to respond to any action, even that of just pressing the Enter key on a blank field in a dialog. This is the DNS lookup timing out for every action that involves addressing the active window in the X Windows system. For more information on this, see “[Network Problems](#)” on page 118.
- ♦ If the NLD system is configured to use Kerberos, the system’s local time might have drifted past the accepted variance with the Kerberos server time (this is typically 300 seconds). If NTP (Network Time Protocol) is not working properly or local NTP servers are not working, Kerberos authentication ceases to function because it depends on common clock synchronization across the network.
- ♦ The system's authentication configuration is misconfigured. Check the PAM configuration files involved for any typos or misordering of directives. For additional information on PAM and the syntax of the configuration files involved, see “Chapter 20: PAM Pluggable Authentication Modules” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

In all cases which do not involve external network problems, the solution is to reboot the system into a single-user mode and repair the configuration before booting again into operating mode and attempting to log in again.

To boot into single-user mode:

- 1 Reboot the system.

The NLD boot screen appears, offering you a prompt.

- 2 Enter 1 at the boot prompt to make the system boot into single-user mode.

You are prompted for a username and password.

- 3 Enter the username and password for root.

- 4 Make all the changes you need.

- 5 Boot into the full multiuser and network mode by entering `telinit 5` at the command line.

### 5.4.2 A user cannot log in; the NLD machine refuses to accept a particular valid username/password combination.

This is by far the most common problem that NLD machines present, because there are many reasons this can occur. First and foremost, determine that the user’s username and password do, in fact, work on other (properly functioning) machines. If so, then see if another user can log in to the misbehaving machine. If another user can log in without difficulty, or if root can log in, then log in

and examine the `/var/log/messages` file. Locate the timestamps which correspond to the login attempts and determine if PAM has produced any coherent error messages.

The following are some common reasons why authentication for a particular user might fail on a specific machine:

- ◆ The userid exists in the machine's local authentication files and is in use by a different user.
- ◆ The home directory exists but is either corrupt or unavailable. Perhaps it is write protected or is on a server which is inaccessible at the moment.
- ◆ The user does not have permission to log in to that particular host in the authentication system.
- ◆ The machine has changed hostnames, for whatever reason, and the user does not have permission to log in to that host.
- ◆ The machine cannot reach the authentication server or directory server which contains that user's information.
- ◆ There might be problems with the X Window system authenticating this particular user, especially if the user's home has been used with another Linux distribution prior to installing NLD.

To locate the cause of the login problems, try the following:

- 1 Try to log in via a console (Ctrl+Alt+F1).

If this is successful, the blame cannot be put on PAM or the directory server the user's home is hosted on, because it is possible to authenticate this user on this machine. Try to locate any problems with the X Window system or the desktop (GNOME or KDE).

- 2 If the user's home directory has been used with another Linux distribution, remove the `Xauthority` file in the user's home. Use a console login via Ctrl+Alt+F1 and issue the `rm .Xauthority` command as this user, then try a graphical login again.
- 3 If graphical login still fails, try a console login via Ctrl+Alt+F1 and try to start an X session on another display (the first one (:0) is already in use) by entering

```
startx -- :1
```

This should bring up a graphical screen and your desktop as well. If it doesn't, check the log files of the X Window system (`/var/log/XFree86.displaynumber.log`) or the log file for your desktop applications (`.xsession-errors` in the user's home directory) for any irregularities.

- 4 If the desktop still cannot start up, it is probably due to corrupt configuration files; therefore, refer to [“A user cannot log in to GNOME Desktop; the NLD machine accepts the username and password but does not bring up the GNOME Desktop properly.”](#) on page 116 or [“A user cannot log in to KDE Desktop; the NLD machine accepts the username and password but does not bring up the KDE Desktop properly.”](#) on page 117.

### **5.4.3 A user cannot log in to GNOME Desktop; the NLD machine accepts the username and password but does not bring up the GNOME Desktop properly.**

If this is true for a particular user, it is likely that the user's GNOME configuration files have become corrupted. Some symptoms might include the keyboard failing to work, the screen geometry becoming distorted, or even the screen coming up as a bare gray field. The important distinction is that if another user logs in, the machine works normally. If this is the case, then it is likely that the

problem can be fixed relatively quickly by simply moving the user's GNOME configuration directory to a new location, which causes the GNOME Desktop to initialize a new one. Although the user is forced to reconfigure his GNOME Desktop settings, none of his data is lost.

- 1 Log in as root.
- 2 Change to the user's home directory.
- 3 Move the user's GNOME config directories to a temporary location by entering

```
nld-machine:~user/ # mv ./gconf ./gconf-ORIG-RECOVER
nld-machine:~user/ # mv ./gnome2 ./gnome2-ORIG-RECOVER
```
- 4 Log out.
- 5 Let the user log in, but do not let them run any applications.
- 6 Recover the user's individual application configuration data (including, most importantly, the Evolution™ e-mail client data) by copying the `~/gconf-ORIG-RECOVER/apps/` directory back into their new `~/gconf` directory as follows:

```
nld-machine:~user/ # cp -a ./gconf-ORIG-RECOVER/apps ./gconf/
```

If this causes the login problems to reoccur, it might be time to attempt to recover only the critical application data and force the user to reconfigure the remainder of the applications.

#### 5.4.4 A user cannot log in to KDE Desktop; the NLD machine accepts the username and password but does not bring up the KDE Desktop properly.

There are several reasons why a KDE Desktop might not allow users to log in. Corrupted cache data can cause login problems as well as corrupt KDE Desktop configuration files.

Cache data is used at desktop startup to increase startup performance. If these data are corrupted, startup is slowed down or fails entirely. Removing them forces the desktop startup routines to start from scratch. This takes more time than a normal startup, but the data is intact after this and the user can log in.

To remove the cache files of the KDE Desktop, issue the following command as root:

```
nld-machine:~ # rm -rf /tmp/kde-user /tmp/socket-user
```

Replace *user* with the actual username. Removing these two directories removes just the corrupted cache files, so no real data is harmed.

Corrupted desktop configuration files can always be replaced by the initial configuration files. If you want to recover the user's adjustments, replace them after restoring the configuration.

To replace a corrupted desktop configuration by the initial configuration values, proceed as follows:

- 1 Log in as root.
- 2 Change to the user's home directory by entering

```
nld-machine:~ # cd /home/user
```
- 3 Move the KDE configuration directory and the .skel files to a temporary location by entering

```
nld-machine:~user/ # mv .kde .kde-ORIG-RECOVER
nld-machine:~user/ # mv .skel .skel-ORIG-RECOVER
```
- 4 Log out.

- 5 Let the user log in to this machine.
- 6 After the desktop has started successfully, copy the user's own configurations adjustments back into place by entering

```
user@nld-machine:~> cp -a .kde-ORIG-RECOVER/share .kde/share
```

---

**TIP:** If the user's own adjustments caused the login to fail and continue to do so, repeat the procedure as described above but don't copy the `.kde/share` directory.

---

## 5.5 Network Problems

Many of your NLD system problems might be network related, even though they don't seem to be at first. For example, the reason for a system not allowing users to log in as mentioned in [“The machine loads the GRUB boot loader properly and boots Linux, but presents a text-based console with a login prompt rather than a graphical desktop login manager.” on page 114](#) might be a network problem of some kind.

This section presents a simple step list you can apply to identify the cause of any network problem you encounter.

When checking the network connection of your NLD machine, proceed as follows:

- 1 If using an Ethernet connection, check the hardware first. Make sure your network cable is properly plugged in to your computer. The control lights right next to your Ethernet connector should both be active.

If the connection fails, check whether your network cable works with another machine. If it does, your network card causes the failure. If hubs or switches are included in your network setup, suspect them to be the culprits as well.

- 2 If using a wireless connection, check whether the wireless link can be established by other machines. If not, contact the wireless network's administrator.
- 3 After you have checked your basic network connectivity, try to find out which service is not responding.

Gather the address information of every network server needed in your NLD setup. Either look them up in the appropriate YaST module or ask your system administrator. The following list gives you some of the typical network servers involved in an NLD setup together with the symptoms an outage of these servers would have on your NLD machine.

Server/Outage	Symptoms
DNS (name service)	A broken or malfunctioning name service affects the network's functioning in many ways. If the local NLD machine relies on any network servers for authentication and these servers cannot be found due to a broken DNS, users cannot even log in. Machines in the network managed by a broken name server are not able to “see” each other and communicate.
NTP (time service)	A malfunctioning or completely broken NTP service could affect Kerberos authentication and X server functionality.

Server/Outage	Symptoms
NFS (file service)	If any application needs data stored in an NFS mounted directory, it cannot start up or function properly if this service is down or misconfigured. In a worst case scenario, a user's personal desktop configuration does not come up if his home directory containing his .gconf or .kde subdirectories cannot be found due to an outage of the NFS server.
Samba (file service)	If any application needs data stored in a directory stored on a Samba server, it cannot start up or function properly if this service is down.
NIS (user management)	If your NLD system relies on a NIS server to provide user data, users cannot log in to this machine if the NIS service is down.
LDAP (user management)	If your NLD system relies on an LDAP server to provide user data, users cannot log in to this machine if the LDAP service is down.
Kerberos (authentication)	Authentication does not work and login to any machine fails.
CUPS (network printing)	Users cannot print.

**4** Check whether the network servers are running and whether your network setup allows you to establish a connection.

**4a** Use `ping hostname` (*hostname* being the hostname of the server you want to connect to) to check whether each server is up and responding to the network.

If this command is successful, it tells you that the host you are looking for is up and running and that the name service for your network is configured correctly.

If `ping` fails with `destination host unreachable`, either your system or the server you are trying to connect to is not properly configured or is down. Check whether your system is reachable by issuing `ping your_hostname` at another machine. If you succeed in reaching your machine at another machine, it is the server which is either not running at all or not configured correctly.

If `ping` fails with `unknown host`, the name service is not configured correctly or the hostname you used is incorrect. Use `ping -n ipaddress` to try to connect to this host without name service. If this is successful, check the spelling of the hostname and look for a misconfigured name service in your network. For further checks on this matter, refer to [Step 4b on page 119](#). If `ping` still fails, either your network card is not configured correctly or your network hardware is faulty. Refer to [Step 4c on page 120](#) for information on this.

**4b** Use `host hostname` to check whether the hostname of the server you are trying to connect to is properly translated into an IP address and vice versa.

If this command returns the IP address of this host, the name service is up and running. If the `host` command fails, check all network configuration files relevant to name/address resolution on your host:

File	Description
<code>/etc/resolv.conf</code>	<p>Keeps track of the name server and domain you are currently using. It can either be modified manually or be automatically adjusted by YaST. The latter option is preferable. However, make sure this file has the following structure and all network addresses and domain names are correct:</p> <pre>search   fully_qualified_domain_name nameserver   ipaddress_of_nameserver</pre> <p>This file can contain more than one name server address, but at least one of them must be correct to provide name resolution to your host. If needed, adjust this file via the YaST Hostname and Nameserver Module.</p> <p>If your network connection is handled via DHCP, let YaST change these parameters for you by selecting <i>Change host name via DHCP</i> and <i>Change name servers and search list via DHCP</i> in the Host name and name server configuration dialog of the YaST network module.</p>
<code>/etc/nsswitch.conf</code>	<p>Directs Linux where to look for name service information. The file should look like this:</p> <pre>... hosts:files dns networks: files dns ...</pre> <p>The <code>dns</code> entry is vital, because it tells Linux to make use of an external name server. Normally, these entries are automatically made by YaST, but it never hurts to check.</p> <p>If all the relevant entries on the host are correct, check the DNS server configuration for the correct zone information. For detailed information on DNS, see “Section 27.1, DNS—Domain Name System” in the <a href="http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf">SUSE LINUX Enterprise Server 9 Administration Guide</a> (<a href="http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf">http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf</a>).</p> <p>If you have made sure that the DNS configuration of your host and the DNS server are correct, proceed with checking the configuration of your network and network card in <a href="#">Step 4c on page 120</a>.</p>

- 4c** If your system cannot establish a connection to a network server and you have excluded name service problems from the list of possible culprits, check the configuration of your network card.

Use `ifconfig network_device` (executed as root) to check whether this device was properly configured. Make sure both `inet address` and `Mask` are configured correctly. A typo in the IP address or a missing bit in your network mask would render your network configuration unusable. If necessary, perform this check on the server machine as well.

- 4d** If name service and network hardware are properly configured and running, but some (external) network connections still get long timeouts or fail entirely, use `tracert` `fully_qualified_domain_name` (executed as root) to track the network route these requests are taking.

This command lists any gateway (hop) a request from your machine passes on its way to its destination. It also lists the response time of any hop and whether this hop is reachable at all. Use a combination of `tracert` and `ping` to track down the culprit and, if this machine is in your company's network, let the administrators know.

After you have identified the cause of your network trouble, you can resolve the problem either yourself (if the problem is located on your machine) or let the system administrator of your network know about your findings so he can reconfigure the services or repair the machine they are running on.

## 5.6 Data Problems

Data problems are those times when the machine might or might not boot properly but, in either case, it is clear that there is data corruption on the system and that the system needs to be recovered. These situations call for a backup of your critical data, enabling you to recover the status quo if your system fails. NLD comes with dedicated YaST modules for system backup and recovery as well as with a rescue system that can be used to recover a corrupted system from the outside.

### 5.6.1 How do I backup critical data?

System backups can be easily managed using the YaST System Backup module:

- 1** As root, start YaST and click *System > System Backup*.

For more information, see [Section A.1, “Starting YaST,” on page 125](#).

- 2** Create a backup profile holding all details needed for the backup (filename of the archived file, scope, and type of the backup).

**2a** Click *Profile Management > Add*.

**2b** Specify a name for the archive.

**2c** Specify the path to the location of the backup, if you want to keep a local backup.

If you want your backup to be archived on a network server (via NFS), specify the IP address or name of the server and the directory which should hold your archive.

**2d** Select the archive type, then click *Next*.

**2e** Select the backup options to use (whether files not belonging to any package should be backed up, whether a list of files should be displayed prior to creating the archive, and whether changed files should be identified using the (time-consuming) MD5 mechanism).

Use the Expert button to open a dialog for the backup of entire hard disk areas. Currently, this option applies only to the Ext2 file system.

**2f** Finally, set the search constraints excluding certain system areas from the backup area which do not need to be backed up (like lock files or cache files); add, edit, or delete items until your needs are met; then click *OK*.

- 3** After you have finished the profile settings, do any of the following:
  - ♦ Start the backup right away (click Start)

- ♦ Configure automatic backup
- ♦ Create other profiles tailored for various other purposes

To configure automatic backup for a given profile, proceed as follows:

**1** As root, start YaST and click *System > System Backup*.

For more information, see [Section A.1, “Starting YaST,” on page 125](#).

**2** Select the profile you want, then click *Profile Management > Automatic Backup*.

**3** Click *Start Backup Automatically*.

**4** Select the backup frequency (daily, weekly, or monthly).

**5** Set the backup start time.

These settings depend on the backup frequency you selected.

**6** Select whether you want to keep old backups and how many of them should be kept.

If you want to receive an automatically generated status message of the backup process, select *Send Summary Mail to user root*.

**7** Click *OK* to apply the settings.

## 5.6.2 How do I replay a system backup?

Use the YaST Restore System module to restore the system configuration from a backup. You can either replay the entire backup or select specific components that are corrupted and need to be reset to their old state.

**1** As root, start YaST and click *System > Restore System*.

For more information, see [Section A.1, “Starting YaST,” on page 125](#).

**2** Specify the location of the backup file, then click *Next*.

This can be a local file, a network mounted file, or a file on a removable device such as a floppy or a CD.

A dialog displays a summary of the archive properties, such as the filename, date of creation, type of backup, and optional comments.

**3** Review the archived content by clicking *Archive content*, then clicking *OK* to go back to the Archive properties dialog.

**4** Click *Expert* to open a dialog where you can do some additional finetuning to the restore process, accept the default options, then return to the Archive properties dialog by clicking *OK*.

**5** Click *Next* to launch the view of packages to restore.

**6** Click *Accept* to restore all files in the archive or use the various Select buttons for a finetuning of your selection.

Select *Restore RPM database* only if you corrupted or deleted the package database by accident and if this file is included in the backup. Otherwise, leave this option unchecked.

After you click *Accept*, the backup is applied.

**7** Click *Finish* to leave the module after the restore process is finished.

### 5.6.3 How do I recover a corrupted system?

There are several reasons why an NLD system could fail to come up and run properly. A corrupted file system after a system crash, corrupted configuration files, and corrupted boot loader configurations are the most common reasons. If the system can't be booted from hard disk, use the installation media (CD1) as boot media and launch the rescue system.

After you log in to the rescue system, you can recover and complete a number of other tasks:

- ◆ Manipulate any type of configuration file.
- ◆ Check, modify, and reinstall the boot loader configuration.
- ◆ Check the file system for defects and start automatic repair processes.
- ◆ Resize partitions using the `parted` command. More information on this tool can be found at the [GNU Parted \(http://www.gnu.org/software/parted/parted.html\)](http://www.gnu.org/software/parted/parted.html) Web site.

To manipulate a configuration file, proceed as follows:

---

**IMPORTANT:** Before entering the rescue system, make sure you have a copy of the partition table of your NLD system. Otherwise, you cannot mount the root file system of your NLD installation to the rescue system in [Step 4 on page 123](#).

---

- 1 Launch the rescue system of NLD by inserting CD1 into the CD-ROM drive of your machine.

Make sure that the BIOS uses the CD-ROM as the preferred source of boot information and that you reboot the system using the RESET button.

- 2 When the initial boot screen appears, select *Rescue System* and press Enter.

- 3 Select the language and keyboard layout used in the rescue system, then click *OK*.

The system boots into a minimal Linux system that resides entirely in a RAM disk and is thus totally independent of your installed system.

- 4 To access your original NLD system, mount its root file system to a directory in the rescue system.

For example, to mount a root file system located under `/dev/hda3` to the rescue system, use the following command:

```
mount /dev/hda3 /mnt
```

All directories of the NLD system are now located in `/mnt`.

- 5 Change to the directory in the mounted NLD root file system by entering

```
cd /mnt
```

- 6 Open the broken configuration file in the minimal text editor `vi` using the following command:

```
vi myfile
```

- 7 Enter and save your changes.

- 8 Unmount the NLD root file system from the rescue system by entering

```
umount /mnt
```

- 9 Reboot the machine.

To check the boot loader configuration and reinstall the boot loader, proceed as follows:

**1** Mount the root file system of your NLD system under the rescue system as described in the previous procedure.

**2** Check whether the following files are correctly configured according to the GRUB configuration principles outlined in “Chapter 8: Booting and Boot Managers” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)):

- ♦ `etc/grub.conf`
- ♦ `boot/grub/device.map`
- ♦ `boot/grub/menu.lst`

Apply fixes to the device mapping (`device.map`) or the location of the root partition and configuration files, if necessary.

**3** Reinstall the boot loader using the following command sequence:

```
Rescue:~# chroot /mnt
Rescue:/# grub --batch < /etc/grub.conf
```

**4** Reboot the system.

Checking a file system while it is mounted is virtually impossible. If the root file system is corrupted, you can analyze and fix it only through the rescue system. The rescue system contains all file system (check) utilities needed for any of the major Linux file systems.

# Using YaST to Configure the Novell Linux Desktop

# A

YaST is the configuration tool for Novell® Linux Desktop. This appendix covers the configuration of your system with YaST, which enables comfortable configuration of the main system components. This includes most of the hardware, the graphical user interface, Internet access, security settings, user administration, software installation, and system updates and information. This chapter also provides instructions for using YaST in text mode.

- ♦ “Starting YaST” on page 125
- ♦ “The YaST Control Center” on page 126
- ♦ “YaST in Text Mode (ncurses)” on page 176

## A.1 Starting YaST

To start YaST:

- 1 Do one of the following, depending on the desktop you are using:

GNOME: Click *System > Administrator Settings*.

KDE: Click  > *System > YaST*.

- 2 Enter the password for the root user.

The configuration must be performed with root privileges, because only the system administrator is entitled to change Linux system files.

The YaST Control Center window appears.

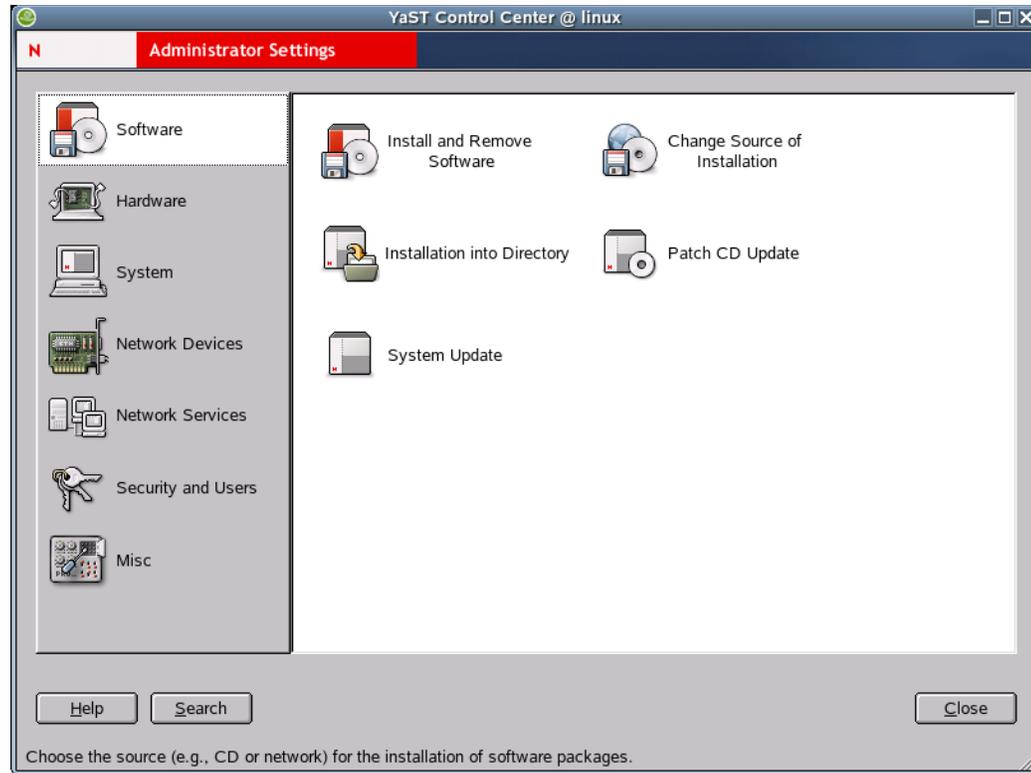
To change the language of YaST and your entire system:

- 1 In the YaST Control Center, click *System > Choose Language*.
- 2 Select the language you want, then click *Accept*.
- 3 Click *Close* to exit the YaST Control Center.
- 4 Log out of your computer, then log in again and restart YaST to activate the new language setting.

## A.2 The YaST Control Center

When you start YaST in the graphical mode, the YaST Control Center opens first.

**Figure A-1** YaST Control Center



In the left frame, the following categories are displayed:

- ◆ Software
- ◆ Hardware
- ◆ System
- ◆ Network Devices
- ◆ Network Services
- ◆ Security and Users
- ◆ Misc

If you click one of the icons, the respective contents are listed on the right-hand side. For example, if you click *Hardware*, then click *Sound* to the right, a configuration dialog opens for the sound card.

The configuration of the individual items usually involves several steps. Always click *Next* to proceed to the following step.

The left frame displays help text for the respective topic, explaining the entries required. After the necessary specifications have been made, complete the procedure by clicking *Finish* in the last configuration dialog. The configuration is then saved.

## A.2.1 Software

You can use the Software option to perform the following tasks:

- ♦ “Changing the Installation Source” on page 127
- ♦ “Installing Patches from CD to Update Your Current Installation” on page 127
- ♦ “Installing and Removing Software” on page 127
- ♦ “Installing the System into a Directory” on page 128
- ♦ “Updating the System” on page 128

### Changing the Installation Source

In the YaST Control Center, click *Software > Change Source of Installation*.

The installation source is the medium containing the software to install. Install from CD or DVD (the usual approach), from a network server, or from the hard disk. Refer to the detailed YaST help text for more information.

When you exit with *Save and Exit*, the settings are saved and applied to the Install and Remove Software, Boot and Kernel Configuration, and System Update configuration module. However, this module also offers the possibility to continue with Install to install or remove packages.

### Installing Patches from CD to Update Your Current Installation

In the YaST Control Center, click *Software > Patch CD Update*.

Patches are installed from a CD. Updating with the CD is pretty faster. When you insert the patch CD, all patches available on the CD are displayed in the dialog of this YaST module. Select packages for installation from the patch list. If an alert is displayed about a missing CD, insert the CD and restart the patch CD update.

### Installing and Removing Software

In the YaST Control Center, click *Software > Install and Remove Software*.

Use this module to install, update, or remove software. To install from CD, insert the first CD in the drive.

#### The Selection Filter

Using the Filter drop-down box at the top left of the main dialog, determine how packages are to be displayed. The default setting is to display according to Selections.

- ♦ With the selection filter, predefined selections of specific application areas can be installed or selected for installation by selecting the respective check boxes. You can also uninstall an entire group. For each selection, the packages of the selection and their current statuses are displayed to the right. Select or deselect individual packages as desired.
- ♦ Another option is to list according to package groups. These package groups are displayed in a tree structure on the left-hand side. If you click one of the main groups (for example, Development or Documentation), all program packages belonging to this main group are listed at the top of the right frame. If you click one of the subgroups, the right frame displays the packages of only the subgroup.

---

**NOTE:** If desired, mark an installed package for deletion. Observe the alerts and do not delete any packages of the Linux base system (mostly located in the package group System).

---

- ♦ The easiest way to find a specific package is to use the search function, which can also be accessed here. Enter a search string and use the check boxes to set the search method (only in the name, in the description, in the package dependencies). For example, you can use this feature to determine which packages use a specific library.

## The Package Window

The package window to the right features the following information (from left to right): status (see below), the package name, a short description, the size, and the version. The package status is displayed by means of various icons that are shown in the context menu reachable via the right mouse button.

Change the status of a package by clicking the icons to the left of the package name. Only relevant status settings are available. For example, a package that is not installed cannot have the status Uninstall. If you are not sure about what a specific status indicates, do not select it or do not change it if set automatically.

You can mark installed packages for deletion. Observe the alerts and do not delete any packages of the Linux base system, mostly located in the System package group.

## The Information Window

At the bottom right, a window with several tabs provides access to various kinds of information about the selected package, such as a detailed description, the technical data, a list of files installed with this package, packages additionally required by this package, and any conflicts with other installed packages or packages marked for installation.

## Checking Dependencies

Under the information window, locate Check Dependencies and Auto Check. If Auto Check is activated and you select a package for installation, other required programs are displayed automatically. If preferred, simply disable the automatic check and use Check Dependencies after selecting packages. If automatic checking is disabled and you do not check the dependencies manually, the package dependencies are checked when you click *Accept*.

## Consumption of Hard Disk Space

Monitor the space consumed on the hard disk partitions in the overview at the bottom left. If you select too many packages, an alert is displayed.

## Installing the System into a Directory

In the YaST Control Center, click *Software > Installation into Directory*.

Use this option to install the Novell Linux Desktop system into a directory of your choice.

## Updating the System

In the YaST Control Center, click *Software > System Update*.

This module let you update your system. The process consists of several steps. YaST checks which packages to update. If desired, decide individually for each package whether to perform an update.

This approach cannot be used for the base system, which requires a boot from the installation medium, such as from CD.

---

**IMPORTANT:** The system update is a very complex procedure. For each program package, YaST must check which version is installed on the computer and what needs to be done to replace the old version with the new version correctly. YaST also tries to adopt any personal settings of the installed packages. However, some configurations might cause problems after the update if the old configuration is unable to handle the new program version as expected or if unexpected inconsistencies arise between various configurations.

The older the existing version is, and the more the configuration of the packages to update diverges from the standard, the more problematic the update is. Sometimes, the old configuration cannot be adopted correctly. In this case, an entirely new configuration must be made. Before starting the update, you should save the existing configuration.

---

## A.2.2 Hardware

New hardware must first be installed or connected as specified by the vendor. Switch on external devices, such as the printer or the modem, and start the respective YaST module. Most devices are automatically detected by YaST and the technical data is displayed. If the automatic detection fails, YaST offers a list of devices (model, vendor, etc.) to select from. Consult the documentation enclosed with your hardware for more information.

---

**IMPORTANT:** Use caution with model designations. If your model is not included in the device list, try a model with a similar designation. However, in some cases, the model must match exactly, as similar designations do not always indicate compatibility.

---

You can use the Hardware option to perform the following tasks:

- ◆ [“Configuring the CD/DVD Drives in Your System” on page 129](#)
- ◆ [“Configuring the Graphics Card and Monitor” on page 130](#)
- ◆ [“Activating or Deactivating the DMA Mode for IDE Hard Disks and CD/DVE Drives” on page 137](#)
- ◆ [“Configuring Your Printer” on page 137](#)
- ◆ [“Changing the Mouse Model” on page 140](#)
- ◆ [“Configuring Disk Controllers” on page 140](#)
- ◆ [“Displaying Hardware Information” on page 140](#)
- ◆ [“Configuring a Joystick” on page 141](#)
- ◆ [“Configuring a Scanner” on page 141](#)
- ◆ [“Configuring Sound Cards” on page 142](#)

### Configuring the CD/DVD Drives in Your System

In the YaST Control Center, click *Hardware > CD-ROM Drives*.

Within the scope of the installation, all detected CD-ROM drives are integrated in the installed system by means of entries in the `/etc/fstab` file. The respective subdirectories are created in `/media`. Use the Add and Remove buttons to change the state of integration for an entry in the list.

When the module is started, a list of all detected drives is displayed. Mark any new drives using the check boxes at the beginning of the lines and complete the integration by clicking Finish. The new drives are then integrated in the system.

## Configuring the Graphics Card and Monitor

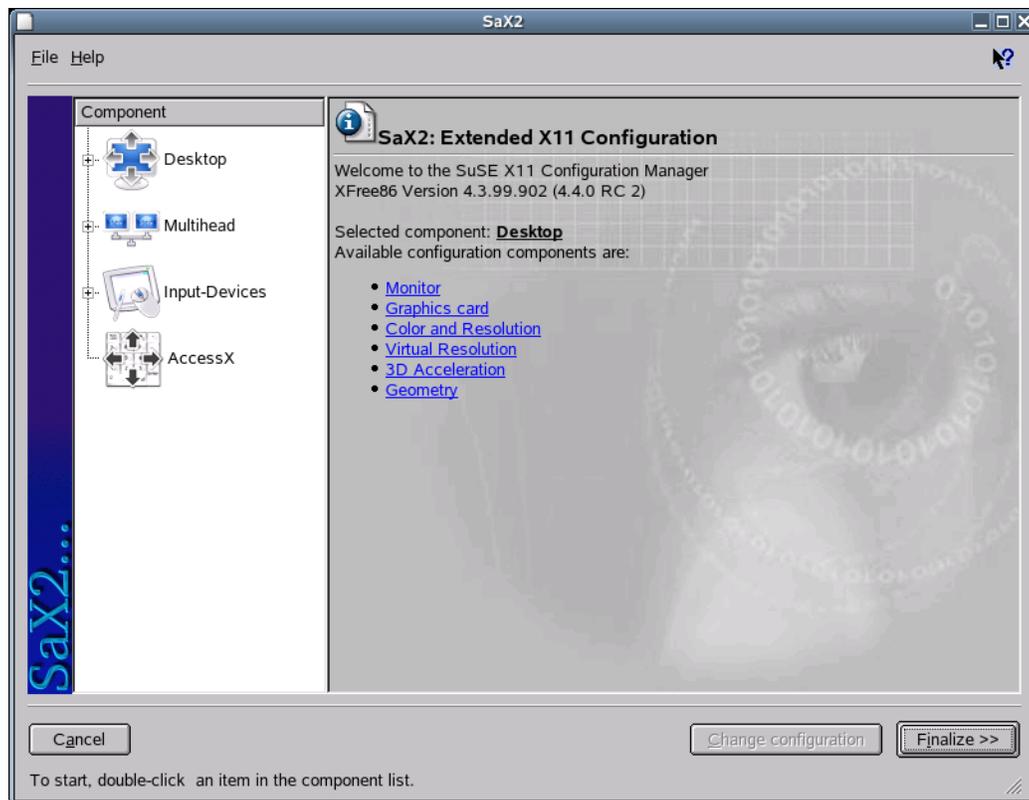
In the YaST Control Center, click *Hardware > Graphics Card and Monitor*.

The graphical user interface or X server handles the communication between hardware and software. Desktops, like KDE and GNOME, use the X server for interaction with the user.

The graphical user interface is initially configured during installation. To change the settings later, run this YaST module. In the Desktop Settings dialog, choose between Text Mode Only (no graphical desktop) and Graphical Desktop Environment. The current settings are saved and you can restore them anytime. The current values are displayed and offered for modification, such as the screen resolution, the color depth, the refresh rate, and the vendor and type of your monitor (if it was autodetected). If you have just installed a new graphics card and you want to initialize it, a small dialog appears asking if you want to activate 3D acceleration for your graphics card.

Click *Change* to open SaX2, the configuration tool for input and display devices.

**Figure A-2** SaX2 Main Window



In the left frame, there are four components displayed:

### Desktop

Configures your monitor, graphics card, color depth, resolution, and the position and size of the screen.

## Multihead

Configures multiple screens.

## Input Devices

Configures a keyboard, mouse, touchscreen monitor, and graphics tablet.

## AccessX

Controls the mouse pointer with the number pad.

Select your monitor and graphics card. Usually, the monitor and graphics card are autodetected by the system. In this case, no manual settings are required. If your monitor is not autodetected, automatically proceed to the monitor selection dialog. Select your monitor from the extensive list of vendors and devices, or manually enter the monitor values specified in the monitor manual. Alternatively, select one of the preconfigured VESA modes.

Click *Finish* in the main window following the completion of the settings for your monitor and your graphics card, then test your settings. This ensures that your configuration is suitable for your devices. If the image is not steady, terminate the test immediately by pressing Esc and reduce the refresh rate or the resolution and color depth. Regardless of whether you run a test, all modifications are activated only after you restart the X server.

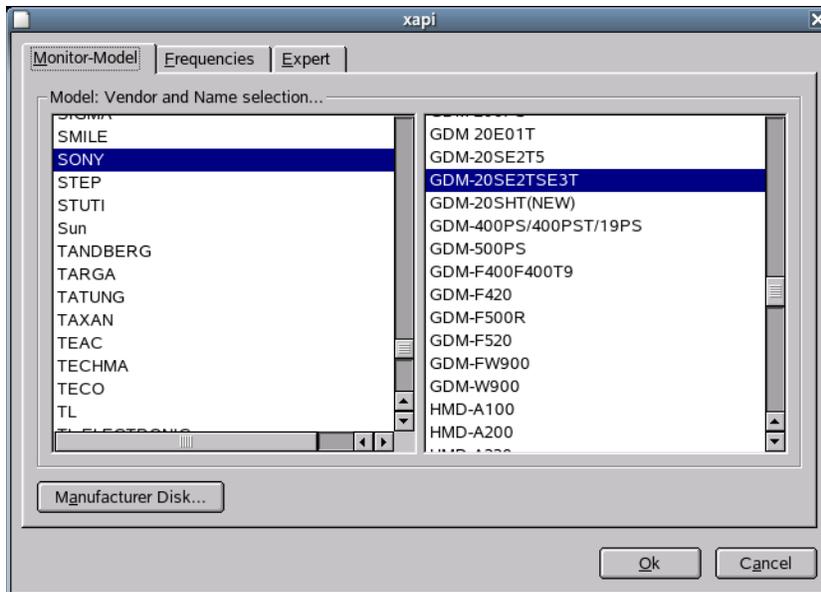
## Desktop

Use the Desktop dialogs to configure your monitor, graphics card, color depth, resolution, and the position and size of the screen.

## Monitor

Click *Properties* to configure your monitor. A dialog with Monitor-Model, Frequencies, and Expert tabs opens.

**Figure A-3** *Monitor Selection*



In the left part of the Monitor-Model tabbed page, select the vendor. In the right part, select your model. If you have floppy disks with Linux drivers for your monitor, click *Manufacturer Disk* to install these.

On the Frequencies tabbed page, specify the horizontal and vertical frequencies for your screen. The vertical frequency is another designation for the image refresh rate. Normally, the acceptable value ranges are read from the model and noted here. Usually, they do not need to be changed.

---

**WARNING:** There are safety mechanisms, but you should still be very careful when manually changing the allowed frequencies. False values might destroy your monitor. If in doubt, refer to the manual for the monitor.

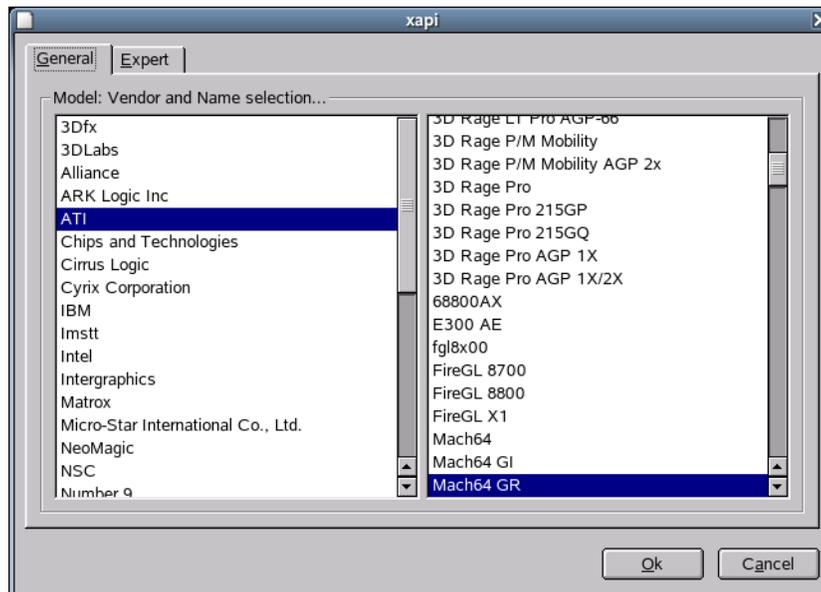
---

On the Expert tabbed page, specify options for your screen. In the upper selection field, define the method to use for the calculation of the screen resolution and screen geometry. Do not change anything unless the monitor is addressed incorrectly and the display is not stable. You can also change the size of the displayed image and activate the DPMS power saving mode.

## Graphics Card

Click *Add New Card* to add a new graphics card, or click *Properties* to configure an existing graphics card. In both cases, a dialog with a General and an Expert tab opens.

**Figure A-4** Graphics Card Selection Dialog



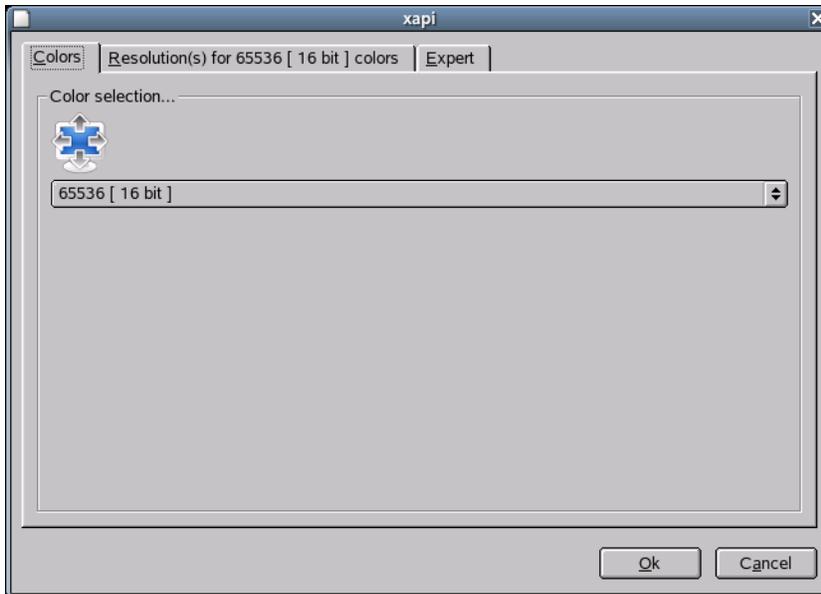
In the left part of the General tabbed page, select the vendor of your graphics card. In the right part, select your model.

On the Expert tabbed page, specify advanced configuration options for your screen. On the right side, you can turn your screen to the left or to a vertical position, which is useful for some turnable TFT screens. The entries for the BusID are relevant only if you operate several screens. Normally, nothing needs to be changed here. You should not modify the card options unless you have experience in this field and know what the options mean. If necessary, check the documentation for your graphics card.

## Colors and Resolutions

Click *Properties* to change the color depth and resolution displayed on your screen.

**Figure A-5** Color and Resolution Dialog



Depending on the hardware used, select a color depth of 16, 256, 32768, 65536, or 16.7 million colors (4, 8, 15, 16, or 24 bit). For a reasonable display quality, set at least 256 colors.

When the hardware is detected, the resolution is queried. Therefore, the module usually offers only resolution and color depth combinations that your hardware can display correctly. This keeps the danger of damaging your hardware with incorrect settings very low. If you change the resolution manually, consult the documentation for your hardware to make sure the value you set can be displayed.

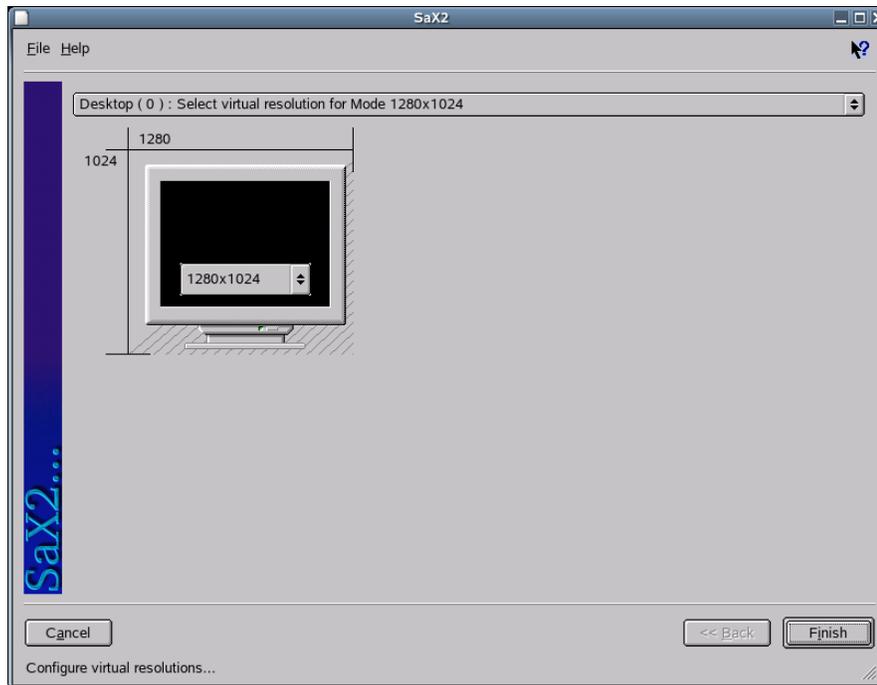
The Expert tabbed page lets you add your own resolutions, which are subsequently included for selection on the Resolution tabbed page.

## Virtual Resolution

Every desktop has a certain resolution that is displayed over the full screen of the monitor. However, it is possible to set the resolution larger than the visible area of the screen. If you move the mouse

beyond the margins of the desktop, the virtual part of the desktop is displayed on screen. This increases the available work space.

**Figure A-6** *Virtual Resolution Dialog*



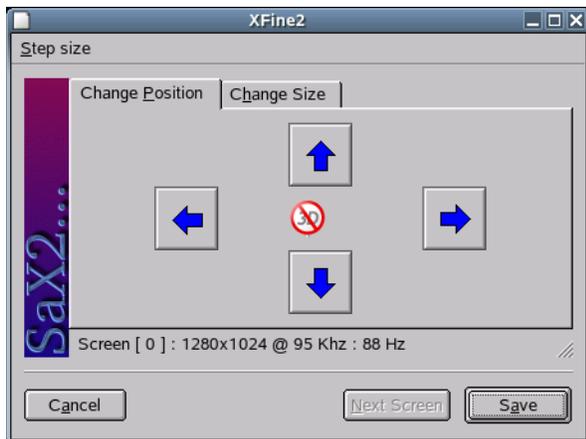
The virtual resolution can be set in two ways:

- ◆ Move the mouse pointer over the monitor image so the pointer turns into crosshairs. While pressing the left mouse button, move the mouse to enlarge the raster image, which corresponds with the virtual resolution. This method is best if you are not quite sure how much virtual space you want on your desktop.
- ◆ The pop-up menu in the middle of the raster image displays the currently used virtual resolution. To use one of the default virtual resolutions, select one from the menu.

## Geometry

You can use the Geometry option to precisely adjust the size and the position of the image with the arrows.

**Figure A-7** Image Geometry Dialog



If you have a multihead environment (more than one screen), click *Next Screen* to switch to the other monitors to adjust their size and position. Click *Save* to save your settings.

## Multihead

If you have installed more than one graphics card in your computer or a graphics card with multiple outputs, you can connect more than one screen to your system. If you operate two screens, this is referred to as *dualhead*. More than two is referred to as *multihead*. SaX2 automatically detects multiple graphics cards in the system and prepares the configuration accordingly. Set the multihead mode and the arrangement of the screens in the Multihead dialog. The following three modes are offered:

### Traditional Multihead (default)

Each monitor represents an individual unit. The mouse pointer can switch between the screens.

### Cloned Multihead

All monitors display the same contents. The mouse is visible only on the main screen.

### Xinerama Multihead (one screen)

All screens combine to form a single large screen. Program windows can be positioned freely on all screens or scaled to a size that fills more than one monitor.

The layout of a multihead environment describes the arrangement of and the relationship between the individual screens. By default, SaX2 configures a standard layout that follows the sequence of the detected graphics cards, arranging all screens in a row from left to right. In the Layout dialog of the Multihead tool, determine the way the monitors are arranged by using the mouse to move the screen symbols in the grid. When finished, click *Test* to verify the new configuration.

---

**NOTE:** Linux currently does not offer 3D support for Xinerama multihead environments. In this case, SaX2 deactivates the 3D support

---

## Input Devices

### Mouse

If the mouse already works, you do not need to do anything. However, if the mouse does not work, control it with the number pad of the keyboard as described in “[AccessX](#)” on page 136.

If the automatic detection fails, use this dialog to configure your mouse manually. Refer to the documentation for your mouse for a description of the model. Select your model from the list of supported mouse types and confirm by pressing 5 on the number pad.

### Keyboard

Use the selection field at the top of this dialog to specify the kind of keyboard you want to use. Then select the language for the keyboard layout (the country-specific position of the keys). Use the Test Field to see if special characters are displayed correctly.

The status of the check box used for activating and deactivating the entry of accented letters depends on the respective language and does not need to be changed. Click *Finish* to apply the new settings to your system.

### Tablet

Currently, XFree86 supports only a limited number of graphics tablets. SaX2 enables the configuration of graphics tablets connected to the USB port or the serial port. From the configuration perspective, a graphics tablet is another input device like a mouse.

Double-click a vendor in the Model list box to add a graphics tablet from the selection list. Select the check boxes to the right if you have connected a pen or eraser. If your tablet is connected to the serial port, verify the port. `/dev/ttyS0` refers to the first serial port, and `/dev/ttyS1` refers to the second; additional ports use similar notation. Click *Finish* to save the configuration.

### Touchscreen

Currently, XFree86 supports only Mutouch, Microtouch, and Elo Touch-Systems touchscreens. SaX2 can only autodetect the monitor, not the toucher. The toucher is treated as an input device.

To configure the toucher, click *Add New Touchscreen* and then double-click the model. Save the configuration by clicking *Finish*. You do not need to test the configuration.

Touchscreens feature a variety of options and usually must be calibrated first. Unfortunately, there is no general tool for this purpose in Linux. The standard configuration contains suitable default values for the dimensions of the touchscreen. Normally, no additional configuration is required.

### AccessX

If you do not use a mouse on your computer, start SaX2 and activate AccessX to be able to control the mouse pointer with the following keys on the numeric keypad:

**Table A-1** Keys Used to Control the Mouse Pointer

Key	Description
/	Selects the left mouse button.
*	Selects the middle mouse button.

Key	Description
-	Selects the right mouse button.
5	Invokes a click event of the previously selected mouse button. The left mouse button is preset if no other button was selected. The selection is reset to its default after the event.
+	Acts like 5 except is a double-click event.
0	Acts like 5 except is a click-and-hold event.
Del	Releases the click-and-hold event previously invoked with 0.
7	Moves the cursor toward the upper left.
8	Moves the cursor straight upwards.
9	Moves the cursor toward the upper right.
4	Moves the cursor toward the left.
6	Moves the cursor toward the right.
1	Moves the cursor toward the lower left.
2	Moves the cursor straight downwards.
3	Moves the cursor toward the lower right.

With the slider, set the speed of the mouse pointer movement when a key is pressed.

### Activating or Deactivating the DMA Mode for IDE Hard Disks and CD/DVE Drives

In the YaST Control Center, click *Hardware > IDE DMA Mode*.

This module enables you to activate and deactivate the DMA mode for the IDE hard disks and IDE CD/DVD drives in the installed system. DMA (Direct Memory Access) enables drives to transmit data directly to the RAM without the detour through the processor control.

This module does not have any function for SCSI devices. DMA modes can substantially increase the performance and data transfer speed in your system. During the installation, the current SUSE<sup>®</sup> LINUX kernel automatically activates DMA for hard disks but not for CD drives, because default DMA activation for all drives often causes problems with CD drives. Use the DMA module to decide whether to activate DMA for your drives. If the drive supports the DMA mode smoothly, the data transfer rate of your CD drive can be increased by activating DMA.

### Configuring Your Printer

This section covers printer configuration with YaST. For more information on printing in Linux, see “Chapter 13: Printer Operation” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

#### Configuration with YaST

To set up a printer:

- 1 In the YaST Control Center, click *Hardware > Printer*.

The main printer configuration window appears. In the upper pane, you can view the detected printers. The lower pane lists any configured queues.

- 2 (Conditional) If your printer was not autodetected, click *Restart Detection* to restart the detection process.
- 3 (Conditional) If it fails again, click *Configure* to configure the printer manually.

Not every printer can be configured for both printing systems (CUPS and LPRng/lpdfilter). Certain configurations are supported only by either CUPS or LPRng/lpdfilter. YaST informs you about this when configuring the printer.

In Novell Linux Desktop, the default printing system is CUPS, but you can switch from CUPS to LPRng and back at any time:

- 1 In the YaST Control Center, click *Hardware > Printer*.
- 2 Click *Change > Advanced*.
- 3 Select the printing system you want, then configure it.

### Automatic Configuration

YaST configures the printer automatically if the following requirements are met:

- The parallel or USB port can be set up automatically in the correct way and the connected printer can be autodetected.
- The ID string of the printer, as supplied to YaST during hardware autodetection, is included in the printer database. Because this ID might be different from the actual name of the model, you might need to select the model manually.
- The printer database contains at least one configuration for the respective model that is known to work without problems. Depending on the printer, up to five queues are configured automatically.

To make sure everything works properly, each configuration should be checked with the print test function of YaST. The YaST test page also provides important information about the selected configuration.

### Manual Configuration

If one of the requirements for automatic configuration is not met or if you want a custom setup, you can configure the printer manually.

Depending on how successful the autodetection is and how much information about the printer model is found in the database, YaST might be able to determine the right settings automatically, or at least make a reasonable preselection. The following parameters must be configured.

#### Hardware Connection (Port)

The configuration of the hardware connection depends on whether YaST has been able to find the printer during hardware autodetection.

- ♦ If YaST is able to detect the printer model automatically, you can assume that the printer connection works on the hardware level and no settings need to be changed in this respect.
- ♦ If YaST is unable to autodetect the printer model, this might indicate that the printer connection on the hardware level must be configured manually. See “Chapter 13: Printer Operation” in the *SUSE LINUX Enterprise Server 9 Administration Guide* (<http://>

[www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf) for more information.

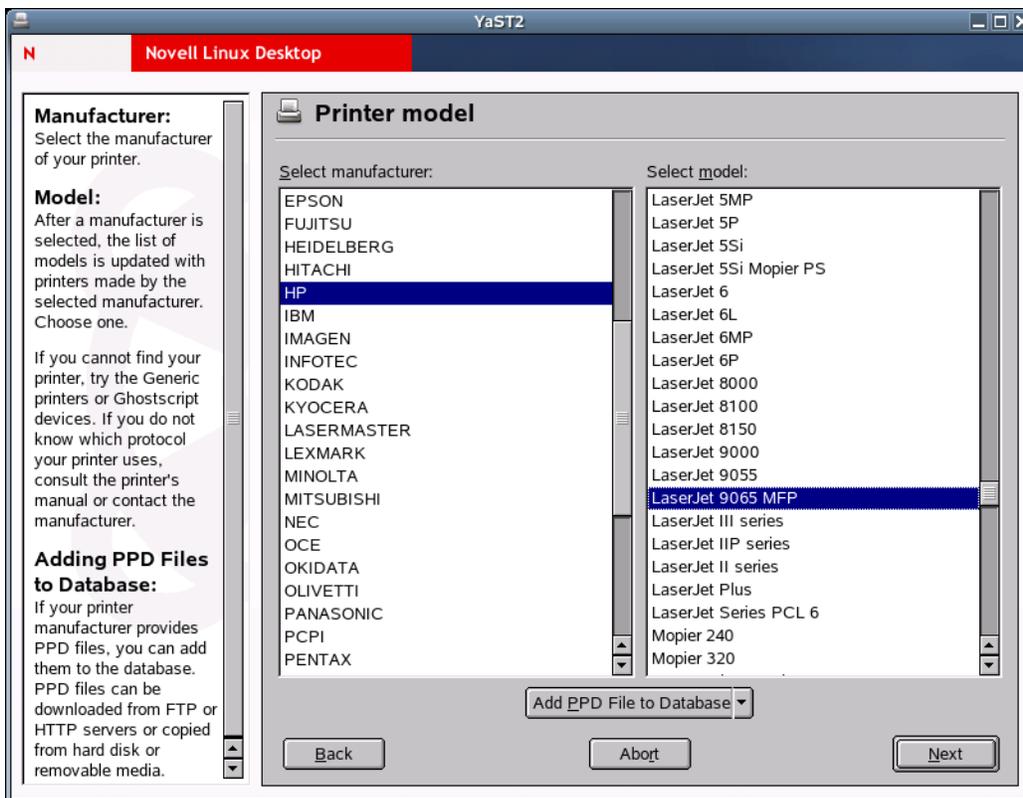
### Name of the Queue:

The queue name is used when issuing print commands. The name should be relatively short and consist of lowercase letters and numbers only.

### Ghostscript Driver or Printer Language (Printer Model):

The Ghostscript driver and the printer language depend on your printer model. YaST lets you select a predefined configuration suitable for the model. Selecting a manufacturer and a model basically means selecting a printer language and a Ghostscript driver suitable for this language with some default settings for the driver. These settings can be changed in an additional dialog as needed.

Figure A-8 Selecting the Printer



For non-PostScript\* models, all printer-specific data is produced by the Ghostscript driver. The driver configuration (both the right driver and the correct options for it) is the single most important factor determining the output quality. The settings made at this point affect the printout on a queue-by-queue basis.

If your printer was autodetected (using the printer database) or if you selected the model manually, YaST presents a choice of suitable Ghostscript drivers, usually with a number of predefined configurations for each of them. For example:

- ♦ monochrome
- ♦ color 300 dpi

- ◆ photo 600 dpi

A predefined configuration includes a suitable Ghostscript driver and, if available, a set of options for the driver related to output quality. Not all selectable combinations of driver settings work with every printer model. This is especially true for higher resolutions.

Always check to make sure your settings work as expected by printing the test page. If the output is garbled, for example, with several almost empty pages, stop the printer by first removing all paper and then stopping the print test from YaST. However, in some cases the printer will refuse to resume work if you do so. It might then be better to stop the print test first and wait for the printer to eject all pages by itself.

If the printer model is not listed in the printer database, YaST offers a selection of standard drivers for the standard printer languages.

### Advanced Settings

Includes the hardware-dependent (driver-specific) and hardware-independent settings. You can specify special settings for the queues and restrict the access to the printer. However, there is normally no need to modify these settings.

### Using the CUPS Printing System

For information on printing with CUPS, see “Chapter 13: Printer Operation” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

### Changing the Mouse Model

- 1 In the YaST Control Center, click *Hardware > Select Mouse Model*.
- 2 Click the mouse type for the mouse attached to your computer.  
You can also use the arrow keys to select a mouse. If the selection bar does not move, press the Tab key until it does.
- 3 Click *Test* to test the selected settings.
- 4 Click *Apply*.

### Configuring Disk Controllers

In the YaST Control Center, click *Hardware > Disk Controller*.

Normally, YaST configures the hard disk controller of your system during the installation. If you add controllers, use this module to integrate these into the system. You can also modify the existing configuration, but this is generally not necessary.

The Disk Controller Configuration dialog presents a list of detected hard disk controllers and enables assignment of the suitable kernel module with specific parameters. Click *Test Loading of Module* to determine if the current settings work before they are saved permanently in the system.

