



SUSE QUEUES UP FOR A CLEAN SWEEP

SuSE Linux 7.2 takes our Editor's Choice for both its server and workstation versions thanks to extensive software offerings, the handy Yast2 administration tool and an impressive service model. BY KEVIN NOVAK AND PATRICK MUELLER

Over the past several years Linux has gone from being simply a bithead's toolbox to one of the most complete and stable operating systems available. Like the various Unix platforms on the market, Linux was designed to be completely customizable for any user's needs. There's one key difference, though: Unlike most commercial Unix offerings, Linux is fully open source. The accessibility provided by the GNU license, under which the Linux kernel is released, gives users unfettered access to change, adapt and patch the OS for their own uses. Such patches, submitted by kernel hackers from across the globe, are how the kernel code continues to progress, improve and have new features added regularly.

So why has it taken Linux so long to gain ground, and why does it still struggle to gain a foothold in today's enterprise environments? Obviously there are some enterprise-specific reasons, which we explore in more detail in "Are We There Yet?" (page 38), but one of the largest problems is market fragmentation. Ideally, a unified effort would mean enhanced benefits of scale, thereby contributing to larger budgets for development, marketing and technical support. But this is not an ideal

world, so we set out to evaluate the major distributions.

Our qualifications for this review were simple: A distribution must have commercial support in the United States via phone and e-mail, and that support must be offered by the vendor—not through a third party. Of the 150-plus distributions available, only six met our qualifications, and only five vendors accepted the invitation: Caldera International, MandrakeSoft, Red Hat, SuSE Linux and TurboLinux. Progeny Linux Systems, the sixth, declined to participate, saying it was between revisions.

We've conducted in-depth tests of Linux before. In fact, in June 2000 we made our Chicago Neohapsis partner lab a completely Linux-driven environment and moved everything from backups to VPNs (virtual private networks) onto the OS (to see how well we fared, check out "The Linux Challenge," at www.nwc.com/1112/1112f1.html). This time, also at the Neohapsis lab, we added a new twist: We also evaluated workstation functionality, as opposed to looking only at the server side.

SERVER VS. WORKSTATION

An enterprise environment comprises basically two classes of computer: workstations and servers. In the Windows world,

SPECIAL REPORT

Microsoft differentiates these categories in the operating system by bundling different software packages and by changing how OS-level resources are allocated—dedicating more resources to processing requests for the server version while giving more cycles to the GUI in its workstation version.

While most Linux vendors also offer workstation and server distributions, the differences are less dramatic. In every workstation distribution we tested, we had the option to install an e-mail server, a Web server and a database server (among many other options). And in every server distribution we reviewed, we had the option to install at least one office suite. Unlike Microsoft Windows, where the entire OS is packaged around its particular role, Linux distributions typically distinguish the workstation from the server based on how much software is included and what software is installed by default. The rest is up to the user. The heart of Linux, the kernel, remains the same.

All five participating vendors have workstation and server versions of their products. However, halfway through our testing, TurboLinux asked us not to review the workstation flavor of its offering. The company is discontinuing general distribution of the product and will be offering it only as an OEM installation.

REPORT CARD • Linux Server Distributions

	Weight	SuSE Linux 7.2	MandrakeSoft MandrakeLinux ProSuite Edition 8.0	Red Hat Linux 7.2	Caldera OpenLinux Server 3.1	TurboLinux Server 6.5
ADMINISTRATIVE TOOLS	15%	3	4.75	2.5	4.75	1.25
AUTHENTICATION OPTIONS	15%	3.5	3.5	5	3.5	3.5
SECURITY	15%	4.5	4.5	4	3	1
SERVERS	15%	5	5	5	5	4
STABILITY	15%	5	3	4	3	4
SUPPORT	15%	5	5	5	5	5
COST	5%	5	4	3	2	3
GRAPHICAL INTERFACE	5%	5	4.75	4.75	5	4
TOTAL SCORE		4.40	4.30	4.21	3.99	3.16
		A-	A-	B+	B	C+

A≥4.3, B≥3.5, C≥2.5, D≥1.5, F<1.5 A-C GRADES INCLUDE + OR - IN THEIR RANGES. TOTAL SCORES AND WEIGHTED SCORES ARE BASED ON A SCALE OF 0-5. CUSTOMIZE THE RESULTS OF THIS REPORT CARD TO YOUR ENVIRONMENT USING THE INTERACTIVE REPORT CARD®, A JAVA APPLLET ON NETWORK COMPUTING ONLINE, AT WWW.NETWORKCOMPUTING.COM.

TESTING CRITERIA

Evaluating a distribution based on the role it will play within your enterprise is important. While one product might make a great workstation, it doesn't necessarily make a great server. It was here that separating the workstation from the server became critical for our tests.

While the distributions themselves don't make much of a distinction between the two classes, our testing and expectations did. Postgres SQL server is far less important to a workstation distribution than it is to a server, and by the same reasoning, you wouldn't turn down a good server distribution simply because it doesn't include a nice office suite.

