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APRIL 2008 | ISSUE 168

REVIEWED

**VMware Server
2.0 Beta**

Rockbox

GREENING THE DATA CENTER

**Cfengine
for the
Enterprise**

**Set Up a
PXE Server
and Boot Kickstart
Images**

**Simplify
Administration
Tasks with Webmin**

PLUS

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CONTENTS

APRIL 2008
Issue 168

COVER STORY

GO GREEN, SAVE GREEN WITH LINUX

46 Linux offers you ways to go green and save some green at the same time.
James Gray

FEATURES

52 CFENGINE FOR CONFIGURATION MANAGEMENT

How to use cfengine to manage configuration files across large numbers of machines.

Scott Lackey

58 PXE MAGIC: FLEXIBLE NETWORK BOOTING WITH MENUS

What if you never had to carry around an install or rescue CD again? Set up a PXE boot server with menus and put them all on the network.

Kyle Rankin

64 GRAPHIC ADMINISTRATION WITH WEBMIN

New to Linux administration? Webmin can help you out.

Federico Kereki

ON THE COVER

- VMware Server 2.0 Beta, p. 40
- Rockbox, p. 42
- Greening the Data Center, p. 46
- Cfengine for the Enterprise, p. 52
- Set Up a PXE Server and Boot Kickstart Images, p. 58
- Simplify Administration Tasks with Webmin, p. 64
- Hack the Eee PC, p. 84
- A Look at Puppy Linux, p. 88
- Eliminate Tape Backups with Bacula and FreeNAS, p. 70

CONTENTS

APRIL 2008

Issue 168

COLUMNS

- 18** REUVEN M. LERNER'S
AT THE FORGE
Social Google Gadgets
- 24** MARCEL GAGNÉ'S
COOKING WITH LINUX
Happy 100th!
- 28** DAVE TAYLOR'S
WORK THE SHELL
Twittering from the Command Line
- 30** MICK BAUER'S
PARANOID PENGUIN
Security Features in Ubuntu Server
- 36** KYLE RANKIN'S
HACK AND /
Mutt Tweaks for System
Administrators
- 96** DOC SEARLS'
EOF
Getting Real about the Ideal

REVIEWS

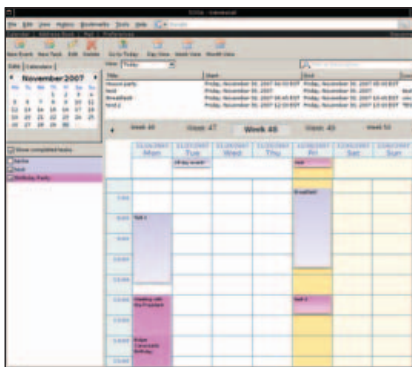
- 40** VMWARE SERVER 2 BETA
Jes Hall
- 42** IPOD + ROCKBOX =
ENTERTAINMENT
EXTRAVAGANZA
Shawn Powers

IN EVERY ISSUE

- 10** LETTERS
14 UPFRONT
38 NEW PRODUCTS
81 ADVERTISERS INDEX

INDEPTH

- 70** BACKUPS TO THE FUTURE:
ELIMINATE TAPE BACKUPS
WITH FREENAS AND BACULA
Lose the tapes. Embrace the disk.
Jeramiah Bowling
- 76** SCALABLE
OPENGROUPOWARE.ORG
Looking for an advanced Web
interface, native clients or access
through mobiles devices to your
groupware platform? SOGo has it all.
**Francis Lachapelle and
Ludovic Marcotte**



- 84** HACKING THE EEE PC
Several ideas for tweaking your
Eee PC.
Jes Hall



- 88** PUPPY LINUX
Check out this lightweight distro.
Louis Iacona



42 ROCKBOX

Next Month

TELEPHONY

Next month, Dan Sawyer compares VoIP programs for use with podcasting, and Federico Kereki shows you how to set up Skype to turn your computer into a phone, complete with instant messaging, file transfer and video conferencing. Plus, Doc Searls interviews tech pioneer Bob Frankson, who sees the "last mile" of the Internet as the end of the road for telecom—and the beginning of a networked world we make for ourselves.