---

**WARNING:** We recommend testing the setting before making it permanent in the system. Incorrect settings can prevent the system from booting.

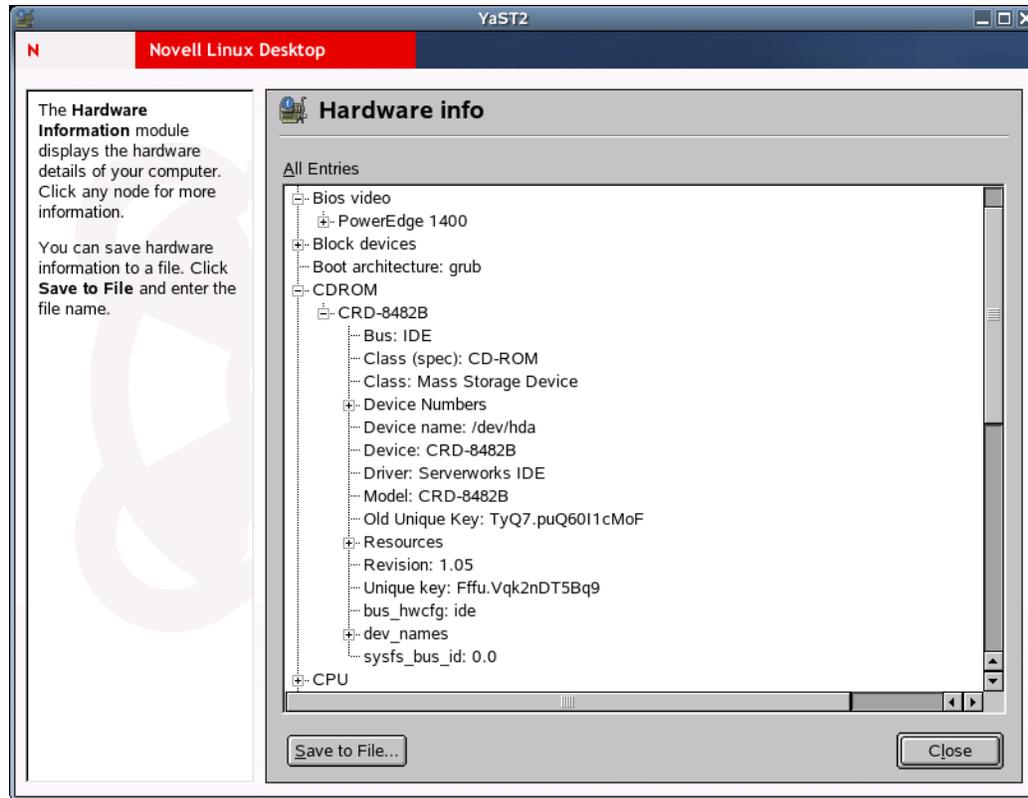
---

### Displaying Hardware Information

In the YaST Control Center, click *Hardware > Hardware Information*.

YaST performs a hardware detection for the configuration of hardware components. The detected technical data is displayed in this screen. This is especially useful if, for example, you want to submit a support request for which you need information about your hardware.

**Figure A-9** Hardware Information



## Configuring a Joystick

In the YaST Control Center, click *Hardware* > *Joystick*.

Use this module to configure your joystick by selecting the manufacturer and the model from the displayed list. Because joysticks are usually connected to the sound card, you can also access this module from the sound card configuration (see [“Configuring Sound Cards” on page 142](#)).

## Configuring a Scanner

In the YaST Control Center, click *Hardware* > *Scanner*.

If your scanner is connected and switched on, it should be detected automatically when this YaST module is started. In this case, the dialog for the installation of the scanner appears. If no scanner is detected, the Manual Scanner Configuration dialog appears. If you have already installed one or more scanners, a table listing existing scanners that can be modified or deleted appears. Click *Add* to configure a new device.

Next, an installation is performed with default settings. If the installation is successful, a corresponding message appears. Test your scanner by inserting a document and clicking *Test*.

## Scanner Was Not Detected

Only supported scanners can be autodetected. Scanners connected to another network host are not detected. The manual configuration distinguishes the three following types of scanners:

### USB scanner

Specify the vendor and model. YaST attempts to load USB modules. If your scanner is very new, the modules might not be loaded automatically. In this case, continue to a dialog in which you can load the USB module manually. See the YaST help text for more information.

### SCSI scanner

Specify the device (such as `/dev/sg0`). SCSI scanners should not be connected or disconnected when the system is running; shut down the system first.

### Network scanner

Specify the IP address or the hostname.

You can use a scanner that is connected to a host in your network and configured as a network scanner. To configure a network scanner, refer to the Support Database article “Scanning in Linux” in [The SUSE Support Database \(http://portal.suse.com/sdb/en/index.html\)](http://portal.suse.com/sdb/en/index.html), keyword “scanner”. When selecting a network scanner, specify the hostname or the IP address of the host that the scanner is connected to.

If your scanner is not detected, the device probably is not supported. However, sometimes even supported scanners are not detected. If that is the case, proceed with the manual scanner selection. If you can find your scanner in the list of vendors and models, select it. For information about scanners that work with Linux, see the [SANE \(http://www.sane-project.org\)](http://www.sane-project.org) Web site.

---

**WARNING:** Assign the scanner manually only if you are absolutely sure of the model. An incorrect selection could damage your hardware.

---

## Troubleshooting

Your scanner might not have been detected for one of the following reasons:

- ◆ The scanner is not supported
- ◆ Your SCSI controller was not installed correctly
- ◆ There are termination problems with your SCSI port
- ◆ Your SCSI cable is too long
- ◆ Your scanner has a SCSI Light Controller that is not supported by Linux
- ◆ Your scanner is defective

---

**IMPORTANT:** SCSI scanners should not be connected or disconnected when the system is running. Shut down the system first.

---

## Configuring Sound Cards

In the YaST Control Center, click *Hardware > Sound*.

When the sound configuration tool is started, YaST tries to autodetect your sound cards. You can configure one or more sound cards. Click *Finish* to save the current settings and complete the sound

configuration. If YaST is unable to autodetect your sound card, click *Add Sound Card* to open a dialog where you can select a sound card and module.

## Setup

With Quick Automatic Setup, you are not required to go through any subsequent configuration steps and no sound test is performed. The sound card is configured automatically. With Normal Setup, you have the possibility of adjusting the output volume and playing a test sound. Advanced Setup lets you manually customize the sound card options.

Set up your joystick by selecting the respective check box. Select the joystick type in the following dialog, then click *Next*. The same dialog appears when you click **Joystick** in the YaST Control Center.

## Sound Card Volume

Click *Volume* to set the volume for each channel of the selected sound card. Click *Next* to save the volume settings, or click *Back* to restore the original settings. Click *Test* to test your sound configuration. If you cannot hear anything, increase the volume.

## Sound Configuration

Click *Delete* to remove a sound card. Existing entries of configured sound cards are deactivated in the `/etc/modules.conf` file. Click *Options* to open a dialog you can use to customize the sound module options manually. Click *Add Sound Card* to configure additional sound cards.

If YaST autodetects another sound card, continue to “**Configuring a Sound Card**” on page 143. If YaST does not detect a sound card, you are directed to “**Manually Selecting a Sound Card**” on page 143 automatically.

With Start ALSA, you can enable or disable the startup of ALSA (Advanced Linux Sound Architecture) when booting. For playback of MIDI files, activate 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 installed sound cards installed is saved when you click *Finish*. The ALSA configuration data is appended at the end of the `/etc/modules.conf` file.

## Configuring a Sound Card

If multiple sound cards were detected, select your preferred card under List of Automatically Recognized. Continue to Setup by clicking *Next*. If the sound card was not autodetected, click *Select from List* and proceed to the next section, “**Manually Selecting a Sound Card**” on page 143.

## Manually Selecting a Sound Card

If your sound card was not autodetected, a list of sound card drivers and models to choose from is displayed. Click *All* to see the entire list of supported cards. Refer to your sound card documentation for the information required. A reference list of sound cards supported by the Advanced Linux Sound Architecture (ALSA) with their corresponding sound modules is available at the [Advanced Linux Sound Architecture \(http://www.alsa-project.org\)](http://www.alsa-project.org) Web site. After making your selection, click *Next* to return to Setup.

## A.2.3 System

Use the System option to perform the following tasks:

- ◆ “Changing the Settings in the `/etc/sysconfig` File” on page 144
- ◆ “Changing the System's Language” on page 144
- ◆ “Changing the Date and Time” on page 144
- ◆ “Partitioning a Hard Disk” on page 145
- ◆ “Configuring Powertweak Settings” on page 145
- ◆ “Restoring Files from Backup Archives” on page 145
- ◆ “Selecting a Keyboard Layout” on page 146
- ◆ “Changing Boot Loader Settings” on page 147
- ◆ “Creating a Boot, Rescue, or Module Disk” on page 149
- ◆ “Creating and Configuring Volume Groups” on page 151
- ◆ “Configuring Power Management” on page 151
- ◆ “Configuring Profiles” on page 152
- ◆ “Configuring Runlevels” on page 152
- ◆ “Backing Up Files and System Areas” on page 153

### Changing the Settings in the `/etc/sysconfig` File

In the YaST Control Center, click *System > /etc/sysconfig Editor*.

The `/etc/sysconfig` directory contains the files with the most important settings for Novell Linux Desktop. The `sysconfig` editor displays all settings in a well arranged form. The values can be modified and saved to the individual configuration files. Generally, manual editing is not necessary, because the files are automatically adapted when a package is installed or a service is configured.

---

**IMPORTANT:** Do not edit the files in `/etc/sysconfig` if you do not know exactly what you are doing, because this could seriously inhibit the operability of your system.

---

For more information on `/etc/sysconfig/`, see “Section 11.6: SuSEconfig and `/etc/sysconfig`” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

### Changing the System's Language

In the YaST Control Center, click *System > Choose Language*.

Use this module to select the language for your Novell Linux Desktop system. The language can be changed at any time. The language selected in YaST applies to the entire system, including YaST and the desktop environment (GNOME or KDE).

### Changing the Date and Time

In the YaST Control Center, click *System > Date and Time*.

The time zone was already set during the installation, but you can make changes here. Select your country or region from the list on the left, then select Local Time or UTC (Universal Time Coordinated) from the Hardware Clock Set To drop-down list. Machines with additional operating systems, such as Microsoft Windows, mostly use local time. Machines that have only Linux installed should be set to UTC.

## Partitioning a Hard Disk

In the YaST Control Center, click *System > Partitioner*.

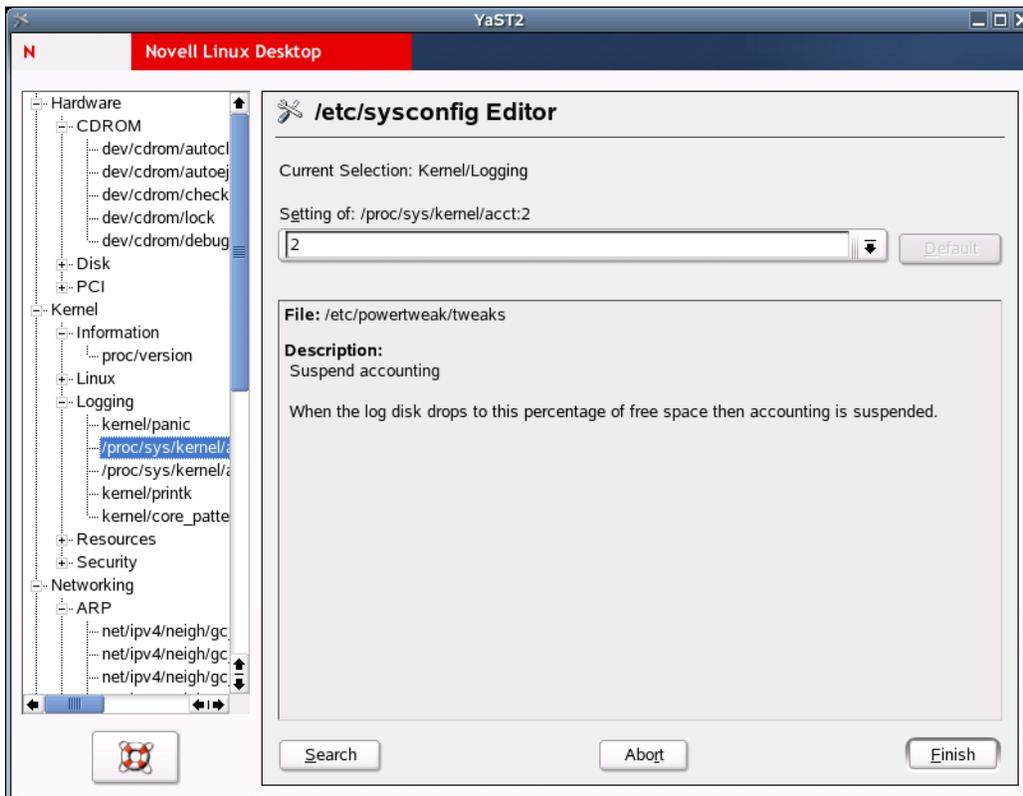
Although it is possible to modify the partitions in the installed system, this should be handled by experts who know exactly what they are doing, because the risk of losing data is very high. If you decide to use this tool, see “[Partitioning](#)” on page 255. The partitioning tool used during the installation is the same as in the installed system.

## Configuring Powertweak Settings

In the YaST Control Center, click *System > Powertweak Configuration*.

Use this module to tune the kernel, hardware, networking, VFS subsystem, and virtual memory options. Select the item you want to tune from the expandable list of the left, then make the changes you want in the panel on the right.

**Figure A-10** Powertweak Configuration

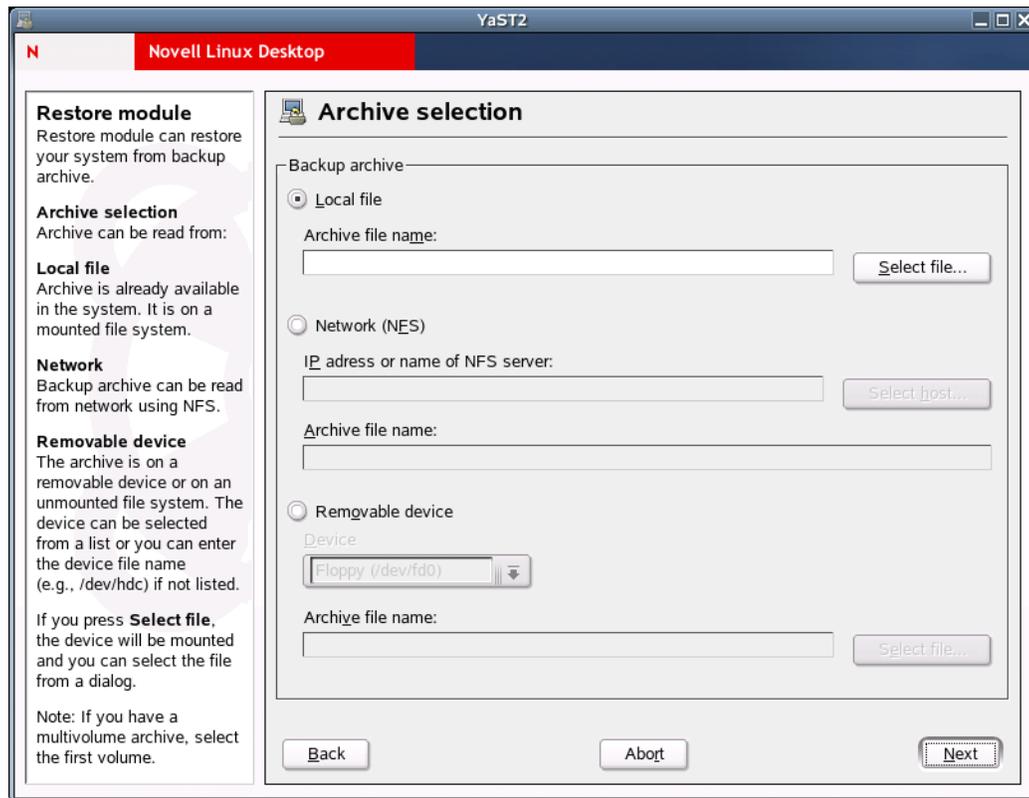


## Restoring Files from Backup Archives

In the YaST Control Center, click *System > Restore System*.

The restore module enables restoration of your system from a backup archive. Follow the instructions in YaST. Click *Next* to proceed to the individual dialogs. First, specify where the archives are located (removable media, local hard disks, or network file systems). A description and the contents of the individual archives are displayed, letting you decide what to restore from the archives.

**Figure A-11** Start Window of the Restore Module



Additionally, there are two dialogs for uninstalling packages that were added since the last backup and for the reinstallation of packages that were deleted since the last backup. These two steps let you restore the exact system state at the time of the last backup.

---

**IMPORTANT:** Because this module normally installs, replaces, or uninstalls many packages and files, use it only if you have experience with backups, or else you might lose data.

---

## Selecting a Keyboard Layout

In the YaST Control Center, click *System > Select Keyboard Layout*.

Use this module only if you work on a system without the X Window System and a graphical user interface. If you use a graphical system (such as GNOME or KDE), set up the keyboard with the **Display and Input Devices** module. The desired keyboard layout usually matches the selected language. Use the test field to see if special characters, such as the pipe symbol (|), are displayed correctly.

## Changing Boot Loader Settings

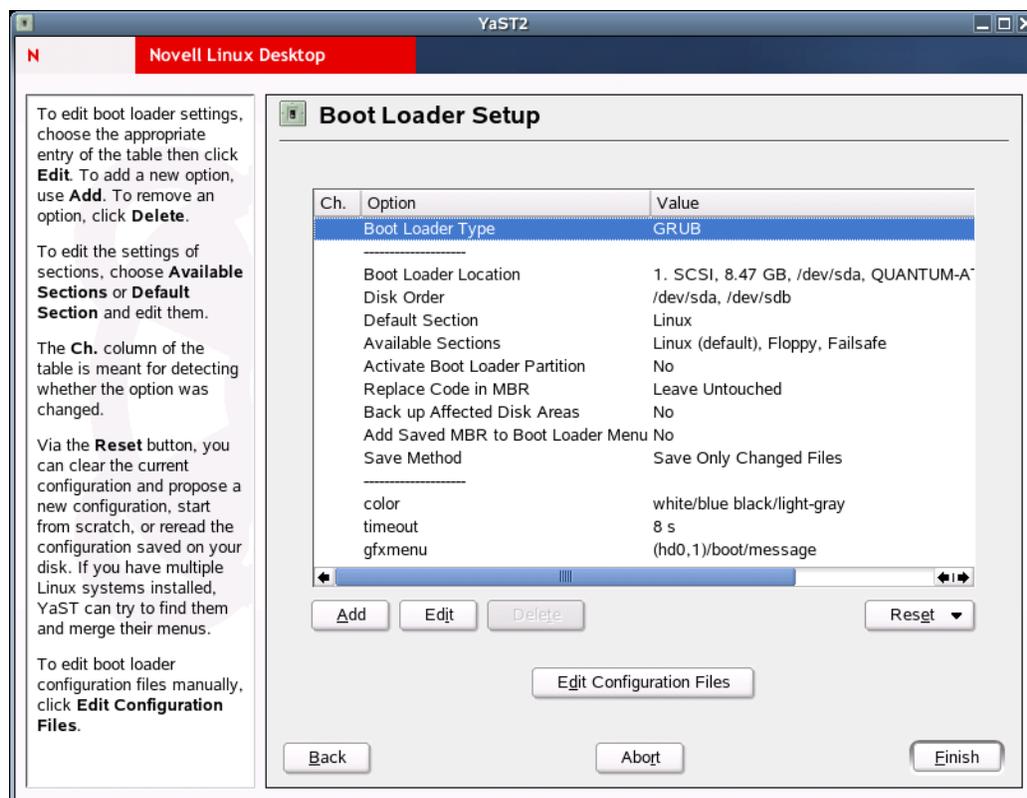
In the YaST Control Center, click *System > Boot Loader Configuration*.

This YaST module simplifies the configuration of the boot loader, which is the first software program that runs when a computer starts. It is responsible for loading and transferring control to the operating system kernel software. The kernel, in turn, initializes the rest of the operating system. You should not experiment with this module unless you understand the concepts behind it. The following discussion mainly covers the default boot loader GRUB.

### The Main Window

The current boot loader configuration of your system is displayed in the main window, where you can make any needed changes.

**Figure A-12** *Boot Loader Setup Main Window*



The table listing the configuration data consists of three columns. Under Ch. (Changed) on the left, flags mark the changed options listed in the Options column (in the center). To add an option, click *Add*. To change the value of an existing option, click *Edit*. If you do not want to use an existing option at all, select it and then click *Delete*. Click *Reset* for the following options:

**Table A-2** *Boot Loader Reset Options*

Option	Description
Propose New Configuration	Generates a new configuration suggestion. Older Linux versions or other operating systems found on other partitions are included in the boot menu, letting you boot Linux or its old boot loader. The latter takes you to a second boot menu.
Start from Scratch	Lets you create the entire configuration from scratch. No suggestions are generated.
Reread Configuration from Disk	If you already made some changes and are not satisfied with the result, use this option to reload your current configuration.
Propose and Merge with Existing GRUB Menus	If another operating system and an older Linux version are installed in other partitions, the menu is generated from an entry for the new Novell Linux Desktop, an entry for the other system, and all entries of the old boot loader menu. This procedure might take some time. This is not possible if LILO is used.
Restore MBR of Hard Disk	Restores the backup master boot record (MBR) saved on the hard disk.

To edit the relevant configuration files in an editor, click *Edit Configuration Files*. To edit a file, load it by means of the selection field and then click *OK* to save your changes. To exit the boot loader configuration, click *Cancel*. To return to the main window, click *Back*.

**IMPORTANT:** The sequence of the options or commands is very important in GRUB. If the specified sequence is not followed, the machine might not boot.

### Boot Loader Configuration Options

For less experienced users, configuration with YaST is easier than editing the files directly. Select an option, then click *Edit* to open a dialog where you can change the settings according to your needs. To confirm the changes and return to the main menu where you can edit other options, click *OK*. The available options depend on the boot loader used.

The following table introduces some options of the GRUB boot loader:

**Table A-3** GRUB Boot Loader Options

Option	Description
Boot Loader Type	<p>Switches between GRUB and LILO. Continue to another dialog to specify the way this change should be performed. (For instance, convert the current GRUB configuration into a similar LILO configuration.) However, some settings might be lost if no equivalent options are available. You can also create a new configuration from scratch or generate and edit a suggestion for a configuration.</p> <p>If you start the boot loader configuration in the running system, you can load the configuration from the hard disk. If you decide to return to the original boot loader, you can load its configuration via the last option. However, this possibility exists only as long as you do not close the boot loader module.</p>
Boot Loader Location	Specifies where to install the boot loader: in the master boot record (MBR), in the boot sector of the boot partition (if available), in the boot sector of the root partition, or on a floppy disk. Use Others to specify a different location.
Disk Order	If your computer has more than one hard disk, specifies the boot sequence of the disks as defined in the BIOS setup of the machine.
Default Section	Specifies the kernel or operating system that should be booted by default. The selected system is booted after the timeout. Click <i>Edit</i> to view a list of all boot menu entries. Select an entry from the list, then click <i>Set as Default</i> . At this point, you can also modify any entry by clicking the <i>Edit</i> button.
Available Sections	Lists the existing entries of the boot menu. If you select this option and then click <i>Edit</i> , a dialog opens that is identical to the Default Entry dialog.
Make Boot Loader Partition Active	Activates the partition whose boot sector holds the boot loader independently from the partition where the directory with the helper files of the boot loader are stored (/boot or the root directory /).
Replace Code in MBR	Specifies whether to overwrite the MBR, which might be necessary if you have changed the location of the boot loader.
Back Up Files and Parts of Hard Disks	Backs up the changed hard disk areas.
Add Saved MBR to Boot Loader Menu	Adds the saved MBR to the boot loader menu.

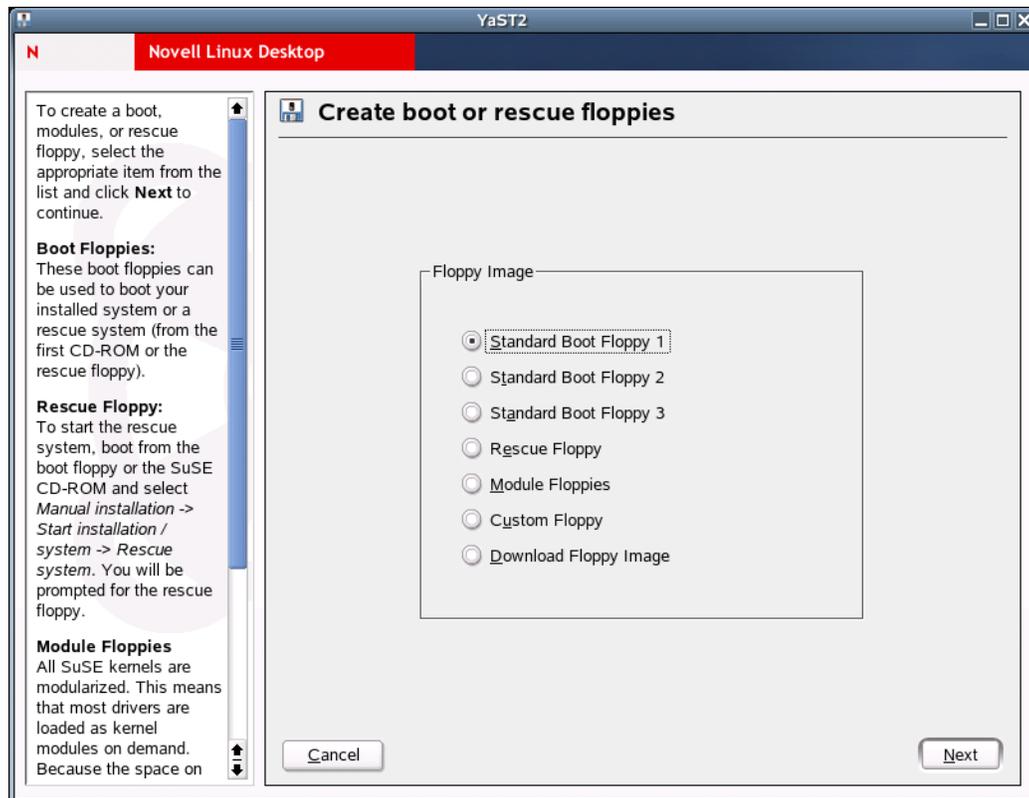
Use Time-out to define how many seconds the boot loader should wait for keyboard input before the default system is booted. A number of other options can be specified with Add. However, the use of these options requires a deeper understanding and is not covered here. See the man pages for GRUB and LILO (`man grub`, `man lilo`, and `man lilo.conf`) for more information. A detailed online manual for GRUB is available at the [GNU GRUB \(http://www.gnu.org/software/grub\)](http://www.gnu.org/software/grub) Web site.

### Creating a Boot, Rescue, or Module Disk

In the YaST Control Center, click *System > Create a Boot, Rescue, or Module Floppy*.

Use this module to create boot disks, rescue disks, and module disks. These floppy disks are helpful if the boot configuration of your system is damaged. The rescue disk is especially necessary if the file system of the root partition is damaged. In this case, you might also need the module disk with various drivers to be able to access the system (for example, to access a RAID system).

**Figure A-13** Creating a Boot, Rescue, or Module Disk



You can create the following types of disks:

### **Standard Boot Floppy 1, 2, or 3**

Use these options to create standard boot disks to boot an installed system with. These disks are also needed to start the rescue system.

### **Rescue Floppy**

This disk contains a special environment that allows you to perform maintenance tasks in your installed system, such as checking and repairing the file system and updating the boot loader.

To start the rescue system, boot with the standard boot disk and then select *Manual Installation > Start Installation or System > Rescue System*. You are then prompted to insert the rescue disk. If your system was configured to use special drivers (such as RAID or USB), you might need to load the respective modules from a module disk.

### **Module Floppies**

Module disks contain additional system drivers. The standard kernel supports only IDE drives. If the drives in your system are connected to special controllers (such as SCSI), load the needed drivers from a module disk. If you select this option and click *Next*, you are taken to a dialog for creating various module disks.

The following module disks are available:

### **USB Modules**

This floppy disk contains the USB modules you might need if USB drives are connected.

### **IDE, RAID, and SCSI Modules**

Because the standard kernel supports only normal IDE drives, you need this module disk if you use special IDE controllers. All RAID and SCSI modules are provided on this disk.

### **Network Modules**

If you need access to a network, load the suitable driver module for your network card from this floppy disk.

### **PCMCIA, CD-ROM (non-ATAPI), FireWire, and File Systems**

This floppy disk contains all PCMCIA modules used especially for laptop computers. The modules for FireWire and some less common file systems are also available here. Older CD-ROM drives that do not comply with the ATAPI standard can also be operated with drivers from this floppy disk.

To load drivers from a module disk to the rescue system, click *Kernel Modules (hardware drivers)* and the desired module category (SCSI, ethernet, etc.). You are prompted to insert the respective module disk and the contained modules are then listed. Select the desired module. Watch the system messages carefully. Loading module *modulename* failed indicates that the hardware could not be recognized by the module. Some older drivers require specific parameters to be able to address the hardware correctly. In this case, refer to your hardware documentation.

### **Custom Floppy**

Use this option to write any existing floppy disk image from the hard disk to a floppy disk.

### **Download Floppy Image**

Using this option, specify a URL and authentication data to download a floppy disk image from the Internet.

To create one of these floppy disks, select the corresponding option and then click *Next*. Insert a blank floppy disk when prompted. If you click *Next* again, the floppy disk is created.

## **Creating and Configuring Volume Groups**

In the YaST Control Center, click *System > LVM*.

The Logical Volume Manager (LVM) is a tool for custom partitioning of hard disks into logical drives. For information about LVM, see “Section 3.10: LVM Configuration” in the [SUSE LINUX Enterprise Server 9 Administration Guide](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf) ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## **Configuring Power Management**

In the YaST Control Center, click *System > Power Management*.

Use this module to configure power management functions such as standby, suspend, hibernation, battery monitor, automatic power off, shutdown of system components, and processor speed control. When starting the module from the YaST Control Center, the first dialog of the module is displayed. Here you can select the schemes to use for battery operation and AC operation. To add or modify the schemes, click *Edit Schemes*, which opens an overview of the existing schemes.

In the scheme overview, select the scheme to modify and then click *Edit*. To create a new scheme, click *Add*. The dialog that opens is the same in both cases.

First, enter a suitable name and description for the new or edited scheme. For the hard disk, define a Standby Policy for maximum performance or for energy saving. The Acoustic Policy controls the noise level of the hard disk. Click *Next* to open the CPU and Cooling Policy dialog. CPU contains the CPU Frequency Scaling and Throttling options. Use these options to define if and to what extent the CPU frequency can be throttled. The Cooling Policy determines the cooling method. Complete all settings for the scheme, then click *OK* to return to the start dialog. In the start dialog, assign the custom scheme to one of the two operating modes. To activate your settings, click *OK*.

Global power management settings can also be made from the initial dialog using Battery Warnings or ACPI Settings. Click *Battery Warnings* to view the battery charge level.

The BIOS of your system notifies the operating system whenever the charge level drops below certain configurable limits. In this dialog, there are three limits: Warning Capacity, Low Capacity, and Critical Capacity. Specific actions are triggered when the charge level drops below these limits. Usually, the first two levels merely trigger a notification to the user. The third critical level triggers a suspend, because the remaining energy is not sufficient for continued system operation. Select suitable charge levels and the respective actions, then click *OK* to return to the start dialog.

Click *ACPI Settings* to access the dialog for configuring the ACPI buttons. These settings determine how the system should respond to the activation of certain switches. Configure the system response to pressing the Power button, pressing the Sleep button, and then closing the laptop lid. Click *OK* to complete the configuration and return to the start dialog. Click *OK* again to exit the module and confirm your power management settings.

For more information, see “Chapter 17: Power Management” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## Configuring Profiles

In the YaST Control Center, click *System > Profile Manager*.

The SCPM (System Configuration Profile Management) module enables creating, managing, and switching between system configurations. This is especially useful for mobile computers that are used in different locations (in different networks) and by different users. However, this feature is useful even for stationary machines, because it enables the use of various hardware components or test configurations. For more information about SCPM basics and handling, see “Chapter 16: Linux on Mobile Devices” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## Configuring Runlevels

In the YaST Control Center, click *System > Runlevel Editor*.

Novell Linux Desktop can be operated in several runlevels. By default, the system boots to runlevel 5, which offers multiuser mode, network access, and the graphical user interface (X Window System). The other runlevels offer multiuser mode with network but without X (runlevel 3) and multiuser mode without network (runlevel 2).

The various runlevels are useful if problems are encountered in connection with a particular service (X or network) in a higher runlevel. In this case, the system can be booted to a lower runlevel to

repair the service. Many servers operate without a graphical user interface and must be booted in a runlevel without X, such as runlevel 3.

Usually you need only the standard runlevel (5). However, if the graphical user interface freezes at any time, you can restart the X Window system by switching to a text console by pressing Ctrl+Alt+F1, logging in as root, and switching to runlevel 3 with the `init 3` command. This shuts down your X Window System, leaving you with a text console. To restart the graphical system, enter the `init 5` command.

In a default installation, runlevel 5 is selected. To start a different runlevel when the system is booted, change the default runlevel here. Click *Expert Mode* to see which services are started in which runlevel.

---

**WARNING:** Incorrect settings for system services and runlevels can render your system useless. To retain the operability of your system, consider the possible consequences before modifying any of these settings.

---

For more information on runlevels, see “Section 11.2: Runlevels” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## Backing Up Files and System Areas

In the YaST Control Center, click *System > System Backup*.

The YaST backup module lets you create a backup of your system. The backup created by the module does not comprise the entire system, but only saves information about changed packages and copies of critical storage areas and configuration files.

Define the kind of data to save in the backup. By default, the backup includes information about any packages changed since the last installation. In addition, it can include data that does not belong to packages themselves, such as many of the configuration files in `/etc` or the directories under `/home`. Apart from that, the backup can include important storage areas on your hard disk that might be crucial when trying to restore a system, such as the partition table or the master boot record (MBR).

## A.2.4 Network Devices

Use the Network Devices option to perform the following tasks:

- ♦ “Configuring a DSL Connection” on page 153
- ♦ “Configuring an ISDN Card” on page 155
- ♦ “Configuring Network Cards” on page 158
- ♦ “Setting Up an ISDN Fax Device” on page 159
- ♦ “Configuring a Modem” on page 160
- ♦ “Setting Up a Phone Answering Machine” on page 161

### Configuring a DSL Connection

In the YaST Control Center, click *Network Devices > DSL*.

This module consists of several dialogs where you can set the parameters of DSL links based on one of the following protocols:

- ◆ PPP over Ethernet (PPPoE)
- ◆ PPP over ATM (PPPoATM)
- ◆ CAPI for ADSL (Fritz Cards)
- ◆ Point-to-Point Tunneling Protocol (PPTP) - Austria

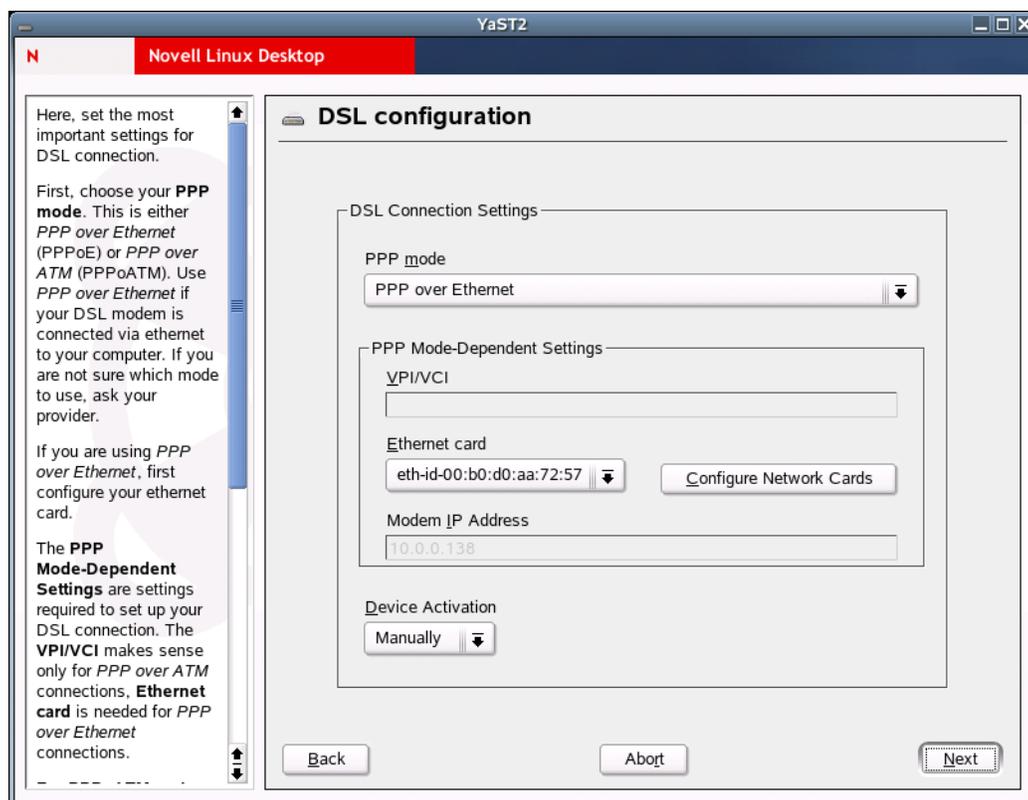
The configuration of a DSL connection based on PPPoE or PPTP requires the corresponding network card to have already been set up in the correct way. If you have not done this, first configure the card by clicking *Network Devices > Network Card* in the YaST Control Center (see “[Configuring Network Cards](#)” on page 158 for more information). In the case of a DSL link, addresses can be assigned automatically but not via DHCP, which is why you should not enable the Automatic Address Setup (via DHCP) option. Instead, type a static dummy address for the interface, such as 192.168.22.1. In Subnet Mask, specify 255.255.255.0. If you are configuring a standalone workstation, leave the Default Gateway field empty.

---

**NOTE:** Values in the IP Address and Subnet Mask fields are only placeholders. They are needed only to initialize the network card and do not represent the DSL link as such.

---

**Figure A-14** DSL Configuration



To begin the DSL configuration, select the PPP mode and the Ethernet card that the DSL modem is connected to (in most cases, this is eth0). Then use Device Activation to specify whether the DSL link should be established during the boot process. The dialog also lets you select your country and choose from a number of ISPs operating in it. The details of any subsequent dialogs of the DSL

configuration depend on the options set so far. For details on the available options, read the detailed help available in the dialogs boxes.

To use Dial on Demand on a standalone workstation, specify the name server (DNS server). Most ISPs support dynamic DNS. The IP address of a name server is sent by the ISP each time you connect. For a single workstation, however, provide a placeholder address such as 192.168.22.99. If your ISP does not support dynamic DNS, specify the name server IP address provided by your ISP.

The Idle Time-out (seconds) option defines a period of network inactivity after which the connection is automatically terminated. A reasonable timeout value is between 60 and 300 seconds.

If you enable Dial on Demand in addition to the option mentioned above, the connection will not be completely terminated after the timeout. Instead, the connection remains in a standby mode and is re-established automatically as soon as a program requests some kind of data traffic. If Dial on Demand is disabled, the connection is completely terminated and must be re-established manually when needed. It might then be useful to set the timeout to zero to prevent automatic hang-up.

The configuration of T-DSL is very similar to the DSL setup. Simply select TOnline as your provider and YaST will open the T-DSL configuration dialog. Here you can provide some additional information required for T-DSL, such as the line ID, the T-Online number, the user code, and your password. All of these should be included in the information you received after subscribing to T-DSL.

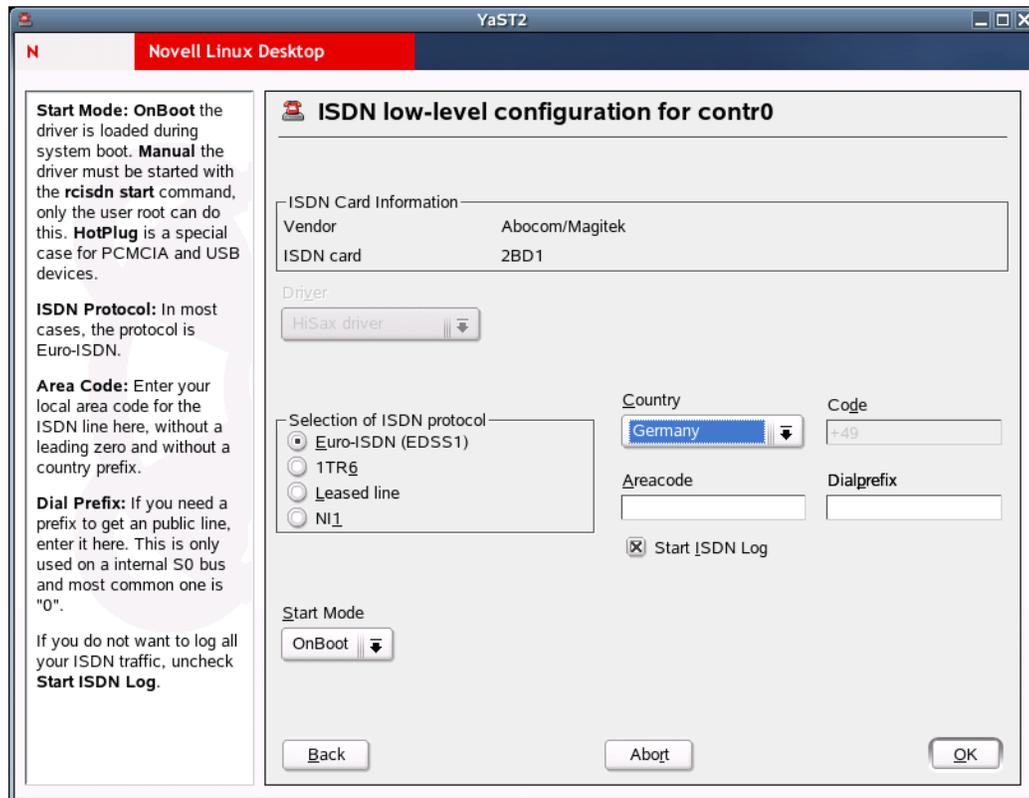
### **Configuring an ISDN Card**

In the YaST Control Center, click *Network Devices > ISDN*.

Use this module to configure one or more ISDN cards for your system. If YaST did not autodetect your ISDN card, manually select it. Multiple interfaces are possible, but several ISPs can be configured for one interface. In the subsequent dialogs, set the ISDN options necessary for the proper functioning of the card.

In the next dialog, shown below, select the protocol to use.

**Figure A-15** ISDN Configuration



The default is Euro-ISDN (EDSS1), but for older or larger exchanges, select 1TR6. If you are in the US, select NI1. Select your country in the relevant field. The corresponding country code then appears in the field next to it. Finally, provide your area code and the dial prefix (if necessary).

Start Mode defines how the ISDN interface should be started. OnBoot causes the ISDN driver to be initialized each time during the boot process. Manual requires you to load the ISDN driver as root with the `rcisdn start` command. Hot Plug, used for PCMCIA or USB devices, loads the driver after the device is plugged in. When you are finished with all these settings, click *OK*.

In the next dialog, specify the interface type for your ISDN card and add ISPs to an existing interface. Interfaces can be either the SyncPPP or the RawIP type, but most ISP operate in the SyncPPP mode, which is described below.

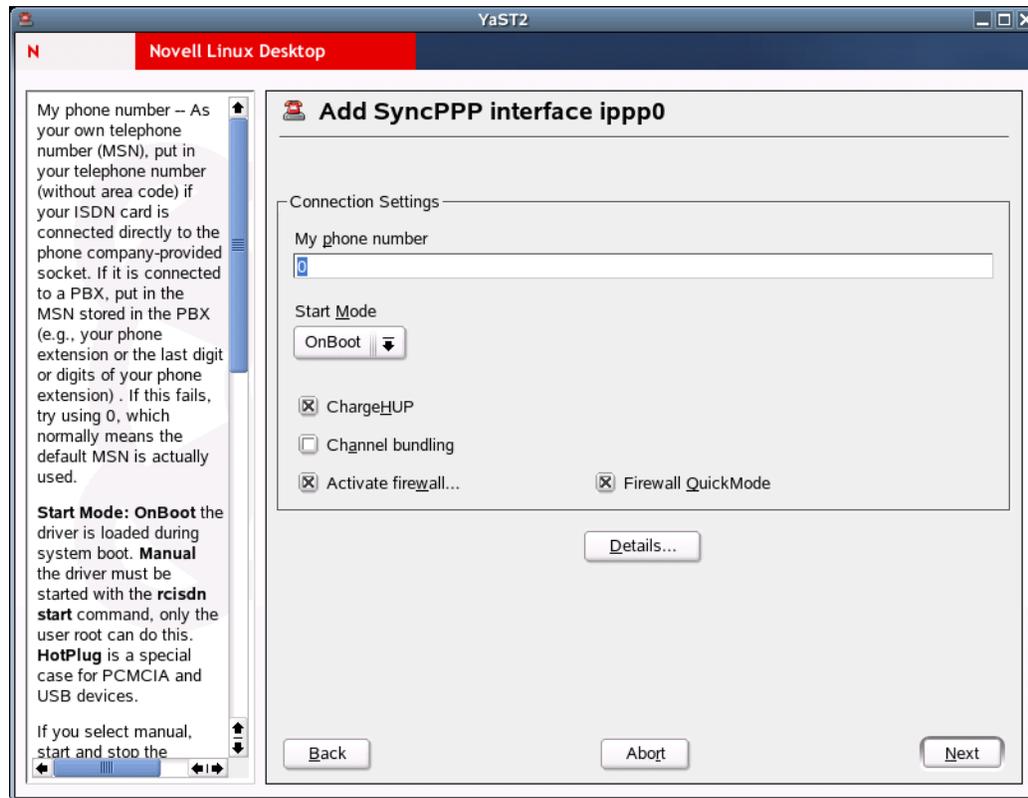
The number to specify for My Phone Number varies depending on your particular setup, as described in the following sections.

### ISDN Card Directly Connected to Phone Outlet

A standard ISDN line provides three phone numbers (called multiple subscriber numbers, or MSNs). If the subscriber asked for more, there can be up to 10. One of these MSNs must be

specified here, but without your area code. If you specify the wrong number, your phone operator automatically falls back to the first MSN assigned to your ISDN line.

**Figure A-16** ISDN Interface Configuration



## ISDN Card Connected to a Phone Exchange

The configuration can vary depending on the equipment installed:

- ◆ Smaller phone exchanges built for home purposes mostly use the Euro-ISDN (EDSS1) protocol for internal calls. These exchanges have an internal S0 bus and use internal numbers for the equipment connected to them.

Use one of the internal numbers as your MSN. You should be able to use at least one of the exchange's MSNs that have been enabled for direct outward dialing. If this does not work, try a single 0. For further information, see the documentation that came with your phone exchange.

- ◆ Larger phone exchanges designed for businesses normally use the 1TR6 protocol for internal calls. Their MSN is called EAZ and usually corresponds to the direct-dial number. For the configuration under Linux, use the last digit of the EAZ. As a last resort, try each of the digits from 1 through 9.

For the connection to be terminated just before the next charge unit is due, enable ChargeHUP. However, this might not work with every ISP. You can also enable channel bundling (multilink PPP) by selecting the corresponding check box. Finally, you can enable SuSEfirewall2 for your link by clicking *Activate Firewall*.

Details opens a dialog where you can implement more complex connection schemes and then click *Next*.

In the next dialog, specify IP address settings. If you have not been given a static IP by your provider, click *Dynamic IP Address*. Otherwise, use the fields provided to specify your host's local IP address and the remote IP address according to the specifications of your ISP. If the interface should be the default route to the Internet, click *Default Route*. Each host can have only one interface configured as the default route.

The next dialog let you set your country and select an ISP. The IPs included in the list are call-by-call providers only. If your ISP is not in the list, click *New*. This opens the Provider Parameters dialog where you can specify all the details for your ISP. When typing the phone number, make sure you do not include any blanks or commas among the digits. Finally, type your login name and the password as provided by the ISP.

To use Dial on Demand on a standalone workstation, also specify the name server (DNS server). Most ISPs support dynamic DNS, which means the IP address of a name server is sent by the ISP each time you connect. For a single workstation, however, you still need to provide a placeholder address such as 192.168.22.99. If your ISP does not support dynamic DNS, specify the name server IP addresses of the ISP. If you want, specify a timeout for the connection, or the period of network inactivity (in seconds) after which the connection should be automatically terminated.

## Configuring Network Cards

In the YaST Control Center, click *Network Devices > Network Card*.

After starting the module, YaST displays a general network configuration dialog. The upper part shows a list with all the network cards yet to be configured. Any card properly autodetected during the boot procedure is listed with its name. Devices that could not be detected are listed as Other (not detected). The lower part displays a list of the devices configured so far, with their network types and addresses. You can now configure a new network card or change an existing configuration.

### Manually Configuring a Network Card

The configuration of a network card that was not autodetected includes the following items:

#### Device Type

Specify the type of network device and the device number.

#### Wireless Settings

If you are within reach of a wireless network and your network card is designed for this connection type, use Wireless Settings to set the operating mode, the network name (ESSID), the network identifier (NWID), the encryption key, and a nickname.

#### Kernel Module and Selection of Network Card

If your network card is a PCMCIA or USB device, select the corresponding check boxes and click *Next*. Otherwise, click *Select from List* and then specify your network card. YaST automatically loads the appropriate driver for the selected card.

### Setting the Network Address

This lets you specify how the address should be assigned to your network card:

#### Automatic Address Setup (via DHCP)

If your network includes a DHCP server, you can rely on it to set up your network address automatically. The option should also be used if you are using a DSL line but with no static IP

assigned by the ISP. If you decide to use DHCP, configure the details after clicking *DHCP Client Options*. Specify whether the DHCP server should always honor broadcast requests and any identifier to use. By default, DHCP servers use the card's hardware address to identify an interface. If you have a virtual host setup where different hosts communicate through the same interface, an identifier is necessary to distinguish them.

### Static Address Setup

If you have a static address, select the corresponding check box and then specify the address and subnet mask for your network. The preset subnet mask should match the requirements of a typical home network.

### Cable Modem

In some countries (such as Austria and the US), it is quite common to access the Internet through the TV cable network. The TV cable subscriber usually gets a modem that is connected to the TV cable outlet on one side and to a computer network card on the other (using a 10Base-TG twisted pair cable). The cable modem then provides a dedicated Internet connection with a fixed IP address.

Depending on the instructions provided by your ISP, when configuring the network card, either click *Automatic Address Setup (via DHCP)* or *Static Address Setup*. Most providers today use DHCP. A static IP address often comes as part of a special business account.

### Setting Up an ISDN Fax Device

This option sets up the fax system for one or more users. Each user must have at least one unique fax number configured.

- 1 In the YaST Control Center, click *Network Devices > Fax*.
- 2 (For users behind a PBX) In the Prefix field, type the prefix number for getting a public line. This number will be dialed before any destination number.
- 3 Click *Add* or *Edit* to add or edit a user.

When adding or editing a user, a dialog appears with the following options:

Option	Description
User	The system user that this fax account belongs to.
Fax Numbers	The numbers (separated by commas) where faxes should be received for this user. If you type an asterisk (*), the user gets any call. Leave this empty for a send-only account.
Outgoing MSN	The number to use for outgoing calls. If empty, the first number in Fax Numbers is used.
StationID	The fax station ID. Set it to the external number in international format, such as +49 89 12345.
Headline	The headline used for sending faxes (normally a string containing a name).
Action	By using the default MailAndSave, received faxes are sent to the user as mail and saved to disk. To disable the mails, set this option to SaveOnly.

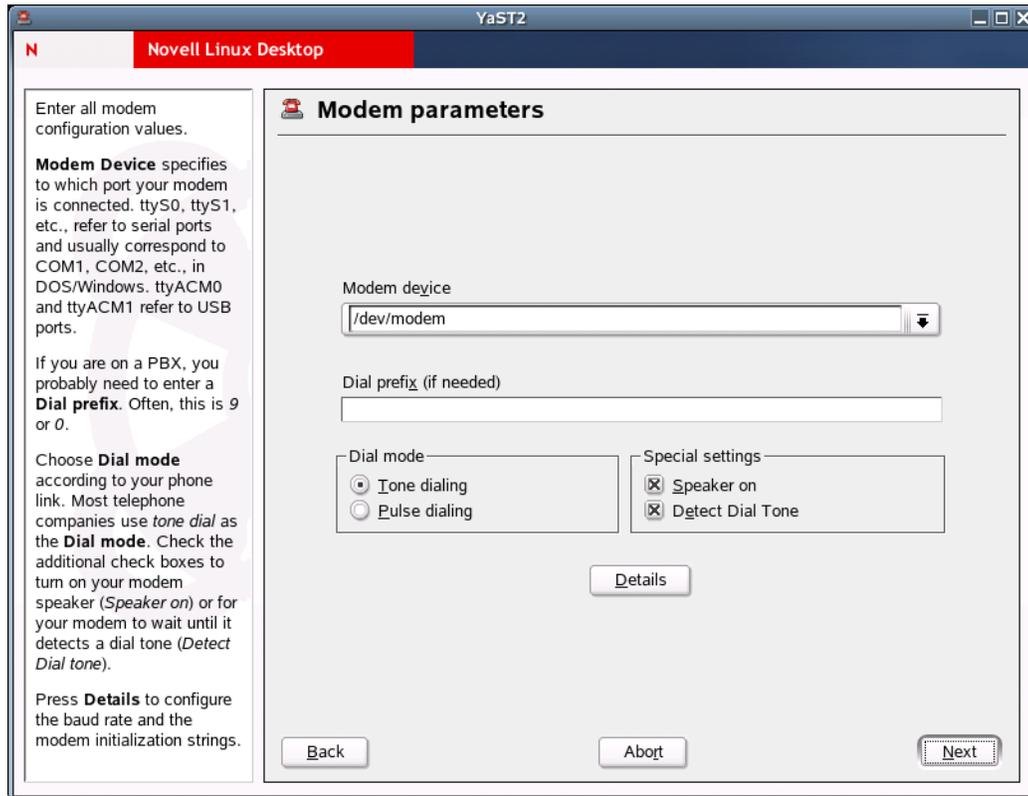
- 4 Click *OK > Finish*.

## Configuring a Modem

In the YaST Control Center, click *Network Devices > Modem*.

If your modem was not automatically detected, click *Configure* to open the dialog for manual configuration. Under Modem Device, specify the interface that the modem is connected to.

**Figure A-17** Modem Configuration



If you are behind a private branch exchange (PBX), you might need to specify a dial prefix. This is often a 0. Consult the instructions that came with the PBX to find out. Also select whether to use tone or pulse dialing, whether the speaker should be on, and whether the modem should wait until it detects a dial tone. The latter option should not be enabled if the modem is connected to an exchange.

Under Details, set the baud rate and the modem initialization strings. Change these settings only if your modem was not autodetected or if it requires special settings for data transmission to work. This is mainly the case with ISDN terminal adapters.

In the next dialog, select the ISP (Internet service provider). To select from a predefined list of ISPs operating in your country, click *Countries*; or click *New* to open a dialog where you can provide the data for your own ISP. This includes a name for the dial-up connection and for the ISP and also the login and the password as provided by your ISP. Enable Always Ask for Password if you want to be prompted for the password each time you connect.

The final dialog allows specification of the following additional connection options:

**Table A-4** *Modem Connection Options*

Option	Description
Dial on Demand	If you enable this, specify at least one name server.
Modify DNS When Connected	Enabled by default, which means that the name server address is updated each time you connect to the Internet. However, if you enable Dial on Demand, disable this option and provide a fixed name server address.
Stupid Mode	Ignores input prompts sent by the ISP's server to prevent it from interfering with the connection process. This option is enabled by default.
Activate Firewall	Enables the firewall, which protects you from outside attacks during the time of your Internet connection.
Idle Time-out (seconds)	Specifies a period of network inactivity after which the modem disconnects automatically.
IP Details	Opens the Address Configuration dialog. If your ISP does not assign a dynamic IP address to your host, disable Dynamic IP Address and then specify your host's local IP address and the remote IP address (ask your ISP for this information). Leave Default Route enabled, then click <i>OK</i> .

Click *Next* to return to the original dialog, which displays a summary of the modem configuration. Then click *Finish*.

## Setting Up a Phone Answering Machine

This option sets up an answering machine for one or more users. Each user must have at least one unique phone number configured.

- 1 In the YaST Control Center, click *Network Devices > Phone Answering Machine*.
- 2 Click *Add* or *Edit* to add or edit a user.

When adding or editing a user, a dialog appears with the following options:

Option	Description
User	The system user who wants to receive calls with the answering machine.
Phone Numbers	One or more phone numbers (separated by commas) that belong (only) to this user. You can also type an asterisk (*), which means that the user will get any call.
Delay	Delay (in seconds) before the answering machine responds to the call.
Duration	Maximum record length for one call.
Action	By using the default MailAndSave, recorded calls are sent to the user as mail and saved to disk. To disable the mails, set this option to SaveOnly. None forbids recording (the answering machine only plays the announcement).