With the exception of some specialized server distributions, such as SuSE's

Groupware Server (a Lotus Domino-specific distribution), Mandrake's Single Network Firewall product and the TurboLinux Database Server (featuring IBM DB2), we saw no major difference between the installations of plain-vanilla servers and workstation distributions from any of the vendors included. Workstation and server distributions do differ, however, in the included software.

TOPS IN THE SERVER SLOT

Although SuSE Linux takes our Editor's Choice award, all the server distributions we tested had positives and negatives that must be weighed on an individual basis before implementation. Here are the major review criteria shown in our Linux server report card (above):

» **Graphical interface:** An organized and efficient interface is key for less experienced administrators who need to maintain their servers from within X Window-based environments. We judged a graphical interface on its menu organization, customization, and general look and feel.

» **Servers:** With all the distributions we tested, we found at least one application in each of the following categories: Web server, e-mail server, database server and firewall. If you have no preference, just about any product will do; however, do your homework if you're looking for a particular package.

» **Administrative tools:** In the Linux world, there are two types of

REPORT CARD • Linux Workstation Distributions

	Weight	SuSE Linux 7.2	Red Hat Linux 7.2	Caldera OpenLinux Workstation 3.1	MandrakeSoft MandrakeLinux PowerPack Edition 8.0
STABILITY	20%	5	4	4	3
GRAPHICAL INTERFACE	15%	5	5	4.5	4.5
GROUPWARE	15%	5	5	5	5
OFFICE SUITES	15%	5	5	5	5
AUTHENTICATION OPTIONS	10%	3.5	5	3.5	3.5
PRINTING	10%	5	5	5	4
SECURITY	10%	5	5	3	4
COST	5%	5	3	3	2
TOTAL SCORE		4.85	4.70	4.24	4.03
		A	A	B+	B+

A≥4.3, B≥3.5, C≥2.5, D≥1.5, F<1.5 A-C GRADES INCLUDE + OR - IN THEIR RANGES. TOTAL SCORES AND WEIGHTED SCORES ARE BASED ON A SCALE OF 0-5. CUSTOMIZE THE RESULTS OF THIS REPORT CARD TO YOUR ENVIRONMENT USING THE INTERACTIVE REPORT CARD®, A JAVA APPLLET ON NETWORK COMPUTING ONLINE, AT WWW.NETWORKCOMPUTING.COM.

SPECIAL REPORT

administrators—those who consider it an insult to be referred to as a geek and those who consider it a compliment. The latter will likely dismiss X-based administration tools as clunky and slow; however, such tools are important for less experienced administrators and those new to the world of Unix. Availability and stability of these tools are essential for widespread adoption of Linux in the enterprise.

In addition, there is an alternative to X-based utilities. Administrators familiar with text-based tools, similar to those employed by Novell for its console, have this option with several of the distributions. Red Hat Linux and MandrakeLinux have the Setup utility, SuSE has Yast, and TurboLinux has about 15 separate programs, including its software-update facility.

» **Authentication options:** Interoperability with other operating systems is critical in today's enterprise environment, and Linux is no exception. We looked at five main authentication mechanisms: SMB (Server Message Block), LDAP, NIS(+), Kerberos and NDS.

» **Support:** Many factors must be considered when evaluating the support provided with a Linux distribution. Patch times and patching tools,

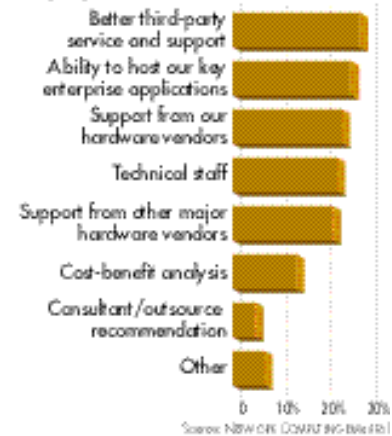
coverage days and times, response times, and escalation procedures are a few of the more important concerns. All the support departments we tested demonstrated adequate expertise but didn't always provide it in an optimum time frame. Typically, dollars make all the difference, and given enough money you can achieve just about any level of support you feel is necessary.

» **Security:** To eliminate distributions that are completely insecure out of the box, many Linux vendors have implemented measures to help network administrators secure their systems at installation or shortly thereafter. To this end, many distributions use predefined scripts to shut down unneeded services, create firewall rules and implement network daemon security with TCPWrappers.

On three of the distributions we tested, these scripts were implemented through a point-and-click interface, where choices ranged from high security to low security. Mandrake and Red Hat let us define our security level during the installation; SuSE required us to do it afterward through Yast. Although these measures aren't perfect, they go a long way toward preventing initial exposure.

One warning: Be careful when using these settings if you're not familiar with Linux firewalls (such as

Which of the following would cause you to change your policy about testing or adapting Linux?



ipchains) because you may wind up removing all remote access to the system you're trying to configure. Enterprises requiring additional security should turn to security-enhanced distributions (see "Locked Down Out of the Box," online at www.nwc.com/1224/1224rd3.html).

