Understanding
Nterprise Linux Services

For Novell Professionals

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Novell®

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1: Introduction

Novell embraces the emergence of Linux and open source software as key enabling technologies for enterprise solutions. Novell Nterprise Linux Services is a crucial component of the Novell's promise to deliver one Net - a world without information boundaries. It lets you take advantage of the open-source benefits of Linux combined with the powerful set of enterprise services previously only available on NetWare. These benefits include:

- Personal File Management
- Directory Services
- Print Services
- Internet Messaging and Calendaring
- System Management
- Web Experience

In response to business customers' wants and needs, Novell becomes the first major software vendor to deliver a comprehensive set of network enterprise services that run on all of the top Linux platforms, including RedHat Enterprise Linux and SuSE Enterprise Linux.

Backed by the entire Novell ecosystem including full customer support, training, developer support, certification and more, Novell Nterprise Linux Services gives customers a compelling new data center offering that has the same level of security, sophistication and reliability provided by the NetWare platform. With this move, Novell provides services on both NetWare and the fastest growing platform in the market today offering customers a choice and flexibility in how they deploy these critical services.

1.1: Have you ever heard about Linux Servers?

Linux as server operating system has become increasingly significant over the last few years. Major Linux Distributors have built Enterprise Server package offerings for the latest developed Linux building blocks which are mature and statble along with the neccessary support for the server distributions.

It goes without saying that in production environments, Speed, stability, security and reliability have to go hand in hand with the latest technology, especially on enterprise networks

Novell has already ported many of its products to the Linux platform over the last few years, especially since NDS version 8 / eDirectory. That made Novell an active Linux distributor for some years now. The software requires to be licensed like most vendors within the commercial versions being ported to Linux.

With Nterprise Linux Services, Novell goes further and offers not only a single product but a comprehensive set of network enterprise services for Linux server distributions with full support from the whole Novell ecosystem of technical support, consulting services and training services. Version 1 of Nterprise Linux Services fully supports the Enterprise servers from RedHat and SuSE.

As Novell specialist, you may have already deployed or worked on Novell network services and made them available in the enterprise by adding the best suitable server operating system and hardware. Adding Linux as a supported server platform you can scale your hardware, varying from Intel based systems to supercomputers, even better.

As long as Novell's involvement in Internet Standards and Open Source is concerned, one only has to look at the cur-

rent activities. This listing is far from complete but high-lights Novell's involvement and vision.

- Novell give the Open Source Software SSO:

  - UDDI Server & service test environment

  - DSML v2 server through OpenLDAP

  - NDK APIs and sample code

- Novell participates in:

  - Apache Web Server

  - Tomcat

  - Ethereal - OS sniffer decodes

  - Forge

  - NCPs

  - OpenLDAP

- Novell's latest server Operating system, NetWare 6.5, is heavily influenced by OSS:

  - Apache 2 Web Server

  - PERL & PHP

  - Tomcat

  - MySQL

  - OpenSSH

  - OpenLDAP (Novell contributed JLDAP and DSML)

  - UDDI

For more detailed information, visit Novell's OSS portal at http://forge.novell.com or search for Novell in the RFCs.

One of the key strategies for all Novell solutions, and there-fore products, is to deliver for integration rather than replacement.

Enjoy this study kit and have a closer look at the Novell technologies being components of Nterprise Linux Services.

1.2: Product aim

To make a clear point, the Nterprise Linux Services are aimed to introduce fully supported set of enterprise proven services on Linux servers in addition to the already supported server operating systems such as Microsoft Windows servers, SUN, and of course NetWare.

Although you are welcome to test Nterprise Linux Services on a Linux distribution developed for multiple purpose or just as a workstation, in a production environment you will use a correctly scaled and supported server distribution.

Novell Nterprise Linux Services are a contribution to the Linux community, but like most other commercial products ported to Linux, the product is licensed.

It is a logical step to add the highly reliable Linux server platforms to the choice of supported servers to run Novell services in an enterprise. With Nterprise Linux Services it has never been easier to add Novell services to Linux servers. However, as with all other server operating systems of choice, you need to have a closeer look at the services you intend need to run. For instance, to deploy a cluster solution for business continuance with up to 32 nodes providing full site failover abilities, you will of course still be required use NetWare.

This study kit is aimed to give you a better understanding of the Linux Enterprise server platform and to provide you with easy step-by-step information how to work with Linux to check the prerequisites and successfully install the Nterprise Linux Services.

The administration, management, maintenance etc. is still accomplished with the well known tools like iMonitor and iManage.

2: Using Novell Solutions

Novell has been a Linux contributor for a while now and Novell solutions on the Linux OS are not new.

Nterprise Linux Services has many of the Novell contributions packaged together with a common installation and management toolbox

The set well-known products covered in version 1 include:

- eDirectory

- DirXML

- eGuide

- iFolder

- iPrint

- Components of ZEN for Servers (Application and Content distribution via RPM)

- NetMail

- exteNd Director

Detailed information on each of the above products can be obtained from www.novell.com

Version 2 of Nterprise Linux Services will add to the list the following:

- Enterprise File Services

- End User Services such as JSR 168 Portlets

- Almost all NetWare 6.5 functionallity

2.1: Enterprise proven

Novell solutions establish information solutions for corporate networks and because of the heterogeneous nature of these networks, most of Novell's products run with the same functionality on various OS platforms including Linux, SUN Solaris, Microsoft Windows Servers and of course Novell NetWare.

All these supported server operating systems are enterprise proven although they have a different approach. Linux servers in particular are the fastest growing server platforms and have proven their reliability and robustness over the past years.

As a Novell expert, you may already be familiar with implementing Novell services on other OS platfroms. With Nterprise Linux Services you now have an easy way to add Linux servers to your server portfolio.

As an example, you can introduce some fine tuned eDirectory servers based on the Linux OS into your existing network. These servers can may be of low cost hardware for additional fault tolerance, fast access or they can be implemented on high performance hardware optimized to run eDirectory services with outstanding performance for instance as LDAP servers. In any case, the deployment method is significantly simplified with Nterprise Linux Services and in terms of management, administration, and maintenance you use the well known platform independent tools such as iMonitor and iManage.

You will receive a more detailed information about all products provided with Nterprise Linux Services and what you need to understand from the Linux server operating system in this training kit.

Different customers have chosen Linux Enterprise servers for several reasons. Make up your own mind by visiting the

Web sites of RedHat and SuSE and walk through the offerings and success stories for the Enterprise server families.

One of the biggest advantages in adding Linux servers to the supported platforms is Novell's commitment to apply it's full ecosystem like Consulting Services, Technical Support, and Training Services to the Linux OS. This ensures the same level of well known professional services on the Linux based implementations of Novell services covered in Nterprise Linux Services as it is for all other server operating systems.

2.2: Cross Platform for corporate use

The ability to run services across multiple server operating systems has many advantages.

Firsty, you can choose the right service(s) for your enterprise before deciding on what server operating system fits the needs best.

Furthermore, you can migrate your server platforms from one operating system to another without disrupting the installed services.

The decision of the operating system can be based on hardware, reliability or required OS services such as File Systems, Application needs, etc.

Linux operating system provides the reliablity of OS services on many hardware platforms varying from Intel based PCs up to Supercomputers. Thus, you can scale your needs down to the hardware level without having to worry about your services such as Directory, Mail, File access, Print, and so on. On top Linux can be very effectively be tuned for the benefit of defined services. In doing so, a server dedicated to run a particular service from the Nterprise Linux Services product or all of them can be significantly improved in performance while leveraging the underlying hardware.

But again, Nterprise Linux Services is not to rip and replace your existing investment in servers, it is an addition to what you currently have and in many aspects a very valuable option. If you need to run a Cluster Solution with business continuance and full site failover capabilities you will, of course, still use NetWare as this is the only server operating system offering such services.

As another example, if you want to offer file services to your Microsoft Windows client machines, you now have a full range of possible server operating systems to imple-

ment this. For this purpose you can not only choose a Microsoft server but also use the well known services from a NetWare or a Linux server. Whatever OS platform you choose, other services such as identity management via eDirectory run on all of these servers and ensure one single point of administration.

2.3: What is in Nterprise Linux Services?

Novell Nterprise Linux Services provides you with a full set of well-known, enterprise proven services from Novell with very simple installation and configuration mechanisms for Linux servers to make it easy for you to add Linux to your choice of server operating systems.

The first version will be fully supported by Novell's Service departments - Consulting Services, Technical Support, Training Services - on the following two Linux Enterprise Server distributions:

- RedHat Enterprise Server 2.1

- SuSE Enterprise Server 8

This chapter lists the prerequisites for installing the Novell services on the above platforms.

You will then receive the information on how to build a simple test system, as used in this kit, and then be guided through the full express installation of Nterprise Linux Services. This first step will enable you to be comfortable in starting to test Nterprise Linux Services in your own environment. In case you do not have a spare Linux Enterprise server, you will be provided with information how to setup an inexpensive Linux version.

Note: *In general, you can use any Linux version and install/configure it to successfully run the Nterprise Linux Services. However, doing so has three drawbacks: Firstly, you need to have a reasonably sound Linux knowledge on the kernel, module compilation and installation; Secondly, only the above two mentioned Enterprise server versions are supported by Novell and thirdly the above Linux Distributors support the Nterprise Linux Services product on their respective platform.*

The remaining chapters will guide you in more detail on the each components.

2.4: Prerequisites

The few prerequisites will, in almost all cases, be already fulfilled in your existing Linux environment. However, you should ensure that all prerequisites are fully met before running Nterprise Linux Services in production environment.

Note: *For the purpose of this study kit we have added some basic Linux commands and the usage of basic Linux tools and log facilities for the benefit of those readers not very familiar with the Linux operating system. If you are already an experienced Linux and Novell technician, feel free to use the more advanced tools you are comfortable with. To make it easier for the new comers to Linux, we also base the whole study kit on the usage of the GUI interface (although mostly working in a terminal window). Whenever you are asked to edit a configuration file, we strongly advise to use standard editors like VI or Emacs. However, you should get the same results with graphical editors such as kwrite.*

If you have a group of Linux technicians in your organization, they will most likely own or have some system documentation, so you can check on how the prerequisites have been met.

2.4.1: Linux Versions

This training kit is based on the supported Linux distributions of Nterprise Linux Services.

Version 1 of Nterprise Linux Services supports two Linux Distributions:

- RedHat Enterprise Server 2.1 (www.redhat.com)

    For this training kit the AS version is used

- SuSE Enterprise Server 8 (www.suse.com)

    This distribution is powered by United Linux 1.0

Note: *Your production environment should always be built on sup-*
ported versions. This will ensure that you get the right support
levels for the Linux distribution and the Nterprise Linux Services
products.