Option	Description
Pin	Identification code for the remote inquiry function.

3 Click *OK > Finish*.

## A.2.5 Network Services

Use the Network Services option to perform the following tasks:

- ◆ “Configuring Your Computer's Hostname and Domain Name” on page 162
- ◆ “Configuring a Kerberos Client” on page 162
- ◆ “Configuring Mail Settings” on page 163
- ◆ “Configuring a NIS Client” on page 164
- ◆ “Configuring Network Services (inetd)” on page 165
- ◆ “Setting Up Remote Administration” on page 166
- ◆ “SLP Browser” on page 167
- ◆ “Host Names” on page 168
- ◆ “Configuring a Machine As an LDAP Client” on page 168
- ◆ “Configuring an NFS Client” on page 168
- ◆ “Configuring the NTP Client” on page 169
- ◆ “Configuring Your Internet Proxy (Caching) Settings” on page 170
- ◆ “Configuring Routing” on page 170
- ◆ “Configuring a TFTP Server” on page 171

### Configuring Your Computer's Hostname and Domain Name

In the YaST Control Center, click *Network Services > DNS and Host Name*.

Use this module to configure your computer's hostname and domain name if these settings were not already been made while configuring the network devices.

Insert the hostname and domain name for your computer. Name Server List and Domain Search List are optional. A name server is a computer that translates hostnames into IP addresses. This value must be specified as an IP address (for example, 10.10.0.1), not as a hostname.

Search domain is the domain name where hostname searching starts. The primary search domain is usually the same as the domain name of your computer (for example, novell.com). There might be additional search domains (for example, novell.de).

If you are using DHCP to get an IP address, specify whether to get a hostname via DHCP or to set name servers and searched domains via DHCP.

If you plan to use a dial-up Internet connection and have set up your connection to use dynamic DNS assignment, these values are temporarily disabled during the connection.

### Configuring a Kerberos Client

In the YaST Control Center, click *Network Services > Kerberos Client*.

Kerberos provides an authentication method that a user must register with once and is then trusted in the complete network for the rest of the session.

To configure a Kerberos client, you need the `pam_krb5` and `heimdal-lib` packages, available from the Novell Linux Desktop CD 1.

When the Kerberos Client Configuration dialog opens, click *Use Kerberos*. To set up a DNS-based client, it is sufficient to confirm the Basic Kerberos Settings as displayed. If your domain does not support this kind of configuration, provide the correct values for the Default Domain, the Default Realm, and the KDC Server Address. Clicking *Advanced Settings* opens another YaST dialog where you can modify options related to tickets, OpenSSH support, and time synchronization.

The dialog opened with Advanced Settings includes all the settings related to ticket attributes. To forward your complete identity to use your tickets on other hosts, click *Tickets Are Forwardable*. To enable the transfer of certain tickets only, click *Tickets Are Proxiable*. Tickets can be kept available by a PAM module even after a session has ended by enabling Retain Tickets. The Default Ticket Lifetime can be specified in days, hours, or minutes (using the units of measurement d, h, and m, with no space between the value and the unit). To enable Kerberos authentication support for your OpenSSH client, select the corresponding check box. The client then uses Kerberos tickets to authenticate with the SSH server. You exclude a range of user accounts from using Kerberos authentication by providing a value for the Minimum UID that a user of this feature must have. For instance, you might want to exclude the system administrator (root). Lastly, use Clock Skew to set a value for the allowable difference between the time stamps and your host's system time.

To keep the system time in sync with an NTP server, you can also set up the host as an NTP client by selecting NTP Configuration. After finishing the configuration, YaST performs all the necessary changes and the Kerberos client is ready for use.

For more information, see “Chapter 25: Network Authentication - Kerberos” and “Chapter 26: Installing and Administering Kerberos” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## Configuring Mail Settings

In the YaST Control Center, click *Network Services > Mail Transfer Agent*.

This module lets you configure your mail settings if you send your e-mail with sendmail, postfix, or the SMTP server of your provider. You can retrieve mail via the fetchmail program, for which you can also specify the details of the POP3 server or IMAP server of your provider.

You can also use a mail program of your choice, such as KMail or Evolution, to set your POP and SMTP access data as usual (to receive mail with POP3 and send mail with SMTP). In this case, you do not need this module.

### Connection Type

To configure your mail with YaST, specify the desired type of connection to the Internet from the following options in the first dialog of the e-mail configuration module:

#### Permanent

Select this option if you have a dedicated line to the Internet. Your machine is online permanently, so no dial-up is required. If your system is part of a local network with a central e-mail server, select this option to ensure permanent access to your e-mail messages.

**Dial-up**

This item is relevant for users who have a computer at home, are not located in a network, and occasionally connect to the Internet.

**No connection**

If you do not have access to the Internet and are not located in a network, you cannot send or receive e-mail.

You can activate virus scanning for your incoming and outgoing e-mail with AMaViS by selecting the respective check box. The package is installed automatically as soon as you activate the mail filtering feature. In the following dialogs, specify the outgoing mail server (usually the SMTP server of your provider) and the parameters for incoming mail. If you use a dial-up connection, specify diverse POP or IMAP servers for mail reception by various users. You can also assign aliases, use masquerading, or set up virtual domains.

**Configuring a NIS Client**

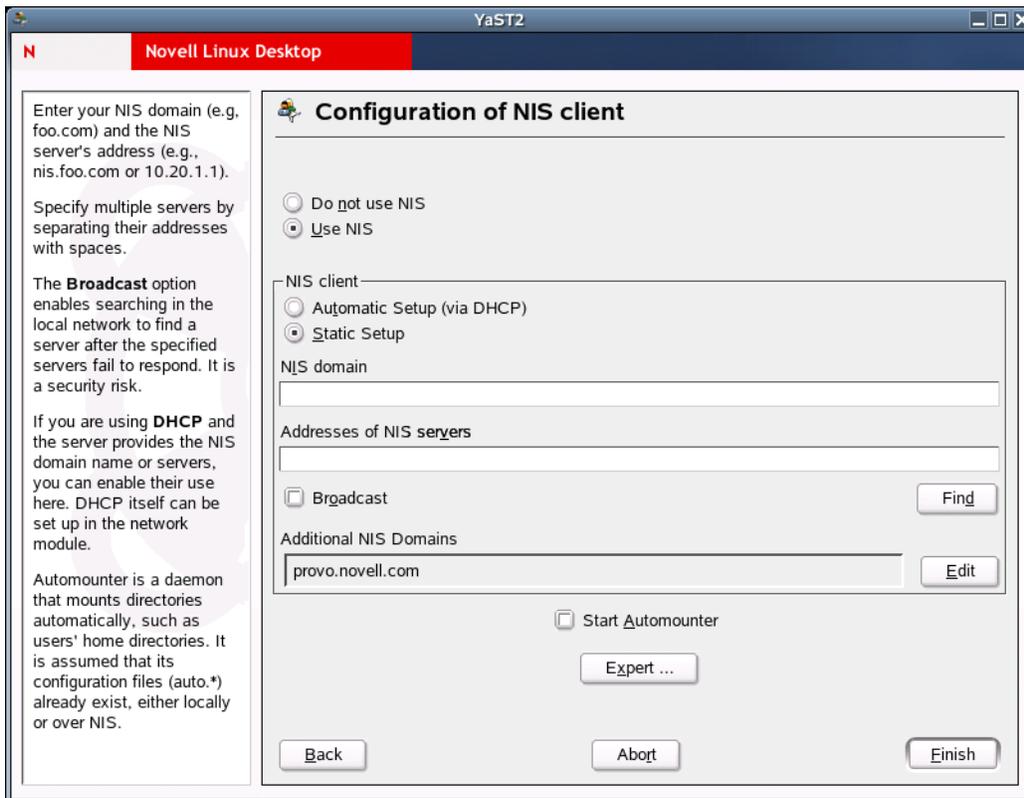
In the YaST Control Center, click *Network Services > NIS Client*.

This module lets you configure the Network Information Service (NIS) client. When multiple Linux systems in a network want to access common resources, it becomes important that all user and group identities are the same for all machines in that network. The network should be transparent to users so that whatever machine users use, they always find themselves in exactly the same environment. This is made possible by means of NIS and NFS services.

NIS can be described as a database-like service that provides access to the contents of `/etc/passwd`, `/etc/shadow`, and `/etc/group` across networks. NIS can also be used for other purposes, such as to make available the contents of files like `/etc/hosts` or `/etc/services`.

After choosing to use NIS and, depending on the circumstances, the following dialog opens:

**Figure A-18** Configuration of NIS Client



Select whether the host has a fixed IP address or receives one issued by DHCP. DHCP also provides the NIS domain and the NIS server. If a static IP address is used, specify the NIS domain (for example, `foo.com`) and the NIS server's address (for example, `nis.foo.com` or `10.20.1.1`). Specify multiple servers by separating their addresses with spaces. The Broadcast option enables searching in the local network to find a server after the specified servers fail to respond. It is a security risk. Find makes YaST search for an active NIS server in your network.

If you are using DHCP and the server provides the NIS domain name or servers, you can enable their use here. DHCP itself can be set up in the network module. Automounter is a daemon that mounts directories (such as users' home directories) automatically. It is assumed that its configuration files (`auto.*`) already exist, either locally or over NIS.

In addition, you can specify multiple domains with one default domain. Use Add to specify multiple servers including the broadcast function for the individual domains.

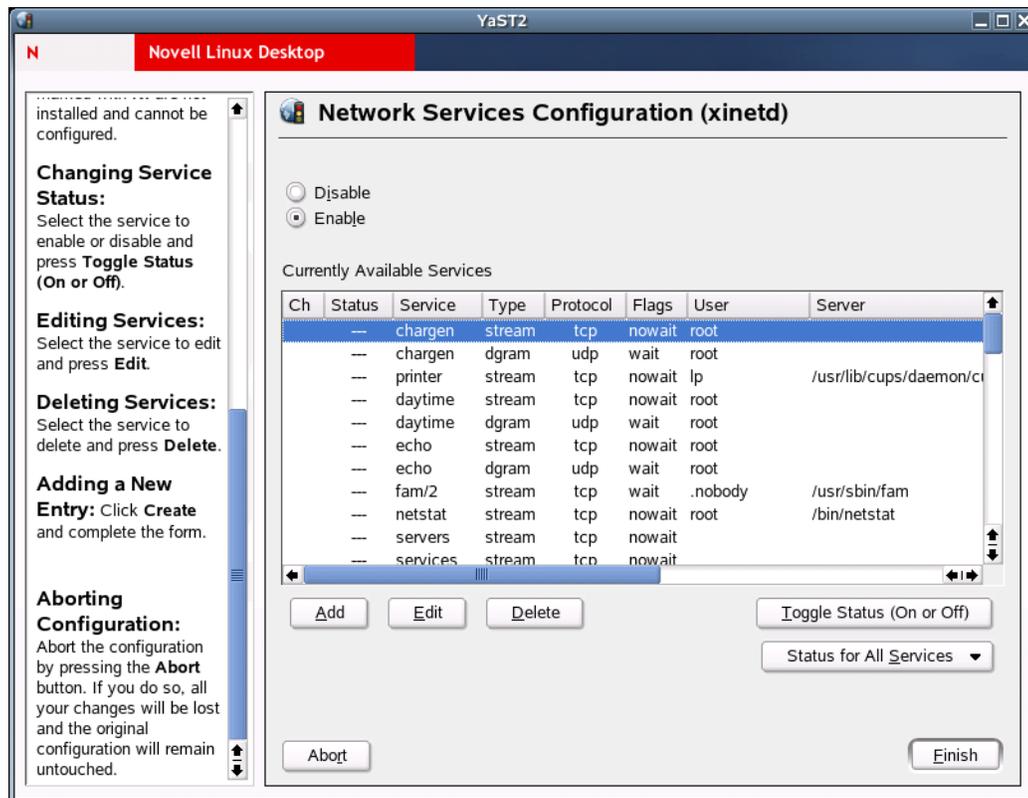
In the expert settings, click *Answer to the Local Host Only* if you do not want other hosts to be able to query which server your client is using. By clicking *Broken Server*, the client is enabled to receive replies from a server communicating through an unprivileged port. For more information, see `man ypbind`.

### Configuring Network Services (inetd)

In the YaST Control Center, click *Network Services > Network Services (inetd)*.

This module lets you determine which network services (such as telnet, finger, talk, or ftp) should start when Novell Linux Desktop boots. These services enable external hosts to connect to your computer. You can also configure various parameters for each service. By default, the master service that manages the individual services (inetd or xinetd) is not started. When this module starts, choose which of the two services to configure. The selected daemon can be started with a standard selection of network services. You can add, delete, or edit services to compose your own selection of services.

**Figure A-19** *Network Services Configuration*



## Network Services Configuration

Click *Enable* to enable network services managed by a super-server (inetd or xinetd—it depends on what you have installed) configuration. To stop the super-server, click *Disable*.

## Service Status

All services marked with X in the Ch column were edited and will be changed in the system configuration. All services marked with a dash (—) are inactive (locked). All services marked with On are active (unlocked). All services marked with NI are not installed and cannot be configured.

To change the service status, select the service you want to enable or disable and then click *Toggle Status (On or Off)*.

## Setting Up Remote Administration

In the YaST Control Center, click *Network Services > Remote Administration*.

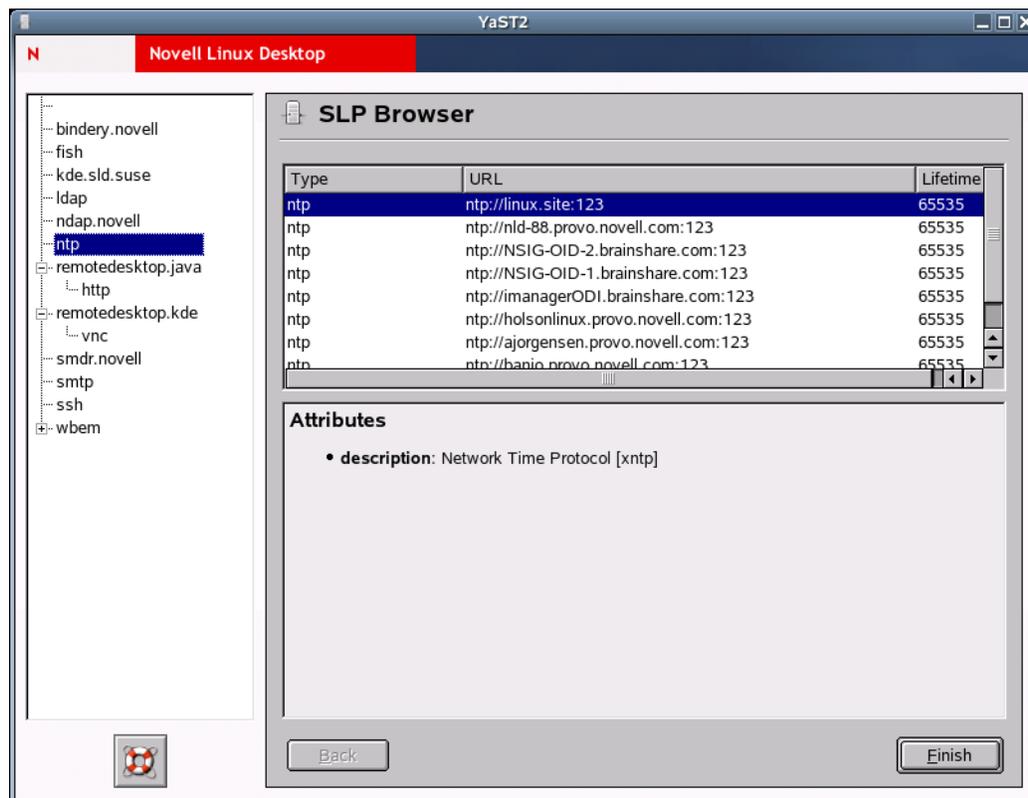
If this is enabled (Allow Remote Administration has been selected), you will be able to administer this machine remotely from another machine. You can use a VNC client, such as `krdc` (connect to `hostname:5901`), or a Java-capable Web browser (connect to `http://hostname:5801/`). This form of remote administration is less secure than using SSH (Secure Shell Server), which is enabled by default.

## SLP Browser

The Service Location Protocol (SLP) is used to make the availability of a certain service known to all clients in the local network. Applications that support SLP can use the distributed information and can be configured automatically. Services that offer SLP support include `cupsd`, `rsyncd`, `ypserv`, `openldap2`, `openwbem` (CIM), `ksysguardd`, `saned`, `kdm vnc login`, `smpppd`, `rpasswd`, `postfix`, and `sshd` (via `fish`). You can use SLP to provide networked clients with central functions, such as installation server, file server, or print server NLD Server.

The SLP Browser lists all services in the local network announced via SLP in a tree diagram.

**Figure A-20** SLP Browser



To open the SLP Browser, click *Network Services > SLP Browser* in the YaST Control Center.

For more information, see “Section 21.6: SLP Services in the Network” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## Host Names

Use this option to set up hosts.

- 1 In the YaST Control Center, click *Network Services > Host Names*.
- 2 Click *Add* or *Edit* to add or edit a hostname.
- 3 Type a host IP address, a hostname, and optional host aliases, separated by spaces.
- 4 Click *OK > Finish*

## Configuring a Machine As an LDAP Client

Use this option to set up a machine as an LDAP client. To configure and access LDAP services, the `pam_ldap` and `nss_ldap` packages must be installed. These packages are available on the Novell Linux Desktop CD 1.

- 1 In the YaST Control Center, click *Network Services > LDAP Client*.
- 2 To authenticate your users with an OpenLDAP server, select *Use LDAP*.  
NSS and PAM are then configured accordingly.
- 3 To deactivate LDAP services, select *Do Not Use LDAP*.  
If you deactivate LDAP, the current LDAP entry for `passwd` in `/etc/nsswitch.conf` is removed. The PAM configuration is modified and the LDAP entry is removed.
- 4 Type the Distinguished Name of the search base (“base DN”, such as `dc=example,dc=com`) and the LDAP server’s address (for example, `ldap.example.com` or `10.20.0.2`).  
Specify multiple servers by separating their addresses with spaces. It must be possible to resolve the addresses without using LDAP. You can also specify the port where the server is running using the syntax `server:port` (for example, `ldap.example.com:379`).
- 5 (Conditional) If your LDAP server supports [StartTLS](http://www.faqs.org/rfcs/rfc2830.html) (<http://www.faqs.org/rfcs/rfc2830.html>) and it is configured, click *LDAP TLS/SSL* to encrypt your communication with the LDAP server.
- 6 (Conditional) If you have an LDAP server using protocol 2 (for example, OpenLDAP v1), click *LDAP Version 2*.
- 7 (Optional) To configure advanced LDAP settings, click *Advanced Configuration*.

Automounter is a daemon that automatically mounts directories, such as users’ home directories. It is assumed that its configuration files (`auto.*`) already exist, either locally or over LDAP. If Automounter is not installed and you want to use it, it will be installed automatically.

For more information, see “Section 21.8: LDAP — A Directory Service” in the [SUSE LINUX Enterprise Server 9 Administration Guide](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf) ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## Configuring an NFS Client

The Network File System (NFS) let you operate a file server that can be accessed by members of your network. On this file server, you can make programs, files, or storage space available for users. It does not matter which terminal users are logged in at, because they will always find themselves in the same environment.

NFS is an asymmetric service, meaning that there are NFS servers and NFS clients. A machine can be both; it can supply file systems over the network (export) and mount file systems from other hosts (import). Generally, these are servers with a very large hard disk capacity, whose file systems are mounted by other clients.

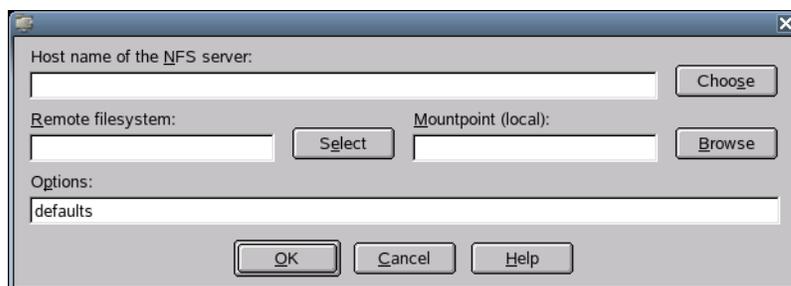
Any user authorized to do so can mount NFS directories from an NFS server into their own file tree. This is accomplished using the NFS Client module to enter the hostname of the NFS server, the directory to import, and the mount point to mount this directory at locally.

- 1 In the YaST Control Center, click *Network Services > NFS Client*.

A table appears containing all NFS entries which will be written to `/etc/fstab`.

- 2 Click *Add* or *Edit* to enter or edit the hostname of the NFS server, the directory to import, and the mount point to mount this directory to locally.

**Figure A-21** *Importing a File System*



- 3 Click *OK > Finish*.

For more information on `fstab`, type `man fstab` in a terminal window. For more information on NFS, see “Section 21.10: NFS — Shared File Systems” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## Configuring the NTP Client

NTP (Network Time Protocol) is a protocol for synchronizing the clocks of network hosts.

- 1 In the YaST Control Center, click *Network Services > NTP Client*.
- 2 To start the NTP daemon when the system is booted, click *When Booting System*.  
The NTP daemon resolves hostnames when initializing. Your network connection must be started before the NTP daemon starts.
- 3 To select the address of the NTP server, click the *NTP Server* drop-down list.  
To find an NTP server, ask your Internet provider or see [Public NTP Time Servers](http://www.eecis.udel.edu/~mills/ntp/servers.html) (<http://www.eecis.udel.edu/~mills/ntp/servers.html>).
- 4 To find NTP servers in the local network using the Service Location Protocol (SLP), click *Lookup*.
- 5 To configure this host to synchronize against multiple remote hosts or against a locally connected clock, click *Complex Configuration*.
- 6 Click *Finish*.

For more information, see “Section 21.12: Time Synchronization with xntp” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## Configuring Your Internet Proxy (Caching) Settings

Use this option to configure your Internet proxy (caching) settings.

- 1 In the YaST Control Center, click *Network Services > Proxy*.
- 2 Click *Enable Proxy*, then complete the following:

Option	Description
HTTP Proxy URL	The name of the proxy server for your access to the World Wide Web (WWW). For example, <code>http://proxy.provider.com:3128/</code> .
FTP Proxy URL	The name of the proxy server for your access to the file transfer services (FTP).
No Proxy Domains	A list of domains that the requests should be done for directly without caching.

- 3 (Conditional) If you are using a proxy server with authorization, fill in the Proxy User Name and Proxy Password fields.
- 4 Click *Finish*.

## Configuring Routing

In the YaST Control Center, click *Network Services > Routing*.

Use this option to set up routing. The Default Gateway matches every possible destination, but poorly. If any other entry exists that matches the required address, it is used instead of the default route. The idea of the default route is simply to let you say “and everything else should go here.”

Enable IP Forwarding if the system is a router.

The routing table is set up in Novell Linux Desktop via the `/etc/sysconfig/network/routes` and `/etc/sysconfig/network/ifroute-*` configuration files. All the static routes required by the various system tasks (routes to a host, routes to a host via a gateway, and routes to a network) can be entered in the `/etc/sysconfig/network/routes` file. For each interface that needs individual routing, define an additional configuration file: `/etc/sysconfig/network/ifroute-*`. Replace `*` with the name of the interface. The entries in the routing configuration files look like this:

```
DESTINATION GATEWAY NETMASK INTERFACE [TYPE] [OPTIONS]
DESTINATION GATEWAY PREFIXLEN INTERFACE [TYPE] [OPTIONS]
DESTINATION/PREFIXLEN GATEWAY - INTERFACE [TYPE] [OPTIONS]
```

To omit GATEWAY, NETMASK, PREFIXLEN, or INTERFACE, write `-` instead. The entries TYPE and OPTIONS can be omitted.

The route’s destination is in the first column. This column might contain the IP address of a network or host or, in the case of reachable name servers, the fully qualified network or hostname.

The second column contains the default gateway or a gateway that a host or a network can be accessed through.

The third column contains the netmask for networks or hosts behind a gateway. The mask is 255.255.255.255, for example, for a host behind a gateway.

The last column is relevant only for networks connected to the local host, such as loopback, Ethernet, ISDN, PPP, and dummy device. The device name must be specified here.

The following scripts in the `/etc/sysconfig/network/scripts/` directory assist with the handling of routes:

**Table A-5** *Route Handing Scripts*

Script	Description
ifup-route	Sets up a route.
ifdown-route	Disables a route.
ifstatus-route	Checks the status of the routes.

## Configuring a TFTP Server

Use this option to configure a server for TFTP (Trivial File Transfer Protocol). It is started using `xinetd`. To configure the TFTP server, the `xinetd` and `tfpt` packages must be installed. These packages are available on the Novell Linux Desktop CD 2.

- 1 In the YaST Control Center, click *Network Services* > *TFTP Server*.
- 2 Click *Enable*, then specify the directory where served files are located.  
The usual value is `/tftpboot`. It is created if it does not already exist. The server uses it as its root directory (using the `-s` option).
- 3 Click *Finish*.

## A.2.6 Security and Users

A basic aspect of Linux is its multiuser capability. Consequently, several users can work independently on the same Linux system. Each user has a user account identified by a 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.

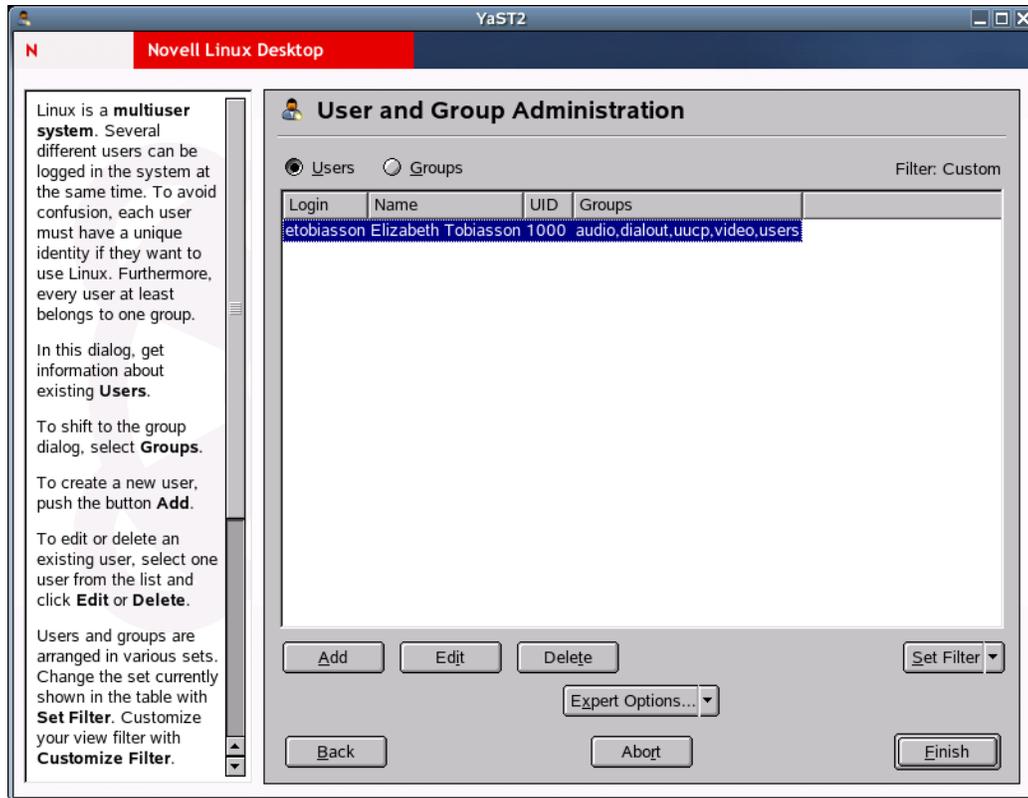
Use the Security and Users option to perform the following tasks:

- ♦ “Creating and Editing Users” on page 172
- ♦ “Creating and Editing Groups” on page 173
- ♦ “Configuring Local Security Settings” on page 173
- ♦ “Setting Up a Firewall” on page 175

## Creating and Editing Users

In the YaST Control Center, click *Security and Users > Edit and Create Users*.

**Figure A-22** User Administration Dialog



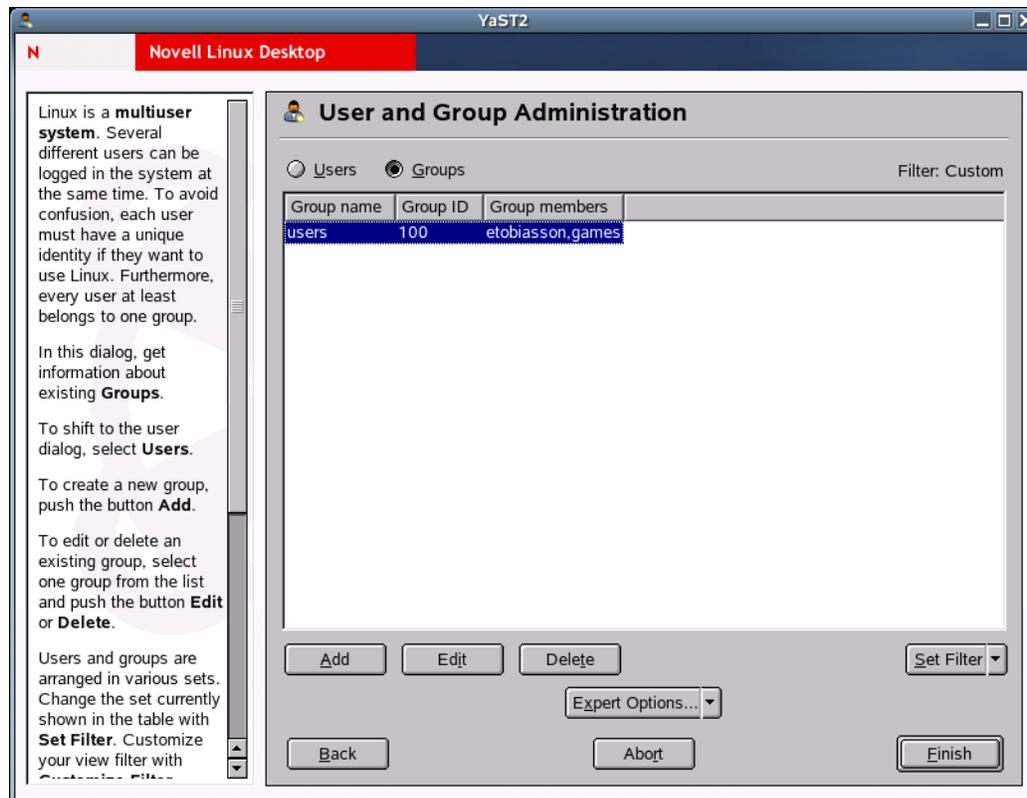
YaST provides an overview of all local users in the system. If you are part of an extensive network, click *Set Filter* to list all system users (for example, root) or NIS users. You can also create user-defined filter settings. Instead of switching between individual user groups, combine them according to your needs. To add new users, fill in the required blanks in the screen that follows. Subsequently, the new user can log in to the host with the login name and password. The user profile can be fine-tuned with *Details*. You can manually set the user ID, the home directory, and the default login shell. And you can assign the new user to specific groups.

Configure the validity of the password in *Password Settings*. Click *Edit* to change these settings whenever necessary. To delete a user, select the user from the list and click *Delete*. For advanced network administration, use *Expert Options* to define the default settings for the creation of new users. Select the authentication method (NIS, LDAP, Kerberos, or Samba) and the algorithm for the password encryption. These settings are relevant for large (corporate) networks.

## Creating and Editing Groups

In the YaST Control Center, click *Security and Users > Edit and Create Groups*.

**Figure A-23** Group Administration Dialog



You can start the Group Administration dialog from the YaST Control Center or by clicking *Groups* in the User Administration dialog. Both dialogs have the same functionality, allowing you to create, edit, or delete groups.

YaST provides a list of all groups. To delete a group, select it from the list (the line is highlighted dark blue) and click *Delete*. Under *Add* and *Edit*, specify the name, group ID (gid), and members of the group in the respective YaST screen. If you want, you can set a password for the change to this group. The filter settings are the same as in the User Administration dialog.

## Configuring Local Security Settings

- 1 In the YaST Control Center, click *Security and Users > Security Settings*.
- 2 In the Local Security Configuration dialog, select one of the following options:
  - ◆ Level 1 (Home Workstation) is for standalone computers (preconfigured).
  - ◆ Level 2 (Networked Workstations) is for workstations with a network (preconfigured).
  - ◆ Level 3 (Network Server) is for a server with a network (preconfigured).
  - ◆ Custom Settings is for your own configuration.

- 3 If you selected Level 1-3, incorporate one of the levels of preconfigured system security options by clicking *Finish*, or click *Details* to access the individual settings that can be modified.

or

If you selected Custom Settings, click *Next* to proceed to the following dialogs, in the order listed:

### **Password Settings**

For new passwords to be checked by the system before they are accepted, click *Checking New Passwords* and *Plausibility Test for Password*. Set the minimum and maximum length of passwords for newly created users. Define the period for which the password should be valid and how many days in advance an expiration alert should be issued when the user logs in to the text console.

### **Boot Settings**

Specify how the Ctrl+Alt+Del key combination should be interpreted by selecting the action from the drop-down list. Usually this key combination causes the system to reboot. Do not modify this setting unless your machine or server is publicly accessible and you are afraid someone could carry out this action without authorization. If you select Stop, this key combination causes the system to shut down. Ignore causes this key combination to be ignored. Specify the Shutdown Behavior of KDM by granting permission to shut down the system from the KDE Display Manager, the graphical login of KDE. Give permission to Only Root (the system administrator), All Users, Nobody, or Local Users. If Nobody is selected, the system can be shut down only via the text console.

### **Login Settings**

Typically, following a failed login attempt, there is a waiting period lasting a few seconds before another login is possible. This makes it more difficult for password sniffers to log in. You can also activate Record Failed Login Attempts and Record Successful Login Attempts. If you suspect someone is trying to discover your password, check the entries in the system log files in `/var/log`. With Allow Remote Graphical Login, other users are granted access to your graphical login screen via the network. However, this access possibility represents a potential security risk, so it is inactive by default.

### **Adding Users**

Every user has a numerical and an alphabetical user ID. The correlation between these is established via the `/etc/passwd` file 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 suitable for users. Proceed in the same way with the group ID settings.

### **Miscellaneous Settings**

For Setting of File Permissions, there are three options: Easy, Secure, and Paranoid. The first one should be sufficient for most users. The YaST help text provides information about the three security levels. The Paranoid setting is extremely restrictive and can serve as the basic level of operation for system administrator settings. If you select Paranoid, remember that some programs might not work correctly or at all because users no longer have the permissions to access certain files. In this dialog, you can also define which user should start the updatedb program. This program, which automatically runs on a daily basis or after booting, generates a database (locatedb) where the location of each file on your computer is stored. If you select Nobody, any user can find only the paths in the database that can be seen by any other (unprivileged) user. If root is selected, all local files

are indexed, because the user root, as superuser, can access all directories. Finally, make sure the Current Directory in Root's Path option is deactivated (default).

- 4 Click *Finish* to complete your security configuration.

## Setting Up a Firewall

In the YaST Control Center, click *Security and Users > Firewall*.

Use this module to configure SuSEfirewall2 to protect your machine against attacks from the Internet. Detailed information about SuSEfirewall2 can be found in “Section 26.3: Masquerading and Firewalls” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## A.2.7 Misc

Use the Misc option to perform the following tasks:

- ♦ “Configuring the System for Autoinstallation” on page 175
- ♦ “Viewing the System Log” on page 175
- ♦ “Installing a Driver from a Vender-Specific CD” on page 175
- ♦ “Viewing the Startup Log” on page 175

### Configuring the System for Autoinstallation

In the YaST Control Center, click *Misc > Autoinstallation*.

See [Appendix C, “Automatic Linux Installation and Configuration Using AutoYaST,”](#) on page 195 for more information.

### Viewing the System Log

In the YaST Control Center, click *Misc > View System Log*.

The system log logs the operations of your computer to `/var/log/messages`. Kernel messages are recorded here, sorted according to date and time.

### Installing a Driver from a Vender-Specific CD

In the YaST Control Center, click *Misc > Load Vender Driver CD*.

Use this module to automatically install device drivers from a Linux driver CD that contains drivers for Novell Linux Desktop. When installing Novell Linux Desktop from scratch, use this YaST module to load the required drivers from the vendor CD after the installation.

### Viewing the Startup Log

In the YaST Control Center, click *Misc > View Start-up Log*.

The boot log contains the screen messages displayed when the computer is started. It is logged to `/var/log/boot.msg`. Use this YaST module to view the log to, for example, check if all services and functions were started as expected.

## A.3 YaST in Text Mode (ncurses)

YaST can also be controlled by means of a text-based terminal. This is useful in the case of a system that cannot run the X Window System, or where X is not needed, such as a dedicated server or firewall machine. It is also useful for administrators remotely accessing a system.

The main window consists of three areas. The left frame, which is surrounded by a thick white border, features the categories that the various modules belong to. The active category is indicated by a colored background. The right frame, which is surrounded by a thin white border, provides an overview of the modules available in the active category. The bottom frame contains the Help and Exit buttons.

When the YaST Control Center is started, the Software category is selected automatically. Use the Up- and Down-arrows to change the category. To start a module from the selected category, press the Right-arrow. The module selection now appears with a thick border. Use the Up- and Down-arrows to select the module you want. Keep the arrow keys pressed to scroll through the list of available modules. When a module is selected, the module title appears with a colored background and a brief description is displayed in the bottom frame.

Press Enter to start a module. Various buttons or selection fields in the module contain a letter with a different color (yellow by default). Use `Alt+yellow_letter` to select a button directly instead of navigating there with the Tab key. Exit the YaST Control Center by pressing the Exit button or by selecting Exit in the category overview and then pressing Enter.

### A.3.1 Navigation in Modules

The following description of the control elements in the YaST modules assumes that all function keys and Alt key combinations work and are not assigned different global functions. See [“Restriction of Key Combinations” on page 177](#) for information about possible exceptions.

#### Navigation among Buttons and Selection Lists

Use Tab and Alt+Tab or Shift+Tab to navigate among the buttons and the frames containing selection lists.

#### Navigation in Selection Lists

Use the Up- and Down-arrow keys to navigate among the individual elements in an active frame containing a selection list (for example, among the individual modules of a module group in the Control Center).

If individual entries within a frame exceed its width, use Shift+Right-arrow or Shift+Left-arrow to scroll horizontally to the right or to the left. You can also use Ctrl+E or Ctrl+A. This combination can also be used if using the Right- and Left-arrow keys would result in changing the active frame or the current selection list, as in the Control Center.

#### Buttons, Radio Buttons, and Check Boxes

To select buttons with empty square brackets (check boxes) or empty parentheses (radio buttons), press the Space bar or Enter key. Radio buttons and check boxes can be selected directly with `Alt+yellow_letter`. In this case, you do not need to confirm with Enter.

If you navigate to an item with the Tab key, press Enter to execute the selected action or activate the respective menu item.

### **Function Keys**

The function keys (F1 to F12) enable quick access to the various buttons. Which function keys are actually mapped to which buttons depends on the active YaST module, because the different modules offer different buttons (Details, Info, Add, Delete, etc.). Use F10 for OK, Next, and Finish. Press F1 to access the YaST help which shows the functions mapped to the individual F keys.

## **A.3.2 Restriction of Key Combinations**

If your window manager uses global Alt combinations, the Alt combinations in YaST might not work. Keys like Alt or Shift can also be occupied by the settings of the terminal.

### **Replacing Alt with Esc**

Alt shortcuts can be executed with Esc instead of Alt. For example, Esc+H can replace Alt+H.

### **Backward and Forward Navigation with Ctrl+F and Ctrl+B**

If the Alt and Shift combinations are occupied by the window manager or the terminal, use the combinations Ctrl+F (forward) and Ctrl+B (backward) instead.

### **Restriction of Function Keys**

The F keys are also used for functions. Certain function keys might be occupied by the terminal and might not be available for YaST. However, the Alt key combinations and F keys should always be fully available on a pure text console.

## **A.3.3 Starting the Individual Modules**

To save time, the individual YaST modules can be started directly. To start a module, enter the following:

```
yast module_name
```

The network module, for example, is started by entering `yast lan`.

A list of all module names available on your system can be viewed with the following commands:

```
yast -l or yast --list
```



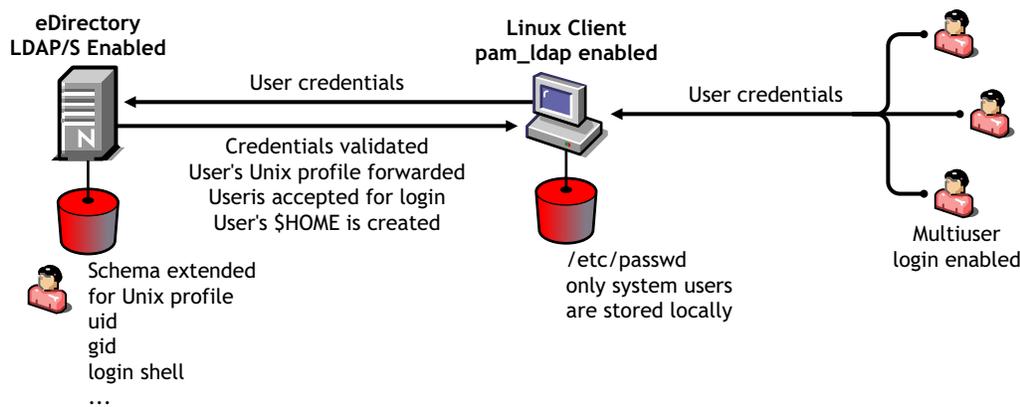
# Linux Authentication Using LDAP and eDirectory

# B

This appendix provides information on implementing Linux authentication against Novell® eDirectory™ (no local users) based on PAM and LDAP.

## B.1 Authentication Scheme

Figure B-1 Authentication Scheme



We recommend the following:

- ◆ Use LDAP APIs for cross-platform services that require accessing eDirectory objects and attribute information.
- ◆ Use PAM-ldap for native Linux applications for Linux authentication and authorization.
- ◆ Use DirXML® (del text, JDBC, JMS drivers) when applications are not directory enabled or PAM enabled, or cannot be customized.

## B.2 Server Configuration

- 1 Add multicast routing, using the following command:

```
route add -net 224.0.0.0 netmask 240.0.0.0 dev eth0
```

- 2 Add a fixed IP address and verify the DNS information.
- 3 Install eDirectory on the server.

See the *Novell eDirectory 8.7.3 Installation Guide* (<http://www.novell.com/documentation/edir873/index.html>) for more information.

#### 4 Update the PATH and MANPATH variables in /etc/profile.

**Figure B-2** /etc/profile File

```
edirlinux:~ # tail /etc/profile -n16
#
Variables de eDir 8.7.3
#
embox necesita jre
PATH=$PATH:/usr/lib/nds-modules/embox/jre/bin
export PATH

Novell LDAP Tools
PATH=$PATH:/usr/ldaptools/bin
export PATH

Novell MAN Pages
MANPATH=$MANPATH:/usr/man:/usr/ldaptools/man
export MANPATH
edirlinux:~ # █
```

#### 5 Configure eDirectory.

**Figure B-3** eDirectory Configuration

```
/bin:/usr/X11R6/bin:/bin:/usr/games:/opt/gnome/bin:/opt/kde3/bin:/usr/lib/java/
in:/usr/lib/nds-modules/embox/jre/bin:/usr/ldaptools/bin:/usr/lib/nds-modules/
box/jre/bin:/usr/ldaptools/bin
edirlinux:~ # man ndsconfig
Reformatting ndsconfig(8), please wait...
edirlinux:~ # ndsconfig def -t nwlab -n o=novell -a .cn=admin.o=novell -S edir.
nux
Enter the password for .cn=admin.o=novell:
Re-enter the password for .cn=admin.o=novell:
Starting the service 'ndsd' ... Done.
Configuring Novell eDirectory server with following parameters
 Admin name = .cn=admin.o=novell
 Tree name = nwlab
 Server Context = o=novell
 Server name = edirlinux
 dibdir path = /var/nds/dib

Searching for Duplicate Tree Name in the network. Please wait...
Configuring Novell eDirectory Server ...
█
```

## 6 Verify the eDirectory and the server status.

Figure B-4 eDirectory and Server Status

```
edirlinux:~ # /etc/init.d/nds status
Tree Name: NWLAB
Server Name: .CN=edirlinux.O=novell.T=NWLAB.
Binary Version: 10550.98
Root Most Entry Depth: 0
Product Version: NDS/Unix - NDS eDirectory v8.7.3 [DS]
edirlinux:~ # █
```

Proto	Recv-Q	Send-Q	Local Address	Foreign Address	State
tcp	0	0	0.0.0.0:32768	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:32769	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:2049	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:389	0.0.0.0:*	LISTEN
tcp	0	0	127.0.0.1:8008	0.0.0.0:*	LISTEN
tcp	0	0	192.168.74.128:8008	0.0.0.0:*	LISTEN
tcp	0	0	127.0.0.1:8010	0.0.0.0:*	LISTEN
tcp	0	0	192.168.74.128:8010	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:907	0.0.0.0:*	LISTEN
tcp	0	0	192.168.74.128:524	0.0.0.0:*	LISTEN
tcp	0	0	127.0.0.1:524	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:111	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:6000	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:6001	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:6002	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:631	0.0.0.0:*	LISTEN
tcp	0	0	127.0.0.1:25	0.0.0.0:*	LISTEN
tcp	0	0	0.0.0.0:636	0.0.0.0:*	LISTEN
tcp	0	0	192.168.74.128:524	192.168.74.128:32810	ESTABLISHED
tcp	0	0	192.168.74.128:524	192.168.74.128:32779	ESTABLISHED
tcp	0	0	192.168.74.128:524	192.168.74.128:32776	ESTABLISHED
tcp	0	0	192.168.74.128:524	192.168.74.128:32777	ESTABLISHED
tcp	0	0	192.168.74.128:524	192.168.74.128:32782	ESTABLISHED
tcp	0	0	192.168.74.128:32783	192.168.74.128:524	ESTABLISHED
tcp	0	0	192.168.74.128:32780	192.168.74.128:524	ESTABLISHED
tcp	0	0	192.168.74.128:32781	192.168.74.128:524	ESTABLISHED

```
Checking server: .edirlinux.novell
Address Type = TCP, data[6] = 192.168.74.128:524
Address Type = UDP, data[6] = 192.168.74.128:524
Checking server address in Replica ID : 1, .[Root].
Repairing replica ring
Start: Friday, April 09, 2004 16:50:40 Local Time

Replica Ring for replica: .[Root].
Remote server's local ID: 00032793
Remote server's replica root ID: 00032791
Remote server name is: .edirlinux.novell
OK - Authenticated to server
Finish: Friday, April 09, 2004 16:50:40 Local Time
Total repair time: 0:01:01
Total errors: 0
NDSRepair process completed.
edirlinux:~ # ndsrepair -U █
```

## 7 Install iManager 2.0.x.

For more information, see the [Novell iManager 2.0.x Administration Guide \(http://www.novell.com/documentation/imanager20/index.html\)](http://www.novell.com/documentation/imanager20/index.html).

## 8 Install ConsoleOne® 1.3.6 and snap-ins.

For more information, see the [ConsoleOne 1.3.x User Guide \(http://www.novell.com/documentation/consol13/index.html\)](http://www.novell.com/documentation/consol13/index.html).

You do not have to install a JRE if a previous one exists.

## 9 Add C1\_JRE\_HOME=/path/to/jre to the /etc/exports file.

## 10 Verify the server status and services.

**Figure B-5** Server Status and Services

```
Tasks: 164 total, 1 running, 163 sleeping, 0 stopped, 0 zombie
Cpu(s): 2.9% user, 10.6% system, 0.0% nice, 86.5% idle
Mem: 255828k total, 246456k used, 9372k free, 16856k buffers
Swap: 136512k total, 1060k used, 135452k free, 106436k cached
```

PID	USER	PR	NI	UIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
8141	root	21	0	1024	1024	764	R	28.4	0.4	0:00.48	top
5647	novlwww	15	0	75480	73m	18m	S	1.4	29.5	0:06.42	java
1	root	16	0	252	252	220	S	0.0	0.1	0:04.04	init

---

**NOTE:** This machine is not running XDM.

---

## B.3 eDirectory Configuration for Linux Client Authentication

- 1 Extend the eDirectory schema using the following command:

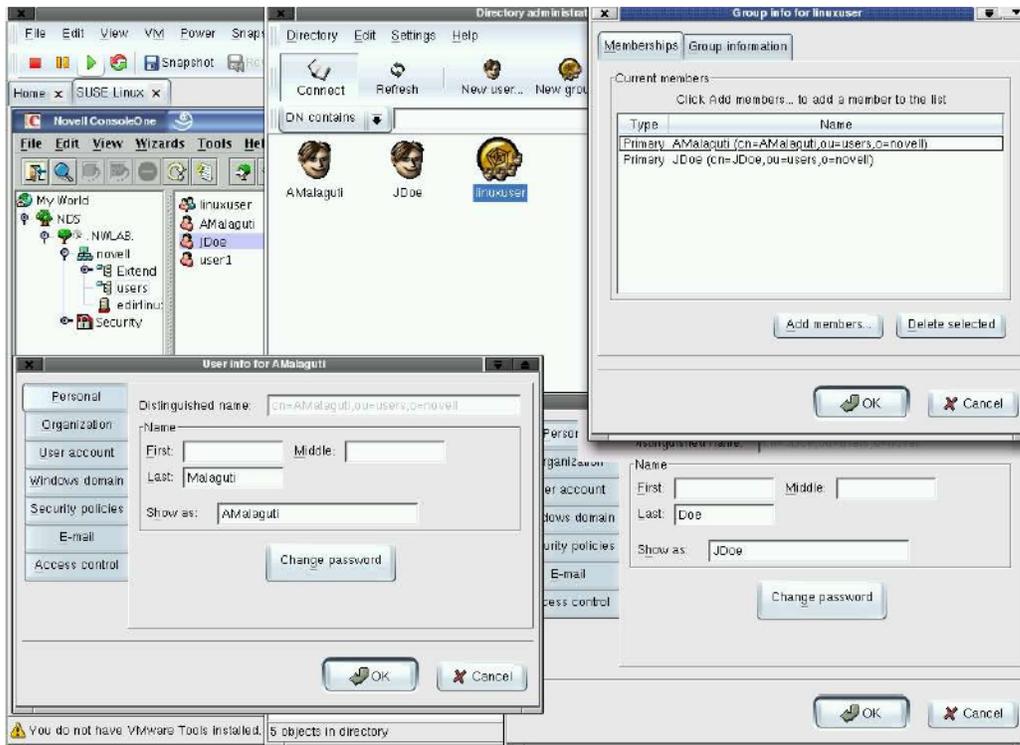
```
ndssch -h localhost -t treename cn=admin.o=novell \
rfc2307-usergroup.sch
```

- 2 Create an eDirectory group and add the posixGroup extension to it.  
These groups are used as primary groups for Linux users.
- 3 Create an eDirectory user and extend it with the posixAccount extension.
- 4 Populate the user's primary Group/GID with the posixGroup you created in [Step 2 on page 182](#).
- 5 After the user has been created, add the loginshell attribute.
- 6 Set loginshell to /bin/bash (or whatever shell you want).
- 7 Verify LDAP services with an LDAP tool such as `directory_administrator`, which lets you manage LDAP objects with UNIX profiles.

For example, in the following figure, there are three users but only two of them have been extended as posixAccount (Amalaguti and Jdoe). When an LDAP search is performed, only

these two users will be displayed. You will also see the primary group you created as posixGroup.

Figure B-6 *directory\_administrator LDAP Tool*



### B.3.1 LDAP Service Configuration

For testing purposes, do not allow clear text connections for a proxy user. Or, for testing purposes, configure a proxy user with Read and Compare rights over all attributes.

- 1 Create a proxy user for LDAP, set a null password for this user, and disable password changing.
- 2 Configure the LDAP Group to use the proxy user.
- 3 Enable TLS/SSL and validate the certificates, server IP address, and hostname.
- 4 Verify that ports 389 and 636 are not being blocked by a firewall.
- 5 Set proxy user tree browsing restrictions and limit proxy user visibility of eDirectory by granting specific rights to your tree.

Make the proxy user a trustee of [root] and give the proxy user the Browse entry right and the Read and Compare property rights on the following attributes:

- ♦ CN
- ♦ Description
- ♦ O
- ♦ OU
- ♦ Object Class
- ♦ dc

- ◆ gecos
- ◆ gidNumber
- ◆ homeDirectory
- ◆ loginShell
- ◆ memberUid
- ◆ uidNumber
- ◆ uniqueID

**6** Refresh the LDAP service and do an **LDAP trace** to verify that it is working fine.

## B.3.2 LDAP Trace

Figure B-7 LDAP Trace Results

```
16:22:11 94024 FFFFFFFF -1 LDAP: Refresh immediate has been issued from an NCP client
16:22:11 3800F FFFFFFFF -1 LDAP: ldapDefaultReferralBehavior: 2
16:22:11 3800F FFFFFFFF -1 LDAP: LDAP:searchReferralUsage: 1
16:22:11 3800F FFFFFFFF -1 LDAP: LDAP:otherReferralUsage: 1
16:22:11 3800F FFFFFFFF -1 LDAP: LDAP Allow Clear Text Password: TRUE
16:22:11 3800F FFFFFFFF -1 LDAP: LDAP Anonymous Identity: "CN=prxldp.O=novell"
16:22:11 3800F FFFFFFFF -1 LDAP: NDS attribute "NSCP:memberCertificateDesc" does not exist, mapping ignored
16:22:11 3800F FFFFFFFF -1 LDAP: NDS attribute "staticMember" does not exist, mapping ignored
16:22:11 3800F FFFFFFFF -1 LDAP: LDAP Referral: Not Defined
16:22:11 3800F FFFFFFFF -1 LDAP: referralIncludeFilter: Not Defined
16:22:11 3800F FFFFFFFF -1 LDAP: referralExcludeFilter: Not Defined
16:22:11 3800F FFFFFFFF -1 LDAP: LDAP Group: CN=LDAP Group · edirlinux.O=novell
16:22:11 3800F FFFFFFFF -1 LDAP: LDAP Screen Level: 29385
16:22:11 3800F FFFFFFFF -1 LDAP: searchSizeLimit: 0
16:22:11 3800F FFFFFFFF -1 LDAP: searchTimeLimit: 0
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP Server Bind Limit: 0
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP Server Idle Timeout: 0
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP Enable TCP: TRUE
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP Enable SSL: TRUE
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP TCP Port: 389
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP SSL Port: 636
16:22:12 3800F FFFFFFFF -1 LDAP: filteredReplicaUsage: 0
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP:keyMaterialName: "SSL CertificateIP"
16:22:12 3800F FFFFFFFF -1 LDAP: extensionInfo: OID:2.16.840.1.113719.1.142.100.1 lburp:ExtensionHandler
16:22:12 3800F FFFFFFFF -1 LDAP: extensionInfo: OID:2.16.840.1.113719.1.27.100.1 ldapxs:ExtensionHandler
16:22:12 3800F FFFFFFFF -1 LDAP: extensionInfo: OID:2.16.840.1.113719.1.39.42.100.1 nmasldap:ExtensionHandler
16:22:12 3800F FFFFFFFF -1 LDAP: nonStdClientSchemaCompatMode: 0
16:22:12 3800F FFFFFFFF -1 LDAP: ldapEnablePsearch: 1
16:22:12 3800F FFFFFFFF -1 LDAP: ldapMaximumPSearchOperations: 0
16:22:12 3800F FFFFFFFF -1 LDAP: ldapIgnorePSearchLimitsForEvents: 1
16:22:12 3800F FFFFFFFF -1 LDAP: ldapEnableMonitorEvents: 1
16:22:12 3800F FFFFFFFF -1 LDAP: ldapMaximumMonitorEventsLoad: 0
16:22:12 3800F FFFFFFFF -1 LDAP: ldapTLSRequired: FALSE
16:22:12 3800F FFFFFFFF -1 LDAP: ldapTLSVerifyClientCertificate: 0
16:22:12 3800F FFFFFFFF -1 LDAP: ldapDerefAlias: FALSE
16:22:12 3800F FFFFFFFF -1 LDAP: ldapNonStdAllUserAttrsMode: 1220218519
16:22:12 3800F FFFFFFFF -1 LDAP: ldapBindRestrictions: 0
16:22:12 3800F FFFFFFFF -1 LDAP: ldapTLSTrustedRootContainer: Not Defined
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP:searchReferralUsage: Not Defined
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP:otherReferralUsage: Not Defined
16:22:12 3800F FFFFFFFF -1 LDAP: ldapDefaultReferralBehavior: Not Defined
16:22:12 3800F FFFFFFFF -1 LDAP: LDAP Referral: Not Defined
16:22:12 3800F FFFFFFFF -1 LDAP: Updating server configuration
16:22:12 3400E FFFFFFFF -1 LDAP: Listener applying new configuration
16:22:17 4C014 FFFFFFFF -1 LDAP: Refresh immediate has been issued from an NCP client
16:22:17 3800F FFFFFFFF -1 LDAP: ldapDefaultReferralBehavior: 2
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP:searchReferralUsage: 1
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP:otherReferralUsage: 1
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Allow Clear Text Password: TRUE
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Anonymous Identity: "CN=prxldp.O=novell"
16:22:17 3800F FFFFFFFF -1 LDAP: NDS attribute "NSCP:memberCertificateDesc" does not exist, mapping ignored
16:22:17 3800F FFFFFFFF -1 LDAP: NDS attribute "staticMember" does not exist, mapping ignored
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Referral: Not Defined
16:22:17 3800F FFFFFFFF -1 LDAP: referralIncludeFilter: Not Defined
16:22:17 3800F FFFFFFFF -1 LDAP: referralExcludeFilter: Not Defined
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Group: CN=LDAP Group · edirlinux.O=novell
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Screen Level: 29385
16:22:17 3800F FFFFFFFF -1 LDAP: searchSizeLimit: 0
16:22:17 3800F FFFFFFFF -1 LDAP: searchTimeLimit: 0
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Server Bind Limit: 0
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Server Idle Timeout: 0
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Enable TCP: TRUE
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP Enable SSL: TRUE
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP TCP Port: 389
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP SSL Port: 636
16:22:17 3800F FFFFFFFF -1 LDAP: filteredReplicaUsage: 0
16:22:17 3800F FFFFFFFF -1 LDAP: LDAP:keyMaterialName: "SSL CertificateIP"
```

## B.3.3 Testing the Connection

To test your connection, use the `ldapsearch` command and verify the results.