» **Stability:** Although Linux is lauded for being a stable environment, we found a few exceptions, mostly with X-based tools and applications. Examples include package managers hanging in an endless loop looking for an update source or video configuration tools annihilating our video setup after we'd simply changed our screen resolution. It's important to note, however, that we never had to reboot our server during one of these application glitches because we were able to kill the process manually and continue with our tests. Try that with Microsoft Windows NT!

ON TO THE WORKSTATION

Once again SuSE comes out on top, taking our first-ever Editor's Choice award for Linux workstation distributions. However, Red Hat, Caldera and Mandrake followed close behind, while TurboLinux bowed out of workstation testing.

The workstation report card (page 56) summarizes the results of our workstation testing, and here are our main criteria (security and stabili-

LINUX TEST BED

Our test bed consisted of the following elements, used together to simulate a mixed enterprise environment:

- » One of each server distribution we tested
- » One of each workstation distribution we tested
- » An HP LaserJet connected via an external HP JetDirect print server
- » A TurboLinux DB2 database server
- » A SuSE groupware server
- » A Mandrake network firewall
- » A Microsoft Windows NT domain controller (server)
- » A Novell NetWare network server
- » A Unix server (Sun Solaris)

SPECIAL REPORT

ty were covered in the server section):
» **Graphical interface:** End users demand an interface that is both easy to use and easy on the eyes, so we

evaluated items such as menu organization, customization and the ability to change display settings. We looked at various window managers and desktop environments, and even though each distribution has its own desktop environment of choice

(GNOME for Red Hat and KDE for the rest), the final selection is generally left up to the end user. It's important to try out the various window managers and desktop environments, as they do differ greatly (see "The Mystery of X Unveiled," below, for a

THE MYSTERY OF X UNVEILED

Window managers, desktop environments, themes, applications ... with all these components from which to choose, it's no wonder many users new to X Window are confused. Even we were confused. Here's what we found out.

More than 20 window managers are available, and an increasing number of them incorporate functionality traditionally reserved for the desktop environment, so making a distinction between the two is a daunting task.

The X Window System, also referred to as X and X11, is the software that lies between the hardware and the GUI. Linux uses the XFree86 implementation of X, which includes low-level video drivers, basic fonts and other core components. The X Window System is responsible for drawing basic windows, icons and backgrounds. X alone, however, would make for a relatively useless computing experience.

A window manager extends the functionality of the X Window System, adding to the windows borders and providing additional icons, virtual desktops and toolbars, for example (see "Components of the Most Common Window Managers," right). A window manager is also responsible for the look and feel of your desktop, and it is the component with which you'll experiment most.

Conversely, the desktop environment is responsible for much of the behind-the-scenes work of your desktop, providing cut-and-paste, drag-and-drop and other capabilities. It also delivers many of the common utilities you would expect in a functional desktop, including a file manager, control panels, a browser and several other useful programs. The desktop environment also typically includes programming libraries, allowing easy integration of new programs into the environment, and toolkits that help standardize the look and feel of those applications.

In the Linux world, there are two main contenders for the desktop environment space, GNOME and KDE. The debate over which is better is much like the debate concerning which Linux

distribution is best: eternal and pointless. Nonetheless, you should be aware of the differences between the two. For example, KDE's browser, Konqueror, is currently more advanced than the GNOME effort, Nautilus. That's liable to change because Nautilus is actively being developed. The look and feel of GNOME and KDE are also quite different because they are based on their own graphics libraries, GTK and QT, respectively.

The bottom line: Selecting a window manager and desktop environment is a personal decision, subject to one's preferences for look and feel, ease of use, and a continuing list of differences between the main contenders. Most agree that the only way to know which environment is right for you is simply to try them out.

Window Manager/Desktop Environment Web Sites:

- » GNOME: www.gnome.org
- » KDE: www.kde.org
- » AfterStep: www.afterstep.org
- » Blackbox: blackbox.alug.org
- » Enlightenment: www.enlightenment.org
- » FVWM: www.fvwm.org
- » IceWM: icewm.sourceforge.net
- » Sawfish: sawmill.sourceforge.net
- » Window Maker: www.windowmaker.net

—Mike Janowski, mjanowski@neohapsis.com

COMPONENTS OF COMMON WINDOW MANAGERS

	Memory ¹	Themes	Pin-up menus	Dock applications	Workspaces	GNOME compliance ²	KDE compliance ²
AfterStep 1.8.8	2,556 KB	Y	Y	Y	Y	Y	Y
Blackbox 0.61.1	1,568 KB	Y	Y	Y	Y	N	Y
Enlightenment 0.16.5	3,784 KB	Y	Y	Y	Y	Y	Y
FVWM 2.2.5	1,428 KB	N	N	N	Y	N	N
IceWM 1.0.7	1,576 KB	Y	N	N	Y	Y	Y
Sawfish 1.0	3,808 KB	Y	N	N	Y	Y	N
Window Maker 0.65.1	2,376 KB	Y	Y	Y	Y	Y	Y

¹TOTAL MEMORY FOOTPRINT CALCULATED FROM TEXT AREA + DATA AREA + STACK + SHARED LIBRARIES.
²ANY OF THE WINDOW MANAGERS WILL RUN IN EITHER ENVIRONMENT, BUT COMPLIANCE INDICATES THAT THE GIVEN WINDOW MANAGER IS TUNED TO INTEGRATE, AT LEAST TO SOME DEGREE, WITH THE PARTICULAR ENVIRONMENT.