Planned versions of Nterprise Linux Services will be sup-
ported on additional market leading Linux distributions.
Likely candidates include:

- Conectiva (www.conectiva.com)

- Turbolinux (www.turbolinux.com

- Debian (www.debian.com)

- MandrakeSoft (www.mandrakesoft.com)

For testing purposes, you can run Nterprise Linux Services
on an unsupported, inexpensive Linux versions. Later in this
chapter we provide an overview on the main precautions
you need to take into consideration to set up an inexpensive
test system.

Novell Training Services will build a Courseware for it's Cer-
tified Linux Engineer (CLE) certification on the inexpensive
Linux versions from RedHat and SuSE. In doing so attendees
of the course will be able to take away all needed software
to build their own test environments and continue to build
on the knowledge received from the course. This is espe-
cially important for those choosing to purchase the course
as Self-Study Kit as well as for those customers not yet run-
ning Linux Enterprise versions.

Note: *The Novell Training Services Courseware for the CLE certifica-*
tion is course 3015 - Novell Nterprise Linux Services. To register
for a CLE training locate a Novell Training Provider near you
using the URL http://developer.novell.com/partnerlocator

This training kit will list the differences between implemen-
tations on RedHat and SuSE Enterprise distributions. The
following is an example of how the differences will be docu-
mented.

RedHat: *This is an example for specific notes on the RedHat Enterprise*
Server version 2.1 AS

SuSE: *This is an example for specific notes on the SuSE Enterprise Server 8 version*

Installation Report

For your reference, provided here is a detailed report on the installation and configuration of the RedHat and SuSE Enterprise server versions.

This will ensure that you can easily build a test environment equal to the environment used throughout this training kit.

Bear in mind, that these steps install only a basic Linux Enterprise server without configuring and tuning the services offered by the distributors. You can easily compare it with your NetWare experience. Think about a standard, basic installation of NetWare 6.5 without additional products and without and fine tuning on the server hardware, NSS, tunable parameters, and so on. This is just the first step allowing you to introduce Nterprise Linux Services on the basic server platform and limiting the number or conflicting products to a minimum. For instance, sendmail is the only conflict we get with this basic installation as it occupies port 25. During the description of the express installation, you will see how the installation and configuration process solves this conflict.

RedHat Enterprise Server 2.1 AS

The RedHat distribution installs the following versions:

*   Kernel 2.4.9-e.3
*   GCC version 2.96
*   GLIB version 1.2.10-5
*   GLIBC version 2.2.4-26

For this kit, the RedHat Server AS has been installed on Dell Latitude 610 laptops as follows:

- Language English

- Keyboard US

- 2 Button Mouse (PS/2)

- Installation Type: Advanced Server

- Manual Partitioning:

    10 GB root partition at mount point /

    1 GB Swap Partition

- Boot Loader default (GRUB on MBR, no password)

- Assign fixed IP address 192.168.200.200 / 24

- Assign RedHat as hostname

- No Firewall

- Language Support English (USA)

- Time Zone: Europe/Berlin

- Root Password = novell

- Package Group Selection (all):

    GNOME

    KDE

    Software Development

- Use detected Graphical Interface

    Dell 1024X Laptop Display Panel

    Resolution 1024 x 768 / 24bit

    KDE as default desktop environment (KDE 2.2.2-2)

    Login type graphical (initdefault 5)

Configured for 8 screens, Small Panel, Focus follows mouse. (You don't need this, its optional)

Additional setup/configuration steps

- **Nterprise Linux Services** Beta product copied and unpacked to /novell-sources

  Here are the steps to perform this:

  Login as root and open a terminal window.

  Type the following commands in one line and press <Enter> after each command.

  "mount /dev/cdrom /mnt/cdrom"

  "mkdir /novell-sources && cd /novell-sources"

  "tar xvfz /mnt/cdrom/Nterprise_Linux-Services.tgz"

SuSE Enterprise Server 8 (United Linux 1.0)

The SuSE distribution installs the following versions:

- Kernel 2.4.19-4GB
- GCC version 3.2
- GLIB version 1.2.10
- GLIBC version 2.2.5-163

For this kit, the SuSE Enterprise Server has been installed on Dell Latitude 610 laptops as follows:

Standard Installation

- Keyboard US
- Mouse Aux port
- Partitions

  10 GB root partition mounted at /

  1 GB Swap partition
- Software default selection

  Default System

Yast2

Analyzing Tools

Authentication Sources (NIS, LDAP, Kerberos)

DHCP, DNS

File and Print Services

Mail and News Services

SLES Administration Tools

GNOME

KDE

Simple Webbrowser

Help and Support Documentation

Graphical Base System

LSB Runtime Environment

- Booting setup from /dev/hda
- Time Zone Setting for Europe/Germany
- Language US English
- Graphic capabilities

  Graphic card 3D abilities disabled

  GUI standard setup 1024x768 24 bit
- Auto detect a printer at LPT1
- Network Interface

  Fixed IP address at 192.168.200.201 / 24
- KDE as default desktop environment (KDE 3.0.3)
- Authentication via KDE (initdefault 5)

  Configured for 8 screens, Small Panel, Focus follows mouse. (This is optional)

Additional setup/configuration steps

- **Nterprise Linux Services** Beta product copied and unpacked to /novell-sources

Here are the steps to perform this:

Login as root and open a terminal window.

Type the following commands in one line and press <Enter> after each of them.

"mount /dev/cdrom /mnt/cdrom"

"mkdir /novell-sources && cd /novell-sources"

"tar xvfz /mnt/cdrom/Nterprise_Linux-Services.tgz"

- Install **gettext** and **locate** from Yast Installer found in the GUI panel. Gettext is needed by the install script. locate allows to locate files easier.

Note: *Bear in mind that this kit is written based on the Nterprise Linux Services Beta product. Eventually you will see a difference in behavior between the final released product and the Beta version described here. However, we wanted to have this kit out as soon as possible to give you a quick start for hands-on experience with the Nterprise Linux Services product.*

2.4.2: IP network

Your production environment will, of course, have a clearly documented and healthy IP network setup.

To successfully introduce the Nterprise Linux Services product, you will additionally need to consider the following:

- The IP network must be known to the servers you install Nterprise Linux Services on. You can refer to your internetwork documentation and perform the tests necessary to ensure this.

- Your firewalls need to allow communication through ports opened by Nterprise Linux Services. Some of these ports may already be in use in your existing network. Check for potential port conflicts before you install Nterprise Linux Services. By default these ports are:

80 for HTTP

443 for HTTPS (SSL)

8008 for eDirectory iMonitor

8010 for eDirectory iMonitor over SSL

8018 for NetMail WebAdmin

8020 for NetMail WebAdmin over SSL

52389 for the NetMail LDAP server

52080 for NetMail ModWeb

52443 for NetMail ModWeb over SSL

25 for the NetMail SMTP Agent

110 for the NetMail POP Agent

143 for the NetMail IMAP Agent

389 for the eDirectory LDAP server

636 for the eDirectory LDAP server over SSL

631 for the iPrint IPP server

443 for the iPrint IPP server over SSL

137 for SAMBA

138 for SAMBA

139 for SAMBA

8080 for Tomcat HTTP

8009 for the MOD_JK

524 for NCP (NDAP access to eDirectory)

1229 for ZEN for Servers

123 for the NTP protocol

427 for the SLP protocol

Please refer to your internetwork documentation. For the Linux server, you can use the command "netstat -nl" to see the ports currently in use. Look

for potential conflicts although they will be resolved by the installation script of Nterprise Linux Services.

For a list of well-known port assignemnets, you can refer to the file /etc/services. For instance, if you like to find out what the well-known services for port 25 might be, execute the command "grep 25 /etc/services".

- Your existing eDirectory servers need to be available if you want to add the Linux server to an existing eDirectory tree. The installation script will introduce the SLP user and service agents on the Linux server and create a multicast route for SLP.

Note: *You can check the IP routing table with the command "netstat -nr" or "route".*

2.4.3: Service Location

On the Linux servers, Novell introduces an SLP user agent and an SLP service agent as defined with version 1 of SLP. As of today a directory agent cannot be installed on Linux servers.

The multicast route is added to the network configuration of the Linux server by the installation script. You can check the existance of the multicast route for SLP with the command "route" showing the IP routing table.

Note: *Refer to RFC 2165 for SLP version 1 and RFC 2608 for SLP version 2. Also check the OpenSLP homepage at www.openslp.org for detailed information.*

The configuration file for SLP, slpuasa.conf, can be found in the /etc directory. This file can be used to customize SLP in your existing environment. You might want to refer to the man pages with "man slpuasa", "man slpinfo", and "man slpuasa.conf" for detailed information to setup the Linux server to be configured according to your SLP layout.

The SLP deamon should run after your installation is finished. You can check that by scanning the process table with a command like "ps ax | grep slpuasa".

2.4.4: Time Synchronization

In almost all cases you will already have time synchronization including NTP time servers established in your production environment. Operating systems like UNIX, Linux, and Microsoft 2000 servers use NTP. NetWare can be added to the NTP time synchronization since NetWare 5 and NetWare 6.5 can be setup as NTP time server according to RFC 1305.

Note: *Please ensure time synchronization in your test environment as well. If you like a reference for the NTP protocol, please refer to RFC 1305 and RFC 2030, depending on what version of NTP you are using. Both of the supported Linux Enterprise versions come with NTP version 4. NetWare 6.5 can be configured as NTP time server according to RFC 1305. You can also refer to the NTP documentation that comes with your Linux and Novell NetWare distribution.*

To setup an easy time synchronization in your test network based on NTP do the following:

*   Choose one of your servers as the time source.

*   This server must have a way to connect to the Internet to synchronize its own time to NTP time sources on the Internet.
    For test environments you can also simplify this further and let this machine use its own BIOS time as NTP time source.
    To do so, modify your /etc/ntp.conf file to read only the following lines:

    server 127.127.1.0

    fudge 127.127.1.0 stratum 5

    Start and add the NTP daemon to appropriate runlevels.