As always, there's much more. *LJ* columnist Dave Taylor details installing and testing Ubuntu Linux within both VMware Fusion and Parallels Desktop on Mac OS X, John Knight takes a look at some promising new Linux software, and Salah M. S. Al-Buraiqi gives an MIPv6 primer.

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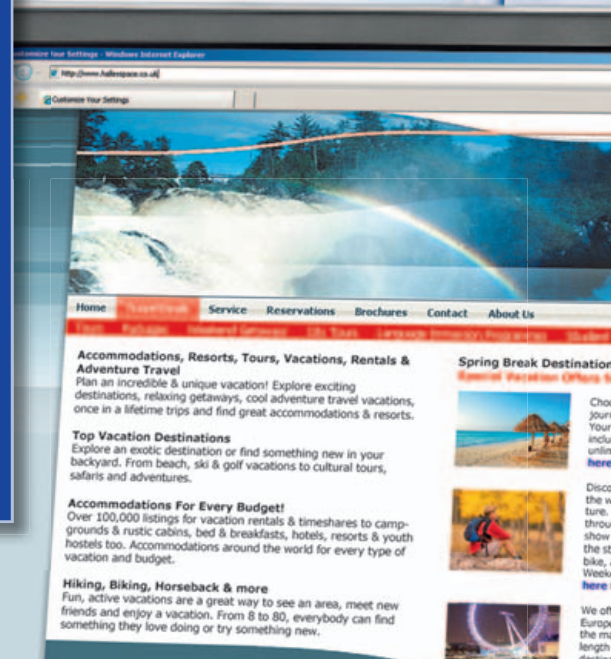
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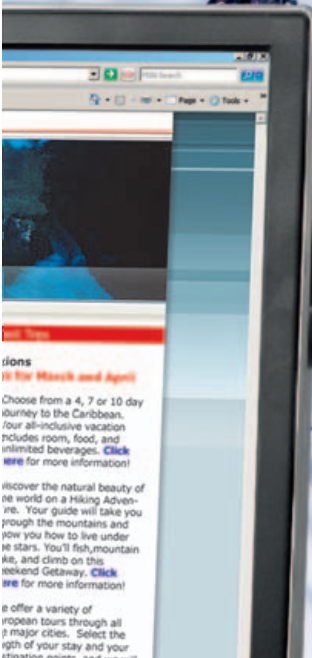
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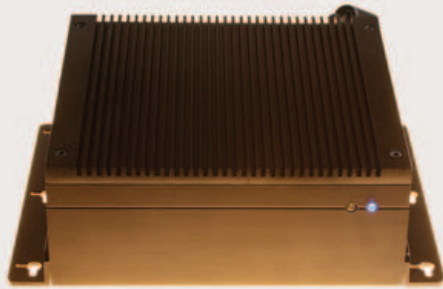


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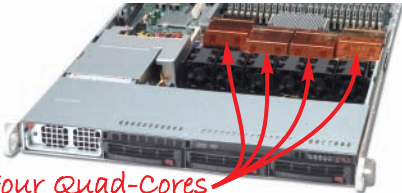
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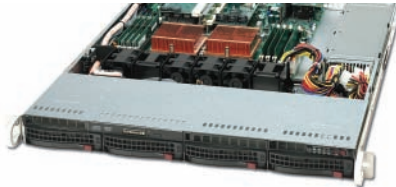
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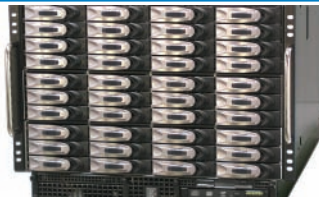


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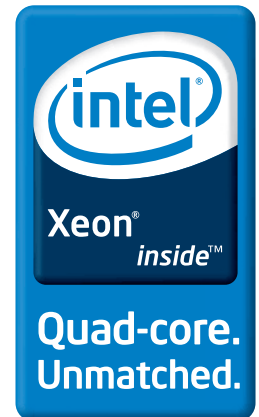
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No Virtual Panning for You!