SOURCES: WWW.WINDOWMAKER.ORG/FEATURES-PERFORMANCE.HTML AND
WWW.PLIG.ORG/XWINMAN/COMPARISONS.HTML

SPECIAL REPORT

detailed explanation of X Window and its various counterparts).

» **Groupware/office suites:** “What would it take for Linux to be fully adopted by enterprises as a viable alternative to Windows?” This is a question we hear quite often. The answer is, “A real groupware and office-suite solution.” Most of us agree that a Microsoft-compatible solution is needed before enterprises will consider Linux for the desktop. Several alternatives are available, but Ximian Evolution (www.ximian.com) and Sun Microsystems StarOffice (www.sun.com/staroffice) are leading the way for groupware and office suites, respectively.

» **Printing:** The ability to print and manage print jobs is critical for everyday functionality. We looked at supported printing protocols, printer-driver support and print-queue administration. Finally, we tested printing on a standard Hewlett-Packard HP LaserJet, both locally and remotely, to its JetDirect print server.

» **Authentication options:** The ability for Linux workstations to authenticate to other operating systems is essential for adoption in the enterprise. We looked at authentica-

tion—from a client perspective via SMB, LDAP, NIS, Kerberos and NDS—to their respective non-Linux operating systems.

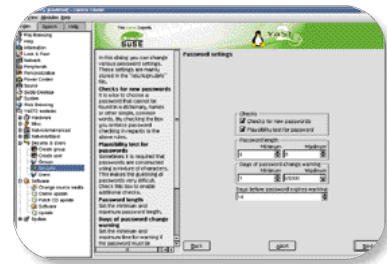
Bottom line, SuSE impressed us enough to walk away with the Editor’s Choice award in both the server and workstation categories. However, none of the other distributions was particularly shabby, especially on the workstation side, where the margin of victory was less than a point—just 0.15. Note that the products are listed in order of how they placed in the server tests; on the workstation side the order was: SuSE, Red Hat, Caldera and Mandrake (TurboLinux opted out of our workstation tests).

We list prices for the distributions but not for support, which may end up costing more than the OS. During our testing we discussed support options with the vendors, but the range of offerings was so vast that we feel your best bet is to identify your preferred distribution, then investigate support costs based on your individual needs. We’ve posted a chart detailing support info from a variety of providers at www.nwc.com/1224/1224rd1.html.



SuSE is one of the most comprehensive and stable distributions we tested, though a bit of rethinking was necessary to navigate the CLI (command-line interface) in light of the more traditional and flat directory structure in */etc*. SuSE places RC (run command) statements in one (large) file—*/etc/rc.config*—whereas every other distribution we tested has subdirectories for different configuration files and scripts. However, once we had a firm grasp on where to find our configs, and found the *rc.config* tool in Yast2, we had no problem performing all normal tasks.

SuSE provides a mammoth amount of software, so much so that the entire distribution is provided not only on the seven-disk CD-ROM set, but also on a single DVD-ROM.



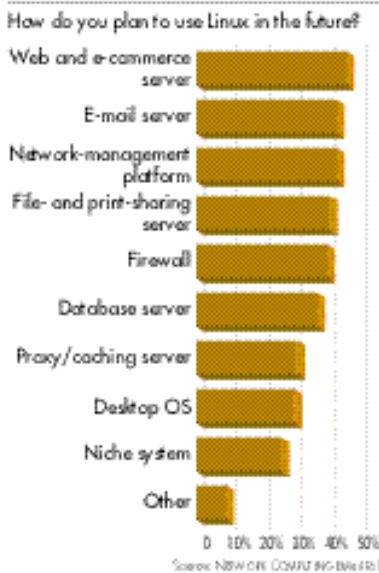
SUSE LINUX'S YAST2 EXECUTABLE MAKES IT EASY TO CONFIGURE SECURITY SETTINGS.

Yast2, SuSE’s graphical install wizard, is well-developed and offers functionality similar to that of the Red Hat/Mandrake GUI tools. The ability to configure the file system, create a crypto file system (a feature unique to SuSE among distributions tested here), select from among two boot loaders and perform a variety of other functions puts SuSE in a league of its own.

Two products are available from SuSE: SuSE Linux 7.2 Personal and SuSE Linux 7.2 Professional. The only difference between the two (besides a measly \$40) is that the Professional version includes several software packages not included with the Personal edition. These additional packages are LDAP server, autoinstaller, clustering tools and development tools; also, Professional offers additional hard-copy manuals. From either edition, the user can choose to install server or workstation, in the same manner as that of the familiar Red Hat. We tested the full Professional version.

SuSE’s X interface contains several well-designed administration tools. Yast2 is SuSE’s tool for configuring hardware, installed software and the overall environment. The same executable, Yast2, when used in a non-X environment, invokes a text-based utility for configuring similar settings.