RedHat: *On Redhat use the following commands:*

To start the deamon, use the following command:

"cd /etc/init.d && ./ntpd start"

To add it to appropriate runlevels, excute the fol-
lowing command:

"chkconfig --level 235 ntpd on"

SuSE: *On a SuSE server use these commands:*

To start the deamon, use the following command:

"cd /etc/init.d && ./xntpd start"

To add it to appropriate runlevels, excute the fol-
lowing command:

"chkconfig xntpd 235"

- This server then need to be referred to from all other
  servers in the network to synchronize time.
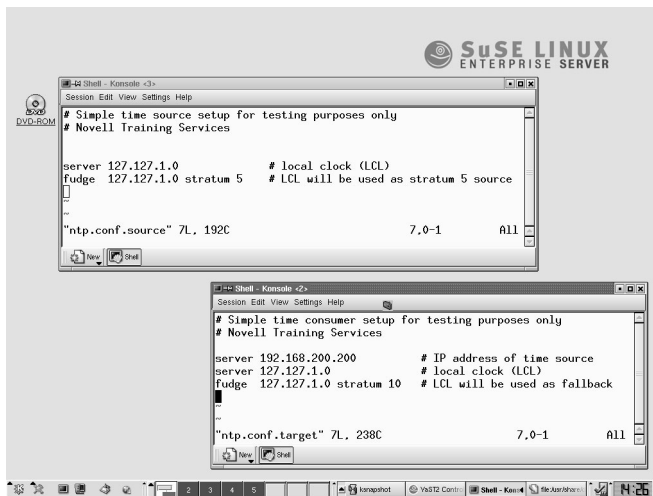
  Again, for testing purposes you can simplify the process
  and just modify the /etc/ntp.conf file to read only the
  following lines:

  server <IP address of your defined time server>

  server 127.127.1.0

  fudge 127.127.1.0 stratum 10

  Start and add the NTP daemon to appropriate run-
  levels as shown in the examples above.

This will ensure, that the software time of the time source server uses its BIOS time as stratum 5 timesource. The other servers will connect to that time source server and establish synchronization at stratum 7. They also have their own BIOS time configured as a fallback source if the communication to the time source server fails.

Furthermore, the software time of all servers sharing time need to be written back to the BIOS time on a scheduled basic. This can be accomplished by atd or crond and avoids issues during unwanted reboots (which might happen during abnormal situations but cannot be avoided totally).

Note: *Note that NTP takes up to 5 minutes after a reboot to establish NTP software time on a Linux server. If a big time difference between BIOS time and NTP provided time is detected, the NTP daemon simply terminates without further notice. This behavior can cause serious issues within an eDirectory server communication.*

You should, in any case, verify your time synchronization is healthy before you introduce Nterprise Linux Services, albeit in a test environment.

The easiest way to accomplish this is by ensuring that the NTP daemon runs and that time synchronization is established. You can check the current status with ntptrace.

To test your time synchronization is established, do the following:

- Exceute the cammand "tail -f /var/log/messages" in an additional terminal windows. This will show the tail of the system log file in forward mode meaning that the file is scanned for additions which are then displayed. This generates a kind of rolling log file viewer. Look for the activities for your ntpd / xntpd service. It should climb the stratums until it reaches the configured stratum.

- If the deamon terminates due to too big a time difference between the NTP time source and the BIOS time (more than 17 minutes by default), use the command "ntpdate <IP of time source server> to adjust the time once to the NTP source, then start the deamon again and watch it's progress.

- Type "ntptrace" without options in a terminal window. Once time is synchronized, you will see detailed information gathered from the NTP time source and the effects on your own software time. As long NTP is not synchronized, you see only limited information. Type the command several times during the startup - up to 5 minutes.

Note: In an isolated test environment you do not need to care about security for the NTP time exchange. However, there are vendors providing NTP time to their customers over the standard port 123 but exchanging a couple of more, not time relevant information over this channel. Search the Internet for security risks using various NTP time providers.
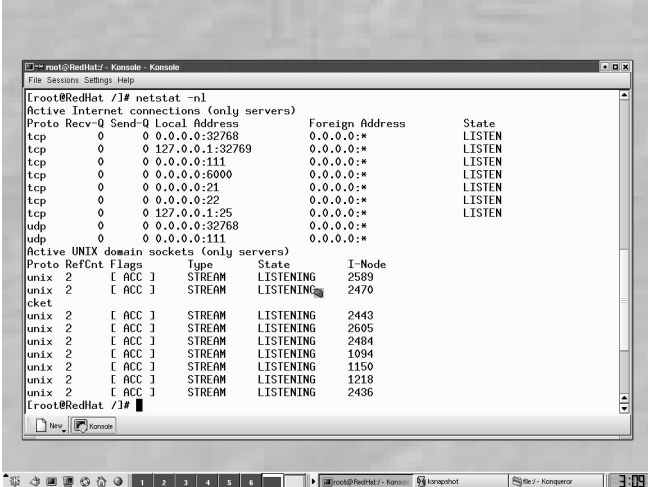
2.5: Install Nterprise Linux Services

At this point, having met all the prerequisites, you are ready to install Nterprise Linux Services on a Linux Enterprise server.

Here we show how to install the whole Nterprise Linux Services product in one single run using the express install function. With express install you are prompted only for a few settings. Most settings will be applied based on the default settings and ports. You can compare this behavior with an express setup of NetWare.

Later chapters will then provide more detailed information about the main products showing how they can be installed, including a closer look at the specific prerequirements.

Just as a check, we do a netstat -nl to compare the ports in use at this time and then after the Nterprise Linux Services are installed.
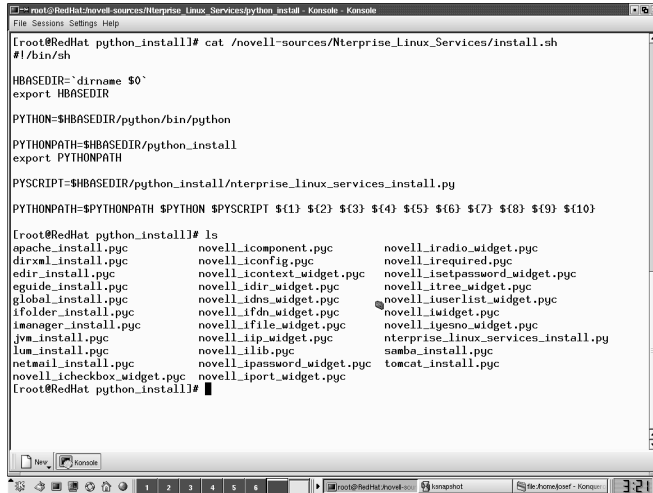
```
root@RedHat:/ - Konsole - Konsole                                    _ □ x
File Sessions Settings Help
[root@RedHat /]# netstat -nl
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp        0      0 0.0.0.0:32768          0.0.0.0:*              LISTEN
tcp        0      0 127.0.0.1:32769        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 0.0.0.0:21             0.0.0.0:*              LISTEN
tcp        0      0 0.0.0.0:22             0.0.0.0:*              LISTEN
tcp        0      0 127.0.0.1:25           0.0.0.0:*              LISTEN
udp        0      0 0.0.0.0:32768          0.0.0.0:*
udp        0      0 0.0.0.0:111            0.0.0.0:*
Active UNIX domain sockets (only servers)
Proto RefCnt Flags       Type       State         I-Node
unix  2      [ ACC ]     STREAM     LISTENING     2589
unix  2      [ ACC ]     STREAM     LISTENING     2470
cket
unix  2      [ ACC ]     STREAM     LISTENING     2443
unix  2      [ ACC ]     STREAM     LISTENING     2605
unix  2      [ ACC ]     STREAM     LISTENING     2484
unix  2      [ ACC ]     STREAM     LISTENING     1094
unix  2      [ ACC ]     STREAM     LISTENING     1150
unix  2      [ ACC ]     STREAM     LISTENING     1218
unix  2      [ ACC ]     STREAM     LISTENING     2436
[root@RedHat /]#
 New  Konsole
```

2.5.1: Install all services in one step

The Nterprise Linux Services product comes with a single install script which calls the various Python based installation or de-installation routines for all components.

```
[root@RedHat python_install]# cat /novell-sources/Nterprise_Linux_Services/install.sh
#!/bin/sh

HBASEDIR=`dirname $0`
export HBASEDIR

PYTHON=$HBASEDIR/python/bin/python

PYTHONPATH=$HBASEDIR/python_install
export PYTHONPATH

PYSCRIPT=$HBASEDIR/python_install/nterprise_linux_services_install.py

PYTHONPATH=$PYTHONPATH $PYTHON $PYSCRIPT ${1} ${2} ${3} ${4} ${5} ${6} ${7} ${8} ${9} ${10}

[root@RedHat python_install]# ls
apache_install.pyc          novell_icomponent.pyc       novell_iradio_widget.pyc
dirxml_install.pyc          novell_iconfig.pyc          novell_irequired.pyc
edir_install.pyc            novell_icontext_widget.pyc  novell_isetpassword_widget.pyc
eguide_install.pyc          novell_idir_widget.pyc      novell_itree_widget.pyc
global_install.pyc          novell_idns_widget.pyc      novell_iuserlist_widget.pyc
ifolder_install.pyc         novell_ifdn_widget.pyc      novell_iwidget.pyc
imanager_install.pyc        novell_ifile_widget.pyc     novell_iyesno_widget.pyc
jvm_install.pyc             novell_iip_widget.pyc       nterprise_linux_services_install.py
lum_install.pyc             novell_ilib.pyc             samba_install.pyc
netmail_install.pyc         novell_ipassword_widget.pyc tomcat_install.pyc
novell_icheckbox_widget.pyc novell_iport_widget.pyc
[root@RedHat python_install]#
```
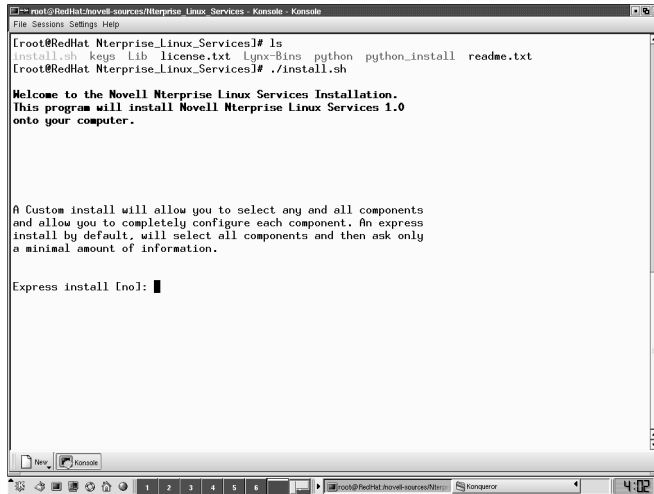
The installation is started by calling up the install script. For the purpose of this chapter, we perform an express installation. The other main option is a custom installation. Both options can run using a response file in unattended mode.

You start the install script by changing to the root of the product directory, /media, and type "./install.sh" as this directory will not be in your path statement.