The following figure shows the results of an anonymous LDAP search from a remote client searching for cn=amalaguti object, with no TLS/SSL. The following command was used:

```
linux:/home/amalaguti # ldapsearch -h 192.168.74.128 -x -b o=novell -s
sub "(cn=amalaguti)"
```

**Figure B-8** *ldapsearch Results*

```
extended LDIF
#
LDAPv3
base <o=novell> with scope sub
filter: (cn=amalaguti)
requesting: ALL
#

AMalaguti, novell
dn: cn=AMalaguti,o=novell
loginShell: /bin/bash
homeDirectory: /home/malaguti
gidNumber: 700
uidNumber: 600
uid: AMalaguti
Language: ENGLISH
sn: Malaguti
passwordAllowChange: TRUE
objectClass: inetOrgPerson
objectClass: organizationalPerson
objectClass: Person
objectClass: ndsLoginProperties
objectClass: Top
objectClass: posixAccount
loginTime: 20040410191121Z
cn: AMalaguti
cn: Adrian Malaguti
ACL: 2#subtree#cn=AMalaguti,o=novell#[All Attributes Rights]
ACL: 6#entry#cn=AMalaguti,o=novell#loginScript
ACL: 2#entry#[Public]#messageServer
ACL: 2#entry#[Root]#groupMembership
ACL: 6#entry#cn=AMalaguti,o=novell#printJobConfiguration
ACL: 2#entry#[Root]#networkAddress

search result
search: 2
result: 0 Success

numResponses: 2
numEntries: 1
```

## B.4 Linux Client Configuration

This sections contains the following information:

- ♦ “LDAP-based eDirectory Authentication” on page 186
- ♦ “X Window Authentication” on page 188
- ♦ “PAM Configuration Examples” on page 189

### B.4.1 LDAP-based eDirectory Authentication

LDAP-based eDirectory authentication requires the following files:

- ♦ /etc/ldap.conf

Configuration file for the pam\_ldap and nss\_ldap modules.

- ♦ /etc/openldap/ldap.conf

Holds configuration and default settings for OpenLDAP utilities. This file is not used for PAM configuration.

- 1 In the YaST Control Center, run the tool for authentication configuration by clicking *Network Services*.> *LDAP Client*.
- 2 Modify /etc/ldap.conf to suite your environment requirements.

Figure B-9 /etc/ldap.conf File

```
host 192.168.74.128
base o=novell
ldap_version 3
binddn cn=admin,o=novell
bindpw novell
scope sub
pam_check_host_attr no
pam_password nds
nss_map_attribute uniqueMember member
ssl no
nss_base_passwd o=novell
nss_base_shadow o=novell
nss_base_group o=novell
```

Testing configuration:  
No anonymous bind and clear  
text connection.  
Verify your LDAP service settings

- 3 Modify /etc/nsswitch.conf to suite your authentication order needs.

Figure B-10 /etc/nsswitch.conf File

```
passwd: files ldap
group: files ldap
```

- 4 Modify /etc/pam.d/login to suite your needs.

Figure B-11 Sample /etc/pam.d/login File

```
auth required pam_securetty.so
auth required pam_nologin.so
auth sufficient pam_ldap.so
auth required pam_unix_auth.so try_first_pass
auth requisite pam_unix2.so nullok #set_secrcp
auth required pam_homecheck.so
auth required pam_env.so
auth required pam_mail.so
account sufficient pam_ldap.so
account required pam_unix_acct.so
password required pam_cracklib.so
password required pam_ldap.so
session required pam_unix_session.so
session required pam_unix2.so none # debug or trace
session required pam_limits.so
session required pam_nkhomedir.so skel=/etc/skel umask=0022
```

- 5 Try LDAP auth first; if it fails, try local auth.

```
auth sufficient pam_ldap.soauth required pam_unix_auth.so
try_first_pass
```

- 6 Create the home directory \$HOME automatically during login if it doesn't already exist.

```
session required pam_mkhome.so skel=/etc/skel umask=0022
```

**Figure B-12** Creating &HOME Automatically

```
linux login: amalaguti
Password:
Creating directory '/home/malaguti'.
Creating directory '/home/malaguti/bin'.
Creating directory '/home/malaguti/Documents'.
Creating directory '/home/malaguti/public_html'.
Creating directory '/home/malaguti/.xemacs'.
Creating directory '/home/malaguti/.fonts'.
Last login: Sat Apr 10 02:22:02 on tty3
Have a lot of fun...
amalaguti@linux:~$ pwd
/home/malaguti
amalaguti@linux:~$ ls -lh
total 0
drwxr-xr-x 2 amalaguti linuxuser 48 2004-04-10 02:37 bin
drwxr-xr-x 2 amalaguti linuxuser 80 2004-04-10 02:37 Documents
drwxr-xr-x 2 amalaguti linuxuser 80 2004-04-10 02:37 public_html
```

## B.4.2 X Window Authentication

Modify `/etc/pam.d/xdm` (KDE) or `/etc/pam.d/gdm` (GNOME), following the same rules as `/etc/pam.d/login`.

### KDE Login Testing

- ◆ NDS/LDAP username: `cn=user1.ou=users.o=novell`
- ◆ NDS/LDAP password: `123`
- ◆ Local user `> /etc/passwd`: Not Available (authentication forwarded to eDirectory LDAP).
- ◆ User's `$HOME`: Not Available (will be created after login).
- ◆ Login KDE Prompt
- ◆ Username: `user1`
- ◆ Password: `123`

### KDE Login Background

1. LDAP query filtering “`user1`”.
2. User and password validation against eDirectory.
3. KDE Login's startups scripts begin running.
4. Service `pam.d/xdm` creates user's `$HOME` in local file system based on the user's UNIX profile.

## B.4.3 PAM Configuration Examples

Figure B-13 PAM Configuration Example 1

```
#
PAM NNLS
#
##PAM-1.0

This is required for console ownership access
session optional /lib/security/pam_console.so

#First try through NDS
auth sufficient /lib/security/pam_nam.so.0
account sufficient /lib/security/pam_nam.so.0
password sufficient /lib/security/pam_nam.so.0
session sufficient /lib/security/pam_nam.so.0

Fall back to flat file authentication, try first password first
auth required /lib/security/pam_securetty.so
auth required /lib/security/pam_pwdb.so shadow nullok try_first_pass
auth required /lib/security/pam_nologin.so
account required /lib/security/pam_pwdb.so
password required /lib/security/pam_cracklib.so
password required /lib/security/pam_pwdb.so nullok use_authtok md5 shadow
session required /lib/security/pam_pwdb.so
```

Figure B-14 PAM Configuration Example 2

```
#
PAM - Ldap login
#
##PAM-1.0
This file is auto-generated.
User changes will be destroyed the next time authconfig is run.
auth required /lib/security/pam_env.so
auth sufficient /lib/security/pam_unix.so likeauth nullok
auth required /lib/security/pam_deny.so

account required /lib/security/pam_unix.so

password required /lib/security/pam_cracklib.so retry=3 type=
password sufficient /lib/security/pam_unix.so nullok use_authtok md5 shadow
password required /lib/security/pam_deny.so

session required /lib/security/pam_limits.so
session required /lib/security/pam_unix.so
```

Figure B-15 PAM Configuration Example 3

```
PAM Login, source documentation

#%PAM-1.0
auth required pam_securetty.so
auth required pam_nologin.so
auth sufficient pam_ldap.so
auth required pam_unix2.so nullok try_first_pass #set_secrc
account sufficient pam_ldap.so
account required pam_unix2.so
password required pam_pwcheck.so nullok
password required pam_ldap.so use_first_pass use_authok
password required pam_unix2.so nullok use_first_pass use_authok
session required pam_unix2.so none # debug or trace
session required pam_limits.so
session required pam_env.so
session optional pam_mail.so
```

## B.5 Security

This sections contains the following information:

- ♦ “LDAP Proxy User” on page 190
- ♦ “Secure LDAP Connections with TLS/SSL” on page 190

### B.5.1 LDAP Proxy User

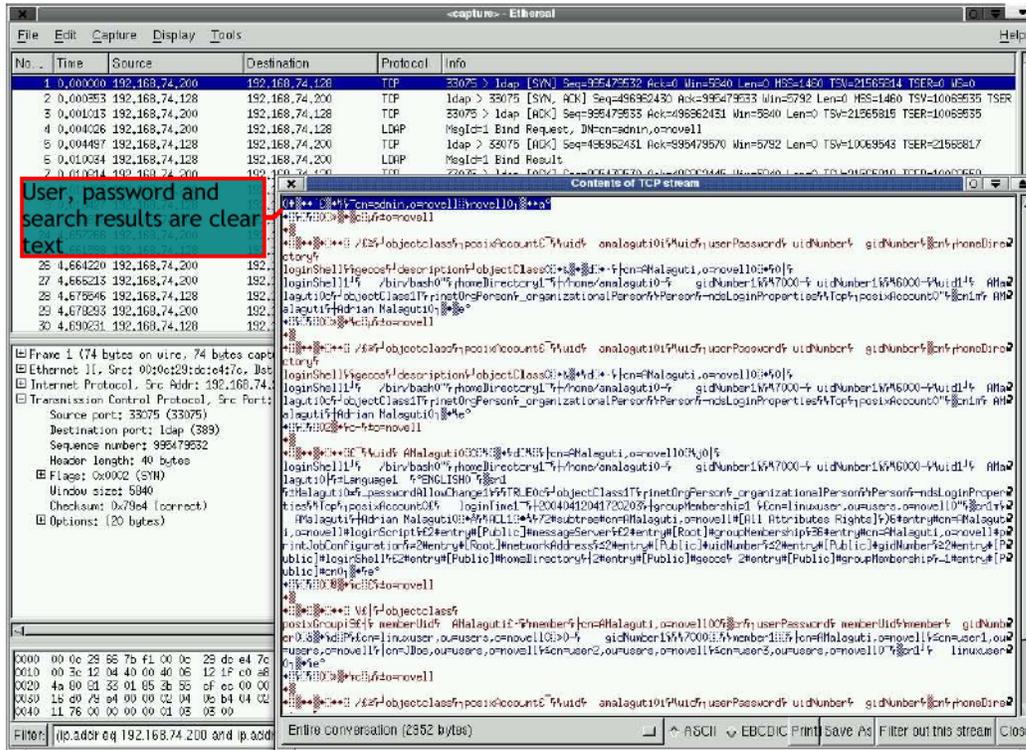
Create an LDAP proxy user and assign corresponding attributes. View the LDAP service configuration.

### B.5.2 Secure LDAP Connections with TLS/SSL

- 1 Use the `ldapsrch` command to perform a TLS-enabled search.

For example: `ldapsearch -h 10.0.0.100 -D cn=admin,o=novell -W -x -b -s one -ZZ`

**Figure B-16** Packet Capture and Trace of a Nonsecure (No TLS/SSL) Connection, Binding User `cn=admin,o=novell` with Password `novell` (No Proxy User)



## 2 Enable secure LDAP connections (TLS/SSL) on the server side.

- For the LDAP Group object, enable the Require TLS for Simple Binds with Password option.
- For the LDAP Server object, enable the Require TLS for All Operations option.

## 3 Enable secure LDAP connection on the client side (TLS).

In `/etc/ldap.conf`, set `ssl start_tls`.

**IMPORTANT:** LDAP bind with username and password is not required or recommended. Use anonymous bind (don't configure `#binddn` and `#bindpwd`).

Figure B-17 Encrypted Session

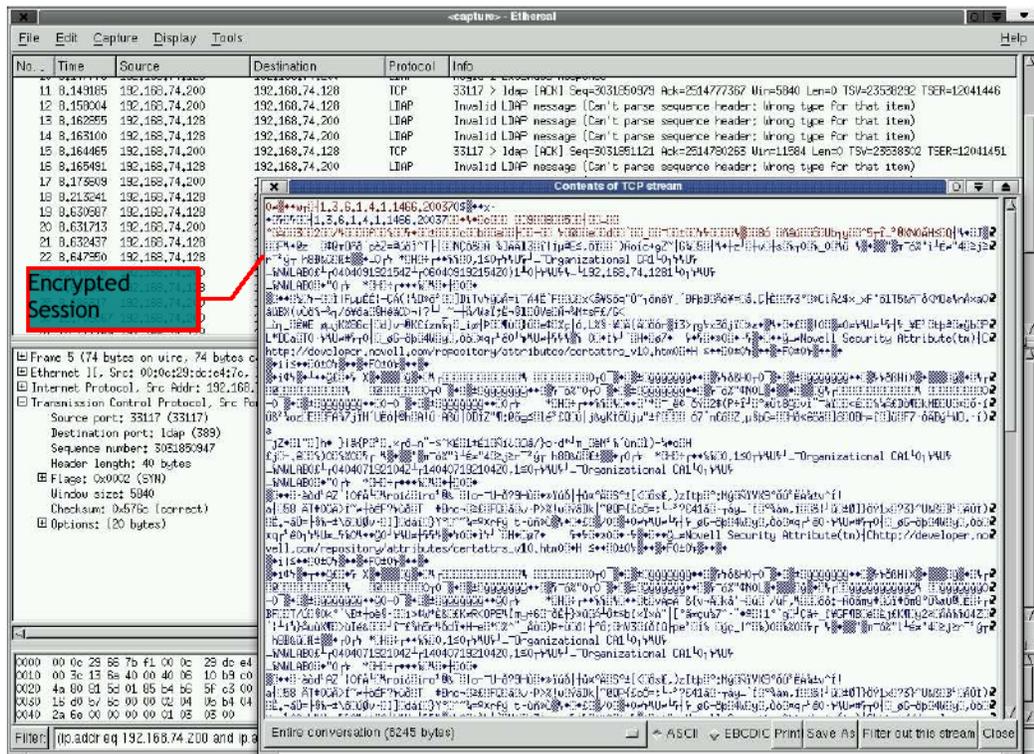


Figure B-18 LDAP Trace: TLS Enabled, Logged In As Username “amalguti,” LDAP Bind As admin.novell (No Anonymous Bind)



**Figure B-19** LDAP Trace: TLS Enabled, Logged In As Username “amalaguti,” Anonymous Bind

```

02:19:09.44012 LDAP: New cleartext connection 0x856e4d0 from 192.168.74.200:33131, monitor = 0x54016, index = -4
02:19:09.60026 LDAP: (192.168.74.200:33131):(0x0001:0x77) Implied anonymous bind by operation 0x1:0x77 on connection 0x856e4d0
02:19:09.60026 LDAP: (192.168.74.200:33131):(0x0001:0x77) DoExtended on connection 0x856e4d0
02:19:09.60026 LDAP: (192.168.74.200:33131):(0x0001:0x77) Start TLS request issued from connection 0x856e4d0
02:19:09.60026 LDAP: (192.168.74.200:33131):(0x0001:0x77) Sending operation result 0:"" to connection 0x856e4d0
02:19:09.74016 LDAP: Monitor 0x54016 initiating TLS handshake on connection 0x856e4d0
02:19:09.124027 LDAP: (192.168.74.200:33131):(0x0000:0x00) DoTLShandshake on connection 0x856e4d0
02:19:10.124027 LDAP: (192.168.74.200:33131):(0x0000:0x00) Completed TLS handshake on connection 0x856e4d0
02:19:10.60026 LDAP: (192.168.74.200:33131):(0x0002:0x60) DoBind on connection 0x856e4d0
02:19:10.124027 LDAP: (192.168.74.200:33131):(0x0000:0x00) Activating pending operation 0x2:0x60 on connection 0x856e4d0
02:19:10.6401A LDAP: (192.168.74.200:33131):(0x0002:0x60) DoBind on connection 0x856e4d0
02:19:10.6401A LDAP: (192.168.74.200:33131):(0x0002:0x60) Treating simple bind with empty DN and no password as anonymous
02:19:10.6401A LDAP: (192.168.74.200:33131):(0x0002:0x60) Bind name: NULL, version:3, authentication:simple
02:19:10.6401A LDAP: (192.168.74.200:33131):(0x0002:0x60) Sending operation result 0:"" to connection 0x856e4d0
02:19:10.60026 LDAP: (192.168.74.200:33131):(0x0003:0x63) DoSearch on connection 0x856e4d0
02:19:10.60026 LDAP: (192.168.74.200:33131):(0x0003:0x63) Search request:
 base: "o=novell"
 scope:2 dereference:0 sizelimit:1 timelimit:0 atrsonly:0
 filter: "((&(objectclass=posixAccount)(uidNumber=600))"
 attribute: "uid"
 attribute: "UserPassword"
 attribute: "uidNumber"
 attribute: "gidNumber"
 attribute: "cn"
 attribute: "homeDirectory"
 attribute: "loginShell"
 attribute: "gecos"
 attribute: "description"
 attribute: "objectClass"
02:19:10.60026 LDAP: (192.168.74.200:33131):(0x0003:0x63) Sending search result entry "cn=AMalaguti,o=novell" to connection 0x856e4d0

```

**4** Enable secure LDAP connection on the client side (SSL).

For PAM LDAP, edit /etc/ldap.conf and set SSL to On and Port to 636.

For OpenLDAP-based tools (such as ldapsearch), edit /etc/openldap/ldap.conf. OpenLDAP must be configured to allow self-signed certificates. To prevent certificate errors during TLS/SSL handshaking, set TLS\_REQCERT to Allow.

Some applications could require importing the Trusted Root Certificate. You can get it from ConsoleOne in DER format and execute this command:

```
#openssl x509 -in trustedroot.der -inform DER -out /etc/ssl/certs/trustedroot.pem -outform PEM
```

**5** Test the LDAP connection over TLS/SSL, using a command similar to the following:

```
#ldapsearch -H ldap://192.168.74.128 -x -b o=novell -s sub -Z
```

## B.6 PAM Module

The pam\_mount module allows users to have NCP™ (NetWare®), SMB (Windows/Samba), NFS, or loopback-encrypted volumes mounted on login, using the same passwords they typed to log in. A

remote volume can even be used as a user's \$HOME directory. Volumes mounted this way are automatically unmounted on logout.

**Figure B-20** *pam\_mount Utility*

```

/etc/pam.d/login [-----] 1 L:1 1+ 2 3/ 191 *(52 / 832b)= u 117 0x75
##PAM-1.0
auth required pam_securetty.so
auth required pam_nologin.so
auth required pam_mount.so debug
auth sufficient pam_ldap.so use_first_pass
#auth sufficient pam_ldap.so
auth required pam_unix2.so nullok
account sufficient pam_ldap.so
account required pam_unix2.so
password required pam_pwcheck.so nullok
password required pam_ldap.so use_first_pass use_authok
password required pam_unix2.so nullok use_first_pass use_authok
session required pam_unix2.so none # debug or trace
session required pam_limits.so
session required pam_env.so
session optional pam_mail.so
session required pam_mkhomedir.so skel=/etc/skel umask=0022
session required pam_mount.so use_first_pass debug

```

pam\_mount has the following two configuration files:

- ◆ /etc/security/pam\_mount.conf  
Global configuration file.
- ◆ \$HOME/.pam\_mount.conf  
Per user configuration file.

## B.7 ConsoleOne Snap-ins for UNIX Profile

These snap-ins are not recommended. In some instances, you might be unable to save changes to a user's UNIX Profile.

To install UNIX snap-ins for ConsoleOne:

- 1 Download the Account Management 2.1 Snap-in for ConsoleOne 1.3.5 from the [Novell Download \(http://download.novell.com\)](http://download.novell.com) site.
- 2 Unzip AccountManagementUnix.zip.
- 3 Copy unixSnapinRes.jar to ../ConsoleOne/resources.
- 4 Copy unixsnapin.jar to ../ConsoleOne/snapins/unix.

# Automatic Linux Installation and Configuration Using AutoYaST

# C

AutoYaST is a system for installing one or more Novell<sup>®</sup> Linux Desktop (NLD) systems automatically and without user intervention. AutoYaST installations are performed using a control file with installation and configuration data. The control file can be created using the configuration interface of AutoYaST and can be provided to YaST2 during installation in different ways.

Regular installation of NLD is semi-automated by default. The user is requested to select the necessary information at the beginning of the installation (in most cases, language only), then YaST2 generates a proposal for the underlying system depending on different factors and system parameters. In most cases, and especially for new systems, such a proposal can be used to install the system and provides a usable installation.

The steps following the proposal are fully automated and the user is prompted only at the end of the installation to configure hardware and network services.

AutoYaST can be used where no user intervention is required or where customization is required. Using a control file, YaST2 prepares the system for a custom installation and avoids any interaction with the user unless specified in the file controlling the installation.

AutoYaST is not an automated GUI system. In most cases, many screens are skipped (that is, you never see the language selection interface). AutoYaST simply passes the language parameter to the subsystem without displaying any language-related interface.

Using AutoYaST, multiple systems sharing the same environment and similar, but not necessarily identical, hardware performing similar tasks can easily be installed in parallel and in a short time. A configuration file (referred to as a control file) is created using existing configuration resources. The control file can be easily tailored for any specific environment.

AutoYaST is fully integrated and provides various options for installing and configuring a system. The main advantage over other auto-installation systems is the ability to configure a computer by using existing modules and avoiding using custom scripts which are normally executed at the end of the installation. This chapter guides you through the three steps of auto-installation:

## 1. Preparation

All relevant information about the target system is collected and turned into the appropriate directives of the control file. The control file is transferred onto the target system where its directives are parsed and transformed to YaST2 conforming data.

## 2. Installation

Follows the instructions given in the control file and installs the base system.

## 3. Configuration

YaST, in addition to user-defined post-install scripts, completes the system configuration.

## C.1 The Control File

The control file is a configuration description for a single system. It consists of sets of resources with properties including support for complex structures representations such as lists, records, trees, and large embedded or referenced objects.

### C.1.1 Format

The XML configuration format provides a consistent file structure, which is easier to learn and remember when attempting to configure a new system.

Using XML, you can eliminate nearly all of the configuration file parsing and error handling. An external XML parser can do that instead, especially if it is a validating parser. To make sure the control file is well formatted and that the syntax is valid, you can run the control file through a validating parser before it is actually used for automatic installation. This is required if you prefer to edit the profile manually.

The following example shows a control file in XML format:

```
<?xml version="1.0"?>
<!DOCTYPE profile SYSTEM
 "/usr/share/autoinstall/dtd/profile.dtd">
<profile
 xmlns="http://www.suse.com/1.0/YaSTns"
 xmlns:cfg="http://www.suse.com/1.0/configns">
 <install>
 <partitioning config:type="list">
 <drive>
 <device>/dev/hda</device>
 <partitions config:type="list">
 <partition>
 <filesystem config:type="symbol">ext2</filesystem>
 <size>520Mb</size>
 <mount>/</mount>
 </partition>
 <partition>
 <filesystem config:type="symbol">reiser</filesystem>
 <size>1200Mb</size>
 <mount>/data</mount>
 </partition>
 </partitions>
 </drive>
 </partitioning>
 </install>
 <configure>
 <scripts>
 <pre-scripts>
 <script>
 <interpreter>shell</interpreter>
 <filename>start.sh</filename>
 <source>
 <![CDATA[
#!/bin/sh
echo "Starting installation"
```

```

exit 0
]]>
 </source>
 </script>
</pre-scripts>
</scripts>
</configure>
</profile>

```

## C.1.2 Structure

The following is an example of a basic control file container, the actual content of which is explained later on in this chapter.

```

<?xml version="1.0"?>
<!DOCTYPE profile SYSTEM
 "/usr/share/autoinstall/dtd/profile.dtd">
 <profile
 xmlns="http://www.suse.com/1.0/YaSTns"
 xmlns:cfg="http://www.suse.com/1.0/configns">
<!-- RESOURCES -->
</profile>

```

The profile element (root node) contains one or more distinct resource elements. The permissible resource elements are specified in the DTD.

The root element in the control file can, for example, contain the following subkeywords:

- ♦ installation (Tag <install>)
  - ♦ **Bootloader configuration:** Bootloader device, bootloader location (Tag <bootloader>).
  - ♦ **Partitioning:** Drives and partition plans (Tag <partitioning>).
  - ♦ **General:** Installation instructions, including all variables related to the client, such as display, languages, and keyboard. (Tag <general>).
  - ♦ **Software:** Software and package selections (Tag <software>).
- ♦ configuration (Tag <configure>)
  - ♦ **Network:** Network configuration for the client and servers providing services to the target client (Tag <networking>).
  - ♦ **Users:** User administration, including first user and root (Tag <users>).
  - ♦ **User scripts:** (Tag <scripts>).

## Resources and Properties

A resource element contains multiple and distinct property and resource elements, or it contains multiple instances of the same resource element, or it is empty. The permissible content of a resource element is specified in the DTD.

A property element is either empty or it contains a literal value. The permissible property elements and values in each resource element are specified in the DTD.

An element can be either a container of other elements (a resource) or have a literal value (a property); it can never be both. This restriction is specified in the DTD. A configuration component

with more than one value must be represented either as some kind of embedded list in a property value or as a nested resource.

## Nested Resources

Nested resource elements allow a tree-like structure of configuration components to be built to any level.

```
...
<drive>
 <device>/dev/hda</device>
 <partitions config:type="list">
 <partition>
 <size>1000mb</size>
 <mount>/</mount>
 </partition>
 <partition>
 <size>250mb</size>
 <mount>/tmp</mount>
 </partition>
 </partitions>
</drive>
....
```

In the example above, the disk resource consists of a device property and a partitions resource. The partitions resource contains multiple instances of the partition resource. Each partition resource contains a size and mount property.

Although it is specified in the DTD that the partitions resource contains multiple instances, you must still specify this to avoid wrong data typing in YaST2. Using the example above, imagine having a drive with only one partition. This would result in interpreting the partition resource as a property. To avoid this, the following syntax must be used when defining multiple instances.

```
...
<drive>
 <device>/dev/hda</device>
 <partitions config:type="list">
 <partition>
 <size>1000</size>
 <mount>/</mount>
 </partition>
 <partition>
 <size>250</size>
 <mount>/tmp</mount>
 </partition>
 </partitions>
</drive>
....
```

For more information about type attributes, see [“Attributes” on page 198](#).

## Attributes

Global profile attributes are used to define metadata on resources and properties. Attributes are used to define context switching. They are also used for naming and typing properties. Profile attributes

are in a separate namespace so they don't have to be treated as reserved words in the default namespace. New ones can be added without having to potentially alter existing profiles.

Profile attributes are defined in the configuration namespace and must always be prefixed with `config:`. All profile attributes are optional. Most can be used with both resource and property elements, but some can be used only with one type of element, which is specified in the DTD.

The type of an element is defined using the `config:type` attribute. The type of a resource element is always `RESOURCE`, although this can also be made explicit with this attribute (to ensure correct identification of an empty element, for example, when there is no DTD to refer to). A resource element cannot be any other type, and this restriction is specified in the DTD. The type of a property element determines the interpretation of its literal value. The type of a property element defaults to `STRING`, as specified in the DTD. The full set of permissible types is also specified in the DTD.

### C.1.3 The XML Document Type Definition (DTD)

The purpose of a DTD is to define the legal building blocks of an XML document. It defines the document structure with a list of legal elements. A DTD can be declared inline in the XML document, or as an external reference.

XML provides an application-independent way of sharing data. With a DTD, the application can use a standard DTD to verify that the data the user supplies is valid. A “Valid” XML document is a “Well Formed” XML document which conforms to the rules of a Document Type Definition (DTD).

In AutoYaST, a DTD should be available to allow users to validate the control files before the installation process is initiated. The DTD can be also used with XML editors while editing the control file to avoid later errors.

#### Example DTD

- ◆ A *drive* resource containing a *device* property and a *partitions* property represented as a nested resource.
- ◆ A *partitions* resource containing multiple instances of the *partition* property represented as a nested resource.
- ◆ A *partition* resource containing a *size* property and a *mount* property.

Below is the XML for an sample node view profile which includes a DTD that validates it.

```
<?xml version="1.0"?>
<!DOCTYPE profile [
<!ELEMENT profile (install)>
<!ELEMENT install (partitioning)>
<!ELEMENT partitioning (drive+)>
<!ELEMENT drive (device,partitions)>
<!ELEMENT device (#PCDATA)>
<!ELEMENT partitions (partition*)>
<!ELEMENT partition (size,mount)>
<!ELEMENT size (#PCDATA)>
<!ELEMENT mount (#PCDATA)>
]>
<profile>
.....
 <install>
 <partitioning config:type="list">
```

```

<drive>
 <device>
 /dev/hda
 </device>
 <partitions>
 <partition>
 <size>1000mb</size>
 <mount>/</mount>
 </partition>
 <partition>
 <size>250mb</size>
 <mount>/tmp</mount>
 </partition>
 </partitions>
</drive>
</partitioning>
</install>
.....
</profile>

```

## C.2 Creating a Control File

In order to create a control file, first you need to collect information about the systems you are going to install. Make sure you know the following about the machines you want to install:

- ◆ Hard disk types and sizes
- ◆ Graphic interface and attached monitor (if any)
- ◆ Network interface and MAC address, if known (that is, when using DHCP)

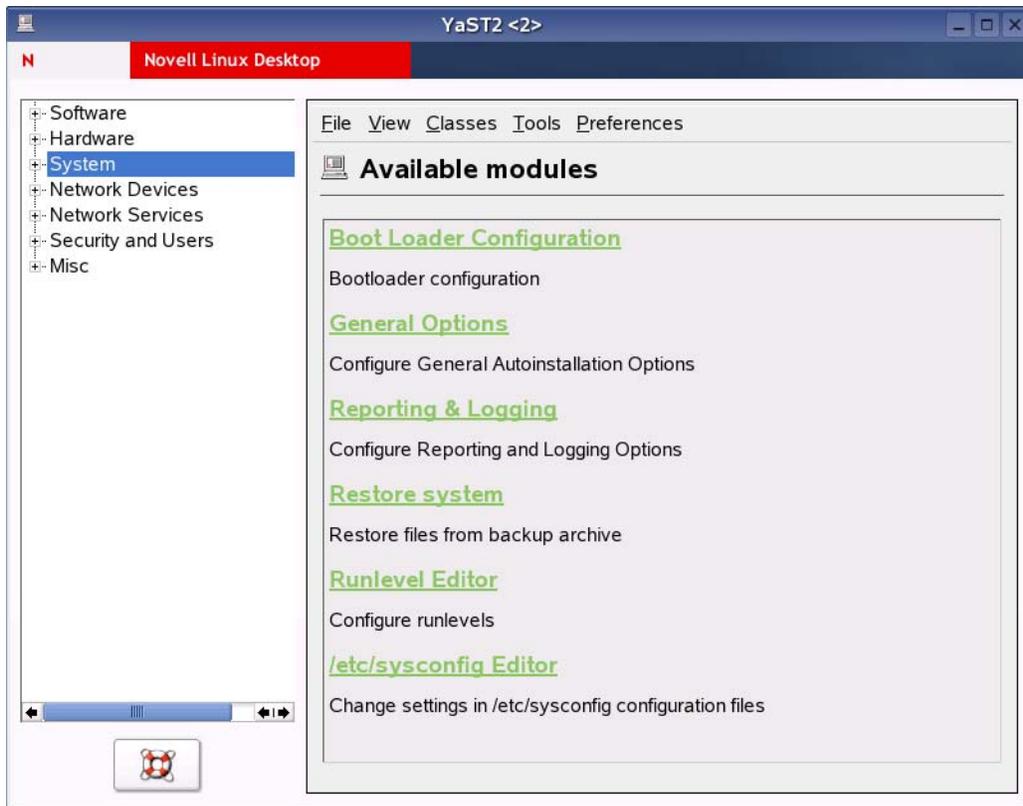
With these parameters, you are ready to create a profile of your systems to control the auto-installation process.

### C.2.1 Using the Configuration Management System

In order to create the control file for one or more computers, a configuration interface based on YaST2 is provided. This system depends on existing modules which are normally used to configure a computer in regular operation mode (that is, after Novell Linux Desktop is installed).

The configuration management system lets you create control files easily, and it also lets you manage a repository of configurations for use in a networked environment and with multiple clients.

**Figure C-1** Configuration Management System



## Creating a New Profile

With some exceptions, almost all resources of the control file can be configured using the configuration management system. The system offers flexibility, and configuration of some resources is identical to that available in the YaST2 Control Center. In addition to the existing and familiar modules, new interfaces have been created for special and complex configurations (for example, for partitioning, general options, and software).

Furthermore, using the configuration management system guarantees that the resulting control file is valid and ensures that it can be used directly to start automated installation.

Make sure the configuration system is installed (package `autoyast`) and call it either using the YaST2 Control Center or directly as root with the following command (make sure the `DISPLAY` variable is set correctly to start the graphical user interface instead of the text-based one):

```
yast2 autoyast
```

## Importing Legacy and Foreign Configuration Files

AutoYaST lets you import ALICE configuration files from previous SUSE® releases and foreign auto-installation systems such as Kickstart. See [“Legacy and Foreign Configuration Formats” on page 248](#) for more information.

## C.2.2 Manually Creating or Editing a Control File

If you edit the control file manually, make sure it has a valid syntax. To check the syntax, use some tools available on the distribution. For example, to verify that the file is well formed, use the `xmllint` utility available with the `libxml2` package:

```
xmllint control_file
```

If the control file is not well formed (that is, if a tag is not closed), `xmllint` reports the errors.

Before going on with the auto-installation, please fix any errors resulting from such checks. The autoinstallation process can't start with an invalid and non-well formed control file.

You can use any XML editor available on your system or use your favorite text editor with XML support (for example, Emacs or Vim). However, it is not optimal to create the control file manually for a large number of machines, and it should be seen only as an interface between the auto-installation engine and the Configuration Management System (CMS).

## C.3 Configuration and Installation Options

This section introduces important parts of a control file for standard purposes. To get an idea of the other options available, use the configuration management system.

For some of the configuration options to work, additional packages must be installed, depending on the software selection you have configured. If you choose to install Minimal, some packages might be missing and they have to be added to the individual package selection.

YaST installs packages required by YaST modules in the second phase of the installation and before the post-installation phase of AutoYaST has started. However, if the YaST modules are not available in the system, this does not happen. For example, no security settings are configured if `yast2-security` is not installed.

### C.3.1 General Options

This is a required section of the profile. General options include all the settings related to the installation process and the environment of the installed system. The following four properties which are required for almost any installation are also included: `language`, `keyboard`, `clock`, and `mouse`. If these are left out, their default values are used.

```
<install>
 <general>
 <clock>
 <hwclock>UTC</hwclock>
 <timezone>US/Eastern</timezone>
 </clock>
 <keyboard>
 <keymap>german</keymap>
 </keyboard>
 <language>de_DE</language>
 <mode>
 <confirm config:type="boolean">true</confirm>
 <forceboot config:type="boolean">>false</forceboot>
 </mode>
 <mouse>
 <device>/dev/psaux</device>
```

```

 <id>ps0</id>
 </mouse>
</general>
</install>

```

By default, the auto-installation process must be confirmed by the user (see the `confirm` property). The confirmation should be disabled if a fully unattended installation is desired. This option is used to view and change the settings on a target system before anything is committed and can be used for debugging. It is set to `True` by default to avoid recursive installs when the system schedules a reboot after initial system setup.

After initial installation, all systems must boot.

It is possible to halt the system after the initial installation phase by using the boolean `halt` property.

## C.3.2 Reporting

The report resource manages three types of pop-ups that can appear during installation.

- ◆ `messages` (usually noncritical, informative messages)
- ◆ `warning` (if something might go wrong)
- ◆ `error` (in case of an error)

```

<install>
 <report>
 <messages>
 <show config:type="boolean">true</show>
 <timeout config:type="integer">10</timeout>
 <log config:type="boolean">true</log>
 </messages>
 <errors>
 <show config:type="boolean">true</show>
 <timeout config:type="integer">10</timeout>
 <log config:type="boolean">true</log>
 </errors>
 <warnings>
 <show config:type="boolean">true</show>
 <timeout config:type="integer">10</timeout>
 <log config:type="boolean">true</log>
 </warnings>
 </report>
</install>

```

You can `skip`, `log`, and `show` (with `timeout`) these messages. We recommend showing all messages with `timeout`. Warnings can be skipped in some places but should not be ignored.

By default, the settings in auto-installation mode show all messages without logging and with a timeout of 10 seconds.

All messages during installation are controlled by the report resource. Some critical messages concerning package installation and partitioning still show up, ignoring your settings in the report section. Those messages mostly have to be answered with `Yes` or `No`.

### C.3.3 The Boot Loader

If the bootloader resource is not configured, the system proposes a configuration depending on the partitioning scheme. In some cases, you must decide where to install the bootloader (the Master Boot Record or the first sector of the `/boot` partition) and you must specify additional options for the bootloader to be installed correctly.

You can also configure special kernel and boot parameters. Kernel parameters can be configured using the `kernel_parameters` property.

```
<?xml version="1.0"?>
<!DOCTYPE profile SYSTEM "/usr/share/autoinstall/dtd/profile.dtd">
<profile xmlns="http://www.mycompany.com/1.0/yast2ns"
xmlns:config="http://
www.mycompany.com/1.0/configs">
 <install>
 <bootloader>
 <global config:type="list">
 <global_entry>
 <key>prompt</key>
 <value config:type="boolean">>false</value>
 </global_entry>
 </global>
 <loader_device></loader_device>
 <loader_type>lilo</loader_type>
 <location>mbr</location>
 <sections config:type="list"/>
 </bootloader>
 </install>
</profile>
```

The `global` resource is used to configure additional boot loader options. Bootloaders can have different configurable options. Consult the documentation for the specific bootloader you want to use before adding any options.

For example, to configure the serial console with GRUB, add the following options:

```
<bootloader>
 <global config:type="list">
 <global_entry>
 <key>serial</key>
 <value>--unit=1--speed=115200</value>
 </global_entry>
 <global_entry>
 <key>terminal</key>
 <value>serial console</value>
 </global_entry>
 </global>
 <loader_type>grub</loader_type>
 <location></location>
</bootloader>
```

---

**TIP:** The bootloader configuration interface offers more configuration options than you might need for a regular setup. The options described in the example above should be sufficient for most cases.

---

In the current version, bootloader configuration also supports different architectures and boards. The configuration of the bootloader can be done offline using AutoYaST. For example, the bootloader configuration for PPC has the following additional options:

```
<?xml version="1.0"?>
<!DOCTYPE profile SYSTEM "/usr/share/autoinstall/dtd/profile.dtd">
<profile xmlns="http://www.mycompany.com/1.0/yast2ns"
xmlns:config="http://
 /www.mycompany.com/1.0/configns">
 <install>
 <bootloader>
 <board_type>iseries</board_type>
 <global config:type="list"/>
 <iseries_streamfile>/boot/suse_linux_bootfile</
iseries_streamfile>
 <iseries_write_prepboot config:type="boolean">>true</
 iseries_write_prepboot>
 <iseries_write_slot_a config:type="boolean">>true<
 /iseries_write_slot_a>
 <iseries_write_slot_b config:type="boolean">>true<
 /iseries_write_slot_b>
 <iseries_write_streamfile config:type="boolean">>true</
 iseries_write_streamfile>
 <loader_device>B</loader_device>
 <loader_type>ppc</loader_type>
 <location></location>
 <prep_boot_partition>/dev/hda1</prep_boot_partition>
 </bootloader>
 </install>
</profile>
```

The following bootloaders can be configured offline using the AutoYaST interface:

- ◆ LILO
- ◆ GRUB
- ◆ ELILO
- ◆ zipl
- ◆ yaboot

### C.3.4 Partitioning

This section contains the following information:

- ◆ [“Automated Partitioning” on page 206](#)
- ◆ [“Advanced Partitioning Features” on page 207](#)
- ◆ [“Using Existing Mount Table \(fstab\)” on page 212](#)
- ◆ [“Logical Volume Manager \(LVM\)” on page 213](#)
- ◆ [“Software RAID” on page 215](#)

## Automated Partitioning

For the automated partitioning to be completed, only the sizes and mount points of partitions can be provided. All other data needed for successful partitioning can be calculated during installation if they were not provided in the control file.

If no partitions are defined and the specified drive is also the drive where the root partition should be created, the following partitions are created automatically:

### **/boot**

Size of the `/boot` is determined by the architecture of the target system.

### **swap**

Size of the `swap` partitions is determined by the amount of memory available in the system.

### **/ (root partition)**

Size of the `/` (root partition) is the space left after creating `swap` and `/boot`.

Depending on the initial status of the drive and how it was previously partitioned, it is possible to create the default partitioning in the following ways:

### **Use free space**

If the drive is already partitioned, it is possible to create the new partitions using the available space on the hard drive. This requires the availability of enough space for all selected packages in addition to swap.

### **Reuse all available space**

This option deleted all existing partitions (both Linux and non-Linux).

### **Reuse all available Linux partitions**

This option deletes existing Linux partitions. All other partitions (such as Windows) are kept. This works only if the Linux partitions are at the end of the device.

### **Reuse only specified partitions**

This option deletes the specified partitions. The selection of the partitions scheduled for deletion should be started from the last available partition.

Repartitioning using only some of the existing partitions can be accomplished only if the region selected to be partitioned exists at the end of the device and only with neighboring partitions. This means that you cannot repartition a region which contains a partition that should not be touched in the middle.

---

**IMPORTANT:** The value provided in the `use` property determines how existing data and partitions are treated. The `all` value means that *all* data on the disk will be erased. Make backups and use the `confirm` property if you are going to keep some partitions with important data. This is an automated installation and no pop-ups will notify you about partitions being deleted.

---

In case of the presence of multiple drives in the target system, all drives must be identified with their device names and how the partitioning should be performed.

Partition sizes can be given in gigabytes (GB) or megabytes (MB), or can be set to a flexible value using the keywords `auto` and `max`. `Max` is used to fill a partition to the maximal available space on a drive (which mean that the partition should be the last one on the drive). `Auto` can be used to

determine the size of a swap or boot partition depending on the memory available and the type of the system.

A fixed size can be given as shown below:

- ♦ 1GB creates a partition with a 1 GB size.
- ♦ 1500MB creates a partition which is 1.5 GB big.

The following is an example of a single-drive system, which is not prepartitioned and should be automatically partitioned according to the described predefined partition plan:

```
<partitioning config:type="list">
 <drive>
 <device>/dev/hda</device>
 <use>all</use>
 </drive>
</partitioning>
```

A more detailed example shows how existing partitions and multiple drives are handled:

```
<partitioning config:type="list">
<drive>
<device>/dev/hda</device>
<partitions config:type="list">
<partition>
<mount>/</mount>
<size>5gb</size>
</partition>
<partition>
<mount>swap</mount>
<size>1gb</size>
</partition>
</partitions>
</drive>
<drive>
<device>/dev/hdb</device>
<use>all</use>
<partitions config:type="list">
<partition>
<filesystem config:type="symbol">reiser</filesystem>
<mount>/data1</mount>
<size>15gb</size>
</partition>
<partition>
<filesystem config:type="symbol">jfs</filesystem>
<mount>/data2</mount>
<size>auto</size>
</partition>
</partitions>
<use>free</use>
</drive>
</partitioning>
```

## Advanced Partitioning Features

This section covers advanced partitioning including LVM and RAID configuration.

## Mount Options

By default, a file system which is to be mounted is identified in `/etc/fstab` by the device name. This identification can be changed so the file system is found by searching for a UUID or a volume label. Not all file systems can be mounted by UUID or a volume label. To specify how a partition is to be mounted, use the `mountby` property, which has the symbol type.

Possible options:

- ◆ device (default)
- ◆ label
- ◆ UUID

If you choose to mount the partition using a label, the name specified in the label property is used as the volume label.

Add any legal mount option allowed in the fourth field of `/etc/fstab`. Multiple options are separated by commas (`,`). Possible `fstab` options include the following:

**Table C-1** *fstab Options*

Option	Description
Mount Read-Only ( <code>ro</code> )	No writable access to the file system is possible. Default=False
No Access Time ( <code>noatime</code> )	Access times are not updated when a file is read. Default=False
Mountable by User ( <code>user</code> )	The file system can be mounted by an ordinary user. Default=False
Data Journaling Mode ( <code>ordered   journal   writeback</code> )	Specifies the journaling mode for file data. <ul style="list-style-type: none"><li>◆ <b>journal</b>: All data is committed into the journal prior to being written into the main file system.</li><li>◆ <b>ordered</b>: All data is forced directly out to the main file system prior to its metadata being committed to the journal.</li><li>◆ <b>writeback</b>: Data ordering is not preserved.</li></ul>
Access Control List ( <code>acl</code> )	Enable access control lists on the file system.
Extended User Attributes ( <code>user_xattr</code> )	Allow extended user attributes on the file system.

```
<partitions config:type="list">
 <partition>
 <filesystem config:type="symbol">reiser</filesystem>
 <format config:type="boolean">>true</format>
 <fstopt>ro,noatime,user,data=ordered,acl,user_xattr</fstopt>
 <mount>/local</mount>
 <mountby config:type="symbol">uuid</mountby>
 <partition_id config:type="integer">131</partition_id>
 <size>10gb</size>
```

```
</partition>
</partitions>
```

## Creating Primary and Extended Partitions

By default, AutoYaST creates an extended partition and adds all other new partitions as logical devices. It is possible, however, to instruct AutoYaST to create a certain partition as a primary or extended partition. Additionally, it is possible to specify the size of a partition using sectors instead of the size in MB.

The `partition_id` and `partition_type` properties control this behavior. To specify the size in sectors, the `list` resource region can be used.

```
<partitioning config:type="list">
 <drive>
 <device>/dev/hdc</device>
 <partitions config:type="list">
 <partition>
 <partition_id config:type="integer">5</partition_id>
 <region config:type="list">
 <region_entry config:type="integer">0</region_entry>
 <region_entry config:type="integer">16858</region_entry>
 </region>
 </partition>
 <partition>
 <filesystem config:type="symbol">reiser</filesystem>
 <mount>/</mount>
 <partition_id config:type="integer">131</partition_id>
 <region config:type="list">
 <region_entry config:type="integer">0</region_entry>
 <region_entry config:type="integer">2081</region_entry>
 </region>
 </partition>
 <partition>
 <mount>swap</mount>
 <partition_id config:type="integer">130</partition_id>
 <region config:type="list">
 <region_entry config:type="integer">2081</region_entry>
 <region_entry config:type="integer">781</region_entry>
 </region>
 </partition>
 </partitions>
 <use>all</use>
 </drive>
</partitioning>
```

The above example makes sense only if you know the exact boundaries of the partitions and if you are creating an exact copy of a system (for example, when cloning). The first region entry in the list is the beginning of the region, and the second represents the length of the region.

The following example lets you create an extended partition with a custom size:

```
<partitioning config:type="list">
 <drive>
 <device>/dev/hdc</device>
 <partitions config:type="list">
```

```

<partition>
 <filesystem config:type="symbol">ext2</filesystem>
 <mount>/boot</mount>
 <partition_id config:type="integer">131</partition_id>
 <partition_nr config:type="integer">2</partition_nr>
 <size>50mb</size>
</partition>
<partition>
 <mount>swap</mount>
 <partition_id config:type="integer">130</partition_id>
 <partition_nr config:type="integer">3</partition_nr>
 <size>100mb</size>
</partition>
<partition>
 <partition_id config:type="integer">15</partition_id>
 <partition_nr config:type="integer">4</partition_nr>
 <size>3000mb</size>
</partition>
<partition>
 <filesystem config:type="symbol">ext2</filesystem>
 <mount>/</mount>
 <partition_id config:type="integer">131</partition_id>
 <partition_nr config:type="integer">5</partition_nr>
 <size>1gb</size>
</partition>
</partitions>
<use>free</use>
</drive>
</partitioning>
</install>

```

## Keeping Specific Partitions

In some cases, you might choose to keep some partitions untouched and format only specific target partitions, rather than creating them from scratch. This might be the case if Linux installations have to coexist with another operating system, or if certain partitions contain data that you want to keep untouched.

Such scenarios require a certain knowledge of the target systems and hard drives. Depending on the scenario, you might need to know the exact partition table of the target hard drive with partition IDs, sizes, and numbers. With this data, you can tell AutoYaST to keep certain partitions, format others, and create new partitions if needed.

The following example keeps partitions 1, 2, and 5 and deletes partition 6 to create two new partitions. Only all kept partitions are formatted.

```

<install>
 <partitioning config:type="list">
 <drive>
 <device>/dev/hdc</device>
 <partitions config:type="list">
 <partition>
 <create config:type="boolean">>false</create>
 <format config:type="boolean">>true</format>
 <mount>/</mount>

```

```

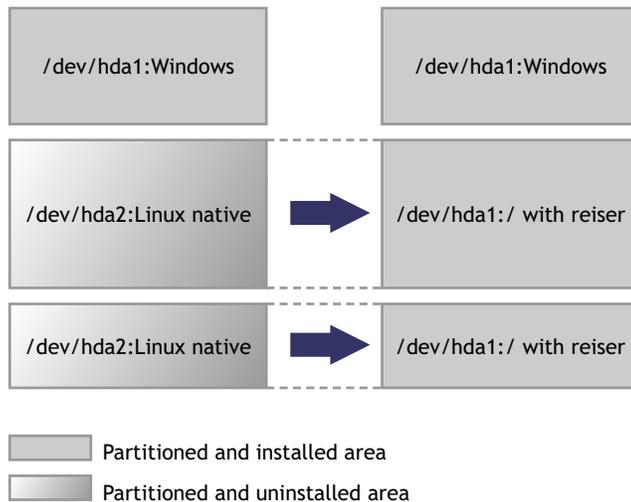
 <partition_nr config:type="integer">1</partition_nr>
</partition>
<partition>
 <create config:type="boolean">>false</create>
 <format config:type="boolean">>false</format>
 <partition_nr config:type="integer">2</partition_nr>
 <mount>/space</mount>
</partition>
<partition>
 <create config:type="boolean">>false</create>
 <format config:type="boolean">>true</format>
 <filesystem config:type="symbol">swap</filesystem>
 <partition_nr config:type="integer">5</partition_nr>
 <mount>swap</mount>
</partition>
<partition>
 <format config:type="boolean">>true</format>
 <mount>/space2</mount>
 <size>50mb</size>
</partition>
<partition>
 <format config:type="boolean">>true</format>
 <mount>/space3</mount>
 <size>max</size>
</partition>
</partitions>
<use>6</use>
</drive>
</partitioning>
</install>

```

The above example requires exact knowledge of the existing partition table and about the partition numbers of those partitions that should be kept. In some cases, however, this data might be not available, especially in a mixed hardware environment with different hard drive types and

configurations. The following scenario is for a system with a non-Linux operating system with a designated area for a Linux installation.

**Figure C-2** *Keeping Partitions*



In this scenario, as shown in [Figure C-2, “Keeping Partitions,” on page 212](#), AutoYaST should not in any case create new partitions. Instead, it should search for certain partition types on the system and use them according to the partitioning plan in the control file. No partition numbers are given in this case, only the mount points and the partition types. Additional configuration data can be provided (for example, file system options, encryption, and filesystem type).

```
<install>
 <partitioning config:type="list">
 <drive>
 <partitions config:type="list">
 <partition>
 <create config:type="boolean">>false</create>
 <format config:type="boolean">>true</format>
 <mount>/</mount>
 <partition_id config:type="integer">131</partition_id>
 </partition>
 <partition>
 <create config:type="boolean">>false</create>
 <format config:type="boolean">>true</format>
 <filesystem config:type="symbol">swap</filesystem>
 <partition_id config:type="integer">130</partition_id>
 <mount>swap</mount>
 </partition>
 </partitions>
 </drive>
 </partitioning>
</install>
```

### Using Existing Mount Table (fstab)

This option lets AutoYaST use an existing `/etc/fstab` file and the partition data from a previous installation. All partitions are kept and no new partitions are created. The found partitions are formatted and mounted as specified in the `/etc/fstab` file found on a Linux root partition.

Although the default behavior is to format all partitions, it is also possible to leave some partitions (for example, data partitions) untouched and only mount them. If multiple installations are found on the system (multiple root partitions with different `fstab` files), the installation aborts unless the desired root partition is configured in the control file. The following example illustrates how this option can be used.

```
<install>
 <partitioning_advanced>
 <fstab>
 <!-- Read data from existing fstab. If multiple root partitions
are
 found, use the one specified below. Otherwise the first root
 partition is taken -->
 <!-- <root_partition>/dev/hda5</root_partition> -->
 <use_existing_fstab config:type="boolean">>true</
use_existing_fstab>
 <!-- all partitions found in fstab will be formatted and mounted
 by default unless a partition is listed below with different
 settings -->
 <partitions config:type="list">
 <partition>
 <format config:type="boolean">>false</format>
 <mount>/bootmirror</mount>
 </partition>
 </partitions>
 </fstab>
 </partitioning_advanced>
</install>
```

## Logical Volume Manager (LVM)

To configure LVM, first you need to create a physical volume using the normal partitioning method described above.

The following example shows how to prepare for LVM in the partitioning resource:

```
<partitioning config:type="list">
 <drive>
 <device>/dev/sda</device>
 <partitions config:type="list">
 <partition>
 <lvm_group>system</lvm_group>
 <partition_type>primary</partition_type>
 <size>max</size>
 </partition>
 </partitions>
 <use>all</use>
 </drive>
</partitioning>
```

This above example creates a nonformatted partition on the `/dev/sda1` device of the LVM type and with the system volume group. The partition created uses all available space on this drive.

In previous versions of Linux, LVM configuration was done in a separate resource. This method for configuring LVM is still supported, but a new and easier way is now possible which allows you to have the LVM configuration directly in the partitioning resource. Currently, it is not possible to

configure LVM using the configuration system. You must add the resource manually, as shown in the following example.

```
<partitioning config:type="list">
 <drive>
 <device>/dev/sda</device>
 <partitions config:type="list">
 <partition>
 <lvm_group>system</lvm_group>
 <partition_type>primary</partition_type>
 <size>max</size>
 </partition>
 </partitions>
 <use>all</use>
 </drive>
</partitioning>
<lvm config:type="list">
 <lvm_group>
 <lvm_name>system</lvm_name>
 <logical_volumes config:type="list">
 <lv>
 <lv_fs>reiser</lv_fs>
 <lv_mount>/usr</lv_mount>
 <lv_name>usrlv</lv_name>
 <lv_size>500mb</lv_size>
 </lv>
 <lv>
 <lv_fs>reiser</lv_fs>
 <lv_mount>/opt</lv_mount>
 <lv_name>optlv</lv_name>
 <lv_size>1500mb</lv_size>
 </lv>
 <lv>
 <lv_fs>reiser</lv_fs>
 <lv_mount>/var</lv_mount>
 <lv_name>varlv</lv_name>
 <lv_size>200mb</lv_size>
 </lv>
 </logical_volumes>
 <pesize>4M</pesize>
 </lvm_group>
</lvm>
```

Using the new method, the above configuration has the following syntax:

```
<partitioning config:type="list">
 <drive>
 <device>/dev/sda</device>
 <partitions config:type="list">
 <partition>
 <lvm_group>system</lvm_group>
 <partition_type>primary</partition_type>
 <size>max</size>
 </partition>
 </partitions>
 <use>all</use>
```

```

</drive>
<drive>
 <device>/dev/system</device>
 <is_lvm_vg config:type="boolean">true</is_lvm_vg>
 <partitions config:type="list">
 <partition>
 <filesystem config:type="symbol">reiser</filesystem>
 <lv_name>user_lv</lv_name>
 <mount>/usr</mount>
 <size>500mb</size>
 </partition>
 <partition>
 <filesystem config:type="symbol">reiser</filesystem>
 <lv_name>opt_lv</lv_name>
 <mount>/opt</mount>
 <size>1500mb</size>
 </partition>
 <partition>
 <filesystem config:type="symbol">reiser</filesystem>
 <lv_name>var_lv</lv_name>
 <mount>/var</mount>
 <size>200mb</size>
 </partition>
 </partitions>
 <pesize>4M</pesize>
 <use>all</use>
</drive>
</partitioning>

```

## Software RAID

Using AutoYaST, you can create and assemble software RAID devices. The supported RAID levels are the following:

**Table C-2** *Supported RAID Levels*

Level	Description
RAID 0	Increases your disk performance. There is <b>no</b> redundancy in this mode. If one of the drives crashes, data recovery is not possible.
RAID 1	Has the best redundancy. It can be used with two or more disks. It maintains an exact copy of all data on all disks. As long as at least one disk is still working, no data is lost. The partitions used for this level of RAID should have approximately the same size.
RAID 5	Combines management of a larger number of disks and still maintains some redundancy. It can be used on three or more disks. If one disk fails, all data is still intact. If two disks fail simultaneously, all data is lost.
Multipath	Allows access to the same physical device over multiple controllers for redundancy against a fault in a controller card. It can be used with at least two devices.