As for the workstation, SuSE has a clean menu system, StarOffice 5.2 and many productivity tools, making it a potential alternative to Windows.



SPECIAL REPORT

Security updates are timely and can be installed from within X, using the software-update utility, or downloaded from SuSE's Web site and installed manually.

SuSE's support model follows a nontraditional path, where issues flow directly into Tier 1 (high level) support for assessment. Low-level issues are rerouted to less experienced technicians. SuSE support offerings range from online response to one-hour resolution. The company even offers a four-hour system-replacement package, where the entire system is replaced in the event that the problem can't be resolved within the first hour of support.

SuSE Linux 7.2, \$69.95 (Professional), \$29.95 (Personal). Available: Now. SuSE Linux, (510) 628-3380, (888) 875-4689; fax (510) 628-3381. www.suse.com



**MANDRAKESOFT
MANDRAKELINUX
PROSUITE 8.0 AND
POWERPACK 8.0**

Mandrake is popular among beginners and experts alike, and for good reason. Based on Red Hat's offering, Mandrake adds enhanced configuration tools and is optimized for Pentium-class and above processors.

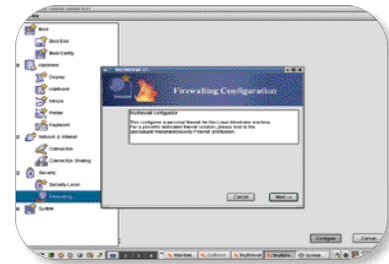
The Mandrake installation is very polished and should make the Windows lovers among you feel comfortable. Numerous installation options, such as text, graphic and expert, from

numerous sources, including FTP, HTTP and CD; choice of hard-drive partitioning utilities; multiple boot managers; security-level settings; and multiple file systems all make for a very customizable installation package. The installer is also more functional than most, letting you go back to any of the past steps to make changes. Unlike most other distributions, Mandrake even recognized and configured our Cisco 802.11b wireless network adapters.

Mandrake's server side offers an array of applications matched only by SuSE. Like Caldera, Mandrake provides Webmin over SSL (Secure Sockets Layer) for secure remote administration from a Web browser. For updating packages and security patches, Mandrake uses the KDE Software Manager and simply adds its security patch site into the search path for updates.

Sounds simple enough, but we experienced most of our problems with Mandrake from this utility. According to the software-update facility, two versions of Apache were available for install. We chose the newer version and selected the install button. The installation failed miserably. We finally were able to determine that the new version listed wasn't even on the install CD. To make matters worse, when we attempted to install the other version of Apache, which was on the CD, the installation failed as the utility went looking for the new version all over again.

The next adventure involved not only the same software installer, but also Mandrake technical support. We decided to patch our system for available security fixes. After instructing



WE COULD CONFIGURE FIREWALLS VIA THE MANDRAKE CONTROL CENTER.

the application to search for updates, we received a laundry list of security patches. We selected all of them and fired away.

The install went perfectly—until we rebooted. Upon reboot, LILO (Linux Loader) simply wouldn't work. Since Mandrake provides 90 days of free tech support over the Web on MandrakeExpert, we decided to give it a try.

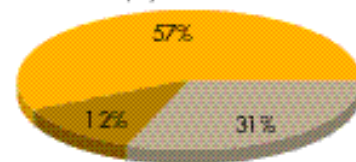
We drafted a detailed message describing our dilemma, then waited. For five days. Finally we received a message back, indicating a particular course of action. It wasn't ideal, and didn't completely resolve our problem, but it was valid nonetheless. Four messages later, we were informed that we should uninstall the new kernel and drop in the original one because the installer was failing to reconfigure LILO properly and to relink *kernel*, *map* and *initrd* files. We were disappointed.

We sent a reply to Mandrake inquiring why this happened and how we could prevent it from happening in the future. Also, we asked how we would be able to maintain a secure box

PLATFORM SUPPORT

	Caldera	MandrakeSoft	Red Hat	SuSE	TurboLinux
Alpha	N	Y	Y	Y	Y
PPC	N	Y	N	Y	N
Intel	Y	Y	Y	Y	Y
SPARC	N	Y	Y (but not developed)	N	N
Intel Itanium	N	N	Y	N	Y
IBM eServer	N	N	N	Y	Y
IBM S/390	N	N	N	Y	Y

How would you describe the majority of your Linux server deployments?



■ Large scale and management approved
 ■ Small scale and management approved
 ■ Small scale and not management approved

Source: NETWORK COMPUTING-BLUEFI

SPECIAL REPORT

if we couldn't install the recommended security updates. The response we received was classic.

Dear Customer;

Thank you for using MandrakeSoft Professional Services technical support. Unfortunately, your question is currently not included in our list of free provided support. As a reminder, support is dedicat -

ed to operating system installation only, covering the topics shown below ...

When we then spoke with a representative from Mandrake, we were informed that Mandrake's paid subscription would have alleviated any support problems we'd encountered. Furthermore, we learned that Mandrake had since "resolved" this issue by no longer allowing kernel updates to be performed automatically. This eliminates an entire population of

administrators from being able to maintain the system, since compiling kernel updates isn't a trivial task. Mandrake admits this drawback and says it is actively working on a solution.