You need to read and accept the License agreement as the Nterprise Linux Services are a licensed product.

Next you need to provide the path and filename for the license key. In Beta state you will get a license key for evaluating the Beta product. Once you purchase the product, you will receive your valid license.
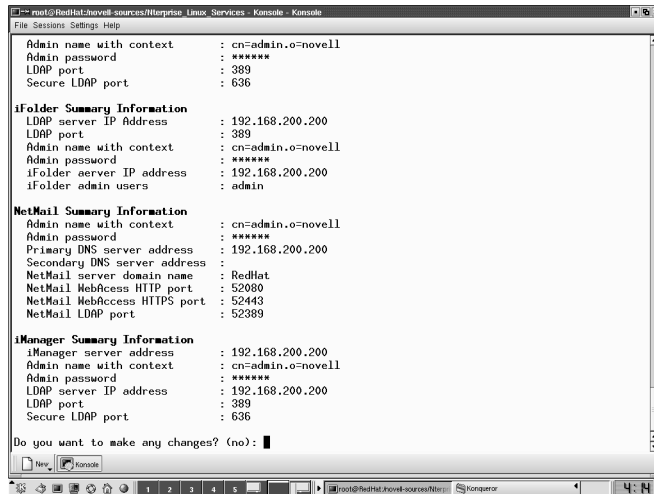
In the subsequent steps, you need to provide a few information on your configuration:

- The name for your new eDirectory tree

- The name for your eDirectory admin and the context it should be created in

- The admin password

- The DNS server address holding the records for your NetMail service

Once you have provided the necessary information, you can review a configuration summary for all components of Nterprise Linux Services or if necessary, make the required amedments.

Note: *As already mentioned SLP is started first to discover an existing eDirectory installation. If none is found via SLP, the express*

---

installation assumes a new tree installation. If an existing eDi-rectory tree is found, the express install offers to add this new server to the existing tree.

Upon accepting these settings, the installation process starts. After a few minutes Nterprise Linux Services are installed and configured on your Linux Enterprise server platform.

The installation log file is copied to /var/log, the main log file directory on Linux, and can be used as a reference. For instance, if the running sendmail service has been detected, terminated, pulled out of the runlevels, and then NetMail has been installed.

To view the log file, you can either use one of the GUI based tools or another simple tool from a terminal window such as less or more (see the relevant man page). If you prefer to look for a specific expression, grep can also be used.

For instance if you want to see only those lines from the file containing the pattern 'error', you can type "grep -i error <name of the file>" to do a case ignore (-i) search for the pattern and display the corresnponding lines.

As mentioned at the beginning of this installation, below is a screenshot with the results of netstat -nl after the installtion of Nterprise Linux Services.

You can compare this with the list of default ports provided earlier or with the installation summary presented by the install process just before the installation started.

Port 25 is in use, but it is no longer sendmail. At this time NetMail has control over the well-known SMTP port.

2.6: Building an inexpensive test environment

The Nterprise Linux Services installation script is built to avoid most of the past issues

As mentioned with the NetMail example, it checks the already occupied ports or existing versions. It then de-activates those potential conflicts and installs the Nterprise Linux Services component.

With this in mind, you can use virtually any current Linux distribution and install Nterprise Linux Services.

The following few suggestions will help in sucessfully instaing the services on other Linux distributions:

- Make a very basic install of your Linux Distribution. Nterprise Linux Services are services aimed to run on dedicated server platforms.

- Have the Nterprise Linux Services media and a valid license key available.

- Make sure the pre requirements listed earlier in this chapter are met.

- Run the installation script and look for error messages during installation. This can be accomplished by monitoring the terminal you issued the installation from and another terminals you started a rolling log file for instance with "tail -f /var/log/messages".

- Once the installation is done, have a closeer look at the installation log file in /var/log for errors. This file contains detailed information on how the products were been installed. Use tools like grep to search for specific patterns.

- If you run into unresolved dependencies, you can use the standard RPM tools to fix these issues. The RPM packages are in sub-directories on the Nterprise Linux

Services media under Lynx-Bins. (See man rpm for more details or you might prefer to use the KDE provided RPM package manager or similar GUI based tools)

- Ensure that you use a supported Web browser such as Netscape 6 or higher.

- Check your process table before and after the installation to figure out which additional processes are running. You will see several instances of Apache and ndsd as well as more Nterprise Linux Services specific processes depending on what has been installed. You can redirect your process table to a file before and after the installation (ps ax > filex) and then run a diff for the files (diff filex filey) which outputs the differences between the content of both files.

3: Directory Services

Directory Services plays a significant role especially in all enterprise scale networks because of they handle information about resources in the enterprise.

The main components of Directory Services as first defined in the X.500 recommendation are:

• Discovery

• Storage

• Relationship

• Security

With the Lightweight Directory Access Protocol (LDAP) a common standard has been established to access the data stored in a given Directory Service. The current version is LDAP v3 is still without encryption facilities.

Note: *For more information about LDAP, visit Novell's developer Web site at http://developer.novell.com, visit www.openldap.org, or just type ldap in the search field of any Internet search engine.*

In the past a Directory Service was implemented for various different reasons because each vendors had specific sets of functionality. For example, if a Directory Service was only implemented to store the company white pages, only a limited set of functionality retrieved from the X.500 recommendations is needed. There was simply no need to implement more functions into that Directory Service thus keeping the code size small and hence faster access from the directory.

Use a search engine on the Internet for the pattern 'Directory Services' for additional information on the X.500 recommendation.

The most logical Directory Service implementation on Linux is OpenLDAP, an Open Source Software. Just have a look at the Linux Enterprise Solution Web sites; whenever a specific application benefits from an existing Directory Service,

OpenLDAP is the first chose. As mentioned earlier, Novell contributes to OpenLDAP.

The primary reason for the introduction of Novell's own proprietary Directory Service more than 10 years ago along with NetWare 4 was very simple. Prior to that all NetWare servers had a server based user and group management, much like the UNIX / Linux world. With the customers' needs for larger and more scalable networks having many servers where specific people need access to, the server based user and group management became a bit of a nightmare to administer. Other server operating system vendors faced the similar challenges and found their own ways to overcome them.

UNIX/Linux systems for instance used their Network Information Service NIS or NIS+ systems to administer users and groups in only one location. Remember that Linux was just being born as a little but very promising child.

Novell introduced Novell Directory Services (NDS). This Directory Service was only developed to store resources for NetWare users based on the X.500 recommendations. Later, specific versions of NDS were developed for the SUN Solaris and Microsoft Windows server platforms. From the beginning every single object has its own Access Control List (ACL) where specific rights for other Directory objects can be assigned for the whole object as well as for any single attribute of the given object.

3.1: OpenLDAP

Let's have a brief look at OpenLDAP. A full discussion about OpenLDAP is outside the scope of this study kit.

OpenLDAP is an Open Source project and widely used for special purposes with Linux based solutions. Below are the steps on how it is installed:

- Get the most current build from the OpenLDAP Web site and make yourself familiar with the release notes and documentation

- Unpack the tar-ball and configure the package

- Adjust the make file if appropriate

- Make the dependencies, then the product itself

- Install the product

- Configure the product

- Use the product in all aspects it provides

You might also be able to use a pre-configured RPM package form your Linux Distributor.

OpenLDAP is a Directory Services following the X.500 recommendation for Directory Services.

Understand clearly that OpenLDAP is very valuable and an excellent example for the quality of Open Source Software. However, Novell created a so called 'full service directory' supporting many more needs out of the same enterprise wide implementation where eDirectory servers can exist on disparate operating systems.

3.2: Novell eDirectory

Although it is assumed that you have knowledge about eDirectory, we like to provide a brief overview especially with the Linux as operating system in mind.

With NDS version 8, on the market since 1999, the product was renamed to eDirectory to make the main new features visible:

• eDirectory is a product independent from NetWare

• eDirectory works cross platform with the same code base for many server operating systems including Linux, NetWare, Windows, Solaris, AIX, ...

• Because of a change in the underlying database engine, eDirectory is able to scale almost without limits. In 1999 a single eDirectory tree was presented with 1 Billion objects which by the way is NOT the upper limit. One single server instance of eDirectory can handle up to 1 TB of eDirectory data. This equals to approximately 1 Billion objects without indexing. On platforms like Linux you can easily scale the hardware even above that and run multiple instances of eDirectory to overcome this 'limitation'.

• eDirectory is a global Directory that allows you to store information about all network resources such as users, groups, NetWare Volumes, workstation configuration, user profiles, applications, DNS entries, DHCP entries, Novell Cluster Resources running on Netware based Cluster Services with up to 32 nodes, and many more. Furthermore, the eDirectory schema can be extended for any special purpose object or just company specific extensions to already existing objects.

For detailed information about eDirectory, visit Novell's Web site or simply use an Internet search engine.

3.2.1: Main Features

Novell's eDirectory is a full service Directory which can be extended in almost all aspects. Full service Directory means that it can be used for multiple purposes. Traditionally, it serves very well for all authentication and authorization processes in Novell based networks. Whatever the size might be, a single employee has one single user object which has relations to all resources being represented as eDirectory objects as well. With that concept, the employee can log in to the network from any place, inside or outside the firewall, using any device guaranteeing the enforcement of all corporate polices. This way the user gets authorized access to all assigned resources only.

Within the last couple of years, eDirectory has also been chosen for many other purposes:

- Ease the management of Microsoft Windows domain based networks

- Act as very fast LDAP server for authentication needs of devices or applications

- Handle content management and authentication for dynamic Web sites

Note: *Of course, this list is far from complete and acts only as example. For many customers with such needs the Intel based OS platform for eDirectory became the bottleneck. This is of course not an issue in traditional eDirectory implementations, but for instance to serve incoming requests for Web content for thousands of users in extremely short time periods is a different story. Visit Novell's Web site (cool solutions, success stories, etc.) or an Internet search engine for more detailed information*

The main benefits include:

- It scales to billions of objects

- It runs as one single Directory cross platform with a common management and administration toolset in mixed server OS environments

- It can be accessed via LDAP

- It can be partitioned

- For fast access and fault tolerance, the data from any partition can be replicated to various other servers independent of the OS

- The synchronization process is highly optimized and works transitive meaning that not all servers holding a replica of the same partition need to be able to communicate with each other directly

- Only delta changes on an attribute level are synchronized. For example If the telephone number of a user object is changed, only that single value is synchronized to the servers holding replicas of that piece of Directory data (Partition).

- In partitioned and replicated implementations, queries are automatically resolved between servers in the background (tree walking or chaining) if the information is not stored locally.

- LDAP requests by default get a referral back if the request cannot be answered from the local Directory data but eDirectory can be configured to chain these requests as well.