As with LVM, you need to create all RAID partitions first, then assign the partitions to the RAID device you want to create. You also need to specify whether a partition or a device should be configured in the RAID or if it should be configured as a Spare device.

In previous versions of Linux, RAID configuration was done in a separate resource. This method for configuring RAID devices is still supported, but a new and easier way is now possible which allows the user to have the RAID configuration directly in the partitioning resource.

The following example shows a simple RAID1 configuration:

```
<partitioning config:type="list">
 <drive>
 <device>/dev/sda</device>
 <partitions config:type="list">
 <partition>
 <format config:type="boolean">>false</format>
 <partition_id config:type="integer">253</partition_id>
 <raid_name>/dev/md0</raid_name>
 <raid_type>raid</raid_type>
 <size>4gb</size>
 </partition>
 <!-- Here come the regular partitions, i.e. / and swap -->
 </partitions>
 <use>all</use>
 </drive>
 <drive>
 <device>/dev/sdb</device>
 <use>all</use>
 <partitions config:type="list">
 <partition>
 <format config:type="boolean">>false</format>
 <partition_id config:type="integer">253</partition_id>
 <raid_name>/dev/md0</raid_name>
 <raid_type>raid</raid_type>
 <size>4gb</size>
 </partition>
 </partitions>
 </drive>
</partitioning>
<raid config:type="list">
 <raid_device>
 <chunk_size>4</chunk_size>
 <device_name>/dev/md0</device_name>
 <filesystem config:type="symbol">reiser</filesystem>
 <format config:type="boolean">>true</format>
 <parity_algorithm>left-asymmetric</parity_algorithm>
 <partition_id config:type="integer">131</partition_id>
 <persistent_superblock config:type="boolean">>true</persistent_superblock>
 <mount>/space</mount>
 <raid_type>raid1</raid_type>
 </raid_device>
</raid>
```

Using the new method, the above configuration has the following syntax:

```

<partitioning config:type="list">
 <drive>
 <device>/dev/sda</device>
 <partitions config:type="list">
 <partition>
 <partition_id config:type="integer">253</partition_id>
 <format config:type="boolean">>false</format>
 <raid_name>/dev/md0</raid_name>
 <raid_type>raid</raid_type>
 <size>4gb</size>
 </partition>
 <!-- Here come the regular partitions, i.e. / and swap -->
 </partitions>
 <use>all</use>
 </drive>
 <drive>
 <device>/dev/sdb</device>
 <partitions config:type="list">
 <partition>
 <format config:type="boolean">>false</format>
 <partition_id config:type="integer">253</partition_id>
 <raid_name>/dev/md0</raid_name>
 <raid_type>raid</raid_type>
 <size>4gb</size>
 </partition>
 </partitions>
 <use>all</use>
 </drive>
 <drive>
 <device>/dev/md</device>
 <partitions config:type="list">
 <partition>
 <filesystem config:type="symbol">reiser</filesystem>
 <format config:type="boolean">>true</format>
 <mount>/space</mount>
 <partition_id config:type="integer">131</partition_id>
 <partition_nr config:type="integer">0</partition_nr>
 <raid_options>
 <chunk_size>4</chunk_size>
 <parity_algorithm>left-asymmetric</parity_algorithm>
 <raid_type>raid1</raid_type>
 </raid_options>
 </partition>
 </partitions>
 <use>all</use>
 </drive>
</partitioning>

```

The following must be taken into consideration when configuring RAID using the new syntax:

- ◆ The device for RAID is always /dev/md.
- ◆ The partition\_nr property is used to determine the MD device number. If partition\_nr=0, then /dev/md0 is configured.

- ♦ All RAID-specific options are contained in the `raid_options` resource.

### C.3.5 Software

This section contains the following information:

- ♦ “Package Selections” on page 218
- ♦ “Custom Package Selections” on page 218
- ♦ “Installing Additional and Customized Packages” on page 219
- ♦ “Kernel Packages” on page 220
- ♦ “Removing Automatically Selected Packages” on page 220

#### Package Selections

You can install software on the new system using a predefined package base selection (Minimal, Minimal+X11, default, etc.) in addition to several add-on selections. Check the Novell Linux Desktop CD 1 for available selections in `suse/setup/descr/`.

In the control file, packages and package selections are described as follows:

```
<software>
 <addons config:type="list">
 <addon>Kde</addon>
 </addons>
 <base>Minimal</base>
 <packages config:type="list">
 <package>apache</package>
 <package>sendmail</package>
 </packages>
</software>
```

You can install one base selection and one or more add-on selections.

When installing from a CD-ROM, packages needed from other CD-ROMs are installed after the initial boot of the system in the second installation phase. If you are installing packages from multiple CD-ROMs, auto-installation has to be interrupted for switching the CD-ROMs. In the case of NFS installations, all packages are installed in the first stage of the installation only if the NFS repository is configured as a single medium.

Frequently a package must be installed in the second phase, especially custom packages which might contain scripts for configuring the system. This can be done using the `post-packages` resource.

#### Custom Package Selections

In addition to predefined selections, you can create custom selections by providing a selection file in the selection directory (`suse/setup/descr`). Selection files have a special format and any additional selection file must conform to this format, or YaST2 will not be able to read it.

For examples of a selection file, see the files available in the `/suse/setup/descr/` directory on the Novell Linux Desktop CD1.

After creating a selection file, you can add it to the configuration as described earlier in this section. The selection name (for example, `My.sel`) has to be added to the index files `selections` and `directory.yast` to make it visible to the installer.

The `My.sel` file should have the following format:

```
SuSE-Linux-Package-Selection 3.0 -- (c) 2004 SuSE Linux AG
generated on Thu Apr 15 19:49:04 UTC 2004
=Ver: 3.0
=Sel: LSB
=Sum: LSB Runtime Environment
=Sum.de: LSB-Laufzeitumgebung
=Cat: addon
=Vis: true
=Ord: 108
+Ins:
XFree86-Mesa
XFree86-libs
expect
fontconfig
freetype2
gettext
glibc-i18ndata
libgcj
lsb
make
makedev
patch
pax
rsync
-Ins:
```

To use the above selection, add the following to the control file:

```
<install>
...
 <software>
 <base>My</base>
 </software>
...
</install>
```

## Installing Additional and Customized Packages

In addition to the packages available for installation on the CD-ROMs, you can add external packages including customized kernels. Customized kernel packages must be compatible with the Novell Linux Desktop packages and must be installed to the same locations.

Unlike earlier versions of Linux, there is no need for a special resource in the control file to install custom and external packages. You just need to re-create the package database and update it with any new packages or new package versions in the source repository. A script is provided for this task which queries packages available in the repository and creates the required package database.

Creating a new package database is needed only if new RPMs (for example, update RPMs) were added. To re-create the database, use the `/usr/bin/create_package_descr` command. For example, use this command line to create the package database. When creating the database, all languages are reset to English.

```
cd /usr/local/CDs/LATEST/suse
create_package_descr -x PATH_TO_EXTRA_PROV -d /usr/local/CDs/LATEST/
suse
```

To provide extra dependencies which cannot be extracted from the RPM files, an extra file with missing dependencies is available in the `suse/setup/descr` directory. The `EXTRA_PROV` file can be used when re-creating the package database using the `-x` option.

In the example above, the `/usr/local/CDs/LATEST/suse` directory contains the architecture dependent and independent packages (`noarch` and `i586`). This might look different on other architectures.

The advantage of this method is that you can keep an up-to-date repository with fixed and updated packages (for example, from the Novell FTP server). This method also makes the creation of custom CD-ROMs easier.

## Kernel Packages

Kernel packages are not part of any selection. The required kernel is determined during installation. If the kernel package is added to any selection or to the individual package selection, installation will most likely fail due to conflicts.

To force the installation of a specific kernel, use the kernel property. The following is an example of forcing the installation of the default kernel. In this example, this kernel is installed in any case, even if an SMP or other kernel is required.

```
<software>
 <addons config:type="list">
 <addon>Kde</addon>
 </addons>
 <base>Minimal</base>
 <kernel>kernel-default</kernel>
 <packages config:type="list">
 <package>apache2</package>
 </packages>
</software>
```

## Removing Automatically Selected Packages

Some packages are selected automatically either because of a dependency or because they are available in a selection.

Removing such packages might break the system consistency, and we do not recommend removing basic packages unless a replacement that provides the same services is provided. The best example of this are MTA packages. By default, postfix is selected and installed. If you want to use another MTA, like sendmail, then postfix can be removed from the list of selected packages using a list in the software resource. The following example shows how this can be done:

```
<software>
 <addons config:type="list">
 <addon>Kde</addon>
 </addons>
 <base>Minimal</base>
 <packages config:type="list">
 <package>sendmail</package>
 </packages>
```

```

<remove-packages config:type="list">
 <package>postfix</package>
</remove-packages>
</software>

```

### C.3.6 Services and Runlevels

With the runlevel resource, you can set the default runlevel and specify in detail which system services you want to be started in which runlevel.

The default property specifies the default runlevel of the system. Changes to the default runlevel take effect the next time you boot the system. After installation is completed, the system has runlevel 5, which is Full multiuser with network and XDM. If you have configured a system with no X11, then we recommend rebooting the system after the first stage using the `reboot` property in the `general` resource.

A service should run using a space delimited list of the runlevels, as shown in the following example. An alternative to specifying the exact runlevels is to change the status of the service by either enabling or disabling it using the `service_status` property.

```

<configure>
....
 <runlevels>
 <default>3</default>
 <services config:type="list" >
 <service>
 <service_name>at</service_name>
 <service_start>3 5</service_start>
 </service>
 <service>
 <service_name>portmap</service_name>
 <service_status>enable</service_status>
 </service>
 <service>
 <service_name>hwscan</service_name>
 <service_status>disable</service_status>
 </service>
 </services>
 </runlevels>
....
</configure>

```

### C.3.7 Network Configuration

Network configuration is used to connect a single Novell Linux Desktop workstation to an Ethernet-based LAN or to configure dial-up connection. More complex configuration (multiple network cards, routing, etc.) is also provided. With this module, it's possible to configure and set up Ethernet Controllers and Token-Ring Controllers.

#### Network Devices, DNS, and Routing

To configure network settings and activate networking automatically, one global resource is used to store the whole network configuration.

```

<configure>
.....
 <networking>
 <dns>
 <dhcp_hostname config:type="boolean">true</dhcp_hostname>
 <dhcp_resolv config:type="boolean">true</dhcp_resolv>
 <domain>local</domain>
 <hostname>linux</hostname>
 </dns>
 <interfaces config:type="list">
 <interface>
 <bootproto>dhcp</bootproto>
 <device>eth0</device>
 <startmode>onboot</startmode>
 </interface>
 </interfaces>
 <routing>
 <ip_forward config:type="boolean">>false</ip_forward>
 <routes config:type="list">
 <route>
 <destination>default</destination>
 <device>-</device>
 <gateway>192.168.1.240</gateway>
 <netmask>-</netmask>
 </route>
 </routes>
 </routing>
 <modules config:type="list">
 <module_entry>
 <device>eth0</device>
 <module>e100</module>
 <options></options>
 </module_entry>
 </modules>
 </networking>
.....
</configure>

```

## Proxy

Use this resource to configure your Internet proxy (caching) settings.

`http_proxy` is the name of the proxy server for your access to the World Wide Web (WWW).  
`ftp_proxy` is the name of the proxy server for your access to the File Transfer Services (FTP). No  
`proxy domains` is a list of domains for which the requests should be done directly without caching.

If you are using a proxy server with authorization, specify the Proxy username and password.

```

<?xml version="1.0"?>
<!DOCTYPE profile SYSTEM "/usr/share/autoinstall/dtd/profile.dtd">
<profile xmlns="http://www.suse.com/1.0/yast2ns" xmlns:config="http://
www.suse.com/1.0
/configs">
 <configure>
 <proxy>

```

```

 <enabled config:type="boolean">true</enabled>
 <ftp_proxy>http://192.168.1.240:3128</ftp_proxy>
 <http_proxy>http://192.168.1.240:3128</http_proxy>
 <no_proxy>localhost</no_proxy>
 <proxy_password>testpw</proxy_password>
 <proxy_user>testuser</proxy_user>
 </proxy>
</configure>
</profile>

```

## (X)inetd

The profile has elements to specify which superserver should be used (`netd_service`), whether it should be enabled (`netd_status`), and how the services should be configured (`netd_conf`).

A service description element has conceptually two parts: `key` and `nonkey`. When writing the configuration, services are matched using the key fields, and the `nonkey` fields are applied to the matching service. If no service matches, it is created. If more services match, a warning is reported. The key fields are `script`, `service`, `protocol`, and `server`.

`service` and `protocol` are matched literally. `script` is the base name of the config file, usually a file in `/etc/xinetd.d` (for example, `echo-udp` or `inetd.conf`). `server` is matched more loosely: if it is `/usr/sbin/tcpd`, the real server name is taken from `server_args`. After that, the basename of the first whitespace-separated word is taken and these values are compared.

```

<profile>
 <configure>
 ...
 <inetd>
 <netd_service config:type="symbol">xinetd</netd_service>
 <netd_status config:type="integer">0</netd_status>
 <netd_conf config:type="list">
 <conf>
 <script>imap</script>
 <service>pop3</service>
 <enabled config:type="boolean">true</enabled>
 </conf>
 <conf>
 <server>in.ftpd</server>
 <server_args>-A</server_args>
 <enabled config:type="boolean">true</enabled>
 </conf>
 <conf>
 <service>daytime</service>
 <protocol>tcp</protocol>
 </conf>

 <conf>...</conf>
 </netd_conf>
 </inetd>
 ...
</configure>
</profile>

```

## NIS

Use the NIS resource to configure the target machine as a NIS client. The following example shows a detailed configuration using multiple domains.

```
<configure>
...
<nis>
 <nis_broadcast config:type="boolean">true</nis_broadcast>
 <nis_broken_server config:type="boolean">true</nis_broken_server>
 <nis_by_dhcp config:type="boolean">false</nis_by_dhcp>
 <nis_domain>test.com</nis_domain>
 <nis_local_only config:type="boolean">true</nis_local_only>
 <nis_options></nis_options>
 <nis_other_domains config:type="list">
 <nis_other_domain>
 <nis_broadcast config:type="boolean">false</nis_broadcast>
 <nis_domain>domain.com</nis_domain>
 <nis_servers config:type="list">
 <nis_server>10.10.0.1</nis_server>
 </nis_servers>
 </nis_other_domain>
 </nis_other_domains>
 <nis_servers config:type="list">
 <nis_server>192.168.1.1</nis_server>
 </nis_servers>
 <start_autofs config:type="boolean">true</start_autofs>
 <start_nis config:type="boolean">true</start_nis>
</nis>
...
</configure>
```

## LDAP Client

The installed machine can be set up as an LDAP client to authenticate users with an OpenLDAP server. Required data include the name of the search base (base DN; for example, `dc=mydomain,dc=com`) and the IP address of the LDAP server (for example, `10.20.0.2`).

If LDAP is activated, NSS and PAM are configured accordingly to use LDAP for user authentication.

```
<configure>
...
<ldap>
 <ldap_domain> dc=mydomain,dc=com</ldap_domain>
 <ldap_server>10.10.0.1</ldap_server>
 <ldap_tls config:type="boolean">true</ldap_tls>
 <ldap_v2 config:type="boolean">true</ldap_v2>
 <pam_password>crypt</pam_password>
 <start_ldap config:type="boolean">true</start_ldap>
</ldap>
...
</configure>
```

## NFS Client and Server

You can configure a system as an NFS client or an NFS server by using the configuration system. The following examples show how both the NFS client and server can be configured.

### NFS Client Configuration

```
<configure>
...
 <nfs config:type="list">
 <nfs_entry>
 <mount_point>/home</mount_point>
 <nfs_options>defaults</nfs_options>
 <server_path>192.168.1.1:/home</server_path>
 </nfs_entry>
 </nfs>
...
</configure>
```

### NFS Server Configuration

```
<configure>
....
 <nfs_server>
 <nfs_exports config:type="list">
 <nfs_export>
 <allowed config:type="list">
 <allowed_clients>*(ro,root_squash,sync)</allowed_clients>
 </allowed>
 <mountpoint>/home</mountpoint>
 </nfs_export>
 <nfs_export>
 <allowed config:type="list">
 <allowed_clients>*(ro,root_squash,sync)</allowed_clients>
 </allowed>
 <mountpoint>/work</mountpoint>
 </nfs_export>
 </nfs_exports>
 <start_nfsserver config:type="boolean">>true</start_nfsserver>
 </nfs_server>
....
</configure>
```

### NTP Client

You can choose to start the NTP daemon when booting the system. The NTP daemon resolves hostnames when initializing. The first synchronization of the clock is performed before the NTP daemon is started. To use this host for initial synchronization, configure the `initial_sync` property.

To run the NTP daemon in chroot jail, set `start_in_chroot`. Starting any daemon in a chroot jail is more secure and strongly recommended. To adjust NTP servers, peers, local clocks, and NTP broadcasting, add the appropriate entry to the control file. The following is an example of various configuration options.

```

 <?xml version="1.0"?>
<!DOCTYPE profile SYSTEM "/usr/share/autoinstall/dtd/profile.dtd">
<profile xmlns="http://www.mycompany.com/1.0/yast2ns"
xmlns:config="http://www.mycompany.com/1.0/configs">
 <configure>
 <ntp-client>
 <peers config:type="list">
 <peer>
 <address>10.10.0.1</address>
 <initial_sync config:type="boolean">true</initial_sync>
 <param></param>
 <type>server</type>
 </peer>
 <peer>
 <address>192.168.1.1</address>
 <initial_sync config:type="boolean">true</initial_sync>
 <param></param>
 <type>peer</type>
 </peer>
 <peer>
 <address>1.1.1.1</address>
 <type>broadcastclient</type>
 </peer>
 <peer>
 <address>127.127.2.3</address>
 <create_symlink config:type="boolean">true</create_symlink>
 <device>/dev/test</device>
 <param></param>
 <type>__clock</type>
 </peer>
 </peers>
 <start_at_boot config:type="boolean">true</start_at_boot>
 <start_in_chroot config:type="boolean">true</start_in_chroot>
 </ntp-client>
 </configure>
</profile>

```

### C.3.8 Mail Configuration (Sendmail or Postfix)

This module lets you create a detailed mail configuration. The module contains various options and we recommend using it at least for the initial configuration.

```

 <configure>
 ...
 <mail>
 <aliases config:type="list">
 <alias>
 <alias>root</alias>
 <comment></comment>
 <destinations>foo</destinations>
 </alias>
 <alias>
 <alias>test</alias>
 <comment></comment>

```

```

 <destinations>foo</destinations>
</alias>
</aliases>
<connection_type config:type="symbol">permanent</
connection_type>
<fetchmail config:type="list">
 <fetchmail_entry>
 local_user>foo</local_user>
 <password>bar</password>
 <protocol>POP3</protocol>
 <remote_user>foo</remote_user>
 <server>pop.foo.com</server>
 </fetchmail_entry>
 <fetchmail_entry>
 <local_user>test</local_user>
 <password>bar</password>
 <protocol>IMAP</protocol>
 <remote_user>test</remote_user>
 <server>blah.com</server>
 </fetchmail_entry>
</fetchmail>
<from_header>test.com</from_header>
<listen_remote config:type="boolean">>true</listen_remote>
<local_domains config:type="list">
 <domains>test1.com</domains>
</local_domains>
<masquerade_other_domains config:type="list">
 <domain>blah.com</domain>
</masquerade_other_domains>
<masquerade_users config:type="list">
 <masquerade_user>
 <address>joe@test.com</address>
 <comment></comment>
 <user>joeuser</user>
 </masquerade_user>
 <masquerade_user>
 <address>bar@test.com</address>
 <comment></comment>
 <user>foo</user>
 </masquerade_user>
</masquerade_users>
<mta config:type="symbol">postfix</mta>
<outgoing_mail_server>test.com</outgoing_mail_server>
<postfix_mda config:type="symbol">local</postfix_mda>
<smtp_auth config:type="list">
 <listentry>
 <password>bar</password>
 <server>test.com</server>
 <user>foo</user>
 </listentry>
</smtp_auth>
<use_amavis config:type="boolean">>true</use_amavis>
<virtual_users config:type="list">
 <virtual_user>

```

```

 <alias>test.com</alias>
 <comment></comment>
 <destinations>foo.com</destinations>
 </virtual_user>
 <virtual_user>
 <alias>geek.com</alias>
 <comment></comment>
 <destinations>bar.com</destinations>
 </virtual_user>
</virtual_users>
</mail>
...
</configure>

```

### C.3.9 Security Settings

Use the features of this module to change the local security settings on the target system. These settings include boot configuration, login, password, user addition, and file permissions.

Configuring the security settings automatically corresponds to the Custom Settings in the security module available in the running system which lets you create your own, customized configuration.

See the reference for the meaning and the possible values of the settings in the following example.

```

<configure>
...
 <security>
 <console_shutdown>ignore</console_shutdown>
 <cwd_in_root_path>no</cwd_in_root_path>
 <displaymanager_remote_access>no</displaymanager_remote_access>
 <fail_delay>3</fail_delay>
 <faillog_enab>yes</faillog_enab>
 <gid_max>60000</gid_max>
 <gid_min>101</gid_min>
 <kdm_shutdown>root</kdm_shutdown>
 <lastlog_enab>yes</lastlog_enab>
 <encryption>md5</encryption>
 <obscure_checks_enab>no</obscure_checks_enab>
 <pass_max_days>99999</pass_max_days>
 <pass_max_len>8</pass_max_len>
 <pass_min_days>1</pass_min_days>
 <pass_min_len>6</pass_min_len>
 <pass_warn_age>14</pass_warn_age>
 <passwd_use_cracklib>yes</passwd_use_cracklib>
 <permission_security>secure</permission_security>
 <run_updatedb_as>nobody</run_updatedb_as>
 <uid_max>60000</uid_max>
 <uid_min>500</uid_min>
 </security>
...
</configure>

```

## Password Settings Options

Use this resource to change various password settings stored in the `/etc/login.defs` file, and to activate one of the encryption methods currently supported. If this not set, then DES is configured.

DES, the Linux default method, works in all network environments, but it restricts you to passwords no longer than eight characters. MD5 allows longer passwords, thus providing more security; but some network protocols don't support this, and you might have problems with NIS. Blowfish is also supported.

You can also set the system to check for password plausibility and length.

## Boot Settings

Use the security resource to change the following boot settings:

### How to interpret Ctrl+Alt+Del

When someone at the console presses Ctrl+Alt+Del, the system usually reboots. Sometimes it might be desirable to ignore this event (for example, when the system serves as both workstation and server).

### Shutdown behavior of KDM

Set who is allowed to shut down the machine from KDM.

## Login Settings

Use this option to change various login settings, which are stored in the `/etc/login.defs` file.

### New User Settings (useradd Settings)

Set the minimum and maximum possible user ID as well as the minimum and maximum possible group ID.

## C.3.10 Monitor and X11 Configuration

The following is a monitor and X11 configuration example:

```
<configure>
...
 <x11>
 <color_depth config:type="integer">16</color_depth>
 <configure_x11 config:type="boolean">true</configure_x11>
 <display_manager>gdm</display_manager>
 <enable_3d config:type="boolean">true</enable_3d>
 <monitor>
 <display>
 <max_hsync config:type="integer">48</max_hsync>
 <max_vsync config:type="integer">90</max_vsync>
 <min_hsync config:type="integer">30</min_hsync>
 <min_vsync config:type="integer">50</min_vsync>
 </display>
 <monitor_device>DT-1536A</monitor_device>
 <monitor_vendor>DAYTEK</monitor_vendor>
 </monitor>
 </x11>
</configure>
```

```

 </monitor>
 <resolution>1024x768</resolution>
 <start_x11 config:type="boolean">true</start_x11>
 <window_manager>gnome</window_manager>
 </x11>
 ...
</configure>

```

### C.3.11 Users

The root user and at least one regular user can be added during install using data supplied in the control file. User data and passwords (encrypted or in clear text) are part of the configure resource in the control file.

At minimum, the root user should be configured during autoinstallation, which ensures that you can log in after installation is finished and that nobody else can log in to the system (in case the password is not set).

The two users in the following example are added during system configuration.

```

<configure>
...
 <users config:type="list">
 <user>
 <username>root</username>
 <user_password>password</user_password>
 <encrypted config:type="boolean">true</encrypted>
 <forename/>
 <surname/>
 </user>
 <user>
 <username>nashif</username>
 <user_password>password</user_password>
 <encrypted config:type="boolean">true</encrypted>
 <forename>Anas</forename>
 <surname>Nashif</surname>
 </user>
 </users>
 ...
</configure>

```

This example shows the minimal information required for adding users. More options are available for a more customized user account management. The data in `/etc/default/useradd` is used to determine the home directory of the user to be created, in addition to other parameters.

### C.3.12 Customer User Scripts

By adding scripts to the auto-installation process, you can customize the installation for your needs and take control in different stages of the installation.

In the auto-installation process, three types of scripts can be executed:

#### Pre-install scripts

Executed before YaST2 makes any real change to the system (before partitioning and package installation).

Pre-install scripts with confirmation (pre-scripts) are executed at an early stage of the installation. This means that if you have requested to confirm the installation, the pre-scripts are executed before the confirmation screen shows up (profile/install/general/mode/confirm).

### Post-Install Scripts

These scripts are executed after YaST2 has completed the installation and it has booted the system for the first time.

### Chroot environment post-install scripts

Chroot scripts are executed after all packages have been installed, before YaST2 boots for the first time, and before the boot loader is installed. Although the name of this type of scripts might imply that the scripts are executed in the chroot environment, the scripts are actually executed in the system before it is mounted. To make any changes to the system, the /mnt prefix has to be used with any paths.

It is also possible to run the chroot scripts in the installed system by adding the boolean chrooted element.

It is possible to have scripts outside of the control file. The location of the control file can be specified using a URL similar to the syntax used for referencing the location of the control file. The location of the external script should be specified using the location element.

When manually added to the control file, scripts must be included in a CDATA element to avoid confusion with the file syntax and other tags defined in the control file.

```
<?xml version="1.0"?>
<!DOCTYPE profile SYSTEM "/usr/share/autoinstall/dtd/profile.dtd">
<profile xmlns="http://www.mycompany.com/1.0/yast2ns"
xmlns:config="http://www.mycompany.com/1.0/configs">
 <configure>
 <scripts>
 <chroot-scripts config:type="list">
 <script>
 <chrooted config:type="boolean">>true</chrooted>
 <filename>chroot.sh</filename>
 <interpreter>shell</interpreter>
 <source><![CDATA[
#!/bin/sh
echo "Testing chroot (chrooted) scripts"
ls
]]>
 </source>
 </script>
 <script>
 <filename>chroot.sh</filename>
 <interpreter>shell</interpreter>
 <source><![CDATA[
#!/bin/sh
echo "Testing chroot scripts"
df
cd /mnt
ls
```

```

]]>
 </source>
 </script>
</chroot-scripts>
<post-scripts config:type="list">
 <script>
 <filename>post.sh</filename>
 <interpreter>shell</interpreter>
 <source><![CDATA[
#!/bin/sh
echo "Running Post-install script"
/etc/init.d/portmap start
mount -a 192.168.1.1:/local /mnt
cp /mnt/test.sh /tmp
umount /mnt
]]>
 </source>
 </script>
 <script>
 <filename>post.pl</filename>
 <interpreter>perl</interpreter>
 <source><![CDATA[
#!/usr/bin/perl
print "Running Post-install script";
]]>
 </source>
 </script>
</post-scripts>
<pre-scripts config:type="list">
 <script>
 <interpreter>shell</interpreter>
 <location>http://192.168.1.1/profiles/scripts/prescripts.sh</
 location>
 </script>
 <script>
 <filename>pre.sh</filename>
 <interpreter>shell</interpreter>
 <source><![CDATA[
#!/bin/sh
echo "Running pre-install script"
]]>
 </source>
 </script>
</pre-scripts>
</scripts>
</configure>
</profile>

```

After the installation is finished, the scripts and the output logs can be found in the `/var/adm/autoinstall` directory. The scripts are located in the `scripts` directory and the output logs of the scripts are located in the `log` directory.

The log is the output resulting from executing the shell scripts using the following command:

```
/bin/sh -x script_name 2&> /var/adm/autoinstall/logs/script_name.log
```

### C.3.13 System Variables (sysconfig)

Use the `sysconfig` resource to define configuration variables in the `sysconfig` repository (`/etc/sysconfig`) directly. The `sysconfig` variables let you fine-tune many system components and environment variables exactly to your needs.

The following example shows how a variable can be set using the `sysconfig` resource.

```
<sysconfig config:type="list" >
 <sysconfig_entry>
 <sysconfig_key>XNTPD_INITIAL_NTPDATE</sysconfig_key>
 <sysconfig_path>/etc/sysconfig/xntp</sysconfig_path>
 <sysconfig_value>ntp.host.com</sysconfig_value>
 </sysconfig_entry>
 <sysconfig_entry>
 <sysconfig_key>HTTP_PROXY</sysconfig_key>
 <sysconfig_path>/etc/sysconfig/proxy</sysconfig_path>
 <sysconfig_value>proxy.host.com:3128</sysconfig_value>
 </sysconfig_entry>
 <sysconfig_entry>
 <sysconfig_key>FTP_PROXY</sysconfig_key>
 <sysconfig_path>/etc/sysconfig/proxy</sysconfig_path>
 <sysconfig_value>proxy.host.com:3128</sysconfig_value>
 </sysconfig_entry>
</sysconfig>
```

Both relative and absolute paths can be provided. If no absolute path is given, it is treated as a `sysconfig` file in the `/etc/sysconfig` directory.

### C.3.14 Adding Complete Configurations

For many applications and services, you can prepared a configuration file which should be copied in a complete form to some location in the installed system—for example, if you are installing a Web server and have a ready-to-go server configuration file (`httpd.conf`).

Using this resource, you can embed the file into the control file by specifying the final path on the installed system. YaST2 copies this file to the specified location.

```
<files config:type="list">
 <config_file>
 <file_path>/etc/httpd/httpd.conf</file_path>
 <file_contents>
<![CDATA[
some content
]]>
 </file_contents>
 </config_file>
</files>
```

A more advanced example is shown below. This configuration creates a file using the content supplied in `file_contents` and changes the permissions and ownership of the file. After the file has been copied to the system, a script is executed which can be used to manipulate the file and prepare it for the environment of the client.

```

<files config:type="list">
 <config_file>
 <file_path>/etc/someconf.conf</file_path>
 <file_contents>
<![CDATA[
some content
]]>
 </file_contents>
 <file_owner>nashif.users</file_owner>
 <file_permissions>444</file_permissions>
 <file_script>
 <interpreter>shell</interpreter>
 <source>
<![CDATA[
#!/bin/sh
echo "Testing file scripts" >> /etc/someconf.conf
df
cd /mnt
ls
]]>
 </source>
 </file_script>
 </config_file>
</files>

```

### C.3.15 Miscellaneous Hardware and System Components

In addition to the core component configuration, like network authentication and security, AutoYaST2 offers a wide range of hardware and system configuration available by default on any system installed manually and in an interactive way. For example, it is possible to configure printers, sound devices, TV cards, and any other hardware components that have a module within YaST2.

Any new configuration options added to YaST2 are automatically available as an auto-installation resource.

#### Printer

Although printer configuration, like other configurations, can be done manually, we recommend using the Configuration System to create a printer configuration because of the complexity and the range of options offered by the modules.

Using the Configuration System guarantees that the options provided are consistent. The following is an example of a printer configuration section created using the Configuration System.

```

<configure>
....
 <printer>
 <default>lp</default>
 <printcap config:type="list">
 <printcap_entry>
 <cups-state>void</cups-state>
 <ff config:type="boolean">true</ff>
 <info></info>

```

```

 <location></location>
 <lprng-state>changed</lprng-state>
 <name>lp</name>
 <options>
 <job-sheets>none, none</job-sheets>
 </options>
 <raw config:type="boolean">true</raw>
 <type>yast2</type>
 <uri>parallel:/dev/lp0</uri>
 </printcap_entry>
</printcap>
</printer>
....
</configure>

```

## Sound Devices

The following is an example of sound device configuration created using the Configuration System.

```

<configure>
....
 <sound>
 <autoinstall config:type="boolean">true</autoinstall>
 <modules_conf config:type="list">
 <module_conf>
 <alias>snd-card-0</alias>
 <model>M5451, ALI</model>
 <module>snd-ali5451</module>
 <options>
 <snd_enable>1</snd_enable>
 <snd_index>0</snd_index>
 <snd_pcm_channels>32</snd_pcm_channels>
 </options>
 </module_conf>
 </modules_conf>
 <volume_settings config:type="list">
 <listentry>
 <Master config:type="integer">75</Master>
 </listentry>
 </volume_settings>
 </sound>
....
</configure>

```

## C.4 Network-Based Installation

The installation method using AutoYaST provides a way to automatically and identically install groups of systems. The first step when preparing AutoYaST installations is deciding how you want the systems at your site to be installed. For example, the following scenario would be ideal to set up and perform automated installations:

- ◆ You need to install Novell Linux Desktop on 50 new systems.
- ◆ The development department owns 30 out of the 50 new dual processor and SCSI systems, and its systems must be installed as clients with development software.

- ◆ The sales department owns 20 out of the 50 new uniprocessor IDE-based systems, and its systems must be installed as clients with end user software and office tools.

### Prerequisites

- ❑ A boot server on the same Ethernet segment
- ❑ An install server holding the NLD installation sources
- ❑ An AutoYaST configuration server that defines rules and profiles

## C.4.1 Configuration Server

A configuration repository holds the control files for multiple machines. The control files can have any filenames, which have to be specified at the boot time of a client. To avoid supplying the profile name for every client, you can define only the directory of the control files. If a directory is specified, then the client tries to load a file with a name matching its IP address in HEX mode. This gives you the advantage of dealing with consistent filenames rather than IPs as filenames, which might lead to some confusion.

The configuration repository is the same directory you have to define if you are using the configuration system for creating control files.

### HTTP Repository

To be able to use the HTTP protocol to retrieve control file while auto-installing, you need a working HTTP server on the server side. Install Apache or your favorite Web server and enable it using YaST2. Normally, the Web server root directory resides in `/srv/www/htdocs`, so you need to create a subdirectory below the root directory of the Web server which will be your configuration repository.

### NFS Repository

Create a directory and make it available via NFS to the clients by exporting it. This directory could be in the same place where you have copied the CDs (for example, `/usr/local/NLD`).

### TFTP Repository

By default, the TFTP directory is available under `/tftpboot`, which can also contain boot images if you are booting over the network. Don't forget to enable TFTP in the Inetd configuration file (`/etc/inetd.conf`). Inetd configuration can be done using YaST2.

## C.5 Rules and Classes

For a more granular auto-installation, you need some means to control the configuration of different types of hardware and different kinds of use scenarios. AutoYaST makes use of classes and rules for this.

### C.5.1 Rule-Based Auto-installation

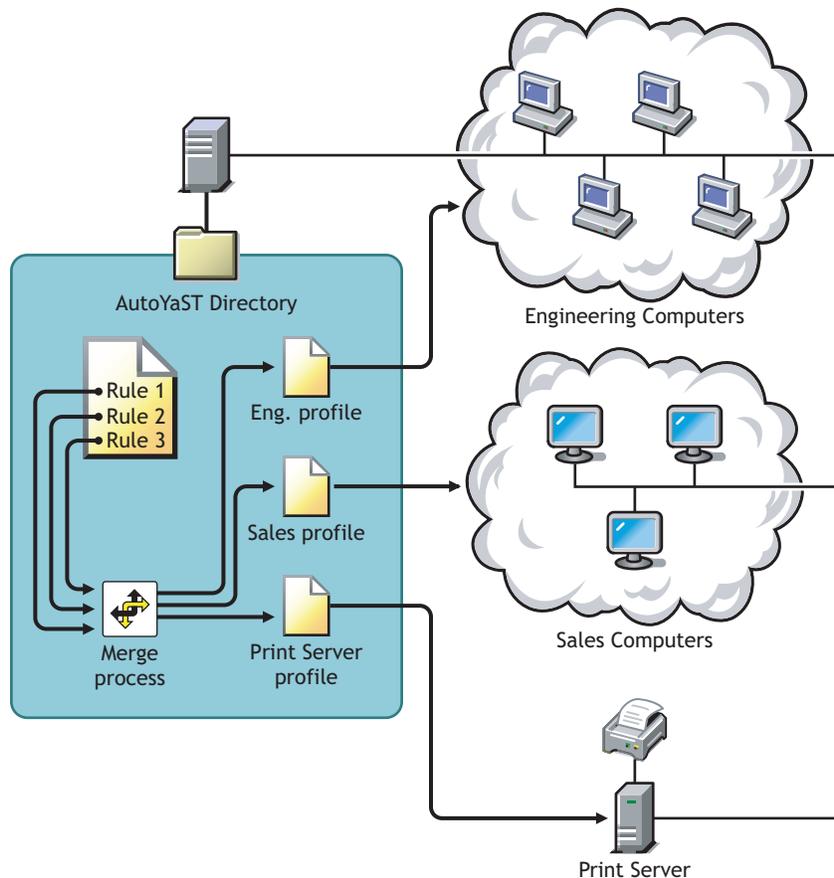
Rules let you configure a system depending on system attributes by merging multiple control files during installation. The rules-based installation is controlled by a rules file.

The rules file is an XML-based file that contains rules for each group of systems (or single systems) that you want to automatically install. A set of rules distinguishes a group of systems based on one or more system attributes. After passing all rules, it links each group of rules to a profile. Both the rules file and the profiles must be located in a predefined and accessible location.

The rules file is retrieved even if a specific control is supplied using the `autoyast` keyword. For example, if the following is used, the rules file is still evaluated:

```
autoyast=http://10.10.0.1/profile/test.xml
```

**Figure C-3** Rules



If more than one rule applies, the final profile for each group is generated using a merge script. The merging process is based on the order of the rules, and later rules override configuration data in earlier rules.

The use of a rules file is optional. If the rules file is not found, system installation proceeds in the usual way by just using the supplied profile or by searching for the profile, depending on the MAC or the IP address of the system.

### Rules File Examples

The following example illustrates how the rules file is used to retrieve the configuration for a client with known hardware.

```
<?xml version="1.0"?>
<!DOCTYPE autoinstall SYSTEM "/usr/share/autoinstall/dtd/rules.dtd">
```

```

<autoinstall xmlns="http://www.suse.com/1.0/YaSTns"
xmlns:config="http://
 www.suse.com/1.0/configs">
 <rules config:type="list">
 <rule>
 <disksize>
 <match>/dev/hdc 1000</match>
 <match_type>greater</match_type>
 </disksize>
 <result>
 <profile>machine1.xml</profile>
 <continue config:type="boolean">>false</continue>
 </result>
 </rule>
 <rule>
 <disksize>
 <match>/dev/hda 1000</match>
 <match_type>greater</match_type>
 </disksize>
 <result>
 <profile>machine2.xml</profile>
 <continue config:type="boolean">>false</continue>
 </result>
 </rule>
 </rules>
</autoinstall>

```

This example defines two rules and provides a different profile for each one. The rule used in this case is `disksize`. After parsing the rules file, YaST2 attempts to match the system being installed to the rules in the `rules.xml` file in the order of first rule through the last rule. A rule match occurs when the system being installed matches all of the system attributes defined in the rule. As soon as a system matches a rule, the result resource is added to the stack of profiles AutoYaST uses to create the final profile. The `continue` property tells AutoYaST if it should continue with other rules or not after a match has been found.

If the first rule does not match, each subsequent rule in the list is examined until a match is found.

Using the `disksize` attribute, you can provide different configurations for different hard drives with different sizes. The first rule checks if the `/dev/hdc` device is available and if it is greater than 1 GB in size using the `match` property.

A rule must have at least one attribute to be matched. If you need to check more attributes (for example, `memory` or `architectures`), you can add more attributes in the rule resource, as shown in the next example. It illustrates how the rules file is used to retrieve the configuration for a client with known hardware.

```

<?xml version="1.0"?>
<!DOCTYPE autoinstall SYSTEM "/usr/share/autoinstall/dtd/rules.dtd">
<autoinstall xmlns="http://www.suse.com/1.0/YaSTns"
xmlns:config="http://
 www.suse.com/1.0/configs">
 <rules config:type="list">
 <rule>
 <disksize>
 <match>/dev/hdc 1000</match>

```

```

 <match_type>greater</match_type>
 </disksize>
 <memsize>
 <match>1000</match>
 <match_type>greater</match_type>
 </memsize>
 <result>
 <profile>machine1.xml</profile>
 <continue config:type="boolean">>false</continue>
 </result>
</rule>
<rule>
 <disksize>
 <match>/dev/hda 1000</match>
 <match_type>greater</match_type>
 </disksize>
 <memsize>
 <match>256</match>
 <match_type>greater</match_type>
 </memsize>
 <result>
 <profile>machine2.xml</profile>
 <continue config:type="boolean">>false</continue>
 </result>
</rule>
</rules>
</autoinstall>

```

The rules directory must be located in the same referenced directory used with the `autoyast` keyword at boot time, so that if the client is booted using `autoyast=http://10.10.0.1/profiles/`, then AutoYaST searches for the rules file in `http://10.10.0.1/profiles/rules/rules.xml`.

## Rules File Structure

The `rules.xml` file must

- ◆ Have at least one rule.
- ◆ Be named `rules.xml`.
- ◆ Be located in the rules directory in the profile repository.
- ◆ Have at least one attribute for matching.

## Predefined System Attributes

The following table lists the predefined system attributes you can match in the rules file.

**Table C-3** *Predefined System Attributes*

Attribute	Values	Description
<code>hostaddress</code>	IP address of host.	Exact match required.

Attribute	Values	Description
domain	Domain name of host.	Exact match required.
network	Network address of host.	Exact match required.
mac	MAC address of host.	Exact match required. MAC addresses to be matched should be in the form 0080C8F6484C.
linux	Number of installed Linux partitions on the system.	This attribute can be 0 or greater.
others	Number of installed non-Linux partitions on the system.	This attribute can be 0 or greater.
xserver	X Server needed for graphic adapter.	This attribute must always match exactly.
memsize	Memory available on host (in MB).	All match types are available.
totaldisk	Total disk space available on host (in MB).	All match types are available.
haspcmica	System has PCMCIA (for example, Laptops).	Exact match required: 1 for available PCMCIA or 0 for none.
hostid	Hex representation of IP address.	Exact match required.
arch	Architecture of host.	Exact match required.
karch	Kernel Architecture of host (for example, SMP kernel, Athlon Kernel).	Exact match required.
disksize	Drive device and size.	All match types are available.
product	The hardware product name as specified in SMBIOS.	Exact match required.
product_vendor	The hardware vendor as specified in SMBIOS.	Exact match required.
board	The system board name as specified in SMBIOS.	Exact match required.
board_vendor	The system board vendor as specified in SMBIOS.	Exact match required.
custom1-5	Custom rules using shell scripts.	All match types are available.

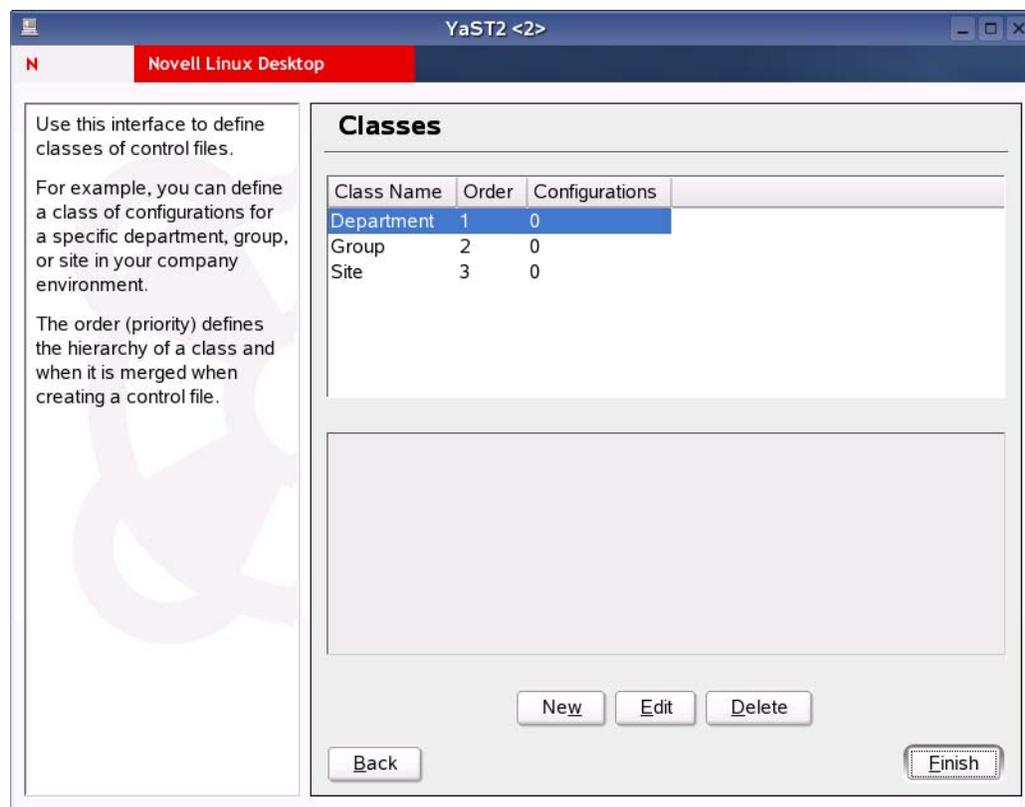
## C.5.2 Classes

You can assign a system to different classes that can be defined in the control file. Unlike rules, classes must be configured in the control file and represent a configuration which is typical for a group of systems. Using the configuration management system, you can define a set of classes. The class definition consists of the following variable for each class:

**Table C-4** *Class Definition Variables*

Variable	Description
Name	Class name.
Descriptions	Class description.
Order	Order (or priority) of the class in the stack of migration.

**Figure C-4** *Defining Classes*



You can create as many classes as you need; however, we recommend keeping the set of classes as small as possible to keep the configuration system concise. As an example, the following set of classes can be used:

**Table C-5** *Classes*

Class	Description
site	Physical location or site.
machine	Type or make of machine.
role	Function of the machine to be installed.
group	Department or group within a site or location.

A file saved in a class directory can have the same syntax and format as a regular control file but represent a subset of the configuration. For example, to create a new control file for a special computer with a specific network interface, only the resource in the control file which controls the configuration of the network is needed. Having multiple network types, you can merge the one needed for a special type of hardware with other class files and create a new control file which suits the system being installed.

### C.5.3 Mixing Rules and Classes

It is possible to mix rules and classes during an auto-installation session. For example, you can identify a system using rules that contain class definitions in them. The process is described in [“Handling Rules” on page 251](#).

After retrieving the rules and merging them, the generated control file is parsed and the presence of class definitions is checked. If classes are defined, then the class files are retrieved from the original repository and a new merge process is initiated.

## C.6 The Auto-installation Process

After the system has booted and the control file has been retrieved, YaST2 performs configuration of the system according to the information provided in the control file. All the configuration is summarized in a window that is shown by default and should be deactivated if a full automatic installation is needed.

When YaST2 has reached the point where the summary of the configuration is shown, it has only probed hardware and prepared the system for auto-installation, so nothing has been changed in the system yet. In case of any error, the process still can be aborted.

A system should be automatically installable without having any graphic adaptor or monitor. Having a monitor attached to the client machine is recommended, however, so you follow the process and also get feedback in case of errors. You can choose between the Qt and the Ncurses interfaces. For headless clients, system messages can be monitored using the serial console.

### X11 Interface

This is the default interface while auto-installing. No special variables are required to activate it.

### Serial Console

You can start installing a system using the serial console by adding the console keyword (that is, `console=ttyS0`) to the kernel command line. This will start linuxrc in console mode and, later in the process, YaST2 also starts in serial console mode.

### Text-Based YaST2 Installation

This option can also be activated at the command line. It starts YaST2 in Ncurses mode. To start YaST2 in text mode, add `textmode=1` on the command line.

Starting YaST2 in text mode is recommended when installing a client with less than 64 MB or when X11 is not being configured at all, especially on headless machines.

## C.6.1 Choosing the Right Boot Medium

There are different methods for booting the client. The computer can boot from its network interface card (NIC) to receive the boot images via DHCP/TFTP or a suitable kernel, and from an initrd image loaded from a floppy or a bootable CD-ROM.

### Booting from a Floppy

For testing/rescue purposes, or because the NIC does not have a PROM or PXE, you can build a boot floppy to use with AutoYaST. Using a floppy to initiate an auto-install process is limited due to the amount of data a floppy can hold. However, it is still possible to use floppies when auto-installing a single, disconnected machine.

Floppies can be used to store the control file, especially when using the original Novell Linux Desktop CD-ROMs for a single, disconnected machine. Using the kernel command line, you can specify the location of the control file on the floppy.

Even without specifying any command line options, it is still possible to initiate the auto-install process by placing a control file on a floppy with a special, predefined filename (`autoinst.xml`). YaST2 checks for `autoinst.xml` upon startup and, if it is found, the installation switches from interactive to automated.

### Booting from CD-ROM

You can use the original Novell Linux Desktop CD-ROMs in combination with other media (for example, with a floppy) to hold the control file or in combination with a network where the control file is located.

It is also possible to create customized CD-ROMs to hold only the package you need in addition to the control file, which also can be saved on the CD-ROM. This method requires creation of CD-ROMs every time you want to change the configuration.

## C.6.2 Invoking the Auto-installation Process

This sections covers all aspects needed to successfully initiate the auto-installation process.

### Command Line Options

Adding the `autoyast` command line variable makes `linuxrc` start in automated mode. `linuxrc` searches for a configuration file, which should be distinguished from the main control file in the following places:

- ◆ Root directory of the initial RAM-disk used for booting the system
- ◆ Root directory of the floppy

The configuration file used by `linuxrc` can have the keywords in the following table. For a detailed description of how `linuxrc` works and other keywords, see [“Advanced linuxrc Options” on page 251](#).

**Table C-6** *linuxrc Configuration File Keywords*

<b>Keyword</b>	<b>Value</b>
netdevice	Network device to use for network setup (device used for BOOTP / DHCP requests).
server	Server to contact for the source directory (NFS Server).
serverdir	Directory on NFS Server.
hostip	When empty, client sends BOOTP request; otherwise, client is configured with entered IP configuration.
netmask	Netmask.
gateway	Gateway.
nameserver	Nameserver.
insmod	Kernel modules to load.
autoyast	Location of the control file to be used for the automatic installation. For example, autoyast=http://192.168.2.1/profiles/.
install	Location of the installation directory. For example, install=nfs://192.168.2.1/CDs/.
instmode	Installation mode (nfs, http, etc.). Not needed if install is set.

These variables and keywords will bring the system up to the point where YaST2 can take over with the main control file. Currently, the source medium is automatically discovered, which in some cases makes it possible to initiate the auto-install process without giving any instructions to linuxrc.

The traditional linuxrc configuration file (`info`) should be used only in the preparation phase. It gives the client enough information about the installation server and the location of the sources. In most cases, this file is not needed. It is needed, however, in special network environments where DHCP or BOOTP is not used or when special kernel modules must be loaded.

All linuxrc keywords can be passed to linuxrc using the kernel command line. The command line can also be set when creating network bootable images or it can be passed to the kernel using a specially configured DHCP server in combination with Etherboot or PXE.

The format of the special autoyast command line variable can be used as described in the following table:

**Table C-7** *AutoYaST Command Line Variables*

<b>Command Line Variable</b>	<b>Description</b>
autoyast=default	Default auto-installation option.
autoyast=file://<path>	Looks for the control file in specified path relative to source root directory (for example, file:///autoinst.xml if in the top directory of a CD-ROM).

Command Line Variable	Description
<code>autoyast=device://&lt;device&gt;/&lt;file&gt;</code>	Looks for the control file on a storage device. Need only the device name without full path (for example, <code>sda1</code> not <code>/dev/sda1</code> ).
<code>autoyast=floppy://&lt;path&gt;</code>	Looks for the control file on the floppy (useful when booting from CD).
<code>autoyast=nfs://&lt;server&gt;/&lt;path&gt;</code>	Looks for the control file on <code>&lt;server&gt;</code> .
<code>autoyast=http://&lt;server&gt;/&lt;path&gt;</code>	Retrieves the control file from a Web server using the HTTP protocol.
<code>autoyast=tftp://&lt;server&gt;/&lt;path&gt;</code>	Retrieves the control file using TFTP.
<code>autoyast=ftp://&lt;server&gt;/&lt;path&gt;</code>	Retrieves the control file using FTP.

Several scenarios for auto-installation are possible using different types of infrastructure and source media. The simplest way is by using the source media from the Novell Linux Desktop box. In that case, you have either a DVD with all Novell Linux Desktop packages or a set of CD-ROMs. To initiate the auto-installation process, however, the auto-installation command line variable should be entered at system bootup and the control file should be accessible to YaST2. The following list of scenarios explains how the control file can be supplied, as well as the setup needed for the auto-installation process to be successful.

- ◆ Using Novell Linux Desktop original CD-ROMs from the Novell Linux Desktop box.

To use the original CD-ROMs, you need a medium with the control file. The control file can reside in the following places:

- ◆ **Floppy:** Accessible via the `autoyast=floppy` option. YaST2 also searches upon startup for a file named `autoinst.xml`. If such a file is found, YaST2 switches into auto-installation mode even if no special command line variables are supplied. (See “[Auto-installing a Single System](#)” on page 246 for more information.)
- ◆ **Network:** Accessible via the `autoyast=nfs://..`, `autoyast=ftp://..`, `autoyast=http://..`, or `autoyast=tftp://..` options.

- ◆ Using self-made CD-ROMs.

In this case, you can include the control file on the CD-ROM for easy access (using the `autoyast=file://` option), or use one of the above-mentioned methods used with the original Novell Linux Desktop CD-ROMs.

When using CD-ROMs for auto-installation, you must instruct the installer to use the CD-ROM for installation and to not try to find the installation files on the network. This can be accomplished by adding the `instmode=cd` option to the kernel command line (which can be done by adding the option to the `isolinux.cfg` file on the CD).

- ◆ Using NFS and floppy, network, or CD-ROM for system boot-up.

This option is the most important one due to the fact that installations of PC farms are normally done using NFS servers and other network services like BOOTP/DHCP. The control file can reside in the following places:

- ◆ **Floppy/CD-ROM:** Accessible via the `autoyast=file://..` option.
- ◆ **Network:** Accessible via the `autoyast=http://..`, `autoyast=ftp://..`, `autoyast=nfs://..`, or `autoyast=tftp://..` options.

## Disabling Network and DHCP

To disable the network during installations where it is not needed or not available (for example, when auto-installing from CD-ROMs), use the `linuxrc netsetup` option to set network configuration behavior. To disable network setup, use `netsetup=0`. If `autoyast=default` is defined, YaST2 looks for a file named `autoinst.xml` in the following places:

- ◆ Root directory of the floppy disk
- ◆ Root directory of the installation medium
- ◆ Root directory of the initial RAM disk used to boot the system

With all `autoyast` invocation options, excluding `default`, it is possible to specify the location of the control file in the following ways:

- ◆ Specify the exact location of the control file:  
`autoyast=http://192.168.1.1/control-files/client01.xml`
- ◆ Specify a directory where several control files are located:  
`autoyast=http://192.168.1.1/control-files/`

In this case, the relevant control file is retrieved using the hex digit representation of the IP as described below.

If only the path prefix variable is defined, YaST2 retrieves the control file from the specified location in the following way:

1. First, it searches for the control file using its own IP address in uppercase hexadecimal (for example, `192.0.2.91` -> `C000025B`).
2. If that file is not found, it removes one hex digit and tries again. This action is repeated until the file with the correct name is found. Ultimately, it tries looking for a file with the MAC address of the clients as the filename (MAC should have the following syntax: `0080C8F6484C`) and, if not found, a file named `default` (in lower case).

For example, for `192.0.2.91`, the HTTP client tries the following in the order given:

```
C000025B
C000025
C00002
C0000
C000
C00
C00
C0
C
0080C8F6484C
default
```

To determine the hex representation of the IP address of the client, use the `/usr/sbin/gethostip` utility, available with the `syslinux` package:

```
/usr/sbin/gethostip 10.10.0.1
10.10.0.1 10.10.0.1 0A0A0001
```

## Auto-installing a Single System

The easiest way to auto-install a system without any network connection is by using the standard CD-ROMs that come in the Novell Linux Desktop box. Using the CD-ROMs in combination with a

floppy disk makes getting started with AutoYaST very fast and without spending much time configuring installation servers and network environments.