You may be wondering why we're slamming our second-place finisher. In a nutshell, we're trying to prove a point. Although Mandrake maintains three levels of support, the first is primarily reserved for its free 90-day support services (which we used). Paid

JOURNALING FILE SYSTEMS TO THE RESCUE

For some time Linux had been denied entrance into the enterprise Unix application space because it lacked a JFS (journaling file system). Over the past two years, however, Linux has gone from having no native JFS to the enviable state of having four. These four systems are at various levels of maturity, ranging from "recently out of beta" to "ready for high-capacity production use."

JFSes employ the use of journals, where data to be committed to disk is first written to a journal file. A thread processes the journal file during idle cycles, writes the journal entries to the disk and marks them as complete. If a partition is unceremoniously dropped without unmounting, the journal entries are processed at boot-up, and very few file-system integrity checks are required. Processing the remaining journal usually takes only a few seconds.

The bottom line is that *fscks* (filesystem checks) are a thing of the past. These new JFSes also address issues of performance and fragmentation, both of which become more important as disk and file sizes continue to grow.

One common misconception about JFSes is that they prevent data loss. Some of the next-generation file systems being created will address data-integrity issues, but the journaling features simply guarantee that the file system will be in a consistent state in the event of a power loss or improper shutdown.

EXT2 AND EXT3

The venerable Ext2 has been enhanced to support journaling and is now known as Ext3. Rather than rewriting the file system from the ground up, the developers chose simply to bolt on journaling capabilities. The advantage is backward (and forward) compatibility. Existing Ext2 partitions can be upgraded to Ext3 with one simple command (*tune2fs -j /dev/hdXX*). Even after upgrade, the file system can still be mounted as Ext2, provided

that the Ext3 partition was unmounted cleanly. On existing systems, administrators might prefer this method of upgrade rather than having to back up, reformat and restore data to one of the other new JFSes described below.

REISERFS

ReiserFS started from a ground-zero coding development and has thereby attained better performance in benchmark tests versus Ext3. ReiserFS was the first Linux JFS to hit the streets and has been in wide use for more than a year. Mandrake has included support for it in its last several releases, as has SuSE. The latest Red Hat offering, 7.2, also includes support, though your root partition cannot be formatted as Reiser at installation.

XFS

SGI has been working on its XFS file system since the early '90s. XFS addresses the high demands of digital video and large databases with support for huge file systems and fast crash recovery via journaling. SGI has jumped on the open-source bandwagon and finalized the 1.0 release of the Linux port earlier this summer. XFS is still too new to be included in either of the Linux kernel trees, much less a distribution. But it is definitely worth keeping an eye on.

JFS

Another industry heavyweight, IBM, is mirroring SGI's move with its own journaling file system, JFS. IBM is also releasing its high-performance file system, which is used in its commercial OS/2 Warp Server offering, under the GPL (GNU Public License). The code is out of beta, and the developers are hoping for inclusion in one of the upcoming kernel releases. As with XFS, the proven track record on thousands of production systems is what may eventually attract Linux administrators.

SPECIAL REPORT

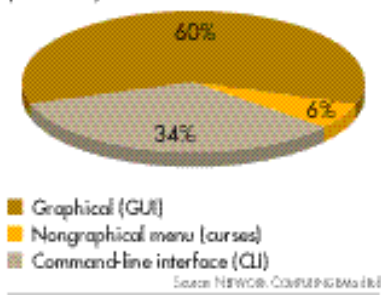
subscribers go directly to the second tier of support and are escalated further based on the time of day and the complexity of problem. In other words, you get what you pay for. Free support options may be OK for the inexperienced home user, but most enterprises will need a higher level of service.

As a workstation, Mandrake offers a large array of software, including Sun StarOffice and KDE Office, along with a variety of multimedia tools and a logical menu system.

For those not installing X, Mandrake offers Setup, a text-based menu system for configuring hardware. It should be noted, however, that this utility adds considerable data to your configuration files. For instance, a typical network-interface configuration file requires only about five lines, and that's all an experienced user would provide (assuming a limited number of protocols are being configured). This leaves the file lean and easy to maintain. The setup configuration utility, on the other hand, inserts a line item for every option configurable, even if it isn't used, thereby leaving your configuration file full of useless information. Although this clutter may not cause any functional problems, manually editing a messy file tends to be more difficult.

Mandrake has a competitive offering, though it lacks polish. We hope version 8.1 will resolve some of those issues. According to Mandrake, that version should be on shelves by the time this article prints.

From within which user interface do you prefer to operate?