- Every object has an Access Control List (ACL) to define the rights other objects have to this object on both, the object level and every single attribute of this object. This allows for very flexible rights assignment and easy administration.

- Decentralized administration is easily established by assigning the proper right at certain parts of the Directory tree. The new Role Based Service makes this process even more simpler.

Note: *Novell's full product documentation including the eDirectory documentation is available through the Web at www.novell.com/documentation - Application and Developer notes as well as all developer information can be accessed at http://developer.novell.com*

3.2.2: Review the prerequisites

What you need to ensure is:

- Have time synchronized with other servers in the net-work - remember that your Linux servers will use NTP

Note: *Be aware that you will see several errors which cannot easily be related back to an underlying time issue. For instance, the whole installation can fail without clear error generation because your time is not in sync. Add time synchronization checks on the OS level to your maintenance plan/health checks. Just grep for the pattern "NTP" in the system log file /var/log/ messages and lock for error conditions. You can also run ntp-trace to check the NTP time synchronization at the OS level.*

- Have a clearly structured IP configuration

- Check for possible port conflicts

- Check the firewall configuration for possible issues with the ports that will be opened for eDirectory to function (of course this is not required for a single server envi-ronment). Based on your existing eDirectory implemen-tation most ports will be open. However, plan for the services you install on the Linux server.

- The eDirectory monitoring and maintenance tool, iMon-itor, will be established on its own Mini Web server. By default it occupies ports 8008 and 8010 (SSL).

- Ensure the running of SLP if this is the first server (this will be taken care of by the install script). Remaining servers will need access to the SLP traffic (multicast) prior to the installation of eDirectory.

  If the installation of a subsequent server is unable to establish the SLP communication first, check the exist-ence of the multicast route for the correct interface. If is has not been established by the install script, add it manually and redo the installation. The command is "route add -net 224.0.0.0 netmask 240.0.0.0 dev eth0", you can check the routing table with "route" or "netstat -nr".

- Have a supported Web browser installed i.e. Netscape 6 or greater.

- Have a plan of your overall implementation to hand before you press any key. Don't forget what you have learned and what you apply for every new installation in your existing network. With Linux, you just install a new server into your Novell Network.

3.2.3: Installation and Configuration

If you already have a running NDS or eDirectory tree in your enterprise, you will most logically add your Linux servers to that existing tree. In this case you need to check the pre-installation tasks for the eDirectory version that ships with Nterprise Linux Services. In the Beta software used for this kit it is version 8.7.1

The installation guide can be found on the Nterprise Linux Services product media and on the Web at www.novell.com/documentation/lg/nnls/02install/data/front.html

The single server test environment

This is the most logical step to get hands on with adding Novell technology to Linux servers.

In the previous chapter, we presented information about the express installation of Nterprise Linux Services.

Here you receive information on how to install only the eDirectory component from the Nterprise Linux Services product.

First, we check the routing table and the active connections of the Linux server before the eDirectory installation.

```
root@RedHat:/novell-sources/Nterprise_Linux_Services - Konsole - Konsole
File Sessions Settings Help
[root@RedHat Nterprise_Linux_Services]# ls
install.sh  keys  lib  license.txt  packages  python  python_install  readme.txt
[root@RedHat Nterprise_Linux_Services]# netstat -nr
Kernel IP routing table
Destination     Gateway         Genmask         Flags  MSS Window  irtt Iface
192.168.200.0   0.0.0.0         255.255.255.0   U      40 0         0 eth0
127.0.0.0       0.0.0.0         255.0.0.0       U      40 0         0 lo
[root@RedHat Nterprise_Linux_Services]# netstat -nl
Active Internet connections (only servers)
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      0 127.0.0.1:32769         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 0.0.0.0:21              0.0.0.0:*              LISTEN
tcp       0      0 0.0.0.0:22              0.0.0.0:*              LISTEN
tcp       0      0 127.0.0.1:25            0.0.0.0:*              LISTEN
udp       0      0 0.0.0.0:32768           0.0.0.0:*
udp       0      0 0.0.0.0:111             0.0.0.0:*
Active UNIX domain sockets (only servers)
Proto RefCnt Flags       Type       State         I-Node Path
unix  2      [ ACC ]     STREAM     LISTENING     1149   /tmp/.font-unix/fs7100
unix  2      [ ACC ]     STREAM     LISTENING     1717   /tmp/mcop-root/RedHat-04bd-3f44f4c3
unix  2      [ ACC ]     STREAM     LISTENING     1220   /tmp/.X11-unix/X0
unix  2      [ ACC ]     STREAM     LISTENING     1570   /tmp/ksocket-root/kdeinit-:0
unix  2      [ ACC ]     STREAM     LISTENING     1618   /tmp/.fam_socket
unix  2      [ ACC ]     STREAM     LISTENING     1604   /tmp/ksocket-root/klauncheruVBV6a.slave-so
cket
unix  2      [ ACC ]     STREAM     LISTENING     1577   /tmp/.ICE-unix/dcop1193-1061483703
unix  2      [ ACC ]     STREAM     LISTENING     1740   /tmp/.ICE-unix/1223
unix  2      [ ACC ]     STREAM     LISTENING     1096   /dev/gpmctl
[root@RedHat Nterprise_Linux_Services]#
New  Konsole
```

Because this is the first server in an isolated test environment, there is no need to worry much about a multicast route for SLP.

You should however bring up the NTP daemon as described in the time synchronization section for the time source server. This will simplify the installation of subsequent servers into your test tree.

The default ports required by eDirectory and its management tools will not be in use. You can veify this by comparing the list of default ports provided in chapter 2 with the active IP connection (netstat -nl).
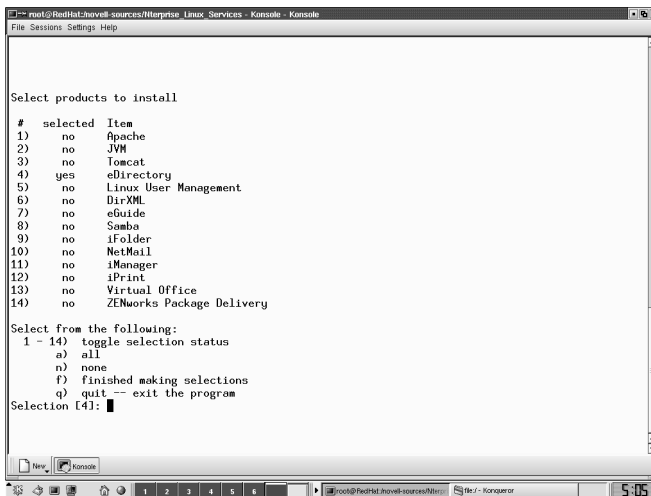
By not selecting the express installation of Nterprise Linux Services the install script offers a list of products allowing for customized selections.

In this chapter, only eDirectory is chosen.

Note: *If you need help with any of the terms used in this chapter, please visit the online documentation at www.novell.com/documentation. If you have questions about the few Linux commands provided here, you can always refer to the vendor's documentation, and Internet search engine, or the man facility. With "man <pattern>" you get help for known commands or configuration*

files. You can also use "apropos <pattern>" to get more compre-
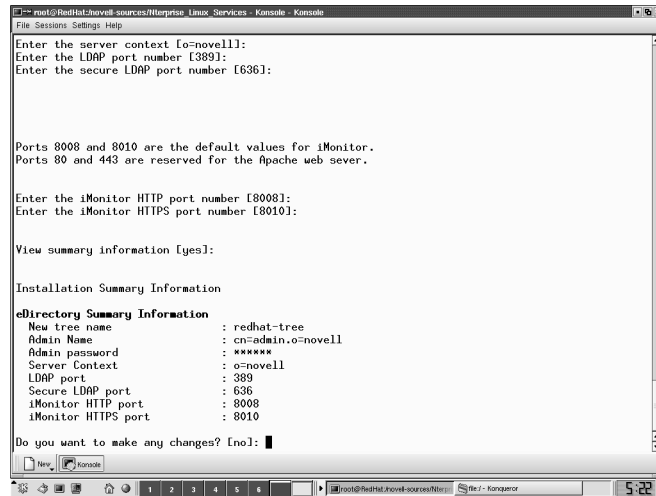*hensive information about available help information on the*
system.

After accepting the license agreement a valid license key
needs to be provided. For testing purposes, a license can be
downloaded from www.novell.com/products/edirectory/
licenses/eval_87.html

For this study kit, the following selections are made for the
installation of a new tree:

- Create new tree

- Tree name: RedHat-Tree

- admin name and context: cn=admin.o=novell

- Password: novell

- Server object context: o=novell

- LDAP port: 389

- LDAP over SSL port: 636

- iMonitor HTTP port: 8008

- iMonitor over SSL port: 8010

Once the presented installation summary is accepted, the installation actually takes place.


The installation settings can be saved to a file. Later installation of other components from Nterprise Linux Services or uninstall operations then call these settings to provide you with a clear information of what already has been installed.

As an alternative or to get more detailed information about the single packages making up the eDirectory installation, you can also use a standard RPM manager. The RPMs are in subdirectories on the Nterprise Linux Services product media.