Having recently read the Laptop Buying Guide in the December 2007 issue of *LJ*, I thought I'd let you know about something not mentioned in the article. Anyone who enjoys using a virtual screen resolution should steer clear of any notebook based on the Intel Graphics Media Accelerator X3100 (found in the Dell Inspiron 1420N mentioned in the Laptop Buying Guide). This chipset is unfortunately quite common and used in many of the "lower-end" modern notebooks.

I just bought a Lenovo Y410 to replace my six-plus-year-old HP N5450, which I use as a table-top PC at home. Going from a PIII-850 with 384MB RAM, S3 Savage video and 60GB drive (upgraded—the 20GB original drive died a year or so ago), you'd think I'd be thrilled with a Core 2 Duo 1.5GHz, 2GB RAM, 160GB SATA drive, built-in dual-layer DVD burner, 802.11g and so on, and for just \$650 after rebate—if I get that rebate! But the truth is, I'm still using that old HP a month and a half after buying the Lenovo.

The Lenovo came with Vista, but of course the first thing I did when I got it home was boot up an Ubuntu 7.10 CD. Running live from the CD, I was amazed that the 1280x800 native screen resolution worked automatically, and that I was able to get the Intel Pro/Wireless 3945ABG working on the home wireless

without any hacking. Getting the built-in 1.3M Webcam working did require actually downloading and compiling linux-uvc, but that was relatively painless. Sound support is a little sketchy. Under Ubuntu 7.10, it doesn't work automatically. You have to edit `/etc/modprobe.d/alsa-base`, and set the `snd-hda-intel` model to `fujitsu`. That gets the internal speakers working, but the headphones jack is totally non-functional (no sound output, and plugging in to it doesn't silence the internal speakers). For my intended use (table PC at home), that's not a huge deal.

But as I mentioned, the biggest issue I have with this notebook is the X3100 and Intel GM965 graphics chipset, or rather the X.org X server written for it. I've been using Linux since about 1994 (and incidentally, I've been an *LJ* subscriber since about issue #2), and this is the first X server I can remember running into that doesn't support panning around a virtual screen resolution greater than the actual screen resolution. From talking to other Linux users, I gather this is one of those emacs/vi issues. Some people hate and never use Virtual. Others always use it when there's enough video memory to support it. On my old HP, I use Virtual 1600 1200. On my desktops at home and work, I use Virtual 2500 2048. These virtual resolutions allow me to have several terminal windows, a browser, IM client, MP3 player and so on, all "visible" on one screen with little or no overlapping windows. I just pan around with my trackball/touchpad to the part of the virtual screen I want to see.

Nobody seems to mention the death of this feature when talking about current notebooks. It was only after considerable Googling that I found this thread where one of the authors of the Intel X server clearly states, "no Virtual panning for you!" (lists.freedesktop.org/archives/xorg/2007-April/023841.html).

This is a big enough issue for me that as soon as Xi Graphics supports the i965GM, I'm going to gladly pay them \$129 for a full-featured X server.

In the meantime, I'll have to get by with multiple workspaces and have

installed brightside so that I can "pan" to adjacent workspaces just by moving the pointer off the edge of the current workspace. It's not the same, but it's apparently the best I can do for now.

--
Jon Lewis

We Don't Need No Stinking Perl (in Our Shell Scripts)!

Well, Dave (Taylor) threw down an irresistible challenge in his January 2008 column when he remarked that he couldn't imagine a shell-only method of calculating the ordinal value of a letter, "without extraordinary levels of effort".