MandrakeLinux ProSuite Edition 8.0 (server); MandrakeLinux PowerPack Edition 8.0 (workstation), \$149 (ProSuite), \$69 (PowerPack). Available: Now. MandrakeSoft, (626) 296-6290; fax (626) 296-6291. www.mandrakesoft.com

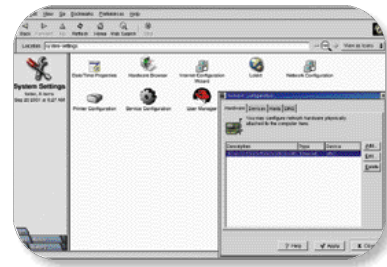
B+ RED HAT LINUX 7.2

Red Hat was one of the first Linux-distribution companies to market its product to end users and vendors alike. By placing its distributions in retail stores and establishing alliances with companies such as Dell Computer Corp. and IBM, Red Hat now has the largest installed base of any Linux product. The development and adoption of Red Hat Package Manager (RPM), the preferred packaging application used in almost all distributions on the market, also played a major role in Red Hat's market dominance. According to Gartner, 8.6 percent of U.S. server shipments in the third quarter of 2000 were Linux-based systems. Of that, a full 8 percent were Red Hat.

We were pleased to be one of the first labs to test Red Hat's new 7.2 release. New features include support for MIT-Kerberos authentication, enhanced firewalling features and the new Ext3 by default (see "Journaling File Systems to the Rescue," page 66).

The Red Hat server package offers a large selection of applications, but not all are available at installation time; some commercial applications must be installed afterward from the accompanying CDs. And, having become quite attached to the handy Webmin configuration tool, we were disappointed that Red Hat does not include a Webmin RPM (though downloading it from the Webmin site is quite easy).

X-based utilities abound in this distribution of Red Hat. Management of printers, print jobs, firewalls and the like is made easier through the Red Hat suite of configuration tools. Red Hat is one of the major



RED HAT'S NEW SYSTEM-CONFIGURATION INTERFACE MAKES IT EASIER TO MANAGE THE UTILITIES.

commercial sponsors of GNOME, so it's not surprising that GNOME is the default desktop environment (see "The Mystery of X Unveiled," page 60). However, Red Hat's use of KDE was equally impressive. We did have some stability issues with a couple of X tools—the package manager locked up and reported software incorrectly—but these problems should be resolved by the time 7.2 begins shipping.

As you might expect after reading about Mandrake, Red Hat also offers the Setup text-based application for configuring hardware outside of X. This tool lets you configure users and groups, passwords, networking configuration and more, but it suffers from the configuration file bloating described earlier.

Red Hat's support department is more mature than most. It offers development support, multiplatform implementation support and traditional end-user support. Support is divided into several categories ranging from 12x5 with two-day response up to premium 24x7 immediate response services. Online support was also top-notch: Red Hat responded to an issue submitted online within eight hours.

Security updates are timely and can be installed through X using the update manager or the CLI using *Up2date*, Red Hat's custom update utility.

Red Hat Linux 7.2, \$59.95 (Standard), \$199.95 (Professional). Available: Now. Red Hat, (919) 547-0012, (888) REDHAT1; fax: (919) 547-0024. www.redhat.com

SPECIAL REPORT

B CALDERA INTERNATIONAL OPENLINUX SERVER 3.1 AND WORKSTATION 3.1

The big sleeper in the group, Caldera OpenLinux gave us something to think about. It was one of the most polished and stable distributions we've used, and the installation is well-thought-out and allows an extensive customization.

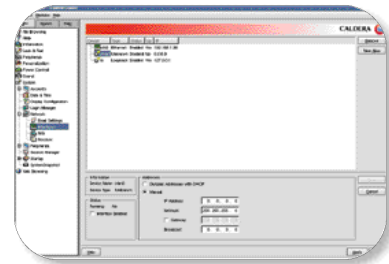
We'd like to see a few items supported at installation time—namely, NTP synchronization, remote printing, a crypto file system and a way of enforcing strong security. For example, there was no password quality check when choosing a root password. Although it didn't offer the largest selection of applications, OpenLinux Server 3.1 provided us with ample choice.

One weakness is that, though Caldera has invested a tremendous amount of time in the development of its OpenLinux X-based administrative utilities—including tools for patching, network and modem configuration, and

X setup—the tools didn't always work as expected. For example, whenever we attempted to alter the video resolution from within the GUI configuration utility, all other video settings would reset to an unconfigured state and would prevent X from initializing properly in the future. Sadly, text-based counterparts for configuration are almost nonexistent, so if these tools are important to you, OpenLinux might not be the best choice.

On the other hand, we found OpenLinux Workstation 3.1 to be both user-friendly and feature rich. It comes prepackaged with the StarOffice suite, making it a fully functional and productive desktop environment. Security options are lacking during install, but it does come with security tools such as Tripwire, for a form of host-based intrusion detection called binary integrity-checking; *iptables* (formerly *ipchains*) for firewalling; PortSentry automated defense against port scans; and Logcheck, for monitoring and alerting of log files. Security patches can be installed through the X-based update facility or downloaded and installed manually.