Note: *RedHat Package Manager (RPM) has become a quasi standard to distribute software packages on Linux. Such rpm file not only includes the software packages themselves but also comprehensive information about the dependencies such as specific libraries or the existence of required other packages. You can refer to the man page of RPM (man rpm) to get information on the command line tool available on both supported server platforms.*

RedHat: *On the RedHat Enterprise server you can launch the GUI based tool KPackage if you followed the suggestion for the test sys-*

tems provided earlier and run KDE. The following graphic gives you an idea what KPackage provides in terms of information about installed, updated, and new packages. To launch KPackage, just press ALT-F2 and type kpackage in the box, then press Run.
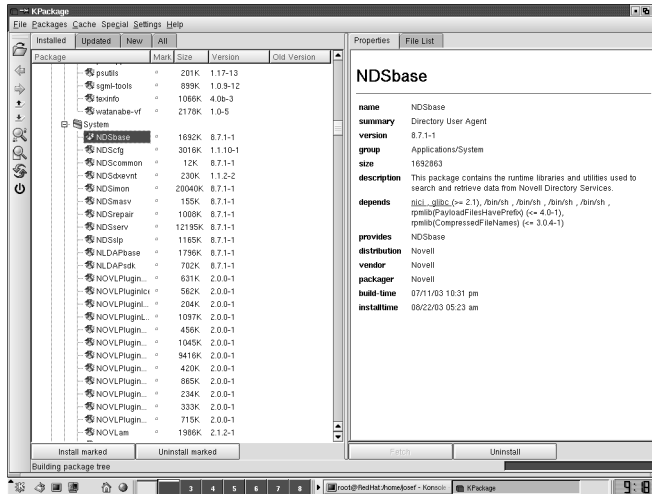

SuSE: *SuSE has developed its own powerful tool to manage and administer the Linux machines independent if it is a server or a multi purpose workstation. The tool is called YAST (Yet Another Setup Tool) and has some updated features since it was first introduced. It can be called from the GUI panel - there is a specific menu shortcut for the various YAST functions. The graphic below show the same package information but on SuSE Enterprise server and with YAST.*
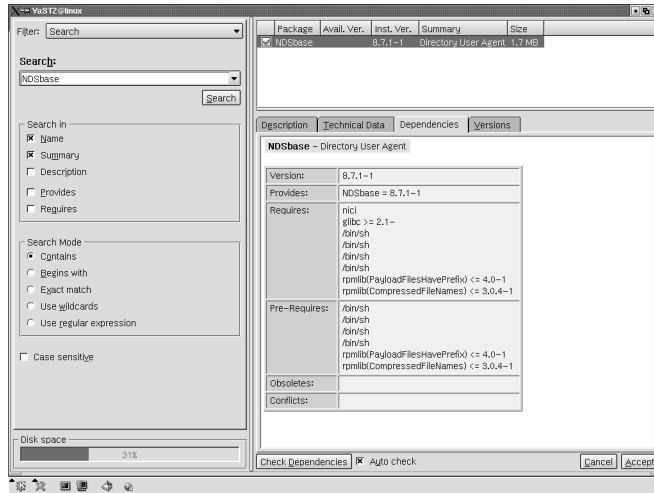
The installation log file can be found in /var/log for a detailed report of the installation.

The routing table has been updated with a multicast route for SLP and the eDirectory services run on the expected / configured ports.
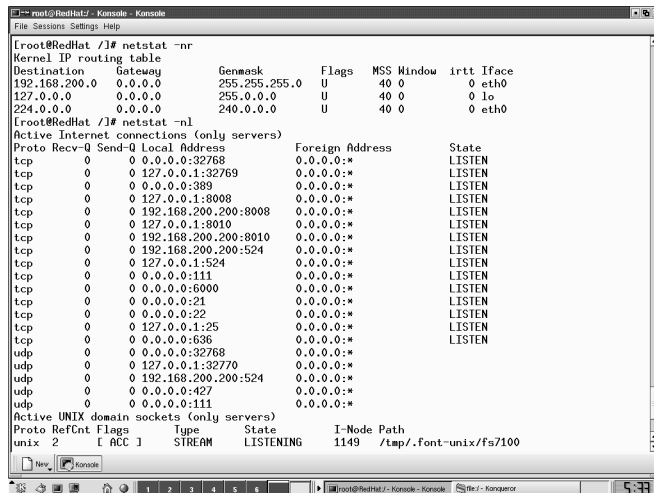
The data files for eDirectory can be found at /var/nds/dib by default. Make sure /var is on a partition with enough

space for your planned eDirectory content and is configured for a high performance file system.

The main settings for eDirectory can be found in the /etc/nds.conf file. For more information, see man nds.conf.

In the process table you will find the ndsd processes and the slpuasa (SLP User Agent and SLP Service Agent). To see the process table you can type "ps ax" in a terminal window. You can also use grep to display only the line containing a defined expression. For more information about how to make most use out of process information please refer to the man page for ps.

As usual, you can start, stop, or restart the ndsd daemon using the script in the /etc/init.d directory. To do so, change to that directory with "cd /etc/init.d". Once you are there, you can call each of the scripts stored here. Almost all of them have at least three options: start, stop, and restart. For instance, to stop NDS on the server, type the following command located in that /etc/init.d directory: "./ndsd stop". You need the ./ because the /etc/init.d directory is not in the search path.

The /etc directory also holds the configuration files for iMonitor, the eDirectory monitoring and maintenance tool, and the SNMP MIB and configuration samples. If you have a running network management system, you should include the eDirectory traps. For more information about the eDirectory related files do a "ls /etc/nd*". You can then get more information from the man system or from the Novell documentation.

3.2.4: Administrative tools

You now have a running Directory Service, but the main tool to administer and manage this Service, iManager, has not yet been installed. Of course, you can immediately start and administer the part of eDirectory located on your Linux servers using ConsoleOne or iManager running on another

eDirectory server in your network. But in this context, we still assume an isolated test environment.

The only tool that is installed by default is iMonitor. iMonitor allows you to monitor and maintain eDirectory.
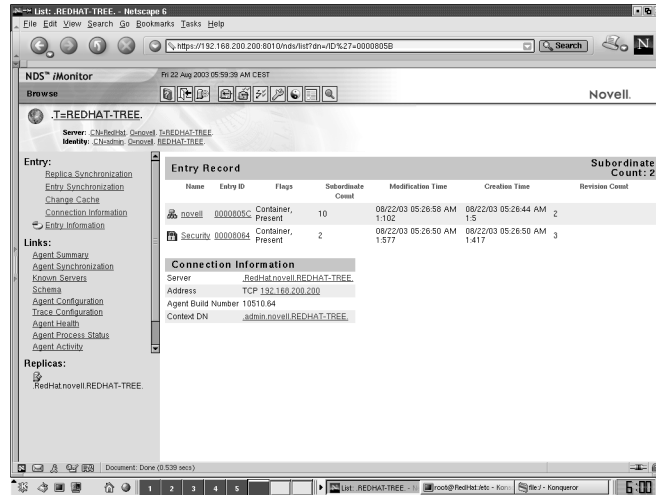
Note: *For more information on iMonitor and its functionality, visit the online documentation or attend course 3015 for Nterprise Linux Services from Novell Training Services.*

With this configuration you can use LDAP tools to add, modify, or delete object. However, in the next step we will install the standard management tools.

Again, the installation script is launched for a single packet install.

The main tool to administer all Novell services including eDirectory, iManager, is dependent on Apache 2, Tomcat 4 and appropriate JVM. As a result, all these packages must be installed.
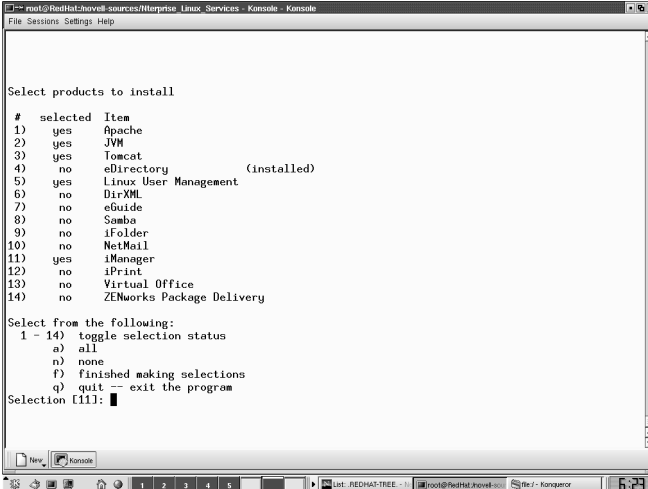
Note: *As mentioned earlier, you can check the dependencies of each RPM package to get a clear understanding about the prerequisites.*

Additionally we also install the Linux User Management in this step. This package adds the functionality to migrate

Linux users and groups from server based files or NIS / NIS+ systems into eDirectory allowing for one single Directory to manage all identities in your enterprise.

Authentication for Linux users will then be provided via PAM modules calling eDirectory.

Note: *For detailed information on how to configure PAM, Pluggable Authentication Modules, and use it to manage migrated Linux accounts please refer to the Online Documentation or register for Novell course 3015 - Nterprise Linux Services.*

Upon completion of the installation view the detailed information found at the same locations as mentioned earlier.

As mentioned in chapter 2, the installation process tested for existing versions of Apache, Tomcat, etc. to avoid conflicts. If a potential conflict is detected, the running service would have been terminated, pulled out of the runlevels, and then the new service would have been established. Detailed information about these steps can be found in the installation log file stored in the /var/log directory.

At this point, the main administration tool for all Novell Services, iManager, is installed and can be accessed using any supported Web browser.
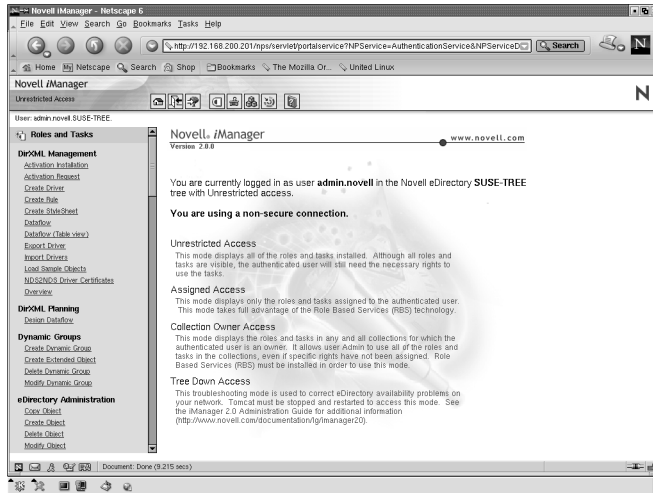
In the following chapters you will see a couple of screen shots showing the various tasks possible from within this single Web based management tool.

3.3: Conclusion

At this point the foundation for all Novell Services, eDirectory, has been successfully installed and configured.

You have also seen how to install the main tools to manage, administer, monitor, maintain, and troubleshoot this Directory service.

Because you have seen the installation process with an express install already in chapter 2 and with detailed single package install twice in this chapter, the installation steps will be omitted from the rest of the study kit.

4: Meta Directories

Meta Directories are used to provide flexibility in synchronization between disparate systems so that all common data can be kept up-to-date with minimal maintenance costs

DirXML is the Novell Meta Directory product based on eDirectory. In existing eDirectory implementations the DirXML product is just an extension to the existing infrastructure. Of course, all eDirectory server platforms can be used to run DirXML.

The overall architecture of DirXML is shown in the graphic below.
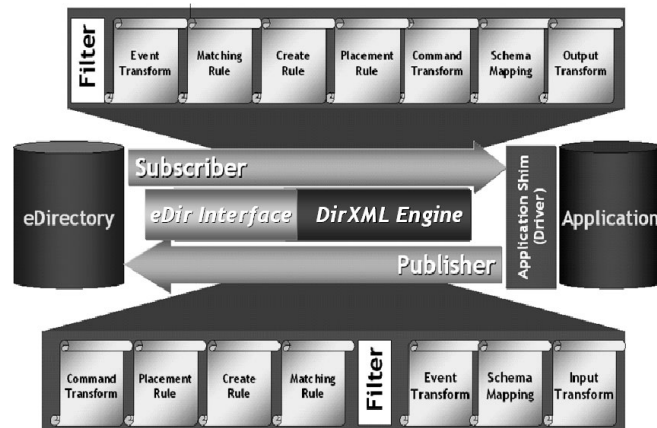
DirXML provides a general method for directory-enabling applications.