I actually found three different ways of doing this, and while it *did* take a certain amount of effort to refresh my memory on some details, I think the resulting methods are all reasonably simple. I've presented them below; the following examples are intended to be drop-in replacements for this line on page 31 of the January 2008 issue:

```
ordvalue="$(echo $letter | \  
perl -e '$a=getc(); print ord($a)-96' )"
```

Solution 1:

```
# Do this array initialization prior  
# to using "LETTERS".  
LETTERS=( { a..z } )  
  
ordvalue=1  
while [ ${LETTERS[$ordvalue]} != $letter ]; do  
    ordvalue=$(( ordvalue + 1 ))  
done
```

The LETTERS array is initialized with the letters of the alphabet, each in its ordinal position—that is, a is in the [1] position. The while loop simply uses `ordvalue` as an index into the array, incrementing it until it points to the array element that matches the desired letter. Note: Using 0 as the value of the first array element is quite arbitrary; any value will do.

Solution 2:

```
# Do this string initialization prior  
# to using "LETTERS".  
LETTERS=0abcdefghijklmnopqrstuvwxyz
```

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[LETTERS]

```
FOO=${LETTERS%${letter}*}
ordvalue=${#FOO}
```

The FOO= line matches a pattern in the LETTERS string; the pattern is the specified letter, then anything else. This pattern is removed from the end of the LETTERS string, and the length of the resulting string is determined. Since this length is simply the number of characters that precede the specified letter in the alphabet, it gives the letter's ordinal value. Note that as in the first solution, the 0 at the start of LETTERS is an arbitrary character. There is simply a need to have one extra character at the start of the string to get the string lengths right, given the way that the pattern matching/string truncation works.

Solution 3:

```
FOO=$(eval echo {a..$letter})
ordvalue=$(( ${#FOO} + 1) / 2 )
```

This one is a little bit more arcane; the FOO= line puts a string of the form

"a b c d e f" into FOO (assuming in this case that letter is f), and the next line finds the length of that string, adds 1 to it, and then divides that result by 2. This effectively gives the length of the string abcdef, which is the ordinal value of f.

Now, my question for Dave: is there some way of nesting operations, such that the temporary variable FOO could be eliminated from Solutions 2 and/or 3? I can't seem to figure out what it is, if such a way exists!

--
Mike Henders

Correction: February 2008 LJ Index

Regarding number 12 on the February 2008 LJ Index—I'm thinking this is a typo or something: 900 billion Nokia phones in use? 150 for every human being on the planet? That seems a little not right.

--
Keith Blackwell

Doc Searls replies: My error, Keith. It's 900 million. Thanks for pointing it out.

TECH TIP Finding All Modified Files between Two Dates in a Filesystem

Sometime you may want to find all files modified during the installation of a given package. This problem can be solved simply as follows:

```
echo temp > /tmp/afile
# Install your package
find /etc -newer /tmp/afile
# Find files modified in /etc
```

A useful variation is to identify all files "accessed" during the execution of a given program. Often some files under /etc are accessed, and you need to know which ones. This can be done as follows:

```
echo temp > /tmp/afile
# Run your program
find /etc -anewer /tmp/afile
```

A sneaky variation is to find all files modified between time1 and time2. Let's use the times 2007-12-02 13:45 and 2007-12-04 01:30 as an example:

```
touch -t 200712021345.00 /tmp/file1
touch -t 200712040130.00 /tmp/file2
```

```
find /etc -newer /tmp/file1 -a ! -newer /tmp/file2
```

This works by using touch -t to set the modification date of the files to set a date range for use with find.