Caldera added a large Unix support



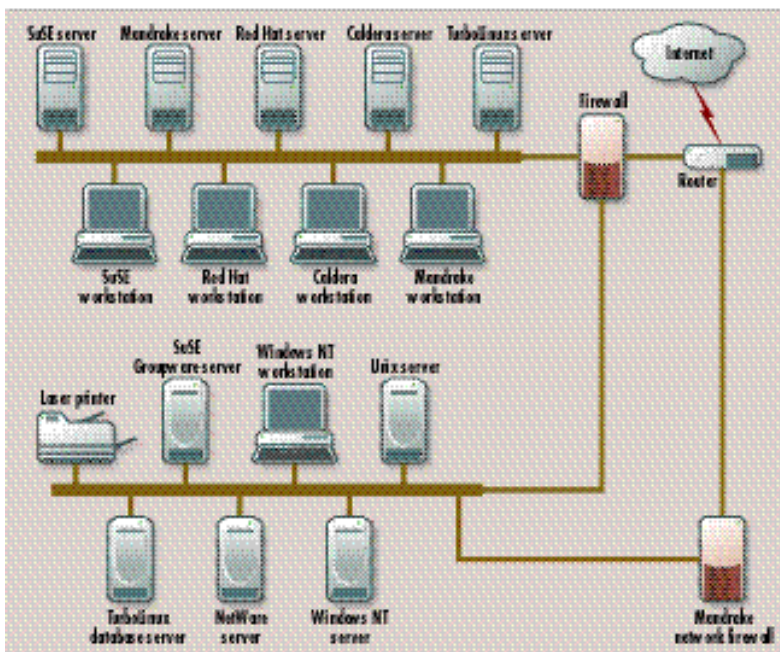
CALDERA'S GRAPHICAL CONFIGURATION TOOL IS SHOWN; NOT ALL TOOLS WORKED AS EXPECTED.

group with its acquisition of UnixWare and OpenServer from SCO. The Caldera support department handles calls for both Unix and Linux.

We had a few issues with OpenLinux. Support for wireless network adaptors is lacking, and the low-level disk and partition setup had some functionality issues. If you let OpenLinux partition your drive for you, as we did, you'll end up with a 2-GB root partition. This may be a little tight depending on how much software you install. Also, unless you drop to manual setup, the root partition will not have the ReiserFS JFS (journaling file system) but will have the stalwart Ext2 file system. Finally, make sure to select "Write Boot Sector" during install; otherwise you won't be booting to that new OS anytime soon.

OpenLinux Server 3.1, OpenLinux Workstation 3.1, \$599 (Server), \$59.99 (Workstation). Available: Now. Caldera International, (801) 765-4999, (888) GOLINUX; fax (801) 765-1313. www.caldera.com

LINUX DISTRIBUTION TEST ENVIRONMENT



C+ TURBOLINUX SERVER 6.5

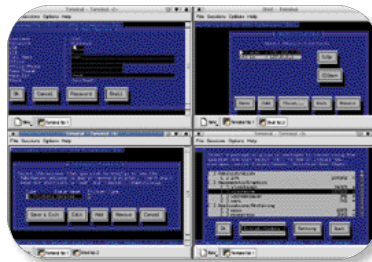
TurboLinux has positioned itself differently from the other vendors simply because of the variety of high-end platforms it supports. The company has aligned itself heavily with IBM by incorporating the distribution into many of IBM's mid- and high-range platforms, including the S/390, the eServer iSeries and the eServer pSeries. TurboLinux also offers sever-

al high-end clustering products. We evaluated only the server portion of TurboLinux because, halfway through our tests, the company discontinued general distribution of its workstation product, which will now be available by OEM only. The company asked that we not include Workstation Pro 6.1 in this evaluation.

Installation options on TurboLinux 6.5 were fairly comprehensive, offering the largest selection of file systems to choose from; however, only Ext2/Ext3 were permitted for the root partition.

TurboLinux hard-drive requirements are lean. A standard Internet install requires only 250 MB, while the more complete intranet install jumps up to just 572 MB. Obviously, TurboLinux doesn't offer the breadth of software available in some of the larger distributions, such as SuSE and Mandrake, which have typical installs of about 1 GB, but if your needs are servercentric, TurboLinux may be the choice.

If X was selected for install,




WE CONFIGURED USERS, NETWORK SETTINGS, PRINTERS AND SOFTWARE WITH FOUR OF TURBO-LINUX'S MANY TEXT-BASED CONFIGURATION TOOLS.

GNOME will be the desktop environment, as KDE support is not offered. Interestingly, TurboLinux seems to have focused much of its development on the text-based side of the house, so almost all tools are executed from the command line. The scripts all begin with *turbo*, so finding them is not a chore. You'll find tools for user and group administration, TCPWrapper configuration and network service setup.

Unfortunately, there is no slick GUI

tool for patches and updates, as we've come to expect—this too is a text-based utility. Given that, TurboLinux is clearly geared for experienced administrators familiar with Linux and not afraid to work from within the boundaries of the command line—not a bad thing, just not for everyone.

Server 6.5, \$199.95. Available: Now. TurboLinux, (650) 228-5000; fax (650) 228-5001. www.turbolinux.com 

Kevin Novak and Patrick Mueller work for Chicago-based security consultancy Neohapsis. Send comments on this article to them at knovak@neohapsis.com and pmueller@neohapsis.com.

ONLINE SPECIAL

Some mainstream Linux distributions are now putting safety—and ease of implementation—first. Read more about secure Linux distributions at www.nwc.com/1224/1224rd3.html.