- The applications do not require changing

It is to share data through the directory

- Transform data to/from the application's native format
- Common data is stored in the directory

4.1: The business need for Meta Directories

The business justification to implement a Meta Directory solution can be prepared with a few simple questions.

- How many applications does your organization maintain with separate identity management?

    A survey in the US resulted in an average of 80!

- How often are users forced to login to a system with just another set of username and password?

- How long does it take until a new employee is entered into all these systems - just to enable her/him to start working and be productive?

- What happens if an employee leaves the company or the contract is terminated?

- Is the data you stored on the disparate systems consistent?

- What happens when data on one system changes? Have you ever moved houses?

- Have you ever heard of typos?

- Does it really make sense for your valuable administrators to enter new user information?

- Have you ever had or plan a merger?

4.2: Connecting to any data source

In general, the DirXML system is flexible enough to connect eDirectory to any data source regardless of a Directory Service, database, application, mail system, HR system, or just a simple text file containing user information.

In the DirXML documentation all these data sources are called applications. We follow with this terminology in this study kit.

The fact that the application need not be touched when implementing DirXML, has got to be good news. So the following is an explaination of what happens to the data on the way from the application into eDirectory and back.

- The Application

  There is no need to do anything with the application other than understand how you want to use the data from the application in the Meta Directory or in other systems connected to the Meta Directory.

- The Application driver

  This is the key component as it needs to understand what the application output is and how to create a valid and well formed XML document out of it. However, the Document Type Definition (DTD) this driver is using can be totally different from the DirXML driver's DTD.

  If you would like to write your own driver, you can find skeleton driver in Java and C++ as well as instructions and learning materials on http://developer.novell.com

  In most cases pre-configured drivers are used.

- The Join engine on the publisher channel

  As the XML data travels the publisher channel it can be modified. The filter, XML rules, and XSLT style sheets

applied here modify the data itself or the XML flavour to fit the business need of this synchronization and make the XML valid against the DirXML DTD.

- The DirXML Driver

   This entity works much like the application driver, but the application for this driver is eDirectory. Thus, it receives valid and well formed XML from the join engine and generates events for eDirectory.

- eDirectory

   In eDirectory the events coming in from the DirXML driver are accepted like any other event, for instance from an ldapadd or from an administration tool like iManager.

- And the other way - being on the subscriber channel

   On the other way it goes all the way down, but in reverse order. When you have a look at the graphic on the first page of this chapter, you will notice, that the order of the rules, style sheets, and the filter are different, but that's it.

Having these two separated channels with different filter settings, allows you to easily define what kind of data flows and in which direction.

The complete list of pre-configured drivers shipping with the Nterprise Services for Linux product is not defined at this moment in time. Novell developed pre-configured drivers for many systems. A complete list can be taken from Novell's Web site.

The pre-configured drivers include:

- Active Directory

- Exchange

- GroupWise

- JDBC for DB2

- JDBC for Informix

- JDBC for MS SQL

- JDBC for MySQL
- JDBC for Oracle
- JDBC for Sybase
- LDAP
- NT
- PeopleSoft
- SAP
- SIF
- Workflow
- eDirectory
- Notes

4.2.1: Applications running on the same host as eDirectory

This was the only possible way to implement DirXML in the first version. Because eDirectory can run cross-platform this was not a big issue. Remember, with appropriate partitioning and a well designed replication plan, the actual datasize of eDirectory and therefore the impact of running eDirectory as additional service can be minimized.

With this concept, the physical server hosting the application you would like connected to DirXML you just get an additional task: Synchronize defined data with eDirectory.

# 4.2.2: Applications running on a different host

The current version of DirXML can be implemented with a remote driver setup. That means, the application can run on one machine and communicate with the DirXML/eDirec-

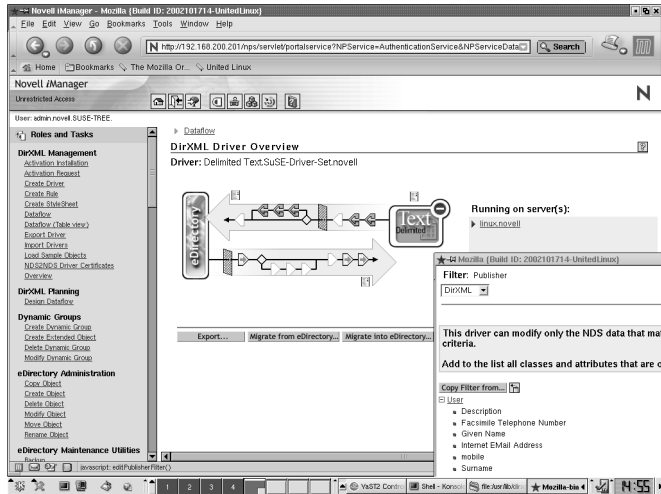tory system on another physical machine using an SSL encrypted connection.

4.3: How to administer DirXML

DirXML is installed on a Linux host like any other product from Nterprise Services for Linux.

The whole administration to setup and configure a DirXML system is accomplished using iManager.
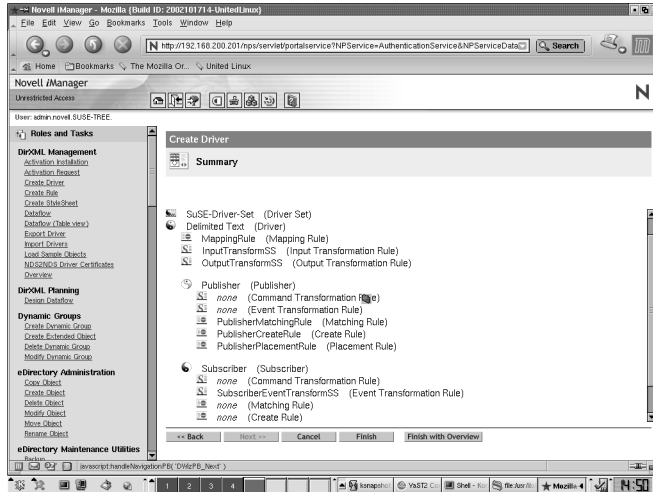
In this sample, a pre-configured driver has just been created.

> This graphic shows the overview of the just installed driver and the filter definition in the publisher channel as detail.

Note: *More detailed information about DirXML can be obtained from Novell's Online Documentation and various training offerings from Novell Training Services.*

5: eGuide

Novell eGuide, delivered as part of the Nterprise Services for Linux is a platform-independent, web-based Net service that helps you quickly find and make one-click connections to people, places and things.

Because it is a web-based service, there is no direct dependency to the underlying server operating system.

It allows you to search for information from a number of LDAP-enabled sources, including Novell eDirectory.

The Web interface lets you quickly launch any web-based application such as e-mail, instant messaging, and video conferencing.

The main features of eGuide are:

- Directory lookup engine

    100% LDAP-compatible

    Multiple directory support and load balancing

    Schema detection

- White pages/search

    Address book functionality

    Multiple search contexts

    Wildcard support

- Collaboration tool

    Launch collaboration applications from address book

    Admin-configurable

- Self-provisioning

    End-user modification of user information

    Admin configuration of "setable" attributes and classes

- Organizational view

Display and print org charts based on reporting hier-
archy and structure

Dynamically generated in real-time

- Platform support

Servlet-based

Pure HTML on client side

- Security

Secure through HTTPS

Admin-configurable filter of attributes and classes

SSL LDAP directory authentication

5.1: Using data from eDirectory

To access one or more LDAP Directories to retrieve data from, the administrator need to configure them in the eGuide configuration tool.

In the sample shown below, two different LDAP Directories are used. With this setting, employees from Novell and Cambridge were immediately all visible for the eGuide clients. This was especially helpful at the time the two companies merged.

For each Directory the administrator can map and enable the attributes visible from the eGuide clients.

Using a DirXML Meta Directory as source for eGuide, you can access data from various systems connected via DirXML.

5.2: User Experience

From the Client side, users can simply search for people in various configured categories such as Employees and Customers. The results can be retrieved from different LDAP Directories or LDAP enabled applications.

Depending on the administrative configuration, users will see more or less attributes for each search result. They can not only view attributes but also, by clicking on those attributes, link to messaging services such as e-mail, instant messaging, etc. what launches the appropriate application on the client workstation.

Every user can make modifications to her/his own entries directly via the eGuide interface. With this, users have a very easy tool to keep some of their records current thus relieving the administrators.

5.3: Organizational Charts

Based on eDirectory attributes, eGuide automatically gen-
erates Organizational Charts. To make use of this feature,
you need to decide, how these eDirectory attributes for
user objects will be modified with the current value. You
can grant the appropriate rights via the eDirectory ACLs to a
team of administrators, to those employees acting as peo-
ple manager only, or you have a DirXML connection to your
HR system to fill the values from that source.

The result is an Organizational Chart which users can view
for every object in the search result. Furthermore, every
user can walk the whole reporting structure of the enter-
prise.
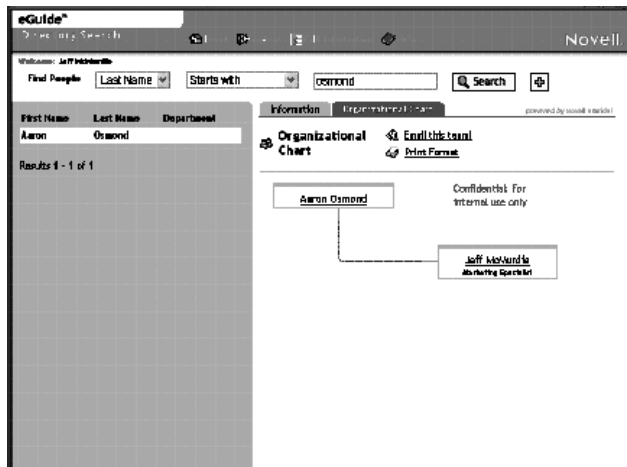
5.4: Customize the Interface

You have seen already a few screenshots from the user interface of eGuide with a different look and feel.

The interface can be modified to have for instance your corporate identity. You can also very easily change many of the fields from a choice of pre-defined options.

The same is true for the skin, the overall look and feel. If the pre-defined skins are not appropriate, you can modify the XML file to apply your corporate identity.