—KIM HENDRIKSE

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WHAT'S NEW
IN KERNEL
DEVELOPMENT

Dave Jones has tracked down every available kernel release, prerelease, release-candidate and what-not, right down to Linux version 0.01, and created a 2GB git repository of the whole thing, at [git://git.kernel.org/pub/scm/linux/kernel/git/davej/history.git](https://git.kernel.org/pub/scm/linux/kernel/git/davej/history.git). For almost half of the thousand or so commits, Dave also has scoured the mailing lists and retrieved changelog entries. This represents the most complete **Linux repository** ever compiled, although unfortunately, it does seem as though some kernel versions have been truly lost forever. Also, unlike current kernel development, Dave's repository does not have a patch-by-patch accounting of every change, because no record was ever kept of those individual changes. Only the versions actually released by **Linus Torvalds** have come down to us, each of which represents dozens or hundreds of individual patches, mashed together as one. Given the wacky nature of some of these kernel hackers, it's possible that various folks will try to correct and expand Dave's repository during the coming years, and there's no telling how detailed it might become over time. Linus has volunteered to recompose changelog entries from memory, if other people do the work of gathering the patches together. Now Dave has a big pile of commits ready for Linus to make good on; once he's done with that, maybe someone will have more commits for him to comment on. In the meantime, Dave already has accomplished something of tremendous benefit to anyone interested in the history of kernel development.

Pavel Machek has started a daring attempt to give Linux systems the ability to go to **sleep** in response to one desired event and to **wake up** in response to another. The path is fraught with difficulties—the main one being the plethora of hardware in the world, all with different bugs and behaviors. Trying to support this feature universally will be like threading a very strange and complicated needle. Most of the early comments from other kernel folks were along the lines of “this can't be done”—to which Pavel essentially responded, “well, not fully, no, but this really cool part might be doable”. So, by the end of the discussion, various

folks ended up suggesting other really cool parts that might be doable as well. All in all, it looks to be a very piecemeal project, but one with fun results. Pavel envisions a system that might wake up playing particular MP3s in the morning or if particular network traffic comes down the wire. With so many folks starting to show interest, it may turn out that the whole thing is doable, one way or the other.

Borislav Petkov has taken over maintainership of the **IDE-CD driver**, in the wake of a major code reworking by **Bartłomiej Zolnierkiewicz**. Bartłomiej had done this as a one-off, just to bring the driver back into a maintainable state. Because it hadn't had a maintainer for quite a while, all the fixes and other changes going into it had tended to make the code uglier and more difficult to understand. Bartłomiej's work cleaned up the code and also made it easier for the **libata ATAPI developers** and others to identify all the hardware special cases they'll need to code around in their own projects. With the driver now in a workable state, Borislav should have a fairly straightforward time carrying it along.

There have been some other **maintainership changes** recently. **Hans-Jürgen Koch** has teamed up with **Greg Kroah-Hartman** as co-maintainers of **UIO** (Userspace Input/Output). **Swen Schillig** also recently stepped down as the **zFCP** maintainer, saying the project was about to undergo a major rewrite, and he didn't have time to shepherd it through that. Instead, he's patched the MAINTAINERS file to list **Christof Schmitt** and **Miartin Peschke** as the new co-maintainers during the rewrite, although they probably will continue to be the maintainers after the new code settles. Additionally, **Joe Perches** has removed the **TMS380 Token-Ring Network Driver** entry from the MAINTAINERS file, formerly maintained by **Adam Fritzler**.

While Joe was making that change, he also updated Adam's e-mail address wherever it appeared in the kernel tree. As a result of this, **Andrew Morton** initiated a new policy of keeping all contributor e-mail addresses in a single location, giving their names in the various files they touched, so that if an address changed, it would need to be updated only in one place. Joe fixed all the cases involving Adam.

A variety of new drivers has been submitted into the kernel. Some of these have been written recently, and others have been marinating in various forked trees until now. **David Sterba's 3G UMTS PCMCIA card wireless driver** has been in Andrew Morton's -mm tree for a while, and he recently submitted it to Linus Torvalds for inclusion in the main tree. After various technical comments from a few different folks, Andrew endorsed the patch and passed it up to Linus. Some code submissions this month came from longer ago than that. **Harald Welte** unearthed some work by **Thomas Kleffel** to support the **Samsung S3C24xx SD/MMC controller**. Thomas' work had never made it into the kernel proper and had grown a bit stale in the intervening years. Harald had brought it up to date with the current tree and the relevant APIs. He and Thomas planned to share maintainership once the code was accepted formally. And, **Andrzej Zaborowski** submitted the **OMAP1 PWL-based LCD backlight driver** to Linus, after it had lived for some time in the OMAP tree.