Create the control file and name it `autoinst.xml`. Copy `autoinst.xml` to a floppy by either mounting the floppy or by using the `mtools`.

```
mcopy autoinst.xml a:
```

### Combining the `linuxrc` info File with the YaST2 Control File

If you choose to pass information to `linuxrc` using the info file, it is possible to integrate the keywords in the XML control file. In this case, the file has to be accessible to `linuxrc` and has to be named `info`.

`Linuxrc` will look for a string (`start_linuxrc_conf`) in the control file which represents the beginning of the file. If it is found, it parses the content starting from that string and finishes when the string `end_linuxrc_conf` is found. The options are stored in the control file in the following way:

```
....
 <install>
....
 <init>
 <info_file>
<![CDATA[
##
Don't remove the following line:
start_linuxrc_conf
#
install: nfs://192.168.1.1/CDs/full-i386
textmode: 1
autoyast: file:///info
end_linuxrc_conf
Do not remove the above comment
#
]]>
 </info_file>
 </init>
.....
</install>
```

Note that the `autoyast` keyword must point to the same file. If it is on a floppy, then the protocol floppy has to be used. In other cases where the info file is stored in the initial RAM disk, the file option has to be used.

## C.6.3 System Configuration

The system configuration during auto-installation can be viewed as the most important part of the whole process. Customizing a system to your environmental needs is what makes an auto-installation system attractive, not the installation part.

Anything can be configured automatically on the target system. In addition to the predefined directives, you can always use post-scripts to change other things in the system. Additionally, you

can change any system variables and, if required, copy complete configuration files into the target system.

## Post-Install and System Configuration

The Post-Installation and the System Configuration are initiated directly after the last package is installed in the target system, and they are continued after the system has booted for the first time.

Before the system is booted for the first time, YaST2 writes all data collected during installation into the system, then it writes the boot loader in the specified location. In addition to these regular tasks, which are also done when performing a regular installation, YaST2 executes the chroot-scripts as specified in the control file. Note that these scripts are executed while the system is still not mounted.

If a different kernel than the default is installed, a hard reboot is required. A hard reboot can also be forced during auto-installation, independent of the installed kernel. This can be accomplished using the `reboot` property of the general resource. See [“General Options” on page 202](#) for more information.

## System Customization

Most of the system customization is done in the second stage of the installation. YaST2 provides most of the important resources needed to bring up a system to a usable, general state. However, you might have other requirements for the installed system. If the required customizations can't be done using YaST2 resources, then the post-install scripts can be used to accomplish this task.

You can define an unlimited number of custom scripts in the control file either by editing the file or by using the configuration system.

# C.7 Legacy and Foreign Configuration Formats

While it is possible to migrate from SUSE's former auto-installation tool ALICE or Red Hat's Kicstart to AutoYaST to some degree, there are drawbacks to these approaches.

## C.7.1 Migration from YaST2 and ALICE

ALICE, a former SUSE auto-installation system, was built around the auto-installation features that were available with YaST1. To use existing ALICE configuration files and resources, a special option provided in the configuration system lets you convert ALICE configuration files into a control file readable by AutoYaST.

ALICE uses YaST1 for the installation of a Linux system. This is done by creating a boot medium with the needed control file (`info`) from a set of configuration files maintained in a CVS repository. The `info` file has the traditional format used with YaST1.

The system configuration is done almost entirely after the system is installed and is initiated using the `%post` section of the ALICE RPM package.

### ALICE Modules

Each ALICE module performs certain tasks and requires one or more configuration files. The modules are shell scripts that are invoked after the installation of the machine to set up different services on the client.

YaST offers an extensive and rich interface to the installed system that replaces most of the modules that were available with ALICE.

- ♦ The `prepare_alice` and `make_all` modules provided the base and main scripts of all ALICE modules. The `prepare_alice` module is called right after the initial installation process, which is done after YaST1 has finished installation packages.
- ♦ With YaST2, the alternative to these modules is part of the system and is not an addition or extension. This means that YaST2 configures the system in a single process and not in two different steps.

The following table shows how the results of some ALICE modules can be accomplished with YaST2:

**Table C-8** ALICE Modules Results Using YaST2

Module	ALICE Result	YaST Method	Relevant File
User configuration	Adding users is performed without any consistency checks.	Using YaST2 users module.	<code>/etc/passwd</code>
Group configuration	Adding groups is performed without any consistency checks.	Using YaST2 users module.	<code>/etc/group</code>
Services	X	–	<code>/etc/services</code>
Inetd	X	Using the <code>inetd</code> module.	<code>/etc/inetd.conf</code>
Syslog	X	–	<code>/etc/syslog.conf</code>
Lilo	X	X	<code>/etc/lilo.conf</code>
SNMP	X	–	<code>/etc/ucdsmpd.conf</code>
Cron	X	–	<code>/etc/crontab</code>
hosts	X	X	<code>/etc/hosts</code>
Routing	X	X	<code>/etc/route.conf</code>
Printer	X	X	<code>/etc/printcap</code>
SSH	X	–	<code>/etc/ssh</code>
Kernel modules	X	X	<code>/etc/modules.conf</code>

### Other Configuration Options with YaST2 and ALICE

ALICE completed most of the configuration using the `/etc/rc.config` system configuration file. This interface to the system does not exist anymore with Novell Linux Desktop. Instead, configuration options are now available in `/etc/sysconfig`.

Entries in `/etc/sysconfig` can easily be set and modified using YaST2 and AutoYaST. For network services, we recommend using the relevant YaST2 modules dealing with networking, rather than modifying `/etc/sysconfig/network` directly.

## C.7.2 Red Hat Kickstart

The Configuration Management System offers an option for importing a foreign auto-installation configuration file using the Kickstart system. To import a Kickstart file, you need to specify the path of the configuration file and decide how to handle the data either by saving the result to a file directly or by loading the resulting AutoYaST compatible control file into the Configuration Management System. The following sections describe some limitations and issues to consider when importing from a foreign source.

### Software Selections and Packages

It is currently not possible to import package selections and single package listings into AutoYaST. The packages can be added to the control file, but manual selection of the desired packages is needed. This is because package groups and package names might differ depending on the source distribution.

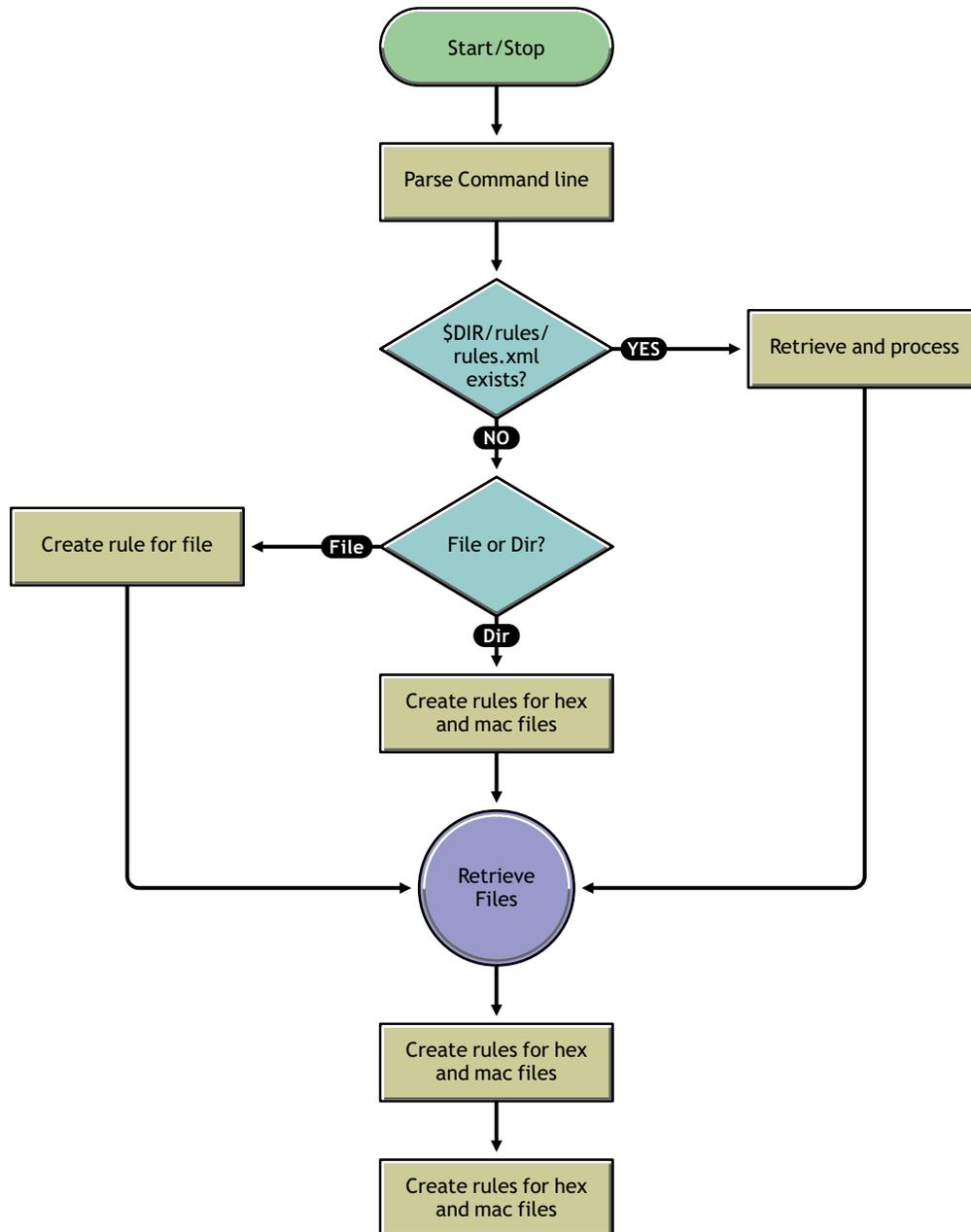
### User Scripts

Kickstart offers two types of scripts, pre- and post-scripts. More than these two types of scripts are not supported as they are in AutoYaST. You might need to split large scripts into smaller components, depending on the function, to make such scripts manageable.

## C.8 Handling Rules

The following figure illustrates how rules are handled and the process of retrieval and merge.

Figure C-5 Rules Retrieval Process



## C.9 Advanced linuxrc Options

The linuxrc program is used for setting up the kernel for installation purposes. It lets you load modules or start an installed system, a rescue system, or an installation via YaST. It is designed to be as small as possible, so all needed programs are linked directly into one binary. There is no need for shared libraries in the initdisk.

---

**NOTE:** If you run `linuxrc` on an installed system, it works slightly differently as it tries to not destroy your installation. As a consequence, you cannot test all features this way.

---

## C.9.1 Passing Parameters to `linuxrc`

Unless `linuxrc` is in manual mode, it looks first for `/info` on the floppy disk. If that does not exist, it looks for `/info` in the `initrd`. After that, it parses the kernel command line for parameters. You can change the info file that `linuxrc` reads using the `info` command line parameter. If you don't want `linuxrc` to read the kernel command line (for example, because you need to give a kernel parameter that accidentally is recognized by `linuxrc`, too), use `linuxrc=nocmdline`.

`linuxrc` always looks for and parses the `/linuxrc.config` file. You can use this file to change default values if you need to, but in general, use the `info` file instead. The `/linuxrc.config` file is read before any `info` file, even in manual mode.

## C.9.2 The info File Format

Lines starting with `#` are comments. Valid entries are of the form `key: value`.

Note that *value* extends to the end of the line and so might contain spaces. *key* is matched case insensitive. You can use the same key/value pairs on the kernel command line using the syntax `key=value`. Lines that don't have the form described above are ignored.

Valid keys are listed in the following table. The values given are only examples.

**Table C-9** Valid Keys for the info File

Keyword/Value	Description
Language: en_EN	Sets the language.
Keytable: en-lat1-nd	Loads this keytable.
Display: Color Mono Alt	Sets the menu color scheme.
Install: nfs://server/install/8.0-i386	Installs via NFS from the server. You can also give username, password, etc., in the URL.
InstMode: cd hd nfs smb ftp http tftp	Sets installation mode.
HostIP: 10.10.0.2	Client IP address.
Netmask: 255.255.0.0	Network mask.
Gateway: 10.10.0.1	Gateway.
Server: 10.10.0.1	Installation server address.
Nameserver: 10.10.0.1	Name server
Proxy: 10.10.0.1	Proxy (either FTP or HTTP).
ProxyPort: 10.10.0.1	Proxy port.
Partition: hda1	Partition with install sources for hard disk install.
Serverdir: /install/8.0-i386	Base directory of the installation sources.

<b>Keyword/Value</b>	<b>Description</b>
Netdevice: eth0	Network interface to use.
BOOTPWait: 5	Sleeps five seconds between network activation and starting bootp.
BOOTPTimeout: 10	10-second timeout for BOOTP requests.
DHCPTimeout: 60	60-second timeout for DHCP requests.
TFTPTimeout: 10	10-second timeout for TFTP connection.
ForceRootimage: 0 1	Loads the installation system into RAM disk.
Textmode: 0 1	Starts YaST in text mode.
Username: <i>name</i>	Sets use name (for example, for FTP install).
Password: <i>password</i>	Sets password (for example, for FTP install).
WorkDomain: <i>domain</i>	Sets work domain for SMB install.
ForceInsmode: 0 1	Uses -f option when running insmod.
DHCP: 0 1	Starts DHCP daemon now, but sees UseDHCP.
UseDHCP: 0 1	Uses DHCP instead of BOOTP (DHCP is default).
MemLimit: 10000	Asks for swap if free memory drops below 10000 KB.
MemYaST: 20000	Runs YaST in text mode if free memory is below 20000 KB.
MemYaSTText: 10000	Asks for swap before starting YaST if free memory is below 10000 KB.
MemModules: 20000	Deletes all modules before starting YaST if free memory is below 20000 KB.
<b>MemLoadImage: 50000</b>	Loads installation system into ramdisk if free memory is above 50000 KB.
Manual: 0 1	Starts linuxrc in manual mode.
NoPCMCIA: 0 1	Doesn't start card manager.
Domain: zap.en	Sets domain name (used for name server lookups).
RootImage: /nld/images/root	Installation system image.
RescueImage: /nld/images/rescue	Rescue system image.
InstallDir: /nld/inst-sys	Installation system.
Rescue: 1 nfs://server/dir	Loads rescue system; the URL variant specifies the location of the rescue image explicitly.
AutoYaST: ftp://autoyastfile	Location of autoinstall file; activates auto-install mode.
VNC: 0 1	Sets up VNC server.

Keyword/Value	Description
VNCPassword: <i>password</i>	Sets VNC server password.
UseSSH: 0 1	Sets up SSH server.
SSHPassword: <i>password</i>	Sets SSH server password. This is not the final root password.
AddSwap: 0 3 /dev/hda5	If 0, never asks for swap.  If the argument is a positive number <i>n</i> , activates the <i>n</i> th swap partition.  If the argument is a partition name, activates this swap partition.
Exec: <i>command</i>	Runs the command.
USBWait: 4	Waits four seconds after loading USB modules.
Insmod: <i>module params</i>	Loads this module.
Loghost: 10.10.0.22	Enables remote logging via syslog.

### C.9.3 Advanced Network Setup

The `netsetup` keyword allows advanced network configurations and enables dialogs to set up the network where required.

#### **netsetup=1**

The normal network setup questions.

**netsetup=xxx,yyy** Just *xxx* and *yyy*.

**netsetup=+xxx,-yyy** Additionally *xxx*, but not *yyy*

*xxx* could have the following values: `dhcp`, `hostip`, `gateway`, `netmask`, `nameserver`. `nameserverN` asks for *N* nameservers (4 maximum).

For example, the following can be entered at the command line:

```
netsetup=-dhcp,+nameserver3
```

# Partitioning

# D

This appendix discusses the following topics:

- ♦ “Partition Types” on page 255
- ♦ “Required Disk Space” on page 255
- ♦ “Partitioning with YaST” on page 256
- ♦ “Using the YaST Expert Partitioner” on page 257

## D.1 Partition Types

Every hard disk has a partition table with space for four entries. An entry in the partition table can correspond to a primary partition or an extended partition. Only one extended partition entry is allowed, however.

A primary partition consists of a continuous range of cylinders (physical disk areas) assigned to a particular operating system. If you have only primary partitions, you are limited to four partitions per hard disk (because more will not fit in the partition table). This is why extended partitions are used. Extended partitions are also continuous ranges of disk cylinders, but an extended partition can be subdivided into logical partitions. Logical partitions do not require entries in the partition table. In other words, an extended partition is a container for logical partitions.

If you need more than four partitions, create an extended partition as soon as the fourth partition or earlier. This extended partition should span the entire remaining free cylinder range. Then create multiple logical partitions within the extended partition. The maximum number of logical partitions is 15 on SCSI disks and 59 on (E)IDE disks.

It does not matter which type of partitions are used for Linux. Primary and logical partitions both work fine.

## D.2 Required Disk Space

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

**Table D-1** *Partitioning Recommendations*

System Type	Size	Description
Minimal System	500 MB	No graphical interface (X Window System) is installed, so only console applications can be used. Also, only a very basic selection of software is installed.
Minimal System with Graphical Interface	700 MB	This includes the X Window System and some applications.

System Type	Size	Description
Default System	1.5 GB	This includes a modern desktop environment, like KDE or GNOME, and also provides enough space for large application suites like Netscape* or Mozilla.
Full Installation	4 GB	All the packages included with Novell® Linux Desktop can be installed.

Depending on the amount of space and how the computer will be used, adjust the distribution of the available disk space. These are some basic guidelines for partitioning:

**Table D-2** *Partitioning Guidelines*

Disk Space	Partitioning Guideline
Less than 4 GB	One partition for the swap space and one root partition (/). In this case, the root partition must allow for those directories that often reside on their own partitions if more space is available.
4 GB or more	A swap partition (1 GB or more), a root partition (2 to 4 GB), and one partition each for the following directories as needed: /usr (4 GB or more), /opt (4 GB or more), and /var (1 GB). The rest of the available space can be used for /home.

Depending on the hardware, it might also be useful to create a boot partition (/boot) to hold the boot mechanism and the Linux kernel. This partition should be located at the start of the disk and should be at least 8 MB or 1 cylinder. As a rule of thumb, always create such a partition if it was included in YaST’s original proposal. If you are unsure about this, create a boot partition to be on the safe side.

You should also be aware that some (mostly commercial) programs install their data in /opt. Therefore, you might want to create a separate partition for /opt or make the root partition larger.

## D.3 Partitioning with YaST

When you select the partitioning item in the suggestion window for the first time, YaST displays a dialog listing the partition settings currently proposed. You can accept these current settings without change or change them before continuing. Or you can discard all the settings and start over from scratch.

Nothing in the partitioning setup is changed if you select Accept Suggested Partitioning Setup. If you select Change Suggested Partitioning Setup, the Expert Partitioner opens. The Expert Partitioner lets you configure the partition setup in great detail. This is explained in [“Using the YaST Expert Partitioner” on page 257](#). The original setup as proposed by YaST is offered there as a starting point.

Selecting Create Custom Partitioning Setup opens the Preparing Hard Disk—Step 1 dialog. Use the list to select from the existing hard disks on your system. Novell Linux Desktop is installed on the disk selected here.

The next step is to determine whether to use entire disk (Use Entire Hard Disk) or to use any existing partitions (if available) for the installation. If a Windows operating system was installed on the disk, you might be asked to delete or resize the partition. Before doing so, read [“Resizing a Windows](#)

Partition” on page 259. If desired, go to the Expert Partitioner dialog to create a custom partition setup at this point (see “Creating a Partition” on page 258).

---

**WARNING:** If you select Use Entire Hard Disk, all existing data on that disk is completely erased later in the installation process and is then lost.

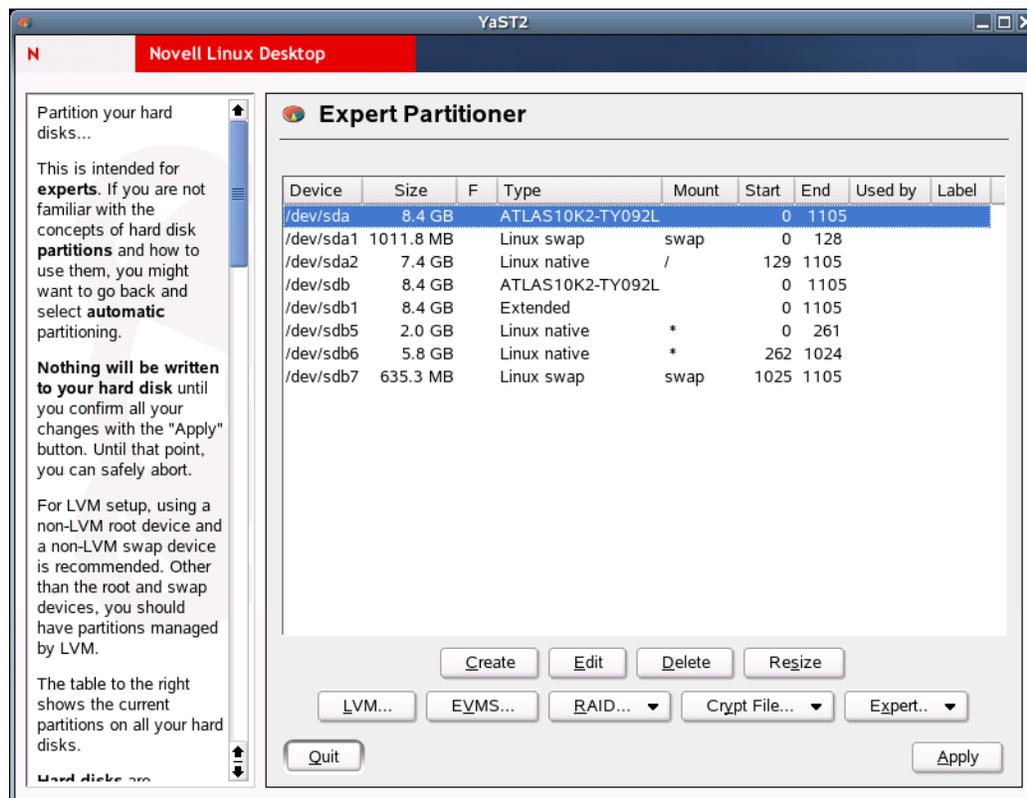
---

YaST checks during the installation to see if the disk space is sufficient for the software selection made. If not, YaST automatically removes parts from the software selection as needed. The suggestion window then includes a notice to inform you about this. As long as there is sufficient disk space available, YaST simply accepts your settings and partitions the hard disk accordingly.

## D.4 Using the YaST Expert Partitioner

With the Expert Partitioner dialog in YaST, you can manually modify the partitioning of your hard disk. Partitions can be added, deleted, or edited.

Figure D-1 YaST Partitioner in Expert Mode



All existing or suggested partitions on all connected hard disks are displayed in the list. Entire hard disks are listed as devices without numbers, such as `/dev/hda` or `/dev/sda`. Partitions are listed as parts of these devices, such as `/dev/hda1` or `/dev/sda1`. The size, type, file system, and mount point of the hard disks and their partitions are also displayed. The mount point describes where the partition is mounted in the Linux file system tree.

Any free hard disk space is also listed and automatically selected. To provide more disk space to Linux, free the needed space starting from the bottom toward the top of the list (starting from the last partition of a hard disk toward the first).

## D.4.1 Creating a Partition

- 1 Click *Create* in the Expert Partitioner dialog.
- 2 (Conditional) If several hard disks are connected and a selection dialog appears, select the hard disk for the new partition.
- 3 Specify the partition type (primary or extended).

You can create up to four primary partitions or up to three primary partitions and one extended partition. Within the extended partition, you can create several logical partitions (see “[Partition Types](#)” on page 255).
- 4 Select the file system you want to use to format the partition and a mount point, if necessary.

YaST suggests a mount point for each partition created. The parameters are described in “[Partitioning Parameters](#)” on page 258.
- 5 Click *OK* to apply your changes.

The new partition is now listed in the partition table.
- 6 Click *Next* to adopt the current values and return to the suggestion screen.

## D.4.2 Partitioning Parameters

If you create a new partition or modify an existing partition, various parameters can be set in the partitioning tool. For new partitions, suitable parameters are set by YaST and usually do not require any modification. To perform manual settings, use the following procedure.

- 1 Select a partition, then click *Edit*.
- 2 Set the following parameters:

Parameter	Description
File System ID	Even if you do not want to format the partition at this stage, assign it a file system ID to ensure that the partition is registered correctly. Possible values include Linux, Linux swap, Linux LVM, or Linux RAID.
File System	To format the partition immediately within the scope of the installation, specify one of the following file systems for the partition: Swap, Ext2, Ext3, ReiserFS, or JFS.
File System Options	Sets various parameters for the selected file system.
Encrypt File System	If you activate encryption, writes all data to the hard disk in an encrypted format.
fstab Options	Specifies various parameters for the administration file of the file systems ( <i>/etc/fstab</i> ).
Mount Point	Specifies the directory where the partition should be mounted in the file system tree. Various YaST suggestions can be expanded in the respective entry field. If you accept these suggestions, the default file system structure is implemented. You can also specify any other names.

- 3 Click *Next* to activate the partition.

If you partition manually, create a swap partition. The swap partition is used to free the main memory of data that is not used at the present moment. This keeps the main memory free for the most frequently used important data.

### D.4.3 Resizing a Windows Partition

If a hard disk containing a Windows FAT or NTFS partition was selected as the installation target, YaST offers to delete or shrink this partition. This way, you can install Novell Linux Desktop even if there is currently not enough space on the hard disk. This functionality is especially useful if the selected hard disk contains only one Windows partition that covers the entire hard disk. This is sometimes the case on computers where Windows comes preinstalled.

If YaST sees that there is not enough space on the selected hard disk, but that space could be made available by deleting or shrinking a Windows partition, it presents a dialog where you can choose one of these two options.

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

---

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

---

To shrink the Windows partition, interrupt the installation and boot Windows to prepare the partition from there. Although this step is not strictly required for FAT partitions, it speeds up the resizing process and also makes it safer. These steps are vital for NTFS partitions.

**Table D-3** Steps for NTFS Partitions

---

File System	Steps to Perform
FAT	<p>In Windows, first run <code>scandisk</code> to make sure the FAT partition is free of lost file fragments and crosslinks. Then run <code>defrag</code> to move files to the beginning of the partition. This accelerates the resizing procedure in Linux.</p> <p>If you have optimized virtual memory settings for Windows in such a way that a contiguous swap file is used with the same initial (minimum) and maximum size limit, consider disabling these Windows optimizations for the time being and re-enabling them after the resizing has been completed. With these Windows settings, the resizing might split the swap file into many small parts scattered all over the FAT partition. Also, the entire swap file would need to be moved during the resizing, which makes the process rather slow.</p>
NTFS	<p>In Windows, run <code>scandisk</code> and <code>defrag</code> to move the files to the beginning of the hard disk. In contrast to the FAT file system, you <b>must</b> perform these steps or the NTFS partition cannot be resized.</p> <hr/> <p><b>NOTE:</b> If you operate your system with a permanent swap file on an NTFS file system, this file might be located at the end of the hard disk and remain there despite <code>defrag</code>, possibly making it impossible to shrink the partition sufficiently. In this case, temporarily deactivate the swap file (the virtual memory in Windows). After the partition has been resized, reconfigure the virtual memory.</p> <hr/>

---

After these preparations, return to the Linux partitioning setup and select Shrink Windows Partition. After a quick check of the partition, YaST opens a dialog with a suggestion for resizing the Windows partition. The first bar graph shows how much disk space is currently occupied by Windows and how much space is still available. The second bar graph shows how the space would be distributed after the resizing, according to YaST's current proposal.

Accept the proposed settings or use the slider to change the partition sizing (within certain limits). If you click *Next*, the settings are stored and you are returned to the previous dialog. The actual resizing takes place later, before the hard disk is formatted.

By default, Windows NT\*, 2000, and XP use the NTFS file system. Unlike FAT file systems, NTFS file systems can be read (but not edited) from Linux. In other words, you can read your Windows files from Linux, but you cannot edit them. If you want write access to your Windows data and do not need the NTFS file system, install Windows on a FAT32 file system. This way, you can have full access to your Windows data from Novell Linux Desktop.

# GNOME Configuration for Administrators

# E

This appendix discusses the following topics:

- ♦ [“Using GConf for Defaults” on page 261](#)
- ♦ [“Customizing Menus” on page 277](#)
- ♦ [“Installing Themes” on page 283](#)
- ♦ [“Configuring Fonts” on page 287](#)
- ♦ [“MIME Types” on page 288](#)
- ♦ [“Setting Screensavers” on page 294](#)
- ♦ [“Session Management” on page 295](#)
- ♦ [“Improving Performance” on page 295](#)
- ♦ [“Hidden Directories” on page 301](#)
- ♦ [“Security Note on Configuring SMB Printers” on page 302](#)
- ♦ [“Disabling GNOME Desktop Features” on page 302](#)

## E.1 Using GConf for Defaults

GConf is a system for storing application preferences that simplifies the administration of user preferences. GConf lets system administrators do the following:

- ♦ Set mandatory values for particular preferences for all users. This controls whether users can update particular preferences.
- ♦ Set default values for particular preferences for all users.
- ♦ Use suggested values for preferences that are specified in definition files for the preferences.
- ♦ Read documentation on each preference.

GConf also notifies applications when a preference value changes, locally or across a network. Therefore, when you change a preference, all applications that use the preference are immediately updated.

GConf provides a preferences database, similar to a simple file system. The file system contains keys organized into a hierarchy. Each key is either a directory containing more keys or it has a value. For example, the key `/apps/metacity/general/titlebar_font` contains an integer value giving the size of the titlebar font for the Metacity window manager.

GConf has the following components:

- ♦ [“GConf Repository” on page 262](#)
- ♦ [“GConf Daemon” on page 265](#)
- ♦ [“GConf Command Line Tool” on page 265](#)
- ♦ [“Configuration Editor” on page 275](#)

## E.1.1 GConf Repository

Each preference in the GConf repository is expressed as a key-value pair. A GConf preference key is an element in the repository that corresponds to an application preference. For example, the `/apps/gnome-session/options/show_splash_screen` preference key corresponds to the Show Splash Screen on Login option in the Sessions preference tool. The GNOME Desktop user interface does not contain all of the preference keys in the GConf repository. For example, the Panel preference tool does not contain an option that corresponds to the `/apps/panel/global/tooltips_enabled` key.

The repository is structured like a simple hierarchical file system. The repository contains the following:

- ◆ Directories that correspond to applications that use the GConf repository. For example, the file system contains the directory `/apps/metacity`.
- ◆ Subdirectories that correspond to categories of preferences. For example, the file system contains the directory `/apps/metacity/general`.
- ◆ Special files that list the preference keys in the directory and contain information about the keys. For example, a file that contains information about the keys that relate to the HTTP proxy preferences is in the directory `/system/http_proxy`.
- ◆ A `/schemas` directory that contains files that describe all of the preference keys.

Preference keys typically have simple values such as strings, integers, or lists of strings and integers. The format of the preference key in the repository depends on the backend module that is used to read the repository. The following is an example of the `/desktop/gnome/interface/font_name` preference key when an Extensible Markup Language (XML) backend module is used to read the repository:

```
<entry name="font_name" mtime="1038323555" muser="user123"
type="string">
<stringvalue>Sans 10</stringvalue>
</entry>
```

---

**NOTE:** When this guide refers to a preference key, the path to the key is added to the name of the key. For example, the `font_name` preference key in the `/desktop/gnome/interface` subdirectory is referred to as `/desktop/gnome/interface/font_name`.

---

### GConf Configuration Sources

The GConf repository contains a series of storage locations that are called configuration sources. The configuration sources are listed in the `/etc/opt/gnome/opt/gnome/gconf/gconf-version-number/path` GConf path file. Each user has a path file. The path file specifies the following information for each configuration source:

- ◆ Backend module to use to read the repository
- ◆ Permissions on the repository
- ◆ Location of the repository

The GConf path file also contains include instructions. By default, the contents of the GConf path file are as follows:

```
xml:readonly:/etc/opt/gnome/opt/gnome/gconf/gconf.xml.mandatory
include /etc/opt/gnome/opt/gnome/gconf/2/local-mandatory.path
```

```
include "$ (HOME) / .gconf .path"
include /etc/opt/gnome/opt/gnome/gconf/2/local-defaults.path
xml:readwrite:$ (HOME) / .gconf
xml:readonly:/etc/opt/gnome/opt/gnome/gconf/gconf.xml.defaults
```

When GConf searches for a preference value, it reads the configuration sources in the order specified in the path file. The following table describes the configuration sources in the path file:

**Table E-1** Configuration Sources in the Path File

Configuration Source	Description
Mandatory	The permissions on this configuration source are set to Read Only. Users cannot overwrite the values in this source, so the preferences in the source are mandatory.
User	This configuration source is stored in the .gconf directory in the home directory of the user. When the user sets a preference, the new preference information is added to this location.  You can use the Configuration Editor to modify the user configuration source.
Default	This configuration source contains the default preference settings.

The sequence of the configuration sources in the path file ensures that mandatory preference settings override user preference settings. The sequence also ensures that user preference settings override default preference settings. That is, GConf applies preferences in the following order of priority:

1. Mandatory preferences
2. User-specified preferences
3. Default preferences

The include instructions in the GConf path file enable system administrators to specify other configuration sources:

**Table E-2** Other Configuration Sources

Included Configuration Source	Description
/etc/opt/gnome/opt/gnome/gconf/2/local-mandatory.path	Stores mandatory preference values for a particular system.
\$(HOME) / .gconf.path	Specifies the location of the configuration source in the .gconf.path file in the user's home directory.
/etc/opt/gnome/opt/gnome/gconf/2/local-defaults.path	Stores default preference values for a particular system.

## GConf Schema

A GConf schema is a collective term for a GConf schema key and a GConf schema object. The following table describes schema keys and schema objects and their relationship to preference keys:

**Table E-3** *Schema Keys and Objects*

Item	Description
Preference key	An element in the GConf repository that corresponds to an application preference.
Schema key	A key that stores a schema object for a preference key.
Schema object	An element in a configuration source that contains information for a preference key, such as the following: <ul style="list-style-type: none"><li>◆ The name of the application that uses the preference key</li><li>◆ The type of value required for the preference key (for example, integer, boolean, etc.)</li><li>◆ A default value for the preference key</li><li>◆ Brief documentation on the preference key</li></ul>

The following are examples of a preference key, a schema key, and a schema object:

**Table E-4** *Preference Key, Schema Key, and Schema Object Examples*

Preference key:	<code>/desktop/gnome/interface/font_name</code>
Schema key:	<code>/schemas/desktop/gnome/interface/font_name</code>
Schema object:	<pre>&lt;schema&gt; &lt;applyto&gt;/desktop/gnome/interface/font_name&lt;/ applyto&gt; &lt;key&gt;/schemas/desktop/gnome/interface/font_name&lt;/ key&gt; &lt;owner&gt;gnome&lt;/owner&gt; &lt;type&gt;string&lt;/type&gt; &lt;default&gt;Sans 10&lt;/default&gt; &lt;locale name="C"&gt; &lt;short&gt;Default font&lt;/short&gt; &lt;long&gt;Name of the default font used by gtk+.&lt;/long&gt; &lt;/locale&gt;</pre>

You can associate a schema key with a preference key. For example, the following `/desktop/gnome/interface/font_name` key includes a schema key:

```
<entry name="font_name" mtime="1034873859"
schema="/schemas/desktop/gnome/interface/font_name"/>
```

When you associate a schema key with a preference key, the preference uses the suggested value that is specified in the schema object of the schema key. The suggested value is contained in the `<default>` element in the schema object. By default, all the preference keys in the default configuration source are associated with schema keys.

Typically, schemas are stored in the default configuration source.

## GConf Schema Definition Files

Schemas are generated from schema definition files. A schema definition file defines the characteristics of all of the keys in a particular application. Schema definition files have a `.schemas` extension.

The schema definition files are included in the `/etc/opt/gnome/opt/gnome/gconf/schemas` directory. You can use the schema definition files to create a new configuration source.

Some schema definition files correspond closely to a part of the GNOME Desktop user interface. For example, `system_http_proxy.schemas` corresponds to the Network Proxy preference tool. Other schema definition files contain preference keys that are not present in the GNOME Desktop user interface. For example, the `/apps/panel/global/tooltips_enabled` key is not present.

Some parts of the GNOME Desktop user interface contain preferences that represent preference keys from more than one schema definition file. For example, the Keyboard Shortcuts preference tool contains preferences that represent keys from the `panel-global-config.schemas` and `metacity.schemas` files.

## E.1.2 GConf Daemon

The GConf daemon is called `gconfd-2`. It notifies applications when a preference value changes. For example, you might choose to show only icons in toolbars in the Menus & Toolbars preference tool. When you select this option in the preference tool, the toolbars on all open applications are updated instantly. The daemon can operate locally or across a network.

An instance of the GConf daemon is started for each user. It does not have to deal with complex problems such as authentication and data security. When the daemon starts, it loads the GConf path file. The daemon also manages all access between applications and the configuration sources.

When an application requests the value of a preference key, the daemon searches the configuration sources as follows:

1. Search for the value of the preference key in each configuration source, in the order specified in the path file.
2. If the value is found, return the value.
3. If the value is not found, search for the schema key that corresponds to the preference key in each configuration source, in the order specified in the path file.
4. If the schema key is found, check the value of the schema key.
5. If the value of the schema key is a schema object, return the suggested value in the `<default>` element of the schema object.

The GConf daemon also caches preference key values. All applications use this cache, so applications need to access the configuration sources only once.

To terminate the GConf daemon, use the following command:

```
gconftool-2 --shutdown
```

## E.1.3 GConf Command Line Tool

GConf includes a command line tool called `gconftool-2`. You can use `gconftool-2` to perform the following tasks:

- ◆ Set the values of keys
- ◆ Display the values of keys
- ◆ Install schemas from schema definition files when you install an application

For example, you would use the following command to display the values of all keys in the `/desktop/gnome` directory and subdirectories:

```
gconftool-2 --recursive-list /desktop/gnome
```

The following table lists some of the options that you can use with the `gconftool-2` command:

**Table E-5** *gconftool-2 Options*

Option	Function
<code>--all-dirs</code>	Lists all subdirectories in a directory that you specify.
<code>--all-entries</code>	Displays the values of all keys in a directory that you specify.
<code>--config-source=<i>configuration-source</i></code>	Use with the <code>--direct</code> option to specify a configuration source to use. If you do not specify a configuration source with this option, the command runs on all configuration sources in the path file.
<code>--direct</code>	Use with the <code>--config-source</code> option to access a configuration source directly. When you use this option, GConf bypasses the server. Ensure that the GConf daemon, <code>gconfd-2</code> , is not running before you use this option.
<code>--dump</code>	Generates a list that contains all preference keys in a GConf repository directory that you specify. The list contains XML descriptions of all the keys, in a <code>&lt;gconfentryfile&gt;</code> element.  For example, you can redirect the output from this option to generate a file that lists all keys that are related to your panel configuration. You can use the <code>--load</code> option with this file.
<code>--get</code>	Displays the value of a preference key that you specify. Also displays the values of the elements in the schema object for a schema key that you specify.
<code>--help</code>	Displays a help message about the <code>gconftool-2</code> command and the options that you can use with it.
<code>--load=<i>filename</i></code>	Sets the values of preference keys in the current directory in a configuration source to the values in the file that you specify. The file that you specify must contain XML descriptions of the keys, in a <code>&lt;gconfentryfile&gt;</code> element.
<code>--long-desc=<i>description</i></code>	Use with the <code>--set-schema</code> option to specify a long description for a schema key.
<code>--makefile-install-rule</code>	Installs schema definition files to applications.
<code>--owner=<i>owner</i></code>	Use with the <code>--set-schema</code> option to specify an owner for a schema key.
<code>--recursive-list</code>	Displays the values of all preference keys in all subdirectories in a directory that you specify.
<code>--recursive-unset</code>	Resets the values of all preference keys, in all subdirectories in a directory, from the user setting to the setting in the default configuration source.

Option	Function
<code>--set</code>	<p>Sets the value of a preference key and writes the value to the user configuration source. Use it with the <code>--type</code> option to specify the data type of the value that you want to set. For example, the following command sets the value of the <code>/apps/gnome-terminal/profiles/Default/background_color</code> key in the user configuration source:</p> <pre>gconftool-2 --set "/apps/gnome-terminal/profiles/Default/background_color" --type string "#000000"</pre> <p>You can also use it with the <code>--direct</code> option and the <code>--config-source</code> option to write a value to another configuration source.</p>
<code>--set-schema</code>	<p>Sets the value of an attribute in a schema key and writes the value to the default configuration source.</p> <p>Use it with the following options to specify the attribute that you want to update:</p> <ul style="list-style-type: none"> <li>◆ <code>--type</code></li> <li>◆ <code>--short-desc</code></li> <li>◆ <code>--long-desc</code></li> <li>◆ <code>--owner</code></li> </ul> <p>For example, the following command sets the short description in the schema key for the <code>/apps/gnome-terminal/profiles/Default/background_color</code> key:</p> <pre>gconftool-2 --set-schema "/schemas/apps/gnome-terminal/profiles/Default/background_color" --short-desc "Default background color of terminal"</pre>
<code>--short-desc=<i>description</i></code>	Use with the <code>--set-schema</code> option to specify a short description for a schema key.
<code>--shutdown</code>	Terminates the GConf daemon.
<code>--type=<i>data-type</i></code>	<p>Specifies the data type when you set a value of a preference key. You can also use this option when you set the value of an attribute in a schema key. The following are valid data types:</p> <ul style="list-style-type: none"> <li>◆ <code>bool</code></li> <li>◆ <code>float</code></li> <li>◆ <code>int</code></li> <li>◆ <code>list</code></li> <li>◆ <code>pair</code></li> <li>◆ <code>string</code></li> </ul>
<code>--unset</code>	Resets the value of a preference key from the user setting to the setting in the default configuration source.

Option	Function
<code>--usage</code>	Displays a brief help message about the <code>gconftool-2</code> command and the options that you can use with it.

## E.1.4 Setting Preference Values

You can set a mandatory value or a default value for a preference key. Before you change mandatory preference values or default preference values for users, you must ensure that the GConf daemon is not running for any user.

---

**IMPORTANT:** Before you change mandatory preference values or default preference values for users, you must ensure that all users are logged out.

---

To set a mandatory value or a default value for a preference key, use the `gconftool-2` command, as follows:

```
gconftool-2 --direct --config-source configuration-source --type data-type --set preference-keyvalue
```

For example, to set `wwwproxy.xyz.com` as the mandatory HTTP proxy host, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/opt/gnome/gconf/gconf.xml.mandatory --type string --set /system/http_proxy/host wwwproxy.xyz.com
```

The user *cannot* override this preference value.

You can also use the `gconftool-2` command to set default values. For example, to set the default number of workspaces to five, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/opt/gnome/gconf/gconf.xml.defaults --type int --set /apps/metacity/general/num_workspaces 5
```

The user *can* override this preference value.

## E.1.5 Setting General Preferences

The following sections describe how to assign mandatory or default values to general preferences:

- ◆ [“Setting HTTP Proxy Preferences” on page 269](#)
- ◆ [“Setting Print Manager Preferences” on page 269](#)
- ◆ [“Setting the Number of Workspaces” on page 269](#)
- ◆ [“Setting Keyboard Accessibility Preferences” on page 270](#)
- ◆ [“Setting Keyboard Shortcut Preferences” on page 270](#)
- ◆ [“Setting Panel and Panel Object Preferences” on page 270](#)

## Setting HTTP Proxy Preferences

To set HTTP proxy preferences, modify the values of the preference keys in the `/system/http_proxy/` location. For example, to set a mandatory value for the HTTP proxy host, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/opt/gnome/gconf/gconf.xml.mandatory --type string --set /system/http_proxy/host proxy-name
```

To set a default value for the HTTP proxy host, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/opt/gnome/gconf/gconf.xml.defaults --type string --set /system/http_proxy/host proxy-name
```

You can also set other HTTP proxy-related preferences. For more information, see the `system_http_proxy.schemas` schema definition file.

## Setting Print Manager Preferences

To set print manager preferences, modify the values of the preference keys in the `/apps/gnome-print-manager` location. For example, if you do not want users to view the print jobs of other users, set a mandatory value as follows:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/gconf/gconf.xml.mandatory --type bool --set /apps/gnome-print-manager/show_all_jobs false
```

To set a default value for this preference, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/gconf/gconf.xml.defaults --type bool --set /apps/gnome-print-manager/show_all_jobs false
```

You can also set other print manager preferences. For more information, see the `gnome-print-manager.schemas` schema definition file.

## Setting the Number of Workspaces

To set a mandatory number of workspaces, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/gconf/gconf.xml.mandatory --type int --set /apps/metacity/general/num_workspaces integer
```

To set a default number of workspaces, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/gconf/gconf.xml.defaults --type int --set /apps/metacity/general/num_workspaces integer
```

You can also set other window manager preferences. For more information, see the `metacity.schemas` schema definition file.

## Setting Keyboard Accessibility Preferences

To set keyboard accessibility preferences, modify the values of the preference keys in the `/desktop/gnome/accessibility/keyboard` location. For example, if you want to set a mandatory value so that keyboard accessibility features are enabled, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/gconf/gconf.xml.mandatory --type bool --set /desktop/gnome/accessibility/keyboard/enable true
```

To set a default value for this preference, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/gconf/gconf.xml.defaults --type bool --set /desktop/gnome/accessibility/keyboard/enable false
```

You can also set other keyboard accessibility preferences. For more information, see the `desktop_gnome_accessibility_keyboard.schemas` schema definition file.

## Setting Keyboard Shortcut Preferences

To set keyboard shortcut preferences, modify the values of preference keys in `/apps/metacity/global_keybindings` location. For example, you might want users to use only the `Alt+F3` keyboard shortcut to open the Run Application dialog. To set this mandatory value, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/gconf/gconf.xml.mandatory --type string --set /apps/metacity/global_keybindings '<Alt>F3'
```

You can also set other keyboard shortcut preferences. For more information, see the `metacity.schemas` schema definition file.

## Setting Panel and Panel Object Preferences

The `panel-default-setup.entries` file specifies the following details of the panels in the GNOME Desktop:

- ◆ Number of panels
- ◆ Types of the panels
- ◆ Properties of the panels
- ◆ Contents of the panels

The configuration of individual panels and of panel objects is a complex task. You must first understand the structure of the `panel-default-setup.entries` file. For more information, see [“Specifying Individual Panels and Panel Objects” on page 271](#).

To set preferences for individual panels and panel objects, you must set the values of many preferences in a configuration source. The easiest way to do this is to use the `gconftool-2` command with the `--dump` and `--load` options. For more information, see [“Setting Preferences for Individual Panels and Panel Objects” on page 273](#).

## Specifying Individual Panels and Panel Objects

The `panel-default-setup.entries` file contains sections that specify panels and panel contents, and it specifies values for schema keys. This file is located in the `/etc/opt/gnome/gconf/schemas` directory.

The `panel-default-setup.entries` file is structured as follows:

1. Keys that specify the general structure of panels, applets, and other panel objects in the GNOME Desktop.

The following keys specify the number of panels, panel objects, and applets that appear in the GNOME Desktop:

- ♦ `/apps/panel/default_setup/general/toplevel_id_list`
- ♦ `/apps/panel/default_setup/general/object_id_list`
- ♦ `/apps/panel/default_setup/general/applet_id_list`

The keys also assign identifiers to each panel, panel object, and applet. For example, the following sample from `panel-default-setup.entries` specifies that one panel appears in the GNOME Desktop:

```
<entry>
 <key>toplevel_id_list</key>
 <schema_key>/schemas/apps/panel/general/toplevel_id_list
</schema_key>
 <value>
 <list type="string">
 <value>
 <string>bottom_panel</string>
 </value>
 </list>
 </value>
</entry>
```

In the `panel-default-setup.entries` file, the identifier `bottom_panel` identifies the bottom edge panel.

2. Keys that specify the properties of the panels.

The panel property keys are structured as follows:

`/apps/panel/default_setup/toplevels/panel-name/panel-property-key`

For example, the `/apps/panel/default_setup/toplevels/bottom_panel/size` key specifies the size of the bottom panel.

3. Keys that specify the panel objects, the panel object properties, and the panels where the objects reside.

For example, the following sample from `panel-default-setup.entries` specifies a Main Menu object at the left side of the bottom panel:

```
<entrylist base="/apps/panel/default_setup/objects/main_menu">
 <entry>
 <key>object_type</key>
 <schema_key>/schemas/apps/panel/objects/object_type</
schema_key>
 <value>
 <string>menu-object</string>
```

```

 </value>
 </entry>
 <entry>
 <key>toplevel_id</key>
 <schema_key>/schemas/apps/panel/objects/toplevel_id</
schema_key>
 <value>
 <string>bottom_panel</string>
 </value>
 </entry>
 <entry>
 <key>position</key>
 <schema_key>/schemas/apps/panel/objects/position</schema_key>
 <value>
 <int>0</int>
 </value>
 </entry>
 .
 .
 .
</entrylist>

```

4. Keys that specify the applets, the applet preferences, and the panels where the applets reside.

For example, the following sample from `panel-default-setup.entries` specifies the Window List applet, in the bottom panel:

```

<entrylist base="/apps/panel/default_setup/applets/window_list">
 <entry>
 <key>object_type</key>
 <schema_key>/schemas/apps/panel/objects/object_type
</schema_key>
 <value>
 <string>bonobo-applet</string>
 </value>
 </entry>
 <entry>
 <key>toplevel_id</key>
 <schema_key>/schemas/apps/panel/objects/toplevel_id
</schema_key>
 <value>
 <string>bottom_panel</string>
 </value>
 </entry>
 <entry>
 <key>position</key>
 <schema_key>/schemas/apps/panel/objects/position
</schema_key>
 <value>
 <int>2</int>
 </value>
 </entry>
 .
 .
 .
</entry>

```

```

 <key>bonobo_iid</key>
 <schema_key>/schemas/apps/panel/objects/bonobo_iid_type</
schema_key>
 <value>
 <string>OAFIID:GNOME_WindowListApplet</string>
 </value>
</entry>
</entrylist>

```

The OAFIID is a unique identifier for an applet. To find the OAFIID for a particular applet, see the `.server` file for the applet in the `/usr/lib/bonobo/servers` directory. For example, the following excerpt from `GNOME_Wncklet_Factory.server` shows the OAFIID for the Window List applet:

```

<oaf_server iid="OAFIID:GNOME_WindowListApplet"
type="factory" location="OAFIID:GNOME_Wncklet_Factory">

```

### Setting Preferences for Individual Panels and Panel Objects

- 1 Log in to a GNOME session, then configure the panels as required.
- 2 Use the `--dump` option with the `gconftool-2` command line tool to generate a file that contains an XML description of your panel configuration.

The `--dump` option generates a list that contains all preference keys in a GConf repository directory that you specify.

For example, the following command creates an XML description of the default panel configuration in a file called `my-panel-setup.entries`:

```

gconftool-2 --dump /apps/panel/profiles/default > my-panel-
setup.entries

```

- 3 Open the `my-panel-setup.entries` file in a text editor, then modify the file as required.

For example, you might want to change the location of the desktop entry files. The following is an excerpt from a file generated with the `--dump` option:

```

<entry>
 <key>objects/object_16/launcher_location</key>
 <schema_key>/schemas/apps/panel/objects/launcher_location
</schema_key>
 <value>
 <string>hadjaha-00adce02f7.desktop</string>
 </value>
</entry>

```

In the above example, you might want to change the reference to `hadjaha-00adce02f7.desktop` to another desktop entry file that is available globally.

When you generate a panel configuration with the `--dump` option, the positions of the panel objects are absolute positions. You might want to change these positions to relative positions. The object at the extreme left of a panel has a position value of 0. The next object has a position value of 1, and so on. If you want object positions to be relative to the right side of the panel, set the value of the `right_stick` key to `True`.

- 4 Use the `--load` option with the `gconftool-2` command line tool to set the values of the default configuration source to the values in the `my-panel-setup.entries` file.

For example, the following command sets the values of the keys in the default configuration source to the values of the corresponding keys in `my-panel-setup.entries`:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/
gconf/gconf.xml.defaults --load my-panel-setup.entries
```

## E.1.6 Setting Look-and-Feel Preferences

The following sections describe how to assign mandatory or default values to look-and-feel preferences:

- ◆ “Setting Font Preferences” on page 274
- ◆ “Setting Background Preferences” on page 274
- ◆ “Setting Splash Image Preferences” on page 275

### Setting Font Preferences

To set font preferences, modify the values of two preference keys. The following table shows the keys to modify and the part of the user interface that the keys correspond to:

**Table E-6** Font Preference Keys

GConf Location	User Interface Component
/desktop/gnome/interface/font_name	Font preference tool, Application font option
/apps/nautilus/preferences/ desktop_font	Font preference tool, Desktop font option

For example, to set Sans 12 as the mandatory application font, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/
gconf/gconf.xml.mandatory --type string --set /desktop/gnome/
interface/font_name "Sans 12"
```

To set Palatino 12 as the default desktop object font, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/
gconf/gconf.xml.defaults --type string --set /apps/nautilus/
preferences/desktop_font "palatino 12"
```

### Setting Background Preferences

To set preferences for the desktop background, modify the values of the preference keys in the /desktop/gnome/background location. For example, to set a mandatory image for the background, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/
gconf/gconf.xml.mandatory --type string --set /desktop/gnome/
background/picture_filename filename.png
```

To set a default value for this preference, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/
gconf/gconf.xml.defaults --type string --set /desktop/gnome/
background/picture_filename filename.png
```

You can also set other background preferences. For more information, see the desktop\_gnome\_background.schemas schema definition file.