6: File Access

In terms of providing the server based file systems to client workstations with various operating systems, Linux has almost the same level of experience than Novell has.

In terms of server based file systems and security you should already in place a clear strategy.

If you want to setup file system security on your Linux server, you need an in-depth understanding of Linux partitions and file systems as well as the concept of Linux based file system security.

Note: *The supported Linux distributors both offer a wide range of Linux training. Visit the Web sites from RedHat and SuSE to find the right training offer.*

In this context we cannot stress enough the importance of the fact on placing the storage areas for Nterprise Services for Linux related files.

Most important is the directory where you store the eDirectory DIB sets. By default they are stored in /var/nds/dib but this can be changed during the installation or later by editing the /etc/nds.conf file. You need to plan enough free disk space, as a rule of thumb you can calculate 75 MB disk space for every 50.000 average user objects. The file system you created for the partition holding /var should be a as high performance file system as you would choose it for any database storage. You should also setup security restrictions for that directory structure to avoid problems caused by unauthorized access.

The next thing you need to consider in terms of disk space for Nterprise Services for Linux is the space you want to provide your users with via iFolder. This component of the Nterprise Services for Linux product is described in this chapter. In terms of disk space, you need to calculate the disk space you want to assign to your users and multiply that with the number of your users. This can be quite a significant amount of space.

6.1: iFolder

iFolder is provided as a component of the Nterprise Services for Linux product and allows users easy access to their files from anywhere using any device.

It comprises of two main components, the iFolder Server and the iFolder client components.

The user authentication is accomplished via LDAP against eDirectory.

6.1.1: Server components

The server component provides disk space (by default on /var/opt/novell/ifolder) for all users allowed to use the system. It stores all files encrypted which the user puts into his iFolder account in that storage area. It also controls the authentication via LDAP for users accessing iFolder and the synchronization with iFolder clients.

The server component can run on Linux as well as on the other supported OS platforms.

6.1.2: Client components

A real iFolder Client component is currently only available for MS Windows users. This client creates a local disk space area on the Windows machine which is then synchronized with the iFolder server as long as a connection can be established. The synchronization is a delta sync and the interval can be customized by the administrator and the user.

Because the same user can establish many iFolder clients which all synchronize to the iFolder server, employees can have the same data content on their workstation in the office, their laptop computer when travelling, and their

home office computer. As soon as the machines are connected to the Internet, they will connect to the iFolder server and synchronize the data. And because the iFolder server data is stored on corporate file servers, a regular backup is ensured by standard security policies every company has in place.

All non MS Windows clients need to use a browser based interface to access the data stored on the iFolder server directly. This can be done from anywhere, as long the computer has a browser installed. The current development on iFolder adds more devices, recently a PDA access has been added.

The browser based access has some more advantages. If you are one the road it is no longer a disaster if you loose your presentation - just ask for an Internet connection and grep it from your iFolder.

To authenticate, you have three pieces:

- Your login name to iFolder which needs to be setup in eDirectory (your employees will be already be configured in eDirectory. This includes the Linux users if you configured for Linux Account Management)

- A password for your iFolder client

- A pass phrase which is used to encrypt your data and which is needed to access your data via a browser.

Linux workstations can only use the browser based access, by now there is no iFolder client available as it is on Microsoft Windows workstations.

6.1.3: Administrative Tools

All administration tools for administrators can be found in iManager.

The administration tool for iFolder client users is installed with the client on MS Windows machines and has an icon in the Windows system tray.

Here we present a couple of screenshots showing how the iFolder client administration and monitoring looks on the MS Windows workstation in your enterprise you serve from your Linux based iFolder server.
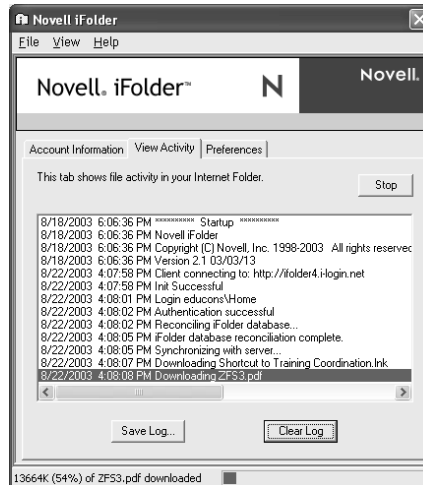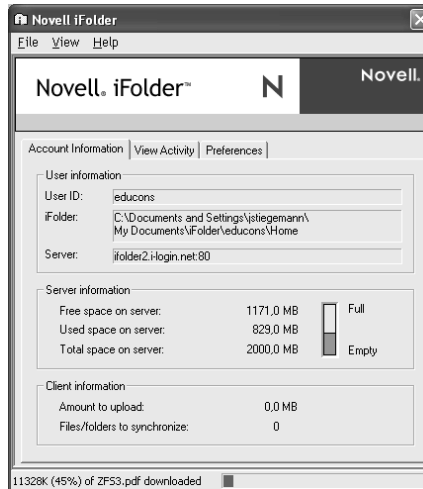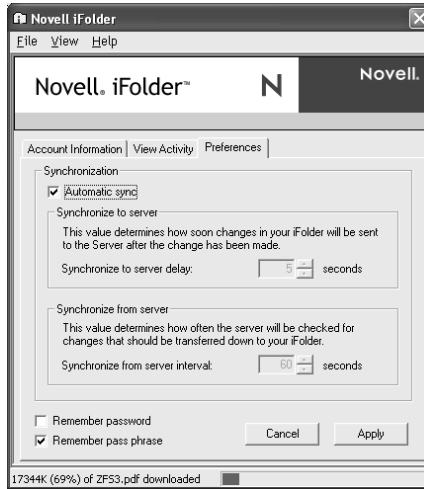
7: Other Solutions

In this chapter we will briefly describe the solutions provided with Nterprise Services for Linux not covered so far.

These are:

- Printing
- RPM Distribution
- Messaging
- Web experience

Note: *As mentioned earlier in the study kit, please bear in mind, that this kit has been written in an early Beta state where not all components are in a shape to be covered in great detail.*

7.1: Print Services

Novell's solution for enterprise wide printing is based on the Internet Printing Protocol (IPP).

Note: *You might want to refer to RFC 2911 for more information about IPP*

With Nterprise Services for Linux, Novell introduces iPrint on Linux servers as well as, for some time now, on NetWare.

iPrint supports standard IPP enabled printers. The package comes with a map generator allowing the creation of office floor plans and adding a symbol for your IPP printers to it. Users can then click the symbol to install the appropriate printer driver and print to that printer.

This is very handy for enterprise scale networks with employees travelling between different offices. They do not need to care anymore where they are and where to find the appropriate printer driver. They just bring up the correct floor plan in a browser and click on a printer near to them.

Provo H 2nd Floor

7.2: RPM Distribution

Novell developed a solution to ensure the distribution of software packages automatically between servers. On Net-Ware servers, this solution is part of the ZEN for Servers product.

Based on the physical network a given company uses, such software packages are distributed in a so called Tiered electronic distribution (TED).

TED allows a software package to be customized and created on a single server. Policies can then be used to distribute the package to other defined servers. The server the original package resides on will send it in a compressed format to a set of servers defined to subscribe from it. These 2nd tier servers will not only unpack and apply the package but continue to send them on schedule to servers subscribing from them.

With a well designed system for this tiered electronic distribution you automatically distribute and apply software packages optimizing your physical network resources. Just think about your different line speeds and network loads.

For Linux, Nterprise Services for Linux in version 1 will just introduce the tiered electronic distribution for RPM packages following the same concept used on NetWare servers.

Future versions of Nterprise Services for Linux will introduce even more ZEN for Servers functionality.

Note: *Don't forget to visit Novell's Web site and look out for ZEN for Servers. The cool solution area give you a pretty good understanding what Novell's customers have already in use and what the effect is. These benefits will now be available for Linux servers as well.*

7.3: Messaging Solution

Novell has two products handling mail:

- GroupWise
- NetMail

While GroupWise is a complete collaboration tool including mail, calendaring, scheduling, document management, and more working with proprietary clients, NetMail is just mail and calendaring but build entirely to support Internet Standards.

NetMail is part of the Nterprise Services for Linux product and can be installed to introduce a simple, highly scalable e-mail and calendaring system supporting Internet standards such as POP/IMAP, iCAL, and CAP. In this first version of Nterprise Services for Linux two client are provided:

- A Web based mail client
- The full GroupWise client for the MS Windows users you support.

However, due to the supported standard, every standard mail client can be used with the NetMail system.

Note: *For more information on NetMail, just visit the Novell Web site. Information about available, Internet standard based mail clients on Linux can be obtained from RedHat and SuSE.*

Just to give you an idea what we are talking about high scalability, a single NetMail server can server 50.000 users.

7.4: Web Experience

Novell Nterprise Services for Linux ships with Novell exteNd Director, Novell's portal solution.
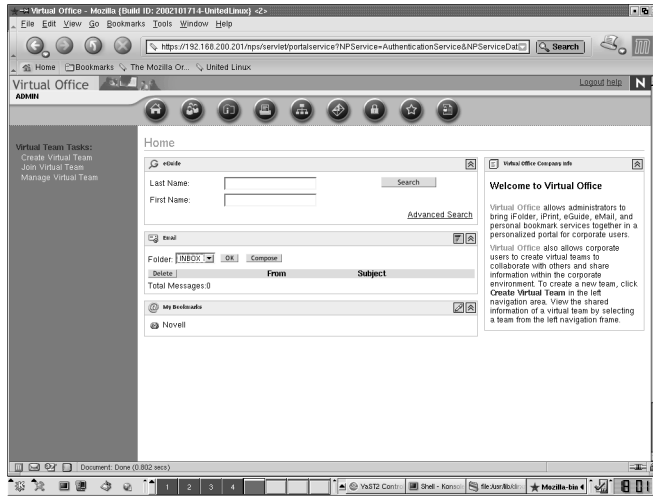
This package supports tools we already talked about in this kit such as iManager.

Having a portal solution installed makes it easy to customize your own dynamic Web sites with content based on the identity of the user. This is easily accomplished because the exteNd Director is linked into eDirectory. This makes it easy to customize the content accessible based on eDirectory objects such as containers, groups, and users.

Also included is an implementation of Novell's virtual office, an already pre-defined portal for a unified user experience via the Web first introduced with NetWare 6.5. Virtual office includes:

- eGuide
- NetMail
- Bookmarks
- Virtual teams can be setup to collaborate with team members
- iFolder
- iPrint
- Self Management - change password

Here is a view of the main Virtual Office page.