## Setting Splash Image Preferences

To set splash image preferences, modify the value of the preference keys in the `/apps/gnome-session/options/` location. For example, if you do not want users ever to see a splash image, set a mandatory value as follows:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/
gconf/gconf.xml.mandatory --type bool --set /apps/gnome-session/
options/show_splash_screen false
```

To set a default value for this preference, use the following command:

```
gconftool-2 --direct --config-source xml:readwrite:/etc/opt/gnome/
gconf/gconf.xml.defaults --type bool --set /apps/gnome-session/
options/show_splash_screen false
```

You can also set other splash image preferences. For more information, see the `gnome-session.schemas` schema definition file.

## E.1.7 Restoring Default Preference Values

To restore the default preference values for a user, use the following command:

```
gconftool-2 --direct --config-source user-configuration-source --
recursive-unset
```

Replace *user-configuration-source* with the configuration source in the `.gconf` directory in the home directory of the user.

This command resets the values of all preference keys, in all subdirectories, from the user setting to the setting in the default configuration source.

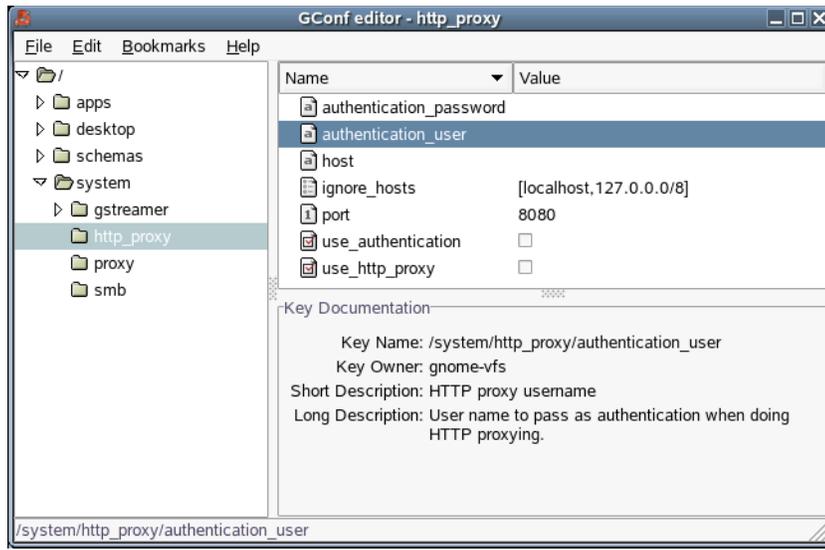
## E.1.8 Configuration Editor

The Configuration Editor (GConf Editor) lets you view and edit the values of the keys stored in the GConf repository.

To open the Configuration Editor:

- 1 Click *System > Run Program*.
- 2 Type `/opt/gnome/bin/gconf-editor`, then click *Run*.

**Figure E-1** Configuration Editor Window



The Configuration Editor window contains the following panes:

### Tree

Lets you navigate the directories and subdirectories in the GConf repository. Use this pane to display the keys that you want to modify in the modification pane. The tree pane is on the left side of the window.

### Modification

Displays the keys in the selected GConf repository directory. Use this pane to select keys that you want to modify, and to modify the values of keys. The modification pane is in the upper part of the right side of the window.

The icons beside the keys in the modification pane indicate what type of value you can enter for the key. For example, the check mark icon beside the `/system/http_proxy/use_http_proxy` key indicates that you can enter a boolean value for the key.

The icons also indicate if you cannot edit the value of a key. For example, a key icon beside a schema key indicates that you cannot modify the value of the key.

### Documentation

Displays documentation for the currently selected key. Use this pane to get more information about the GConf preference keys.

You can copy the names of keys so that you can paste them into another application. You can also add bookmarks to keys.

### Modifying the Value of a Key

- 1 Use the tree pane to display the key that you want to modify in the modification pane.
- 2 Click the key you want to modify.
- 3 To change the value of an integer key or a string key, click the *Value* column of the key and then type the new value for the key.
- 4 To change the value of a boolean key, click the *Value* column of the key.

## Copying a Key Name

- 1 Click the key whose name you want to copy in the modification pane.
- 2 Click *Edit > Copy Key Name*.
- 3 If required, you can paste the name of the key into another application.

## Using Bookmarks with Keys

To access a key in your bookmarks, select the key from the Bookmarks menu.

### Adding a Bookmark

- 1 Click the key that you want to bookmark in the modification pane.
- 2 Click *Bookmarks > Add Bookmark*.

### Deleting a Bookmark

- 1 Click *Bookmarks > Edit Bookmarks*.  
An Edit Bookmarks dialog is displayed.
- 2 Select a bookmark from the list on the left, then click *Delete*.
- 3 Click *Close*.

## E.2 Customizing Menus

The way in which the GNOME Desktop implements menus enables you to do the following:

- ♦ Customize the menu hierarchy easily. The menu hierarchy is not based on the file system hierarchy. You can edit a small number of files to customize the menu hierarchy. You do not need to modify your applications or move files.
- ♦ Install applications easily. You do not need to provide information about the menu hierarchy to applications when you install the applications.
- ♦ Configure menus so that users cannot modify them.

Menus in the GNOME Desktop use the following components:

- ♦ **File abstraction layer**
- ♦ **Vfolders**
- ♦ **Desktop entry files**
- ♦ **Directory entry files**

### E.2.1 File Abstraction Layer

The `gnome-vfs` file abstraction layer provides a simplified and generalized way for applications to interact with files. The file abstraction layer also provides Uniform Resource Identifier (URI) locations that map to particular menu configuration files. To add a menu or a menu item for all users, you must add the menu or menu item to one of the URI locations. The following table lists the menus that you can add items to, and the URI locations that correspond to the menus.

**Table E-7** *Menus You Can Add Items To*

Menu	URI Locations
Applications menu for all users	applications-all-users:///
Desktop Preferences menu for all users	preferences-all-users:///

## E.2.2 Vfolders and Menus

In general terms, a vfolder is a virtual representation of items that reside in a physical location or locations on your system. For example, a vfolder might represent the contents of several directories. A vfolder is an abstraction from one or more physical locations. In terms of menus in the GNOME Desktop, a vfolder is a representation in a menu of items that might be physically located in several directories.

A vfolder information file is an XML file that describes a vfolder. Vfolder information files specify the structure of your menus. Vfolder information files specify the names of your menus and the order in which applications appear in your menus. Vfolder information files have a .vfolder-info file extension.

The following is an excerpt from a vfolder information file:

```
<?xml version="1.0"?>
<VFolderInfo>
.
.
.
 <Folder>
 <Name>Applications</Name>
 <Desktop>Applications.directory</Desktop>
 <Folder>
 <Name>Accessories</Name>
 <DontShowIfEmpty/>
 <Desktop>Accessories.directory</Desktop>
 <Query>
 <And>
 <Keyword>Application</Keyword>
 <Keyword>Utility</Keyword>
 </And>
 </Query>
 </Folder>
.
.
.
 </Folder>
</VFolderInfo>
```

The following table describes some of the elements in vfolder information files.

**Table E-8** *Vfolder Elements*

Element	Description
<Folder>	Contains the elements that define the name, content, and structure of the menu.
<Name>	Specifies the name of the menu.
<Desktop>	Specifies the name of the directory entry file that specifies the name, comment, and icon for the menu.
<Query>	<p>Specifies a query to run on desktop entry files. If a desktop entry file matches the requirements in the query, the menu item is displayed in the menu.</p> <p>The query in the excerpt searches for desktop entry files that contain the keywords Application and Utility in the Categories key. Desktop entry files that match are displayed in the Applications menu.</p> <p>This element is optional.</p>
<DontShowIfEmpty/>	<p>If this element is present, the menu is not displayed if the menu does not contain any items.</p> <p>This element is optional.</p>

## E.2.3 Desktop Entry Files

A desktop entry file is a data file that provides information about an item in a menu. This file specifies the details for the item such as a name, a command to run, or an icon. It also contains keywords which determine the location of the item in the menu hierarchy. Desktop entry files have a .desktop file extension.

The following is a sample desktop entry file:

```
[Desktop Entry]
Encoding=UTF-8
Name=Calculator
Comment=Perform calculations
Exec=gcalctool
Icon=gcalctool.png
Terminal=false
Type=Application
Categories=GNOME;Application;Utility;
X-GNOME-DocPath=gcalctool/gcalctool.xml
```

The following table describes the most important keys in desktop entry files.

**Table E-9** *Desktop Entry File Keys*

Desktop Entry Key	Description
Encoding	Specifies the encoding of the desktop entry file.
Name	Specifies the name of the item. This name is displayed on the item in the menu.

Desktop Entry Key	Description
Comment	Specifies a short description of the item. The comment is displayed as a tooltip when you point to the item in the menu.
Exec	Specifies a command to execute when you select the item from the menu.
Icon	Specifies the filename of an icon that represents the item. Does not specify the file extension or the path to the filename.
Terminal	Specifies whether the command in the Exec key runs in a terminal window. If the value is True, the command runs in a terminal window.  If the command does not create a window in which to run, the value of this key must be True.
Type	Specifies the type of item. This value is one of the following: <ul style="list-style-type: none"> <li>◆ <b>Application:</b> Use this option for an item that starts an application.</li> <li>◆ <b>Link:</b> Use this option for an item that links to a file, folder, or FTP site.</li> </ul>
Categories	Specifies the keywords that describe the item. The keywords are separated with semicolons (;). To view a list of the standard category keywords, see the desktop menu specification at <a href="http://www.freedesktop.org">freedesktop.org (http://www.freedesktop.org)</a>  The vfolder information files map the keywords to menus.
X-GNOME-DocPath	Specifies the help file to display when you select Help on application-name from the menu item pop-up menu.

For more information on the keys in desktop entry files, see the desktop entry specification at [freedesktop.org \(http://www.freedesktop.org\)](http://www.freedesktop.org).

**NOTE:** Panel launchers and desktop objects also use desktop entry files. These desktop entry files provide the same information as for items in a menu. For example, the desktop entry files provide the command to run when a user selects the launcher or object.

## E.2.4 Directory Entry Files

A directory entry file is a data file that provides information about a menu. The directory entry file specifies the details for the menu, such as a name, a tooltip, and an icon. Directory entry files have a .directory file extension.

The following is a sample directory entry file:

```
[Desktop Entry]
Name=Accessories
Comment=Accessories menu
Icon=gnome-util.png
Type=Directory
```

The following table describes the most important keys in directory entry files.

**Table E-10** Directory Entry File Keys

Directory Entry Key	Description
Name	Specifies the name of the menu, which is displayed on the menu.
Comment	Specifies a short description of the menu. The comment is displayed as a tooltip when you point to the menu.
Icon	Specifies the filename of an icon that represents the menu. Does not specify the file extension or the path to the filename.
Type	Specifies the type of menu. The value of this key is always Directory.

## E.2.5 Editing Menus

You use the following GNOME Desktop components to edit menus:

- ◆ Nautilus file manager
- ◆ Menus on panels

When you use the file manager to add menus or menu items for all users, you must add the menu or menu item to a URI location. The table in “[File Abstraction Layer](#)” on [page 277](#) lists the menus that you can add items to, and the URI locations that correspond to the menus.

When you use panels to customize menus for all users, you use the menu item popup menu. For more information, see [Working With Menus](#) in the GNOME 2.6 Desktop User Guide.

You can also use menu configuration files and menu data files to customize menus.

### Adding Menus

You can add menus for all users in either of the following ways.

#### Using the File Manager

To add a menu for all users, perform the following steps:

- 1** In a file manager window, access the location where you want to add the menu.

For example, to add a menu to the Applications menu, type `applications-all-users:///` in the Location field and then press Enter.

- 2** Click *File > New Folder*.

An untitled folder is added to the view pane. The name of the folder is selected.

- 3** Type a name for the folder, then press Enter.

The vfolder information file for the location that you accessed in [Step 1 on page 281](#) is automatically updated with the details of the new menu. The name of the folder is displayed as the name of the menu.

The next time that users log in, the menu is in the assigned location.

## Using Menu Files

To add a menu for all users, perform the following steps:

- 1 Create a directory entry file for the item that you want to add.  
Create the directory entry file in the `/opt/gnome/share/gnome/vfolders` directory. For more information on directory entry files, see [“Directory Entry Files” on page 280](#).
- 2 Locate the vfolder information file for the location where you want to add the menu.  
For example, to add a menu to the Applications menu, locate the file `/etc/opt/gnome/gnome-vfs-2.0/vfolders/applications-all-users.vfolder-info`.
- 3 In the vfolder information file, add a `<Folder>` element for the new menu.  
For more information, see [“Vfolders and Menus” on page 278](#).

The next time that users log in, the menu will be in the assigned location.

## Adding an Item to a Menu

To add an item to a menu for all users:

- 1 Create a desktop entry file for the item that you want to add.  
For more information, see [“Desktop Entry Files” on page 279](#).
- 2 Open a file manager window, then click *File > New Window* to open a second file manager window.
- 3 In one window, access the location where you want to add the menu item.  
For example, to add a menu item to the Preferences menu, type `preferences-all-users:///` in the Location field and then press Enter.
- 4 In the other window, select the desktop entry file that you created for the menu item and then drag the desktop entry file to the location where you want to add the menu item.  
or  
Copy the desktop entry file, then paste the file into the location where you want to add the menu item.

The next time that users log in, the menu item is in the assigned location.

## Editing the Properties of a Menu

To edit the properties of a menu for all users:

- 1 In a panel, open the menu that you want to edit and right-click any item in the menu.
- 2 Click *Edit > Properties*.  
A Launcher Properties dialog is displayed.
- 3 Modify the properties of the menu in the Launcher Properties dialog.  
For more information on the elements in the Launcher Properties dialog, see [Working With Panels \(http://www.gnome.org/learn/users-guide/2.6/ch04.html\)](http://www.gnome.org/learn/users-guide/2.6/ch04.html) in the *GNOME 2.6 Desktop User Guide*.
- 4 Click *OK*.

## Editing a Menu Item

- 1 In a panel, open the menu that contains the item that you want to edit and right-click the item that you want to edit.
- 2 Click *Properties*.  
A Launcher Properties dialog is displayed.
- 3 Modify the properties of the menu item in the Launcher Properties dialog.  
For more information on the elements in the Launcher Properties dialog, see [Working With Panels \(http://www.gnome.org/learn/users-guide/2.6/ch04.html\)](http://www.gnome.org/learn/users-guide/2.6/ch04.html) in the *GNOME 2.6 Desktop User Guide*.
- 4 Click *OK*.

## Deleting an Item from a Menu

- 1 In a panel, open the menu that contains the item that you want to delete.
- 2 Right-click the item that you want to delete.
- 3 Click *Remove This Item*.

The next time that users log in, the menu item is not displayed in the menu.

## E.2.6 Configuring Menus That Users Cannot Modify

Users cannot modify a menu if the following conditions are true:

- ♦ A vfolder information file that corresponds to the menu is present in the `/etc/opt/gnome/gnome-vfs-2.0/vfolders` directory
- ♦ The vfolder information file has the same name as the URI location that corresponds to the menu
- ♦ The user permissions for the vfolder information file are set to read only

To configure a menu so that users cannot modify the menu:

- 1 Create a vfolder information file for the menu that you want to configure in the `/etc/opt/gnome/gnome-vfs-2.0/vfolders` directory.
- 2 Give the vfolder information file the name of the URI location that corresponds to the menu that you want to configure.  
For example, to configure the Applications menu, create a vfolder information called `applications.vfolder-info` in the `/etc/opt/gnome/gnome-vfs-2.0/vfolders` directory.
- 3 Set the permissions on the vfolder information file to read only.

## E.3 Installing Themes

A theme is a group of coordinated settings that specifies the visual appearance of a part of the GNOME Desktop. Users can select themes to change the appearance of the GNOME Desktop.

A theme contains settings that affect different parts of the GNOME Desktop, as follows:

### Controls

Determines the visual appearance of windows, panels, and applets. It also determines the visual appearance of the GNOME-compliant interface items that appear on windows, panels, and applets (such as menus, icons, and buttons). Some of the controls setting options that are available are designed for special accessibility needs. Users can select an option for the controls setting from the Controls tabbed section in the Theme preference tool.

### Window frame

Determines the appearance of the frames around windows only. Users can select an option for the window frame setting from the Window Border tabbed section in the Theme preference tool.

### Icon

Determines the appearance of the icons on panels and the desktop background. Users can select an option for the icon setting from the Icons tabbed section in the Theme preference tool.

## E.3.1 Theme Index File

Each theme has an index file which defines the characteristics of the theme. The name of the index file is `/opt/gnome/share/themes/theme-name/index.theme`.

The following is a sample theme index file:

```
[Desktop Entry]
Type=X-GNOME-Metatheme
Name=High Contrast Large
Name[es]=Alto contraste grande
Comment=Large black-on-white text and icons
Comment[es]=Textos e iconos grandes en negro sobre blanco
Encoding=UTF-8
[X-GNOME-Metatheme]
GtkTheme=HighContrastLargePrint
IconTheme=HighContrast
MetacityTheme=Atlanta
ApplicationFont=sans 18
```

The following table describes the keys in theme index files:

**Table E-11** Theme Index File Keys

Index File Key	Description
Type	Specifies that this theme determines the appearance of several theme options, such as controls, window frames, and icons.
Name	The name of the theme, which is displayed in the Theme preference tool.
Comment	A brief description of the theme, which is displayed under the name of the theme in the Theme preference tool.
GtkTheme	Corresponds to the controls setting in the Theme preference tool. Specifies which controls setting option to apply to windows, panels, and applets.
IconTheme	Corresponds to the icons setting in the Theme preference tool. Specifies which icons setting option to apply to panels and the desktop background.

Index File Key	Description
MetacityTheme	Corresponds to the window frame setting in the Theme preference tool. Specifies which window frame setting option to apply to windows.
ApplicationFont	Corresponds to the application font setting in the Font preference tool.

### E.3.2 Installing a New Controls Option

You can add a new option for the controls setting in the Theme preference tool. Controls options reside in the `/opt/gnome/share/themes` directory. The typical structure of a controls option in the file system is as follows.

#### Option file

```
/opt/gnome/share/themes/option-name/gtk-2.0/gtkrc
```

#### Image files

```
/opt/gnome/share/themes/option-name/pixmaps/*.*
```

Typically, a new option for the controls setting is supplied as a `.tar.gz` file. To install the new controls option, unzip the `.tar.gz` file and then untar the `.tar` file into the `/opt/gnome/share/themes` directory.

Users can install their own options for the controls setting. If a user installs an option for the controls setting, the option is stored in the `$HOME/.themes` directory.

### E.3.3 Installing a New Window Frame Option

You can add a new option for the window frame setting in the Theme preference tool. Window frame options reside in the `/opt/gnome/share/themes/option-name/metacity-1` directory. The typical structure of a window frame option in the file system is as follows.

#### Option file

```
/opt/gnome/share/themes/option-name/metacity-1/metacity-theme-1.xml
```

#### Image files

```
/opt/gnome/share/themes/option-name/metacity-1/*.*
```

Typically, a new option for the window frame setting is supplied as a `.tar.gz` file. To install the new window frame option, unzip the `.tar.gz` file and then untar the `.tar` file into the `/opt/gnome/share/themes` directory.

Users can install their own options for the window frame setting. If a user installs an option for the window frame setting, the option is stored in the `$HOME/.themes` directory.

## E.3.4 Installing a New Icons Option

You can add a new option for the icons setting in the Theme preference tool. Icons options reside in the `/opt/gnome/share/icons/option-name` directory. The typical structure of an icons option in the file system is as follows.

### Option file

```
/opt/gnome/share/icons/option-name
```

### Image files

```
/opt/gnome/share/icons/option-name/icons/*.*
```

Typically, a new option for the icons setting is supplied as a `.tar.gz` file. To install the new icons option, unzip the `.tar.gz` file and then untar the `.tar` file into the `/opt/gnome/share/icons` directory.

Users can install their own options for the icons setting. If a user installs an option for the icons setting, the option is stored in the `$HOME/.icons/option-name` directory.

## E.3.5 Installing Icons for Themes

The GNOME Desktop provides several themes that are designed for users with special visual needs. For example, some of the themes are designed for users with low vision. Several versions of icons might be required so that the icon can be displayed properly in each theme.

You might need to install a new icon for an application. When you install a new icon, you must create several versions of the icon so that the icon displays correctly in the themes. You must create several versions of the following types of icon:

- ◆ Icons that are used within applications in the GNOME Desktop
- ◆ Icons that are used internally by GTK+ applications or GTK+ stock icons

You can create the icons in several formats (for example, Portable Network Graphic (PNG) format). The suggested size of icons for the desktop environment is 48 x 48 pixels; at this size, most themes can rescale the icons.

When you install a new icon, create the following 48 x 48 pixel versions of the icon:

- ◆ Regular icon
- ◆ Low-contrast icon
- ◆ High-contrast icon
- ◆ Inverse high-contrast icon

If possible, also create 16 x 16 pixel versions of the each of the icons above, for themes that do not require large print.

Install the icons to the image files location that is specified for the theme in [“Installing a New Controls Option” on page 285](#) or [“Installing a New Window Frame Option” on page 285](#). For example, to add icons to the `HighContrastLargePrint` theme, add the icons to the `/opt/gnome/share/themes/HighContrastLargePrint/pixmaps` directory. Add references to the icons to the relevant theme files. For example, to add icons to the `HighContrastLargePrint` theme,

add references to the icons to the `/opt/gnome/share/themes/HighContrastLargePrint/gtk-2.0/gtkrc` file. Modify the `gtkrc` file for the theme to associate the icon with a GTK stock icon identifier.

For more information on how to create icons for application launchers and panels, see the [Icon Themes \(http://www.freedesktop.org/Standards/icon-theme-spec\)](http://www.freedesktop.org/Standards/icon-theme-spec).

## E.3.6 Creating a Custom Controls Option

If the options for the controls setting are not suitable for the needs of your users, you can create a custom controls option.

- 1 Create a directory structure for the option in the `/opt/gnome/share/themes` directory.

Use the same directory structure that other options use. For example, to create an option that is called `SmallPrint`, create the following directories:

- ♦ `/opt/gnome/share/themes/SmallPrint`
- ♦ `/opt/gnome/share/themes/SmallPrint/gtk-2.0`

- 2 Locate the `gtkrc` file that is closest to meeting the needs of your users, then copy the file to the `gtk-2.0` directory of your new option.

- 3 Open the `gtkrc` file in a text editor and modify the attributes of the interface elements as needed.

- 4 (Conditional) If the new option includes images, install the images for the new option in the `pixmaps` directory of your new option.

If the new option uses images from another option, you do not need to create copies of the images for the new option. Instead, make sure that the reference to the images in the  `pixmap_path`  entry in the `gtkrc` file is correct.

Users can now select the new option for the controls setting.

For more information on `gtkrc` files, see the [GTK+ Reference Manual \(http://developer.gnome.org/doc/API/2.0/gtk/index.html\)](http://developer.gnome.org/doc/API/2.0/gtk/index.html).

## E.4 Configuring Fonts

The GNOME Desktop uses the `fontconfig` font configuration and customization library. The `fontconfig` library can use all kinds of fonts, including PostScript Type 1 fonts and TrueType\* fonts. The `fontconfig` library provides a list of all the fonts available on a GNOME Desktop system. To compile this list, `fontconfig` searches the directories listed in the `/etc/opt/gnome/fonts/fonts.conf` file. To view all the fonts available on a system, access the `fonts:///` location in the file manager on the system.

For more information about the `fontconfig` library, see the [Fontconfig \(http://freedesktop.org/software/fontconfig\)](http://freedesktop.org/software/fontconfig) Web site.

### E.4.1 Font Substitution

The `fontconfig` library performs font substitution when entire fonts or individual characters are not present. If the system needs to display a font that is not available, `fontconfig` attempts to display

another, similar font. For example, if a Web page requests to display the Verdana font, and that font is not installed on the system, fontconfig displays a similar font, such as Helvetica. The list of similar fonts is defined in the `/etc/opt/gnome/fonts/fonts.conf` file.

If the system needs to display a character that is not present in the selected font, fontconfig attempts to display the character in another, similar font. For example, you might select Bitstream Vera Sans as the font for the Text Editor application. The Bitstream Vera font family does not include Cyrillic characters. If you open a document which contains a Cyrillic character, Text Editor uses a similar font that includes Cyrillic characters to display the character.

The fontconfig library also defines aliases for fonts (for example, serif, sans-serif, and monospace). When you select one of the aliases for a font, the system uses the first font that is defined for that alias in the `/etc/opt/gnome/fonts/fonts.conf`.

## E.4.2 Adding a Font for All Users

- 1 Copy the font file to one of the directories in the `/etc/opt/gnome/fonts/fonts.conf` file.

Typically, fonts are stored in the `/opt/gnome/share/fonts/` directory.

- 2 (Conditional) The fontconfig library updates the list of fonts automatically. If the list of fonts is not updated, run the following command:

```
fc-cache directory-name
```

## E.4.3 Adding a Font for an Individual User

- 1 Copy the font file to the `$HOME/.fonts` directory of the user.

If you drag the font file to the `fonts:///` location in the file manager, the font file is copied to the `$HOME/.fonts` directory.

- 2 (Conditional) The fontconfig library updates the list of fonts automatically. If the list of fonts is not updated, run the following command:

```
fc-cache directory-name
```

## E.5 MIME Types

A Multipurpose Internet Mail Extension (MIME) type identifies the format of a file. The MIME type enables applications to read the file. Applications such as Internet browsers and e-mail applications use the MIME type to handle files of different types. For example, an e-mail application can use the MIME type to detect what type of file is attached to an e-mail.

The Nautilus file manager uses MIME types to identify the type of a file. The file manager needs to know the MIME type of a file to perform the following tasks:

- ◆ Open the file in an appropriate application
- ◆ Display a string that describes the type of file
- ◆ Display an appropriate icon to represent the file
- ◆ Display a list of other applications that can open the file

If you add a new application, you must make sure that other applications can recognize the files associated with the application. You must perform several tasks to enable other applications to detect the MIME type of the application files.

This section describes how applications detect the MIME types of files, and how applications are associated with MIME types. This section also describes the procedure that you must follow to add a new application.

## E.5.1 Detecting the MIME Type for a File

Applications can detect the MIME type of a file as follows:

1. The application uses file content sniffers to search for a particular pattern in the file. A file content sniffer associates a specific pattern in a file with a MIME type. If the application finds a match for the pattern, the MIME type associated with the pattern is the MIME type of the file.
2. If file content sniffers do not identify the MIME type, then the application can check the filename. The application checks the filename against the MIME type registry. The MIME type registry associates particular file extensions and filename patterns, with particular MIME types. If a match for the filename is found, the MIME type associated with the extension or pattern is the MIME type of the file.

The following sections provide further information on file content sniffers and the MIME type registry.

### File Content Sniffers

File content sniffers are specified in the `/etc/opt/gnome/gnome-vfs-mime-magic` file. The following is an example of a file content sniffer:

```
0 string \x89PNG image/png
```

The syntax for file content sniffers is as follows:

```
offset_start[:offset_end] pattern_type pattern [&pattern_mask] type
```

The following table describes the fields in a file content sniffer.

**Table E-12** Fields in a File Content Sniffer

Field	Description
<code>offset_start</code>	Specifies the number of characters to ignore in the file before searching for a text pattern.
<code>pattern_type</code>	Specifies the type of pattern to search for. Currently, the string pattern type is the only pattern type that is supported.
<code>pattern</code>	Specifies the pattern to search for.
<code>pattern_mask</code>	Specifies a pattern mask, in hexadecimal format. For more information, see <a href="#">“Pattern Masks” on page 290</a> .  This field is optional and is not present in the previous example.
<code>type</code>	Specifies the MIME type to associate with files that match this entry.

## Pattern Masks

A pattern mask identifies bits in the pattern to ignore when searching for a pattern in a file. The following is an example of a file content sniffer with a pattern mask:

```
0 string BMxxxx\000\000 &0xffff00000000ffff image/bmp
```

The pattern and mask in the example are as follows:

```
Pattern B M x x x x \000 \000
Mask ff ff 00 00 00 00 ff ff
```

The above pattern and mask specify a file with the following characteristics:

- ◆ The file begins with BM
- ◆ BM is followed by four bytes with any values
- ◆ The four bytes are followed by \000\000

The file content sniffer specifies that the MIME type of files that match the pattern and mask is image/bmp.

## MIME Type Registry

The MIME type registry is located in /opt/gnome/share/mime-info. The MIME type registry contains the following files:

**Table E-13** MIME Type Registry Files

File	File Extension
MIME information file	.mime
MIME keys file	.keys

The following sections describe MIME information files and MIME keys files.

### MIME Information Files

MIME information files associate MIME types with one or both of the following:

- ◆ File extensions
- ◆ Filename patterns

When an application searches for the MIME type of a file, the application checks the filename against the MIME information files. If a match for the filename is found, the MIME type associated with the extension or pattern is the MIME type of the file.

In MIME information files, the filename pattern to search for is written as a regular expression.

The format of MIME type entries in MIME information files is as follows:

```
MIME-type
ext[,priority]: list-of-extensions
regex[,priority]: list-of-regular-expressions
```

You can specify a priority value for the file extension and the regular expression. You can use the priority value to differentiate composite filenames. For example, you can assign a priority of 1 to the

.gz extension, and assign a higher priority of 2 to the .tar.gz extension. In this case, the file abc.tar.gz takes the MIME type for .tar.gz.

---

**IMPORTANT:** You must indent the ext field and the regex field with a Tab character (t).

---

The following MIME type entries are samples from the `gnome-vfs.mime` MIME information file:

```
application/x-compressed-tar
regex,2: tar\.gz$
ext: tgz
audio/x-real-audio
ext: rm ra ram
image/jpeg
ext: jpe jpeg jpg
image/png
ext: png
text/html
ext: html htm HTML
text/plain
ext: asc txt TXT
text/x-readme
regex: README.*
```

The file manager reads the MIME information files alphabetically. The alphabetical order determines the order in which MIME types are assigned to file extensions or regular expressions. For example, if the same file extension is assigned to different MIME types in the files abc.mime and def.mime, the MIME type in abc.mime is used.

## MIME Keys Files

MIME keys files provide information about MIME types that are used in the user interface. For example, the MIME keys file provides a description of a MIME type and specifies an icon to represent files of that MIME type.

The following is a sample from a MIME keys file:

```
text/html
description=HTML page
icon_filename=gnome-text-html
default_action_type=application
short_list_application_ids_for_novice_user_level=mozilla,netscape,gale
on
category=Documents/World Wide Web
```

---

**IMPORTANT:** You must indent the keys in a MIME keys file with a Tab character (t).

---

The following table describes the most important keys in MIME keys files. Typically, the description key and the category key are localized.

**Table E-14** *MIME Key Files*

<b>Key</b>	<b>Description</b>
<code>can_be_executable</code>	Specifies whether files of this MIME type can be executed.
<code>description</code>	Describes the MIME type. This description can be displayed in the file manager and other applications.
<code>icon_filename</code>	Specifies the filename of an icon to represent the MIME type. Does not specify the file extension or the path to the filename.  This icon can be displayed in the file manager and other applications.
<code>default_action_type</code>	Specifies the category of action to take when a file of this MIME type is opened by the user. Enter application for this MIME type for most applications.
<code>short_list_application_ids_for_novice_user_level</code>	Specifies the application to use when a file of this MIME type is opened by a user. Specify one or more applications, in order of priority. The applications must also be registered in the application registry.
<code>category</code>	Specifies a category for the MIME type. The value of this key determines the location of the MIME type in the File Types and Programs preference tool.

## E.5.2 Registering Applications for MIME Types

The application registry contains text files that register applications. The application registration files contain a series of key-value pairs that specify details for applications. For example, the application registration files can contain the following information:

- ◆ The command to use to start the application
- ◆ MIME types to associate with the application

An application registration file can contain one or more application registrations. Application registration files have a `.applications` extension.

The location of the application registry is `/opt/gnome/share/application-registry`. This directory contains a default application registration file named `gnome-vfs.applications`.

To register an application, add a registration file for the application to the application registry.

The following is an example of an application registration file:

```
eog
command=eog
name=Eye of Gnome
can_open_multiple_files=true
expects_uris=false
```

```
requires_terminal=false
mime_types=image/bmp,image/gif,image/jpeg,image/png,image/tiff,
image/x-xpixmap,image/x-bmp,image/x-png,image/x-portable-anymap,
image/x-portable-bitmap,image/x-portable-graymap,
image/x-portable-pixmap
```

The following table describes the keys in application registration files.

**Table E-15** Application Registration File Keys

Key	Description
Application identifier	Specifies a unique identifier for the application. This identifier must be the same as the identifier in the <code>short_list_application_ids_for_novice_user_level</code> key in the MIME keys file for the application.
command	Specifies the command to use to start the application and any options to use with the command.
name	Specifies a name for the application. The name is used in the user interface. For example, the name is used in the Open With submenu in the file manager.
can_open_multiple_files	Specifies whether the application can open several files at the same time.
expects_uris	Specifies whether the application can process URIs. If the value of this key is true, the application registration entry must also contain a <code>supported_uri_schemes</code> key.
supported_uri_schemes	Specifies the URI schemes that the application can process.
requires_terminal	Specifies whether to run the application in a terminal window. Specify True for this field for an application that does not create a window in which to run.
mime_types	Specifies the MIME types that the application can use.

### E.5.3 Adding an Application to the GNOME Desktop

- 1 Add a menu item for the application.

For more information, see [“Adding Menus” on page 281](#).

- 2 Add an icon for the application to `/opt/gnome/share/icons/theme-name/icon-size/apps`.

For more information, see [“Installing Themes” on page 283](#).

- 3 (Conditional) If the application uses a new MIME type, add a file content sniffer for the new MIME type.

For more information, see [“File Content Sniffers” on page 289](#).

- 4 (Conditional) If the application uses a new MIME type, add a MIME information file for the application to the MIME type registry.

For more information, see [“MIME Information Files” on page 290](#).

- 5 Add a MIME keys file for the application to the MIME type registry.

For more information, see “[MIME Keys Files](#)” on page 291.

- 6 (Conditional) If the application uses a new MIME type, add an icon for the MIME type to `/opt/gnome/share/icons/theme-name/icon-size/mimetypes`.

For more information, see “[Installing Themes](#)” on page 283.

- 7 (Optional) To associate the application with a MIME type, add an application registration file to the application registry.

For more information, see “[Registering Applications for MIME Types](#)” on page 292.

## E.6 Setting Screensavers

A screensaver is an application that replaces the image on a screen when the screen is not in use. The screensaver application for the GNOME Desktop is XScreenSaver. The following sections describe how to set preferences for the XScreenSaver application and how to modify the displays that are available for the screensaver.

### E.6.1 Setting Screensaver Preferences

Default screensaver preferences are stored in the XScreenSaver file, located in `/usr/X11R6/lib/X11/app-defaults/XScreenSaver`.

To modify screensaver application preferences, users can use the Screensaver preference tool. When a user modifies the screensaver preferences, the preferences are stored in the home directory of the user, in the `$HOME/.xscreensaver` file. For information on screensaver preferences, see the *GNOME 2.6 Desktop User Guide* (<http://www.gnome.org/learn/users-guide/2.6>).

Users can also run the `/usr/X11R6/bin/xscreensaver-demo` command to open the XScreenSaver dialog.

To set default screensaver preferences for all users, modify the XScreenSaver file. You can also use the XScreenSaver dialog to create a `$HOME/.xscreensaver` file, then copy the file to the location of the XScreenSaver file.

To restore the default settings for a user, delete the `$HOME/.xscreensaver` file from the home directory of the user. If no `$HOME/.xscreensaver` file is present, the default preferences in the XScreenSaver file are used.

---

**TIP:** The default display behavior of XScreenSaver is to display a blank screen. The blank screen might confuse users. You might want to change this default display behavior.

---

To activate changes to the screensaver preferences, use the following command to reload screensaver preferences:

```
xscreensaver-command -restart
```

### E.6.2 Modifying Screensaver Displays

The screensaver application allows users to select one or more screensaver displays. A screensaver display is an application that displays images on the screen of the user when the screen is not in use. The screensaver displays are listed in the XScreenSaver file and in the `$HOME/.xscreensaver` file.

To add a new screensaver display, copy the executable file for the display to the directory where the displays are located. Add the command for the screensaver display to the XScreenSaver file or the `$HOME/.xscreensaver` file. Include any arguments that are required to run the screensaver display on the whole screen, rather than in a window. For example, you might want to include the `-root` option to display the screensaver display on the whole screen.

To disable a screensaver display, add a Minus sign (-) to the start of the command for the screensaver display in the preferences file. The following excerpt from a `$HOME/.xscreensaver` file shows a disabled Qix (solid) screensaver display:

```
- "Qix (solid)" qix -root -solid -segments 100
```

## E.7 Session Management

A session occurs between the time that a user logs in to the GNOME Desktop and the time that the user logs out. The session manager starts after the login manager authenticates the user. The session manager lets the user manage the session. For example, a user can save the state of a session and return to that session the next time that he logs in.

At a minimum, the following applications run in a session:

- ♦ The session manager, `gnome-session`.
- ♦ The GConf X settings daemon, `gnome-settings-daemon`.
- ♦ The `gnome-panel` application, which runs the panels in the GNOME Desktop.
- ♦ The Metacity window manager.

The following table lists the files that contain default session information:

**Table E-16** *Default Session Information Files*

File	Description
<code>/opt/gnome/share/gnome/default.session</code>	Default session file. Default session details are stored in this file.
<code>\$HOME/.gnome2/session</code>	User session file. When a user modifies the session, the details are stored in this file.

To set default session details for all users, modify the default session file.

To restore the default session settings for a user, delete the session file from the home directory of the user. If no user session file is present, the default settings in `/opt/gnome/share/gnome/default.session` are used.

To save the current session as the default session, users can run the `gnome-session-save` command.

## E.8 Improving Performance

This section discusses several preference settings you can change to improve the performance of the GNOME Desktop. You can use the `gconftool-2` command to set values for preferences for users. The example commands in this section show how to set values in the user configuration source.

You can also use the `--direct` and `--config-source` options to set mandatory values or default values for preferences. And you can use the `gconftool-2` command in a script to set the values of many preferences. For more information on the `gconftool-2` command and the options that are available with the command, see [“Using GConf for Defaults” on page 261](#).

## E.8.1 Reducing CPU Usage

There are a number of preferences that you can set to reduce CPU usage by the GNOME Desktop.

### Using Theme Options That Require Less CPU Resources

Some window frame theme options load image files to draw the window frame. Other options use simpler techniques to draw the window frame. The Crux window frame option loads image files, but can be slow on systems with limited CPU resources. To reduce CPU usage, use one of the following window frame options:

- ◆ Atlanta
- ◆ Esco

The following window frame options also use fewer CPU resources than Crux:

- ◆ AgingGorilla
- ◆ Bright
- ◆ Metabox

---

**TIP:** Metabox does not work well with inverse controls options such as `HighContrastInverse`. Use Atlanta with inverse controls options.

---

To change the window frame theme option, use the following command:

```
gconftool-2 --type string --set /apps/metacity/general/theme option-name
```

For example, to use Atlanta, run the following command:

```
gconftool-2 --type string --set /apps/metacity/general/theme Atlanta
```

Users can also use the Theme preference tool to select the appropriate option.

You can use the Metacity Theme Viewer to measure the performance of a window frame option and to preview the option. To start Metacity Theme Viewer, use the following command:

```
metacity-theme-viewer option-name
```

For example, to measure the performance of Atlanta and preview Atlanta, use the following command:

```
metacity-theme-viewer Atlanta
```

### Turning Off Display of Icons in Menus

Some items in menus display an icon beside the item. To turn off this feature, use the following command:

```
gconftool-2 --type bool --set /desktop/gnome/interface/menus_have_icons false
```

Users can also use the Menus & Toolbars preference tool to deselect the Show Icons in Menus option.

### Turning Off the Splash Screen

When users log in to the desktop environment, a splash screen is displayed by default. Icons are displayed on the splash screen while the user logs in. You can turn off the splash screen to reduce CPU usage during login.

To turn off the splash screen, use the following command:

```
gconftool-2 --type bool --set /apps/gnome-session/options/
show_splash_screen false
```

### Turning Off Panel Animation

When users show or hide panels, the panels can show or hide in an animated style. To turn off panel animation, use the following command:

```
gconftool-2 --type bool --set /apps/panel/global/enable_animations
false
```

Users can also use the Panel preference tool to deselect the Drawer and Panel Animation option.

### Improving File Manager Performance

The Nautilus file manager includes some features that you can modify to improve performance.

#### Modifying Performance Preferences

The file manager includes performance-related preferences. Each of these preference can take any of the following three values.

**Table E-17** Performance-related Preferences

Value	Description
always	Performs the action for both local files and files on other file systems.
local_only	Performs the action for local files only. Using this value reduces CPU usage.
never	Never performs the action. Using this value reduces CPU usage and network traffic.

The following table describes the performance preferences for the file manager. For the fastest performance, set the value of the preferences to Never.

**Table E-18** File Manager Performance Preferences

Preference	Description
<code>show_icon_text</code>	<p>Specifies when to preview the content of text files in the icon that represents the file. To never preview the content of text files, use the following command:</p> <pre>gconftool-2 --type string --set /apps/nautilus/preferences/show_icon_text never</pre> <p>Users can also perform the following steps:</p> <ol style="list-style-type: none"><li>1. Click <i>Edit &gt; Preferences</i> in a file manager window, then click <i>Preview</i>.</li><li>2. Select an option for the Show Text in Icons preference.</li></ol>
<code>show_directory_item_counts</code>	<p>Specifies when to show the number of items in folders. To never show the number of items in folders, use the following command:</p> <pre>gconftool-2 --type string --set /apps/nautilus/preferences/show_directory_item_counts never</pre> <p>Users can also perform the following steps:</p> <ol style="list-style-type: none"><li>1. Click <i>Edit &gt; Preferences</i> in a file manager window, then click <i>Preview</i>.</li><li>2. Select an option for the Count Number of Items preference.</li></ol>
<code>show_image_thumbnails</code>	<p>Specifies when to show thumbnails of image files. To never show thumbnails, use the following command:</p> <pre>gconftool-2 --type string --set /apps/nautilus/preferences/show_image_thumbnails never</pre> <p>Users can also perform the following steps:</p> <ol style="list-style-type: none"><li>1. Click <i>Edit &gt; Preferences</i> in a file manager window, then click <i>Preview</i>.</li><li>2. Select an option for the Show Thumbnails preference.</li></ol>
<code>preview_sound</code>	<p>Specifies when to preview the content of sound files. To never preview the content of sound files, use the following command:</p> <pre>gconftool-2 --type string --set /apps/nautilus/preferences/preview_sound never</pre> <p>Users can also perform the following steps:</p> <ol style="list-style-type: none"><li>1. Click <i>Edit &gt; Preferences</i> in a file manager window, then click <i>Preview</i>.</li><li>2. Select an option for the Preview Sound Files preference.</li></ol>

### Turning Off the Side Pane, Toolbar, and Location Bar

The file manager includes preferences that let you turn off the side pane and the toolbar. Turning these off improves file manager performance.

To turn off the side pane, use the following command:

```
gconftool-2 --type bool --set /apps/nautilus/preferences/
start_with_sidebar false
```

To turn off the toolbar, use the following command:

```
gconftool-2 --type bool --set /apps/nautilus/preferences/
start_with_toolbar false
```

You can also turn off the location bar. Users can use the Ctrl+L keyboard shortcut to display a location bar when required.

To turn off the location bar, use the following command:

```
gconftool-2 --type bool --set /apps/nautilus/preferences/
start_with_location_bar false
```

## Turning Off the Desktop

The file manager contains a preference that lets users use Nautilus to manage the desktop. You can disable the desktop to improve performance. However, if you disable the desktop, you cannot

- ◆ Use the Desktop menu.
- ◆ Use the file manager to change the pattern or color of the desktop background.
- ◆ Use the desktop objects, such as Trash. (The desktop objects are not displayed on the desktop.)

To disable the desktop, use the following command:

```
gconftool-2 --type bool --set /apps/nautilus/preferences/show_desktop
false
```

## E.8.2 Reducing X Window System Network Traffic

There are some preferences that you can set to reduce X Window System network traffic on the GNOME Desktop.

### Using Theme Options That Create Less Network Traffic

Remote display protocols do not transfer every pixel in a block of pixels if all pixels in the block are the same color. To reduce X Window System network traffic, use one of the following window frame options that uses solid colors:

- ◆ Atlanta
- ◆ Esco

For information on how to change theme options, see [“Using Theme Options That Require Less CPU Resources” on page 296](#).

### Turning Off Display of Icons in Menus

Some items in menus display an icon beside the item. This feature can increase X Window System network traffic if the icon is located on another file system or if the panels are displayed on a remote host.

For information on how to turn off this feature, see [“Turning Off Display of Icons in Menus” on page 296](#).

## E.8.3 Reducing Color Usage and Improving Display Quality

Many modern computer systems support 24-bit color (that is, 16,777,216 colors). However, many users still use systems that support only 8-bit color (256 colors). The GNOME Desktop uses the websafe color palette. This palette is a general-purpose palette of 216 colors which is designed to optimize the use of color on systems that support 8-bit color. However, some visual components of the GNOME Desktop are designed for systems that support 24-bit color.

The following display problems might occur on systems that support only 8-bit color:

- ♦ Windows, icons, and background images might appear grainy. Many themes, background images, and icons use colors that are not in the websafe color palette. The colors that are not in the palette are replaced with the nearest equivalent or a dithered approximation, which causes the grainy appearance.
- ♦ Applications that do not use the websafe color palette have fewer colors available; therefore, color errors might occur. Some colors might not appear in the user interface of the application, and some applications might crash if the application cannot allocate colors.
- ♦ Color flashing might occur when users switch between applications that use the websafe color palette and applications that do not use this palette. The applications that do not use the websafe color palette might use a custom colormap. When the custom colormap is used, other visual components might lose colors and then become unviewable.

The following sections describe how to optimize the appearance of the GNOME Desktop for systems that support only 8-bit color.

### Using Theme Options That Use the Websafe Color Palette

Some window frame theme options use colors that are in the websafe color palette. Bright and Esco use colors from the websafe color palette and do not have the grainy appearance of other window frame options on 8-bit color displays. Use Bright or Esco for the best color display on 8-bit visual modes.

For information on how to change theme options, see [“Using Theme Options That Require Less CPU Resources” on page 296](#).

### Reducing Color Usage by Turning Off Display of Icons in Menus

Some items in menus display an icon beside the item. If the icon contains colors that are not in the websafe color palette, this feature can increase the number of colors used.

For information on how to turn off this feature, see [“Turning Off Display of Icons in Menus” on page 296](#).

### Reducing Color Usage by Turning Off the Splash Screen

You can turn off the splash screen to make more colors available for the GNOME Desktop and for applications.

For information on how to turn off the splash screen, see [“Turning Off the Splash Screen” on page 297](#).

## Reducing Color Usage by Using a Solid Color for the Background

Use a solid color for the desktop background. This reduces the number of colors used by the GNOME Desktop.

To set a solid color for the background, use the following commands:

```
gconftool-2 --type string --set /desktop/gnome/background/
picture_options none
gconftool-2 --type string --set /desktop/gnome/background/
color_shading_type solid
gconftool-2 --type string --set /desktop/gnome/background/
primary_color \#hexadecimal-color
```

Users can also use the Background preference tool to choose a solid color for the background.

## E.9 Hidden Directories

The following table describes the hidden directories that the GNOME Desktop adds to the home directories of users. A hidden directory is a directory that has a name that begins with a period (.).

**Table E-19** *Hidden Directories Added to Users' Home Directories*

Directory	Description
<code>.esd_auth</code>	Contains the authentication cookie for the GNOME sound daemon, the Enlightened Sound Daemon (ESD).
<code>.gconf</code>	Contains the GConf configuration source for the user. When the user sets a preference, the new preference information is added to this location.
<code>.gconfd</code>	Contains the following GConf daemon details: <ul style="list-style-type: none"><li>◆ Configuration information</li><li>◆ Lock information for objects that are referenced by an Interoperable Object Reference (IOR)</li><li>◆ State information for objects that are referenced by an IOR</li></ul>
<code>.gnome</code>	Contains user-specific application data that is not stored in the GConf repository. For example, this directory contains MIME type information and session information for the user.
<code>.gnome-desktop</code>	The Nautilus file manager contains a preference that enables users to use the file manager to manage the desktop. If this option is selected, this directory contains the following: <ul style="list-style-type: none"><li>◆ Objects on the desktop (for example, the Home object, the Trash object, and other launchers). The objects appear in the directory as desktop entry files. For example, the <code>starthere.desktop</code> file contains a link to the Start Here location.</li><li>◆ Removable media volumes that are mounted.</li></ul> The file manager also contains a preference that enables users to use the home directory as the desktop directory, instead of <code>.gnome-desktop</code> . If a user selects this option, the contents of the home directory are displayed as desktop objects.

Directory	Description
<code>.gnome2</code>	<p>Contains user-specific application data that is not stored in the GConf repository, such as the following:</p> <ul style="list-style-type: none"> <li>◆ Keyboard shortcut information</li> <li>◆ Window location information</li> <li>◆ Desktop entry files for panel launchers</li> </ul> <p>This directory also contains user-specific menu data. If a user modifies menus, the details are stored here.</p>
<code>.gnome2-private</code>	(Ignore this directory. It currently has no function.)
<code>.metacity</code>	Contains session data for the Metacity window manager.
<code>.nautilus</code>	<p>Contains file manager data that is specific to the use, such as the following:</p> <ul style="list-style-type: none"> <li>◆ Metadata for the directories with which the user works</li> <li>◆ Nautilus emblems that the user adds</li> <li>◆ Nautilus desktop images</li> </ul>
<code>.themes</code>	Contains controls theme options, window frame theme options, and icons theme options that the user adds. The user can add themes from the Theme preference tool.
<code>.thumbnails</code>	Contains image thumbnails for the user. The image thumbnails are used in the file manager. The file manager contains a preference that the user can select to stop generation of thumbnail images.
<code>.xscreensaver</code>	Contains screensaver configuration data and screensaver preference data.

## E.10 Security Note on Configuring SMB Printers

Windows network shares are also referred to as Samba or SMB shares. When you configure a printer on an SMB share, you must enter a username and password for the print queue.

The username and password are stored as unencrypted text in the `/etc/opt/gnome/cups/printers.conf` file. This file has read-only permissions for users with root privileges, so any user with root privileges can read the username and password for the print queue.

To reduce the impact of possible security violations, make sure that the username and password required to access the print queue is used only for the print queue. This ensures that any possible security violation is restricted to unauthorized use of the print queue.

## E.11 Disabling GNOME Desktop Features

The GNOME Desktop includes features you can use to restrict access to certain of its functions. These disable (or lockdown) features let you restrict the actions that users can perform on a computer. For example, you might want to prevent command line operations on a computer that is for public use at a trade show.

You disable feature by setting GConf keys (see [“Using GConf for Defaults” on page 261](#)). You can also use the Configuration Editor application to set GConf keys in a user configuration source (see [“Configuration Editor” on page 275](#)).

## E.11.1 Disabling Lock Screen and Log Out

To disable the lock screen and log out functions, set the `/apps/panel/global/disable_lock_screen` key and the `/apps/panel/global/disable_log_out` key to True.

When you disable the lock screen and log out functions, the following items are removed from the panels:

- ◆ Lock Screen and Log Out user menu items from the Main Menu
- ◆ Lock and Log Out menu items from the Add to Panel > Actions menu  
To open this menu, right-click a vacant space on a panel and then click *Add to Panel > Actions*.
- ◆ Lock Screen and Log Out user menu items from the Actions menu in the Menu Bar applet

Additionally, any Lock Screen buttons and Log Out buttons on panels are disabled.

## E.11.2 Disabling Command Line Operations

To disable operations from a command line, set the `/desktop/gnome/lockdown/disable_command_line` key to True.

When you disable command line operations, the following changes occur in the user interface:

- ◆ The Run Application menu item is removed from the following menus:
  - ◆ Main Menu
  - ◆ Actions submenu in the Add to Panel menu
  - ◆ Actions menu in the Menu Bar applet
- ◆ Any Run buttons on panels are disabled

To disable command line operations, you must also remove menu items that start terminal applications. For example, you might want to remove menu items that contain the following commands:

- ◆ GNOME Terminal command (`/opt/gnome/bin/gnome-terminal`)
- ◆ `/usr/bin/xterm`
- ◆ `/usr/bin/setterm`

These items are removed from the following menus:

- ◆ Main Menu
- ◆ Add to Panel > Launcher From menu

To disable command line operations, you must also disable the Command Line applet. To disable this applet, add the applet to the `/apps/panel/global/disabled_applets` key. When you disable the Command Line applet, it is removed from the Main Menu and the Add to Panel > Utility menu.

## E.11.3 Disabling Panel Configuration

To disable panel configuration, set the `/apps/panel/global/locked_down` key to True.

When you disable panel configuration, the following changes occur in the user interface:

- ◆ The following items are removed from the Panel and Drawer pop-up menus:
  - ◆ Add to Panel
  - ◆ Delete This Panel
  - ◆ Properties
  - ◆ New Panel
- ◆ The launcher popup menu is disabled.
- ◆ The following items are removed from the Applet pop-up menu:
  - ◆ Remove from Panel
  - ◆ Lock
  - ◆ Move
- ◆ The Main Menu pop-up menu is disabled.
- ◆ The Launcher drag feature is disabled so that users cannot drag launchers to or from panels.
- ◆ The Panel drag feature is disabled so that users cannot drag panels to new locations.

# KDE Configuration for Administrators

# F

KDE is an extensively configurable desktop environment. In addition to being configurable for the individual user, it is also configurable for administrators. This allows system administrators to provide custom default settings for their environments. Settings can differ between groups and individual users. It is also possible to restrict which settings users can change. Additionally, access to parts of KDE or functions in KDE can be restricted for all users, groups of users, or specific users.

KDE reads and stores all files in fixed directory trees. Several directories can be used to store system or group-specific configuration. One directory tree with user data is saved in each user's home directory.

KDE and all KDE applications scan these directory trees in a preset order. Normally, the home directory tree is scanned first, giving it a higher priority. In most cases, the application uses the first file found. For configuration files, all files in all directory trees with the same name are read and the content merged. The priority order is used to handle different configurations for the same configuration key.

The directory locations can be changed using the following environment variables:

**Table F-1** Directory Location Environment Variables

Variable	Description
<code>\$KDEHOME</code>	Sets the private user's directory—the only directory used to store user settings. The default location is <code>\$HOME/.kde</code> . A tilde ( <code>~</code> ) can be used to indicate the user's home directory.
<code>\$KDEROOTHOME</code>	The same as <code>\$KDEHOME</code> , but used only for the root user. To avoid problems with applications started with root privileges, root ignores the <code>\$KDEHOME</code> variable.
<code>\$KDEDIRS</code>	Sets one or more system configuration directories. These directories are handled as read-only directories. Separate multiple directories with colons ( <code>:</code> ). The default value is <code>/etc/opt/kde3:/opt/kde3</code> , which contains the core KDE installation files that come with applications. <code>/etc/opt/kde3</code> also contains Novell® Linux Desktop-specific configurations and has a higher priority. Add directories in front of these to give the added directories a higher priority.

Each directory tree used by KDE has a fixed directory structure. However, directories not relevant for a certain tree need not be included. For example, directories used for temporary files are usually found in `$KDEHOME` but not in any other directory tree.

The KDE runtime environment combines the subdirectories found in the various directory trees and refers to them as a single KDE resource. There are three broad categories: files that are CPU or architecture-specific, files that are host-specific, and files that are not specific with regard to host, CPU, or architecture. You can view a list of resources at the [KDE for System Administrators Filesystem Hierarchy](http://www.kde.org/areas/sysadmin/fsh.php) (<http://www.kde.org/areas/sysadmin/fsh.php>) Web site.

## F.1 Profiles

To avoid problems with future updates, do not use the `/opt/kde3` and `/etc/opt/kde3` directories for custom configuration. Any package update or installation might revert changes in those directories. Add your own directory via `$KDEDIRS` or, preferably, use the profile mechanism. Profiles can be used to configure the user desktop for all users, for specific user groups, or even for single users.

A profile is basically an additional KDE directory tree as described above. It has a higher priority than the system trees, but a lower one than the user configuration. The profile directory can be placed in any location—for example, in an NFS directory mounted by the automounter.

The default profile is used if no other profiles are specified for the user. Save this profile to `/var/run/kde-profiles/default`. This directory does not exist by default.

### F.1.1 Adding Profiles

Kiosk allows you to both add local or remote profiles. This allows you not only to have local Kiosk configurations for single users, but to distribute a central configuration to all workstations.

#### Local Profiles

Profile directory trees can be placed in any directory, but they must be added to `/etc/kde3rc` as a separate section. This example shows the default profile:

```
[Directories-default]
ProfileDescription=Default profile
ProfileDescription[de]=Defaultprofil
ProfileInstallUser=root
prefixes=/var/run/kde-profile/default
```

Only the `prefixes` key is required below `[Directories-profile]`. The other values are usually written and used by the **Kiosk** tool.

#### Remote Profiles

Profiles stored in a remote directory, such as those saved to a partition mounted with NFS, require an additional step. The base directory must be specified using the `profileDirsPrefix` key in `/etc/kde3rc` in the `[Directories]` section. Create a profile in this directory using a subdirectory tree with the same name as the profile.

### F.1.2 Mapping Profiles to Users

A mapping file determines which profiles should be used for which users. Configure the mapping file in `/etc/kde3rc` in the `[Directories]` group:

```
[Directories]
userProfileMapFile=/etc/kde-user-profile
```

Map profiles to individual users based on username or to groups of users based on the groups that the users are members of (see `man groups`). It might make sense to save this file on an NFS share to create one central configuration location.

## Mapping Profiles to Individual Users

Include a `[Users]` section in the mapping file to map profiles to an individual user. Entries in the `[Users]` section consist of the user's account name followed by one or more profiles, as in the following example:

```
[Users]
tux=developer
geeko=developer,packager</screen>
```

The above example assigns the profile `developer` to user `tux`. To user `geeko`, it assigns the two profiles `developer` and `packager`. The order in which the profiles are listed is significant in that settings in earlier profiles overrule settings in profiles listed after it. In the above case of user `geeko`, the settings of the `developer` profile take precedence when the `developer` and `packager` profiles contain conflicting settings.

If a user has an entry under the `[Users]` section, this entry determines all profiles applicable to the user. The user is not assigned any additional profiles based on the groups that the user is a member of.

## Mapping Profiles to Groups

If a user has no entry under the `[Users]` section in the mapping file, the profiles applicable to the user are determined by the groups that the user is a member of. The groups and the order that they are considered in is determined by the following entry in the `[General]` section of the mapping file:

```
[General]
groups=pkgs,devel</screen>
```

Each of these groups should have an entry under the `[Groups]` section that defines which profiles belong to that group, as in the following example:

```
[Groups]
pkgs=packager
devel=developer
bofh=admin,packager,developer
```

For each group for a user, the corresponding profiles are used. The order in which the groups are listed in the `[Groups]` entry determines the resulting order of all the applicable profiles. If multiple profiles are applicable to a particular user and a profile contains settings that conflict with settings in another profile, the settings in the earlier listed profile take precedence.

If, in the above example, a user is part of the `pkgs` group, the `packager` profile is used for that user. If the user is part of the `devel` group, the `developer` profile is used. Users that are part of the `bofh` group use the `admin`, `packager`, and `developer` profiles. In case of conflict, settings in the `admin` profile take precedence over settings in the `packager` or `developer` profiles.

If the user is part of both the `pkgs` and `devel` groups, both the `packager` and `developer` profiles are used. In case of conflicting settings between the two profiles, the `packager` profile takes precedence because the `pkgs` group associated with the profile is listed before the `devel` group.

The `groups` command can be used to see which groups a user belongs to:

```
groups geeko
geeko : users uucp dialout audio video cdrecording devel
```

In general, only a few groups have profiles associated with them. For this example user, only the devel group has a profile associated with it. The other groups do not, so they are ignored. If there is no profile defined for any of a user's groups, the user is assigned the default profile.

## F.2 KDE3 Action Restrictions

Most functionality within KDE is coupled with actions. For example, when a user selects File > Open in a KDE application, the `file_open` action is activated. Likewise, toolbar icons are usually also coupled with actions. KDE makes it possible to disable functionality by restricting specific actions. By restricting the `file_open` action, for example, the corresponding entry in the menu bar and the corresponding icon on the toolbar disappear.

To restrict access to functions, include the group `[KDE Action Restrictions]` in the `kdeglobals` file. Each action can then be restricted by adding `action=false`. For example, to disable the `shell_access` action, add the following entry:

```
[KDE Action Restrictions][$i] shell_access=false
```

Actions that refer to menu and toolbar actions are prefixed with "action/".

The following actions are defined:

### Standard Actions

- ◆ `action/file_new`
- ◆ `action/file_open`
- ◆ `action/file_open_recent`
- ◆ `action/file_save`
- ◆ `action/file_save_as`
- ◆ `action/file_revert`
- ◆ `action/file_close`
- ◆ `action/file_print`
- ◆ `action/file_print_preview`
- ◆ `action/file_mail`
- ◆ `action/file_quit`
- ◆ `action/edit_undo`
- ◆ `action/edit_redo`
- ◆ `action/edit_cut`
- ◆ `action/edit_copy`
- ◆ `action/edit_paste`
- ◆ `action/edit_select_all`
- ◆ `action/edit_deselect`
- ◆ `action/edit_find`
- ◆ `action/edit_find_next`
- ◆ `action/edit_find_last`
- ◆ `action/edit_replace`

- ◆ action/view\_actual\_size
- ◆ action/view\_fit\_to\_page
- ◆ action/view\_fit\_to\_width
- ◆ action/view\_fit\_to\_height
- ◆ action/view\_zoom\_in
- ◆ action/view\_zoom\_out
- ◆ action/view\_zoom
- ◆ action/view\_redisplay
- ◆ action/go\_up
- ◆ action/go\_back
- ◆ action/go\_forward
- ◆ action/go\_home
- ◆ action/go\_previous
- ◆ action/go\_next
- ◆ action/go\_goto
- ◆ action/go\_goto\_page
- ◆ action/go\_goto\_line
- ◆ action/go\_first
- ◆ **action/go\_last**
- ◆ action/bookmarks
- ◆ action/bookmark\_add
- ◆ action/bookmark\_edit
- ◆ action/tools\_spelling
- ◆ action/options\_show\_menubar
- ◆ action/options\_show\_toolbar
- ◆ action/options\_show\_statusbar
- ◆ action/options\_save\_options
- ◆ action/options\_configure
- ◆ action/options\_configure\_keybinding
- ◆ action/options\_configure\_toolbars
- ◆ action/options\_configure\_notifications
- ◆ action/help
- ◆ action/help\_contents
- ◆ action/help\_whats\_this
- ◆ action/help\_report\_bug
- ◆ action/help\_about\_app
- ◆ action/help\_about\_kde
- ◆ action/fullscreen

### **Konqueror-related Actions**

- ♦ action/editfiletype
- ♦ action/properties
- ♦ action/openwith
- ♦ action/openintab
- ♦ action/kdesktop\_rmb

### **Kicker-related Actions**

- ♦ action/kicker\_rmb
- ♦ action/menuedit

### **KWin Action**

- ♦ action/kwin\_rmb

### **Konsole-related Actions**

- ♦ action/konsole\_rmb
- ♦ action/settings
- ♦ action/show\_menubar
- ♦ action/show\_toolbar
- ♦ action/scrollbar
- ♦ action/fullscreen
- ♦ action/bell
- ♦ action/font
- ♦ action/keyboard
- ♦ action/schema
- ♦ action/size
- ♦ action/history
- ♦ action/save\_default
- ♦ action/save\_sessions\_profile
- ♦ action/options\_configure\_notifications
- ♦ action/options\_configure\_keybinding
- ♦ action/options\_configure
- ♦ action/send\_signal
- ♦ action/bookmarks
- ♦ action/add\_bookmark
- ♦ action/edit\_bookmarks
- ♦ action/clear\_terminal
- ♦ action/reset\_clear\_terminal

- ♦ action/find\_history
- ♦ action/find\_next
- ♦ action/find\_previous
- ♦ action/save\_history
- ♦ action/clear\_history
- ♦ action/clear\_all\_histories
- ♦ action/detach\_session
- ♦ action/rename\_session
- ♦ action/zmodem\_upload
- ♦ action/monitor\_activity
- ♦ action/monitor\_silence
- ♦ action/send\_input\_to\_all\_sessions
- ♦ action/close\_session
- ♦ action/new\_session
- ♦ action/activate\_menu
- ♦ action/list\_sessions
- ♦ action/move\_session\_left
- ♦ action/move\_session\_right
- ♦ action/previous\_session
- ♦ action/next\_session
- ♦ action/switch\_to\_session\_1
- ♦ action/switch\_to\_session\_2
- ♦ action/switch\_to\_session\_3
- ♦ action/switch\_to\_session\_4
- ♦ action/switch\_to\_session\_5
- ♦ action/switch\_to\_session\_6
- ♦ action/switch\_to\_session\_7
- ♦ action/switch\_to\_session\_8
- ♦ action/switch\_to\_session\_9
- ♦ action/switch\_to\_session\_10
- ♦ action/switch\_to\_session\_11
- ♦ action/switch\_to\_session\_12
- ♦ action/bigger\_font
- ♦ action/smaller\_font
- ♦ action/toggle\_bidi

---

**NOTE:** action/options\_show\_toolbar also disables the Toolbars submenu if present.  
action/bookmarks also disables action/bookmark\_add and action/  
bookmark\_edit. action/help is not yet implemented. action/kdesktop\_rmb disables

the RMB menu but some actions (cut, copy, rename, trash, and delete) might still be accessible using keyboard shortcuts.

Applications can use additional actions that they define. To get a list of the actions used by certain applications, use the following `dcop` command:

```
dcop dcopid qt objects | grep KActionCollection/ | cut -d '/' -f 3
```

Alternatively, you can use the following:

```
dcop dcopid mainwindowid actions
```

Actions that refer to applications that need to be run as a different user are prefixed by “`user/`” and identified by the username. For example, `user/root=false` disables all application entries that require root access.

Many useful actions are available. The following actions are related to printing restrictions.

**Table F-2** *Printing Restriction Actions*

Action	Description
<code>print/system</code>	Disables the option to select the printing system (back-end). We recommend disabling this option after the correct printing system has been configured.
<code>print/options</code>	Disables the button to select additional print options.
<code>print/copies</code>	Disables the panel that allows users to make more than one copy.
<code>print/selection</code>	Disables the options that allow selecting a printer or changing any of the printer properties. Make sure a proper default printer has been selected before disabling this option. Disabling this option also disables the <code>print/system</code> and <code>print/options</code> .
<code>print/dialog</code>	Disables the complete print dialog. Selecting the print option immediately prints the selected document using default settings. Make sure that a system-wide default printer has been selected. No application-specific settings are honored.

Other actions that are not print related are also available. They include:

**Table F-3** *Other Restriction Actions*

Action	Description
<code>shell_access</code>	Defines whether a shell suitable for entering random commands can be started. This also determines whether Run Command (Alt+F2) can be used to run shell commands and arbitrary executable. Likewise, executables placed in the user's Autostart folder can no longer be executed. Applications can still be started automatically by placing desktop files in the <code>\$KDEHOME/Autostart</code> or <code>\$KDEDIR/share/autostart</code> directory. See also <a href="#">“run_desktop_files” on page 313</a> .
<code>custom_config</code>	Defines whether the <code>--config</code> command line option should be honored. This option can be used to circumvent locked-down configuration files.

Action	Description
logout	Defines whether the user can log out of KDE.
lock_screen	Defines whether the user can lock the screen.
run_command	Defines whether Run Command (Alt+ F2) is available.
movable_toolbars	Defines whether toolbars can be moved around by the user. See also <code>action/options_show_toolbar</code> .
editable_desktop_icons	Defines whether icons on the desktop can be moved, renamed, deleted, or added. You might want to set the path for the desktop to a read-only directory instead of <code>\$HOME/Desktop</code> .
run_desktop_files	<p>Defines whether users can execute desktop files that are not part of the default desktop, KDE menu, registered services, and autostart services.</p> <p>The default desktop includes the files under <code>\$KDEDIR/share/kdesktop/Desktop</code> but not the files under <code>\$HOME/Desktop</code>.</p> <p>The KDE menu includes all files under <code>\$KDEDIR/share/applnk</code> and <code>\$XDGDIR/applications</code>.</p> <p>Registered services includes all files under <code>\$KDEDIR/share/services</code>.</p> <p>Autostart services include all files under <code>\$KDEDIR/share/autostart</code> but not the files under <code>\$KDEHOME/Autostart</code>.</p>

You probably will also want to activate the following resource restrictions, or users can still execute desktop files by placing them in, for example, `$KDEHOME/share/kdesktop/Desktop`:

**Table F-4** Resource Restrictions

Resource Restriction	Description
appdata_kdesktop	Restricts the default desktop.
apps	Restricts the KDE menu.
xdgdata-apps	Restricts the KDE menu.
services	Restricts registered services.
autostart	Restricts autostart services.
lineedit_text_completion	Defines whether input lines should have the potential to remember any previously entered data and make suggestions based on this when typing. When a single account is shared by multiple people, consider disabling this for privacy reasons.
start_new_session	Defines whether the user can start a second X session. See also the KDM configuration.
opengl_screensavers	Defines whether OpenGL screensavers can be used.

Resource Restriction	Description
<code>manipulatescreen_screensavers</code>	Defines whether screensavers that manipulate an image of the screen (for example, moving chunks of the screen around) can be used.

**IMPORTANT:** Changing restrictions might influence the data cached in the KDE System Configuration Cache (ksycoca) database. Because changes to `.../share/config/kdeglobals` do not trigger an automatic ksycoca update, force an update manually by touching the `.../share/services/update_ksycoca` file. This forces a user's sycoca database to be rebuilt the next time the user logs in.

Application desktop files can have an additional field—X-KDE-AuthorizeAction. In this field, specify actions that need authorization. Separate multiple actions with commas (.). If the desktop file of an application lists one or more actions this way and the user has no authorization for one of these actions, the application does not appear in the KDE menu and cannot be used by KDE for opening files.

## F.3 KDE3 URL Restrictions

It is also possible to restrict URL-related actions. The restriction framework can disable URL actions based on the action, the URL and, in some cases, the referring URL. URLs can be matched based on protocol, host, and path.

Following is the syntax for adding URL action restrictions to `kdeglobals`.

**NOTE:** Parameters of `rule_` are on the same line without the trailing backslash.

```
[KDE URL Restrictions]
rule_count=N
rule_1=action,referringURL_protocol,\
 referringURL_host,referringURL_path,\
 URL_protocol,URL_host,\
 URL_path,enabled
rule_n=action,referringURL_protocol,\
 referringURL_host,referringURL_path,\
 URL_protocol,URL_host,\
 URL_path,enabled
```

The following actions are supported:

**Table F-5** Supported URL Action Restrictions

Action	Description
<code>redirect</code>	With this, an HTML page obtained via HTTP could redirect itself to <code>file:/path/some-file</code> . This is disabled by default but could be explicitly enabled for a specific HTTP host. For example: <code>rule_1=redirect,http,myhost.acme.com,,file,,,true</code>

Action	Description
list	<p>Controls which directories can be browsed with KDE's file dialogs. To restrict users to be able to browse files only under their own home directories, use the following rules:</p> <pre>rule_1=list,,,,file,,,false rule_2=list,,,,file,, \$HOME,true</pre> <p>The first rule disables browsing any directories on the local file system. The second rule then enables browsing the user's home directory.</p>
open	<p>Controls which files can be opened by the user in applications. It also affects where users can save files. To restrict users to open the files only in their own home directories, use the following rules:</p> <pre>rule_1=open,,,,file,,,false rule_2=open,,,,file,, \$HOME,true rule_3=open,,,,file,, \$TMP,true</pre> <p>With the above rules, users would still be able to open files from the Internet. They are also given access to \$TMP to ensure correct operation of KDE applications. (\$TMP is replaced with the temporary directory KDE uses.)</p>

When restricting actions, consider the following:

- ◆ Empty entries match everything.
- ◆ Hostnames can start with a wildcard, as in \*.acme.com.
- ◆ A protocol also matches similar protocols that start with the same name—http matches both http and https. Use http! to match http and not https.
- ◆ Specifying a path matches all URLs that start with the same path. For better results, do not include a trailing slash. To specify one specific path, add an exclamation mark (!). For example, /srv matches both /srv and /srv/www, but /srv! matches only /srv and not /srv/www.

## F.4 KDE3 Resource Restrictions

Most KDE applications use additional resource files that are typically located in directories under \$KDEDIR/share. By default, KDE allows users to override any of these resources by placing files in the same location under \$KDEHOME/share. For example, Konsole stores profiles under \$KDEDIR/share/apps/konsole and users can add additional profiles by installing files in \$KDEHOME/share/apps/konsole.

KDE3 resource restrictions make it possible to restrict the lookup of files to directories outside of \$KDEHOME only. The following resources are defined:

**Table F-6** KDE3 Resource Restrictions

Resource	Directory
data	share/apps
html	share/doc/HTML
icon	share/icon

Resource	Directory
config	share/config
pixmap	share/pixmaps
apps	share/applnk
xdgdata-apps	share/applications
sound	share/sounds
locale	share/locale
services	share/services
servicetypes	share/servicetypes
mime	share/mimelnk
wallpaper	share/wallpapers
templates	share/templates
exe	bin
lib	lib

For the purpose of resource restrictions, there are two special resources:

**all:** Covers all resources.

**data\_ *appname*:** Covers the subsection for *appname* in the data resource.

To restrict resources, include the [KDE Resource Restrictions] group in the kdeglobals file. Each resource can then be restricted by adding *resource=false*. For example, to restrict the wallpaper resource to %KDEDIR/share/wallpapers, add the following:

```
[KDE Resource Restrictions][$i]
wallpaper=false
```

To prevent a user from adding additional konsole profiles, add the following:

```
[KDE Resource Restrictions][$i]
data_konsole=false
```

## F.5 Expansion of Environment Variables in KDE Configuration Files

Entries in configuration files can contain environment variables. To use them, the entry must be marked with [*\$e*]. For example:

```
Name [$e]=$USER
```

When the Name entry is read, \$USER is replaced with the value of the \$USER environment variable. Normally, the application replaces \$USER with the value of the environment variable when saving. To prevent this, combine *\$e* with *\$i* (immutable). For example:

```
Name [$ei]=$USER
```

This example ensures the Name entry always returns the value of the \$USER environment variable. The user cannot change this entry. The following syntax is also supported:

```
Name [$ei]=$ {USER}
```

## F.6 Shell Commands in KDE Configuration Files

Entries in configuration files can contain shell commands. This way, the value of a configuration entry can be determined dynamically at runtime. To use this, the entry must be marked with `[$e]`.

For example:

```
Host [$e]=$ (hostname)
```

## F.7 Tools

The Kiosk desktop configuration framework can be managed by editing bare text files, but using Kiosktool or KConfigEditor offer a much more intuitive way of handling desktop configuration issues.

### F.7.1 Kiosktool

Kiosktool is intended to create and modify profiles. It can enable any lockdown mechanism as described. Kiosktool lets you set up the configuration profiles via the existing applications or KDE configuration modules, such as the panel, the desktop, and various kcontrol settings.

Kiosktool can also be used to define which profiles should apply to any specific users or groups. It can work with remote configurations, hosted by any server, when configured via the configuration dialog. Import all configuration settings using an SSH connection (via the `fish://protocol`), so it is not necessary to configure the server with a writable network file system.

See [“Using the KDE Lockdown Mechanism \(Kiosk\)” on page 317](#) for more information.

### F.7.2 KConfigEditor

KConfigEditor can be used to show and modify single keys in configuration files either for a specific user or globally. It can work on both local and remote configurations. It also supports both KDE and GNOME. For more information, see [“GNOME Configuration for Administrators” on page 261](#).

Browse the settings using the tree view in the side bar. Limit the visible entries by inserting a string in its search field. Applications that use the KDE KConfig XT system provide a longer explanation for each key. KConfigEditor can show all changes not yet saved with the Tools menu.

## F.8 Using the KDE Lockdown Mechanism (Kiosk)

The KDE lockdown mechanism (also known as Kiosk) provides an easy way to disable certain features within KDE so you can create a more controlled environment (for example, if the system is used for one or more specific dedicated tasks only). It builds on KDE’s configuration framework and adds a simple application API that applications can query to get authorization for certain operations. The KDE Kiosk framework should be used in addition to the standard Linux security measures.

Default values are no longer written. When a configuration file in a location other than `$KDEHOME` defines a value for a key and the application subsequently writes a new configuration file to `$KDEHOME`, that configuration file contains an entry for the key only if its value differs from the value read from the other file.

This eliminates the problem of changes to default configuration files under `$KDEDIR` not taking effect for users, because these users have their own copy of these settings under `$KDEHOME`. KDE makes sure not to copy these settings so changes made under `$KDEDIR` affect all users that have not explicitly changed the affected settings to something else.

Starting with KDE3, configuration entries can be marked *immutable*. When a configuration entry is immutable, entries under `$KDEHOME` for that value are ignored. Configuration files read after the file in which it is marked immutable cannot override its value. Immutable entries cannot be changed via KConfig.

Entries can be marked immutable on four different levels:

- ◆ On an entry-by-entry basis by appending `[$i]` after the key.

For example:

```
[MyGroup]
someKey[$i]=42
```

- ◆ On a group-by-group basis by appending `[$i]` after the group. All entries specified in the group are marked immutable and no new entries can be added to the group.

For example:

```
[MyGroup] [$i]
someKey=42
```

- ◆ On a file-by-file basis by starting the file with `[$i]`.

For example:

```
[$i]
[MyGroup]
someKey=42
[MyOtherGroup]
someOtherKey=11
```

- ◆ The file system can also be used to mark files immutable. If KDE does not have write access to the user's version of a configuration file, the file is automatically considered immutable.

To make the configuration file of kicker (the panel) immutable, for example, use the following commands:

```
chown root.root /home/user/.kde/share/config/kickerrc
chmod 644 /home/user/.kde/share/config/kickerrc
```

If you do this, the user is warned that the configuration file is not writable. If you do not want the warning, add the following two lines to the application's configuration file (or to `kdeglobals`, to disable the warning for all applications):

```
[KDE Action Restrictions]
warn_unwritable_config=false
```

When configuration files are marked immutable in whole or in part, the user can no longer make permanent changes to the settings that have been marked immutable. Ideally, the application recognizes this and no longer offers the user the possibility to change these settings. Unfortunately, not all applications support this at the moment. It is therefore possible that the user is still presented with an option in the user interface to change a setting that is immutable. However, changes made

are not saved. In some cases, the user might be able to use the changed setting until the application terminates. In other cases, the changed setting is simply ignored and the application continues to work with the immutable setting.

The following applications currently do detect when their configuration files have been marked immutable and adjust their user interface accordingly:

**kicker**

By marking the `kickerrc` configuration file as immutable, the panel is locked down so it is not possible to make any changes to it.

**kdesktop**

By marking the `kdesktoprc` configuration file as immutable, the desktop is locked down so it is no longer possible to select Configure Desktop from its menus.

**kcalc**

By marking the `kcalcrc` configuration file as immutable, the Configure button is not displayed.



# Working with the Shell

# G

Graphical user interfaces are increasingly becoming important for Linux, but using the mouse is not always the best way to perform daily tasks. The command line provides high flexibility and efficiency. The first part of this appendix provides an introduction to the Bash shell. It is followed by an explanation of the user permissions concept in Linux and a list of the most important commands. It then closes with a description of the vi text editor.

---

**WARNING:** Some commands used at the terminal prompt can delete data and cause your operating system to cease functioning. Only administrators and advanced users should execute shell commands.

---

Text-based applications are especially important for controlling older Linux computers that do not have the resources for demanding display systems. Virtual consoles are used in this case. Six of them are available in text mode (Alt+F1 through Alt+F6). The seventh console is reserved for X.

## G.1 Introduction to Bash

In the KDE taskbar, there is an icon depicting a monitor with a seashell. When you click this icon, a console window opens where you can enter commands. The console normally runs Bash (Bourne again shell), a program developed as part of the GNU project. It is, by far, the most widely used derivative of the Bourne shell (sh). The prompt on the shell's first line usually consists of the username, hostname, and current path, but it can be customized. When the cursor is behind this prompt, you can send commands directly to your computer system.

### G.1.1 Commands

A command consists of several elements. The first element is always the actual command, followed by parameters or options. Commands are executed when you press Enter. Before doing so, you can easily edit the command line, add options, or correct typing errors. One of the most frequently used commands is `ls`, which can be used with or without arguments. Entering the plain `ls` command in the console shows the contents of the current directory.

Options are prefixed with a hyphen. The command `ls -l`, for instance, shows the contents of the same directory in full detail. Next to each filename, you can see the date when the file was created, the file size in bytes, and further details, which will be discussed later. One very important option that exists for many commands is the `--help` option. Entering `ls --help` displays all the options for the `ls` command.

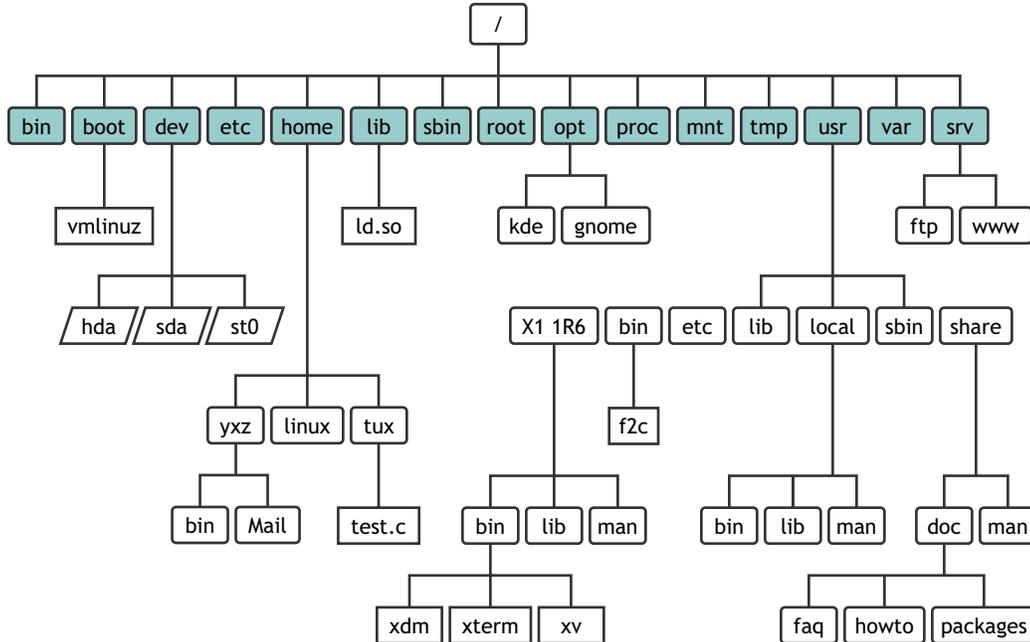
You can also use the `ls` command to view the contents of other directories. To do so, the directory must be specified as a parameter. For example, to see the contents of `Desktop`, you would enter `ls -l Desktop`.

### G.1.2 Files and Directories

To use the shell efficiently, it is really useful to have some knowledge about the file and directory structures of a Linux system. You can think of directories as electronic folders in which files, programs, and subdirectories are stored. The top level directory in the hierarchy is the root directory, referred to as `/`. This is the place from which all other directories can be accessed.

The `/home` directory contains directories where individual users can store their personal files. The following figure shows the standard directory tree in Linux, with the home directories of the example users `xyz`, `linux`, and `tux`.

**Figure G-1** Excerpt from a Standard Directory Tree



The directory tree of a Linux system has a functional structure that follows the Filesystem Hierarchy Standard. The following list provides a brief description of the standard directories in Linux.

**Table G-1** Standard Linux Directories

Directory	Description
<code>/</code>	Root directory, starting point of the directory tree.
<code>/home</code>	Private directories of users.
<code>/dev</code>	Device files that represent hardware components.
<code>/etc</code>	Important files for system configuration.
<code>/etc/init.d</code>	Boot scripts.
<code>/usr/bin</code>	Generally accessible programs.
<code>/bin</code>	Programs needed early in the boot process.
<code>/usr/sbin</code>	Programs reserved for the system administrator.
<code>/sbin</code>	Programs reserved for the system administrator and needed for booting.
<code>/usr/include</code>	Header files for the C compiler.
<code>/usr/include/g++</code>	Header files for the C++ compiler.
<code>/usr/share/doc</code>	Various documentation files.

Directory	Description
<code>/usr/share/man</code>	System manual pages (man pages).
<code>/usr/src</code>	Source code of system software.
<code>/usr/src/linux</code>	Kernel source code.
<code>/tmp, /var/tmp</code>	Temporary files.
<code>/usr</code>	All application programs.
<code>/var</code>	Configuration files (for example, those linked from <code>/usr</code> ).
<code>/var/log</code>	System log files.
<code>/var/adm</code>	System administration data.
<code>/lib</code>	Shared libraries (for dynamically linked programs).
<code>/proc</code>	Process file system.
<code>/usr/local</code>	Local, distribution-independent extensions.
<code>/opt</code>	Optional software, larger add-on program packages (such as KDE, GNOME).

## G.1.3 Bash Functions

There are two important functions of the shell that can make your work a lot easier:

### The history function

To repeat a command that has been entered before, press the Up arrow until the previous command appears at the prompt. Move forward through the list of previously entered commands by pressing the Down arrow. To edit the command line, just move the cursor to the desired position using the arrow keys and start typing. Use `Ctrl+R` to search in the history.

### The expansion function

To expand a filename to its full length after typing its first letters until it can be uniquely identified, type the first letters and then press `Tab`. If there are several filenames starting with the same letters, obtain a list of them by pressing `Tab` twice.

### Exercise

Now that you know what a command looks like, which directories exist in Novell® Linux Desktop, and how to speed up things when using Bash, put this knowledge into practice with a small exercise.

1. Open a console from the KDE desktop by clicking the Shell icon.
2. Enter `ls` to see the contents of your home directory.
3. Use the `mkdir` command (which stands for *make directory*) to create a new subdirectory called `test` by entering `mkdir test`.
4. Now launch the Kate editor by pressing `Alt+F2` and typing `kate` in the input field. Type a few letters in the editor, then save the file as `Testfile` in your home directory. Linux distinguishes between uppercase and lowercase; for this exercise, use an uppercase T.

5. View the contents of your home directory again. Instead of typing `ls` again, just press the up arrow key twice and the `ls` command should reappear at the prompt. To execute the command, press Enter. The newly created directory named `test` should appear in blue letters and `Testfile` in black. This is how directories and files can be distinguished in a console.
6. Move `Testfile` into the subdirectory `test` with the command `mv`. To speed this up, use the expansion function: just enter `mv T` and press Tab. As long as there is no other file beginning with this letter in the directory, the shell expands the filename and adds the string `estfile`. Otherwise, add a letter or two yourself and press Tab each time to see whether the shell can now expand the name. Finally, type a space then `test` after the expanded filename and press Enter to execute the command.
7. At this point, `Testfile` should no longer be in the directory. Check this by entering `ls` again.
8. To see whether the file has been successfully moved, change to the directory `test` by entering the `cd test` command. Now enter `ls` again. You should see `Testfile` in the listing. Change back to your home directory at any point by entering only `cd`.
9. To make a copy of a file, enter `cp`. For instance, enter `cp Testfile Testbackup` to copy `Testfile` to `Testbackup`. Again, the `ls` command can be used to see whether both files are in the directory.

## G.1.4 Specifying Paths

When working with files or directories, it is important specify the correct path. However, you do not need to enter the entire (absolute) path from the root directory to the respective file. Rather, you can start from the current directory. Address your home directory directly with a tilde (`~`). Accordingly, there are two ways to list the file `Testfile` in the directory `test`: by specifying the relative path with `ls test/*` or by specifying the absolute path with `ls ~/test/*`.

To list the contents of home directories of other users, enter `ls ~username`. In the above-mentioned directory tree, one of the sample users is `tux`. In this case, `ls ~tux` would list the contents of the home directory of `tux`.

Refer to the current directory with a dot (`.`). The next higher level in the tree is represented by two dots (`..`). By entering `ls ..`, you can see the contents of the parent directory of the current directory. The command `ls ../../` shows the contents of the directory two levels higher in the hierarchy.

### Exercise

Try this exercise to practice moving around in the directories of your Novell Linux Desktop system.

1. Change into your home directory using the `cd` command. Then create a directory in it with the name `test2` by entering `mkdir test2`.
2. Change into the new directory using `cd test2` and create a subdirectory in it with the name `subdirectory`. To change to it, use the expansion function: enter `cd su` then press Tab. The shell will expand the rest of the directory name.
3. Now try to move the previously created file `Testbackup` into the current directory (subdirectory) without changing the directory again. To achieve this, enter the relative path to that file: `mv ../../test/Testbackup ..`. The dot at the end of this command is required to tell the shell that the current directory is the destination to move the file to. In this exercise, `../../` refers to your home directory.

## G.1.5 Wildcards

Another convenience offered by the shell is four types of wildcards:

**Table G-2** *Shell Wildcards*

Wildcard	Description
?	Matches exactly one arbitrary character.
*	Matches any number of characters.
[ <i>set</i> ]	Matches one of the characters from the group specified inside the square brackets, which is represented here by the string <i>set</i> .
[! <i>set</i> ]	Matches one character other than those identified by <i>set</i> .

Assuming that your test directory contains the files `Testfile`, `Testfile1`, `Testfile2`, and `datafile`, the command `ls Testfile?` lists the files `Testfile1` and `Testfile2`. Entering `ls Test*` will add `Testfile`. The command `ls *fil*` shows all the sample files. Finally, you can use the set wildcard to address all sample files whose last character is a number (for example, `ls Testfile[1-9]`).

Of the four types of wildcards, the most inclusive one is the asterisk (\*). It can be used to copy all files contained in one directory to another one or to delete all files with one command. The `rm *fil*` command, for instance, would delete all files in the current directory whose name includes the string `fil`.

## G.1.6 Less and More

Linux includes two small programs for viewing text files directly in the shell. Rather than starting an editor to read a file like `Readme.txt`, simply enter the command `less Readme.txt` to display the text in the console window. Use the Space key to scroll down one page. Use Page Up and Page Down to move forward or backward in the text. To exit the less program, press Q.

Instead of less, you can also use the older program, more. However, it is less convenient because it does not allow you to scroll backwards.

The program less got its name from the precept that “less is more” and it can also be used to view the output of commands in a convenient way. To see how this works, see the next section, “Pipes” on [page 325](#).

## G.1.7 Pipes

Normally, the standard output in the shell is your screen or the console window, and the standard input is the keyboard. To forward the output of a command to an application such as less, use a pipeline (`|`).

To view the files in the test directory, you would enter the `ls test | less` command. The contents of the `test` directory will be displayed with less. This makes sense only if the normal output with `ls` would be too lengthy. For instance, if you view the contents of the `dev` directory with `ls /dev`, you will only see a small portion in the window. But you can view the entire list with `ls /dev | less`.

It is also possible to save the output of commands to a file. For example, `ls test > Content` generates a new file called `Content` that contains a list of the files and directories in `test`. View the file using the `less Content` command.

You can also use a file as the input for a command. For example, sort the text lines in `Testfile` with `sort < Testfile`. The output of the command `sort` is sent to the screen. The text is sorted by the first letters of the individual lines.

If you need a new file containing the sorted list, pipe the output of the command `sort` to a file. To test this, create an unsorted name list in an editor and save it under `list` in the `test` directory. Then change to `test` and enter the `sort < unsortedlist > sortedlist` command. Finally, view the sorted list with the `less` command.

Just like the standard output, the standard error output is sent to the console as well. However, to redirect the standard error output to a file named `errors`, append `2> errors` to the corresponding command. Both standard output and standard error are saved to one file named `alloutput` if you append `>& alloutput`. Finally, to append the output of a command to an already existing file, the command must be followed by `>>` instead of a single `>`.

## G.1.8 Archives and Data Compression

Now that you have already created a number of files and directories, consider the subject of archives and data compression. Suppose you want to have the entire `test` directory packed into one file that you can save on a floppy disk as a backup copy or send by e-mail. To do so, use the `tar` command (for tape archiver). With `tar --help`, you can view all the options for the `tar` command. The most important of these options are explained here:

**Table G-3** *tar Command Options*

Option	Description
<code>-c</code>	(create) Creates a new archive.
<code>-t</code>	(table) Displays the contents of an archive.
<code>-x</code>	(extract) Unpacks the archive.
<code>-v</code>	(verbose) Shows all files on screen while creating the archive.
<code>-f</code>	(file) Selects a filename for the archive file. When creating an archive, this option must always be given as the last one.

To pack the `test` directory with all its files and subdirectories into an archive named `testarchive.tar`, use the `-c` and `-f` options. For the testing purposes of this example, also add `-v` to follow the progress of the archiving, although this option is not mandatory. After using `cd` to change to your home directory where the `test` directory is located, enter `tar -cvf testarchive.tar test`. After that, view the contents of the archive file with `tar -tf testarchive.tar`. The `test` directory with all its files and directories has remained unchanged on your hard disk. To unpack the archive, you can enter `tar -xvf testarchive.tar`, but do not try this yet.

For file compression, the obvious choice on Linux is the popular `gzip` program. Just enter `gzip testarchive.tar`. With `ls`, you can now see that the `testarchive.tar` file is no longer

there and that the `testarchive.tar.gz` file has been created instead. This file is much smaller and, therefore, much better suited for transfer via e-mail or storage on a floppy.

Now, unpack this file in the `test2` directory created earlier. To do so, enter `cp testarchive.tar.gz test2` to copy the file to that directory. Change to the directory using `cd test2`. A compressed archive with the `.tar.gz` extension can be unzipped with the `gunzip` command. Enter `gunzip testarchive.tar.gz`, which results in the `testarchive.tar` file, which then needs to be extracted (or untarred) with `tar -xvf testarchive.tar`. You can also unzip and extract a compressed archive in one step by adding the `-z` option. The complete command would be `tar -xzvf testarchive.tar.gz`. With `ls`, you can see that a new `test` directory has been created with the same contents as your `test` directory in your home directory.

## G.1.9 mtools

`mtools` is a set of commands for working with MS-DOS file systems. The commands included in `mtools` allow you to address the first floppy drive as `a:`, just like under MS-DOS, and the commands are like MS-DOS commands except they are prefixed with `m`.

**Table G-4** *mtools* Commands

Command	Description
<code>mmdir a:</code>	Displays the contents of the floppy disk in drive <code>a:</code> .
<code>mcopy Testfile a:</code>	Copies the file <code>Testfile</code> to the floppy disk.
<code>mdel a:Testfile</code>	Deletes <code>Testfile</code> from <code>a:</code> .
<code>mformat a:</code>	Formats the floppy disk in MS-DOS format (using the <code>fdformat</code> command).
<code>mcd a:</code>	Makes <code>a:</code> your current directory.
<code>mmd a:test</code>	Creates the subdirectory <code>test</code> on the floppy disk.
<code>mrdd a:test</code>	Deletes the subdirectory <code>test</code> from the floppy disk.

## G.1.10 Cleaning Up

After this crash course, you should be familiar with the basics of the Linux shell or command line. You might want to clean up your home directory by deleting the various test files and directories using the `rm` and `rmdir` commands. See “[Important Linux Commands](#)” on page 331 for a list of the most important commands and a brief description of their functions.

## G.2 Users and Access Permissions

Since its inception in the early 1990s, Linux has been developed as a multiuser system. Any number of users can work on it simultaneously. Users need to log in to the system before starting a session at their workstation, and each user has a username with a corresponding password. This differentiation of users guarantees that unauthorized users cannot see files for which they do not have permission. Larger changes to the system, such as installing new programs, are also usually impossible or restricted for normal users. Only the super user (`root`), has the unrestricted capacity to make changes to the system and has unlimited access to all files. Those who use this concept wisely, only logging

in with full root access when necessary, can cut back the risk of unintentional loss of data. Because under normal circumstances only root 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.

## G.2.1 File System Permissions

Basically, every file in a Linux file system belongs to a user and a group. Both of these proprietary groups and all others 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. For example, you can call a group of people working on a certain project `project3`. Every user in a Linux system is a member of at least one proprietary group, normally called `users`. There can be as many groups in a system as needed, but only root is able to add groups. Every user can find out which groups he is a member of by using the `groups` command.

### File Access

The organization of permissions in the file system differs for files and directories. File permission information can be displayed with the `ls -l` command. The output could appear as follows:

```
-rw-r----- 1 tux project3 14197 Jun 21 15:03 Roadmap
```

In this example, this file belongs to the `tux` user. It is assigned to the `project3` group. To discover the user permissions of the `Roadmap` file, the first column must be examined more closely.

Type	Users Permissions	Group Permissions	Permissions for Other Users
-	rw-	r--	---

This column is comprised of one leading character followed by nine characters grouped in threes. The first of the 10 letters stands for the type of file system component. The dash (-) shows that this is a file. A directory (d), a link (l), a block device (b), or 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. An x in the third position denotes that the object can be executed. Because the file in this example is a text file and not one that is executable, executable access for this particular file is not needed.

In this 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 `project3` group can read the file, but they cannot modify it or execute it. Other users do not have any access to this file. Other permissions can be assigned by means of ACLs (Access Control Lists). See [“Access Control Lists” on page 331](#) for more information.

### Directory Permissions

Access permissions for directories have the type d. For directories, the individual permissions have a slightly different meaning.

```
drwxrwxr-x 1 tux project3 35 Jun 21 15:15 ProjectData
```

In the above example, the owner (`tux`) and the owning group (`project3`) of the `ProjectData` directory are easy to recognize. In contrast to the file access permissions from [“Working with the](#)

Shell” on page 321, the set reading permission (`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 the user can change to this directory. In the above example, this means the user `tux` as well as the members of the `project3` group 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 can enter the directory (`x`) and browse through it (`r`), but not insert any new files (`w`).

## G.2.2 Modifying File Permissions

### Access Permissions

The access permissions of a file or directory can be changed by the owner and, of course, by the root user, with the `chmod` command followed by the parameters changing the permissions and one or more filenames. The parameters form different categories:

1. Users 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
  - ♦ `r` (read)
  - ♦ `w` (write)
  - ♦ `x` (execute)
4. Filenames separated by spaces

If, for example, the `tux` user also wants to grant other users write (`w`) access to the `ProjectData` directory, he can do this using the `chmod o+w ProjectData` command.

If, however, he wants to deny all users other than himself write permissions, he can do this by entering the `chmod go-w ProjectData` command. To prohibit all users from adding a new file to the `ProjectData` folder, enter `chmod -w ProjectData`. Now, not even the owner can write to the file without first re-establishing write permissions.

### Ownership Permissions

Other important commands to control the ownership and permissions of the file system components are `chown` (change owner) and `chgrp` (change group). The command `chown` can be used to transfer ownership of a file to another user. However, only root is permitted to perform this change.

Suppose the file `Roadmap` should no longer belong to `tux`, but to the user `geeko`. root should then enter `chown geeko Roadmap`.

`chgrp` changes the group ownership of the file. However, the owner of the file must be a member of the new group. In this way, the user `tux` can switch the group owning the file `ProjectData` to `project4` with the command `chgrp project4 ProjectData`, as long as he is a member of this new group.

## G.2.3 The setuid Bit

In certain situations, the access permissions might be too restrictive. Therefore, Linux has additional settings that enable the temporary change of the current user and group identity for a specific action. For example, the `cdrecord` program normally requires root permissions to access the writer for burning CDs (or DVDs). Thus, a normal user would not be able to create CDs, because it would be too dangerous to grant all users direct access to all devices. A possible solution to this problem is `setuid` (set user ID), which is a special file attribute that instructs the system to execute programs marked accordingly under a specific user ID. Consider the `cdrecord` command:

```
-rwxr-x--- 1 root root 281356 2002-10-08 21:30 /usr/bin/cdrecord
```

Set the `setuid` bit with the `chmod u+s /usr/bin/cdrecord` command, then assign the `cdrecord` program to the `users` group with the `chgrp users /usr/bin/cdrecord` command. The following access permissions are granted:

```
-rws--x--- 1 root users 281356 2002-10-08 21:30 /usr/bin/cdrecord
```

By means of the `setuid` bit, all users belonging to the `users` group can use the program. In effect, this means that the program is executed as root.

---

**WARNING:** Setting the `setuid` bit for a program makes your computer more vulnerable to attacks. Do this only in exceptional cases when you know the program well and are aware of the potential risks.

---

## G.2.4 The setgid Bit

The `setuid` attribute applies to users. However, there is also an equivalent property for groups—the `setgid` attribute. Any program that this attribute is set for runs under the group ID it was save under, no matter which user starts it. Therefore, in a directory with the `setgid` bit, all newly created files and subdirectories are assigned to the group that the directory belongs to. Consider the following example directory:

```
drwxrwxr-- 2 root archive 48 Nov 19 17:12 backup
```

Set the `setgid` bit with the `chmod g+s /test` command. Subsequently, the access permissions appear as follows:

```
drwxrwxr-- 2 root archive 48 Nov 19 17:12 backup
```

## G.2.5 The Sticky Bit

There is also the sticky bit. It makes a difference whether it belongs to an executable program or a directory. If it belongs to a program, a file marked in this way will be loaded to the RAM to avoid needing to get it from the hard disk each time it is used. This attribute is rarely used because modern hard disks are usually fast enough. If this attribute is assigned to a directory, it prevents users from deleting each other's files. Typical examples include the `/tmp` and `/var/tmp` directories:

```
drwxrwxrwt 2 root root 1160 2002-11-19 17:15 /tmp
```

## G.2.6 Access Control Lists

The traditional permission concept for Linux file system objects, such as files or directories, can be expanded by means of ACLs (Access Control Lists). They allow the assignment of permissions to individual users or groups other than the original owner or owning group of a file system object.

Files or directories bearing extended access permissions can be detected with a simple `ls -l` command:

```
-rw-r--r--+ 1 tux project3 14197 Jun 21 15:03 Roadmap
```

The output of `ls` does not reveal much of a change compared to an `ls` on a file without an ACL. `Roadmap` is owned by `tux` who belongs to the `project3` group. `tux` holds both write and read access to this file, and his group as well as all other users have read access. The only difference that distinguishes this file from a file without an ACL is the additional `+` in the first column holding the permission bits.

Get details about the ACL by executing `getfacl Roadmap`, which results in the following:

```
file: Roadmap
owner: tux
group: project3
user::rw-
user:jane:rw- effective: r--
group::r--
group:djungle:rw- effective: r--
mask::r--
other::---
```

The first three lines of the output do not hold any information not available with `ls -l`. These lines only state filename, owner, and owning group. Lines 4 to 9 hold the ACL entries. Conventional access permissions represent a subset of those possible when using ACLs. This example ACL grants read and write access to the owner of the file as well as to the `jane` user (lines 4 and 5). The conventional concept has been expanded, allowing access to an extra user. The same applies to the handling of group access. The owning group holds read permissions (line 6) and the `djungle` group holds read and write permissions. The `mask` entry in line 8 reduces the effective permissions for the `jane` user and the `djungle` group to read access. Other users and groups do not get any kind of access to the file (line 9).

Only very basic information has been provided here. Find more information about ACLs, see “Chapter 27: Access Control Lists in Linux” in the *SUSE LINUX Enterprise Server 9 Administration Guide* ([http://www.novell.com/documentation/sles9/pdfdoc/sles\\_9\\_admin\\_guide/sles\\_9\\_admin\\_guide.pdf](http://www.novell.com/documentation/sles9/pdfdoc/sles_9_admin_guide/sles_9_admin_guide.pdf)).

## G.3 Important Linux Commands

This section gives insight into the most important commands of your Novell Linux Desktop system. Along with the individual commands, parameters are listed and, where appropriate, a typical sample application is introduced. To learn more about the various commands, use the man pages, accessed using `man` followed by the name of the command (for example, `man ls`).

In the man pages, move up and down with the `PgUp` and `PgDn` keys. Move between the beginning and the end of a document with `Home` and `End`. End this viewing mode by pressing `Q`. Learn more about the `man` command itself with `man man` command.

Adjust the settings 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, for example, by writing `ls -l -a` instead of `ls -l -a`.

---

**TIP:** There are many more commands than listed here. For information about other commands, or more detailed information, we recommend the O'Reilly publication *Linux in a Nutshell*.

---

## G.3.1 File Commands

This section introduces the most important file commands you will need in your every day life with a Linux system.

### File Administration Commands

Command	Description
<code>ls [option(s)] [file(s)]</code>	<p>If you run <code>ls</code> without any additional parameters, the program lists the contents of the current directory in short form.</p> <p>-l Detailed list.</p> <p>-a Displays hidden files.</p>
<code>cp [option(s)] source target</code>	<p>Copies <code>source</code> file to a <code>target</code> file.</p> <p>-i Waits for confirmation, if necessary, before an existing <code>target</code> file is overwritten.</p> <p>-r Copies recursively (includes subdirectories)</p>
<code>mv [option(s)] source target</code>	<p>Copies <code>source</code> file to <code>target</code> file, then deletes the original <code>source</code> file.</p> <p>-b Creates a backup copy of the <code>source</code> file before moving.</p> <p>-i Waits for confirmation, if necessary, before an existing <code>target</code> file is overwritten.</p>
<code>rm [option(s)] files</code>	<p>Removes the specified files from the file system. Directories are not removed by <code>rm</code> unless the <code>-r</code> option is used.</p> <p>-r Deletes any existing subdirectories.</p> <p>-i Waits for confirmation before deleting each file.</p>
<code>ln [option(s)] source target</code>	<p>Creates an internal link from the <code>source</code> file to the <code>target</code> file. Normally, such a link points directly to the <code>source</code> file on the same file system. However, if <code>ln</code> is executed with the <code>-s</code> option, it creates a symbolic link that only points to the directory in which the <code>source</code> file is located, enabling linking across file systems.</p> <p>-s Creates a symbolic link.</p>

Command	Description
<code>cd [option(s)] [directory]</code>	Changes the current directory; <code>cd</code> without any parameters changes to the user's home directory.
<code>mkdir [option(s)] directoryname</code>	Creates a new directory.
<code>rmdir [option(s)] directoryname</code>	Deletes the specified directory, if it is already empty.
<code>chown [option(s)] username.group files</code>	Transfers ownership of a file to the user with the specified username.  -R Changes files and directories in all subdirectories.
<code>chgrp [option(s)] groupname files</code>	Transfers the group ownership of a given file to the group with the specified group name. The file owner can change group ownership only if he is a member of both the current and the new group.
<code>chmod [options] mode files</code>	Changes the access permissions.  The mode parameter has three parts: group, access, and access type. group accepts the following characters: <ul style="list-style-type: none"> <li>◆ u user</li> <li>◆ g group</li> <li>◆ o others</li> </ul> For access, grant access with + and deny it with -.  The access type is controlled by the following options: <ul style="list-style-type: none"> <li>◆ r read</li> <li>◆ w write</li> <li>◆ x eXecute (executing files or changing to the directory)</li> <li>◆ s Set uid bit (the application or program is started as if it were started by the owner of the file)</li> </ul> As an alternative, a numeric code can be used. The four digits of this code are composed of the sum of the values 4, 2, and 1 (the decimal result of a binary mask). The first digit sets the set user ID (SUID) (4), the set group ID (2), and the sticky (1) flags. The second digit defines the permissions of the owner of the file. The third digit defines the permissions of the group members, and the last digit sets the permissions for all other users. The read permission is set with 4, the write permission with 2, and the permission for executing a file is set with 1. The owner of a file would usually receive a 7 (the sum of all permissions).

Command	Description
<code>gzip [parameters] files</code>	<p>This program compresses the contents of files using complex mathematical algorithms. Files compressed in this way are given the extension <code>.gz</code> and need to be uncompressed before they can be used. To compress several files or even entire directories, use the <code>tar</code> command.</p> <p><code>-d</code> Decompresses the packed gzip files so they return to their original size and can be processed normally (like the command <code>gunzip</code>).</p>
<code>tar options archive files</code>	<p><code>tar</code> puts one or more files into an archive. Compression is optional. <code>tar</code> is a complex command with a number of options available. The most frequently used options are the following:</p> <ul style="list-style-type: none"> <li><code>-f</code> Writes the output to a file and not to the screen as is usually the case.</li> <li><code>-c</code> Creates a new tar archive.</li> <li><code>-r</code> Adds files to an existing archive.</li> <li><code>-t</code> Outputs the contents of an archive.</li> <li><code>-u</code> Adds files, but only if they are newer than the files already contained in the archive.</li> <li><code>-x</code> Unpacks files from an archive (<b>extraction</b>).</li> <li><code>-z</code> Packs the resulting archive with <code>gzip</code>.</li> <li><code>-j</code> Compresses the resulting archive with <code>bzip2</code>.</li> <li><code>-v</code> Lists files processed.</li> </ul> <p>The archive files created by <code>tar</code> end with <code>.tar</code>. If the tar archive was also compressed using <code>gzip</code>, the ending is <code>.tgz</code> or <code>.tar.gz</code>. If it was compressed using <code>bzip2</code>, the ending is <code>.tar.bz2</code>. Application examples can be found in <a href="#">"Archives and Data Compression" on page 326</a>.</p>
<code>locate pattern(s)</code>	<p>The <code>locate</code> command can find which directory a specified file is located in. If desired, use to specify filenames. The program is very fast, because it uses a database specifically created for the purpose (rather than searching through the entire file system). This very fact, however, also results in a major drawback: it is unable to find any files created after the latest update of its database. The database can be generated by root with <code>updatedb</code>.</p>
<code>updatedb [options(s)]</code>	<p>This command performs an update of the database used by <code>locate</code>. To include files in all existing directories, run the program as root. It also makes sense to place it in the background by appending an ampersand (<code>&amp;</code>), so you can immediately continue working on the same command line (<code>updatedb &amp;</code>).</p>

Command	Description
<code>find [option(s)]</code>	With <code>find</code> , search for a file in a given directory. The first argument specifies the directory to start the search in. The option <code>-name</code> must be followed by a search string, which can also include wildcards. Unlike <code>locate</code> , which uses a database, <code>find</code> scans the actual directory.

## Commands to Access File Contents

Command	Description
<code>cat [option(s)] files</code>	The <code>cat</code> command displays the contents of a file, printing the entire contents to the screen without interruption.  <code>-n</code> Numbers the output on the left margin.
<code>less [option(s)] files</code>	This command can be used to browse the contents of the specified file. Scroll half a screen up or down with <code>PgUp</code> and <code>PgDn</code> , or a full screen page down with the Spacebar. Jump to the beginning or end of a file using <code>Home</code> and <code>End</code> . Press <code>Q</code> to exit the program.
<code>grep [option(s)] searchstring filenames</code>	The <code>grep</code> command finds a specific search string in the specified file(s). If the search string is found, the command displays the line in which the searchstring was found along with the filename.  <code>-i</code> Ignores case.  <code>-H</code> Displays only the names of the respective files, not the text lines.  <code>-n</code> Additionally displays the numbers of the lines in which it found a hit.  <code>-l</code> Lists only the files in which searchstring does not occur.
<code>diff [option(s)] file1 file2</code>	The <code>diff</code> command compares the contents of any two files. The output produced by the program lists all lines that do not match. This is frequently used by programmers who need to send only their program alterations and not the entire source code.  <code>-q</code> Reports only whether the two files differ.

## File System Commands

Command	Description
<code>mount [option(s)] [device] mountpoint</code>	<p>This command can be used to mount any data media (such as hard disks, CD-ROM drives, and other drives) to a directory of the Linux file system.</p> <p><code>-r</code> Mounts read-only.</p> <p><code>-t filesystem</code> Specifies the file system. The most common are <code>ext2</code> for Linux hard disks, <code>msdos</code> for MS-DOS media, <code>vfat</code> for the Windows file system, and <code>iso9660</code> for CDs.</p> <p>For hard disks not defined in the file <code>/etc/fstab</code>, the device type must also be specified. In this case, only root can mount it. If the file system should also be mounted by other users, enter the option <code>user</code> in the appropriate line in the <code>/etc/fstab</code> file (separated by commas) and save this change. Further information is available in <code>man mount</code>.</p>
<code>umount [option(s)] mountpoint</code>	<p>This command unmounts a mounted drive from the file system. To prevent data loss, run this command before taking a removable data medium from its drive. Normally, only root is allowed to run the commands <code>mount</code> and <code>umount</code>. To enable other users to run these commands, edit the <code>/etc/fstab</code> file to specify the option <code>user</code> for the respective drive.</p>

## G.3.2 System Commands

This section introduces some of the most important commands you need in managing your system.

### System Information Commands

Command	Description
<code>df [option(s)] [directory]</code>	<p>This command, when used without any options, displays information about the total disk space, the disk space currently in use, and the free space on all the mounted drives. If a directory is specified, the information is limited to the drive where that directory is located.</p> <p><code>-H</code> Shows the number of occupied blocks in gigabytes, megabytes, or kilobytes (in human-readable format).</p> <p><code>-t</code> Type of file system (<code>ext2</code>, <code>nfs</code>, etc.).</p>

Command	Description
<code>du [option(s)] [path]</code>	<p>This command, when executed without any parameters, shows the total disk space occupied by files and subdirectories in the current directory.</p> <ul style="list-style-type: none"> <li>-a Displays the size of each individual file.</li> <li>-s Displays only the calculated total size.</li> <li>-h Output in human-readable form.</li> </ul>
<code>free [option(s)]</code>	<p>The command <code>free</code> displays information about RAM and swap space usage, showing the total and the used amount in both categories.</p> <ul style="list-style-type: none"> <li>-b Output in bytes.</li> <li>-k Output in kilobytes.</li> <li>-m Output in megabytes.</li> </ul>
<code>date [option(s)]</code>	<p>This simple program displays the current system time. If run by root, it can also be used to change the system time. Details about the program are available in <code>date</code>.</p>

## Processes Commands

Command	Description
<code>top [options(s)]</code>	<p>Provides a quick overview of the processes currently running. Press H to access a page that briefly explains the main options to customize the program.</p>
<code>ps [option(s)] [process ID]</code>	<p>If run without any options, this command displays a table of all your own programs or processes—those you started. The options for this command are not preceded by hyphen.</p> <p><code>aux</code> Displays a detailed list of all processes, independent of the owner.</p>
<code>kill [option(s)] process ID</code>	<p>Unfortunately, sometimes a program cannot be terminated in the normal way. In most cases, you should still be able to stop such a runaway program by executing the <code>kill</code> command, specifying the respective process ID (see <code>top</code> and <code>ps</code>). <code>kill</code> sends a <code>TERM</code> signal that instructs the program to shut itself down. If this does not help, the following parameter can be used:</p> <ul style="list-style-type: none"> <li>-9 Sends a <code>KILL</code> signal instead of a <code>TERM</code> signal. This brings the specified process to an end in almost all cases.</li> </ul>
<code>killall [option(s)] processname</code>	<p>This command is similar to <code>kill</code>, but uses the process name (instead of the process ID) as an argument, killing all processes with that name.</p>

## Network Commands

Command	Description
<code>ping [option(s)] host name IPAddress</code>	<p>The <code>ping</code> command is the standard tool for testing the basic functionality of TCP/IP networks. It sends a small data packet to the destination host, requesting an immediate reply. If this works, <code>ping</code> displays a message to that effect, which indicates that the network link is basically functioning.</p> <p><code>-c number</code></p> <p>Determines the total number of packages to send and ends after they have been dispatched. By default, there is no limitation set.</p> <p><code>-f</code> flood ping: sends as many data packages as possible. A popular means, reserved for root, to test networks.</p> <p><code>-i value</code> Specifies the interval between two data packages in seconds. Default=one second.</p>
<code>host</code>	<p>The domain name system resolves domain names to IP addresses. With this tool, send queries to information servers (DNS servers).</p>

## Miscellaneous Commands

Command	Description
<code>passwd [option(s)] [username]</code>	<p>Users can change their own passwords at any time using this command. The administrator root can use the command to change the password of any user on the system.</p>
<code>su [option(s)] [username]</code>	<p>The <code>su</code> command makes it possible to log in under a different user name from a running session. When using the command without specifying a user name, you will be prompted for the root password. Specify a user name and the corresponding password to use the environment of the respective user. The password is not required from root, as root is authorized to assume the identity of any user.</p>
<code>halt [option(s)]</code>	<p>To avoid loss of data, you should always use this program to shut down your system.</p>
<code>reboot [option(s)]</code>	<p>Does the same as <code>halt</code> except the system performs an immediate reboot.</p>
<code>clear</code>	<p>Cleans up the visible area of the console. It has no options.</p>

## G.4 The vi Editor

Operating the `vi` editor takes some practice. For many, it is the preferred editor, partly because 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 that follow should enable you to edit various configuration files and other types of files with vi.

vi provides three operating modes. In command mode keys are interpreted as command elements. Insert mode interprets all keys as text entries. Last line mode is used for more complex commands, which are entered in the last line.

The most important commands in command mode are:

**Table G-5** *vi Command Mode Commands*

Command	Description
ESC	Changes to last line mode.
i	Changes to insert mode (characters appear at the current cursor position).
a	Changes to insert mode (characters appear after the current cursor position).
A	Changes to insert mode (characters are 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 is 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 is inserted after the current one).
O	Changes to insert mode (a new line is inserted before the current one).
x	Changes to insert mode (a new line is inserted before the current one).
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.

Each command can be preceded by a number specifying on how many objects the following command should operate. Delete three words at once by entering `3dw`. The command `10x` deletes ten characters after the cursor position and `20dd` deletes twenty lines.

The most important commands in last line mode are:

**Table G-6** *vi Last Line Mode Commands*

<b>Command</b>	<b>Description</b>
:q!	Exits vi without saving any changes.
:w <i>filename</i>	Saves as <i>filename</i> .
:x	Saves the modified file and exits the editor.
:e <i>filename</i>	Edits (loads) <i>filename</i> .
:u	Undoes the last edit command.

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This appendix contains the following:

- ♦ “GNU General Public License” on page 341
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