Other driver submissions were more genuinely new than David's, Andrzej's and Harald's work. **Thomas Bogendoerfer** submitted a new serial driver for **SC2681/SC2691 UARTs**, used in some older **SNI RM400** systems. **Alex Dubov** submitted a patch to support **Sony's Memory Stick card**, in spite of the card using a proprietary, unpublished protocol. Speaking of supporting proprietary hardware, **Adrian McMenamin** wrote a CD-ROM driver for the **SEGA Dreamcast**. The driver supports the proprietary **Giga Disk ROM** format (aka GD-ROM).

Among the numerous new drivers submitted this time around, several of them were for system-monitoring systems. **Jochen Friedrich's** submission supports the watchdog timer on **Power QUICC** hardware. This driver reboots the system if it is not touched periodically by software (that is, if the system has crashed). **Darrick J. Wong** wrote a driver to support tracking volt, temperature and fan sensor readings on the **ADT 7473** monitor chip. And, **Steve Hardy** submitted code to support the **Burr-Brown/Texas-Instruments ADS7972** 12-bit, eight-channel A-D converter, which monitors voltage on various off-the-shelf CPUs.

—ZACK BROWN

LJ Index, April 2008

1. Thousands of Linux-based ASUS Eee PCs the company hoped to sell by the end of 2007: **300**
2. Thousands of ASUS Eee PCs the company actually sold by the end of 2007: **350**
3. Thousands of Ubuntu-based NComputing thin clients to be deployed to students at schools in Macedonia: **180**
4. Estimated hundreds of dollars in cost per student for the above clients: **1**
5. Percentage of schools in Macedonia covered by the NComputing deal: **100**
6. Number of rural North Carolina schools deploying NComputing's Linux-based desktop virtualization: **25**
7. Thousands of NComputing systems deployed in the above schools: **13**
8. Thousands of NComputing systems deployed worldwide: **500**
9. Thousands of organizations using NComputing systems: **13**
10. Minimum power consumption percentage savings estimated by NComputing for its systems: **70**
11. Maximum power consumption percentage savings estimated by NComputing for its systems: **90**
12. Percentage of Americans who learn about political campaigns from the Internet: **24**
13. Percentage of Americans who sourced the Net for politics four years earlier: **13**
14. Percentage of 18–29-year-old Americans who learn about political campaigns from the Net: **42**
15. Percentage of 18–29-year-old Americans who learned about political campaigns from the Net in 2004: **20**
16. Position of the Net among all news sources on political campaigns for 18–29-year-old Americans: **1**
17. Number of Linux-based hosting companies among Netcraft's top five most reliable for November 2007: **3**
18. Number of Linux-based hosting companies among Netcraft's top two most reliable for November 2007: **2**
19. Number of open-source-based (Linux, BSD) hosting companies among Netcraft's top ten most reliable for November 2007: **7**
20. Number of open-source-based (Linux, BSD, Solaris) hosting companies among Netcraft's top 50 most reliable for November 2007: **30**

Sources: 1, 2: *Mobile Magazine*
 3: NComputing and DesktopLinux.com
 4: NComputing, DesktopLinux.com and Engadget | 5–11: NComputing
 12–16: PewInternet.org | 17–20: Netcraft.com

Let's Call It a UVPC

Technically, the Noahpad from E-Lead Electronic is a Linux-based UMPC, or an Ultra-Mobile PC. Generally speaking, a UMPC is smaller than a notepad and bigger than a Mobile Internet Device (MID). But, in fact, the Noahpad is so versatile and odd, it may deserve another category entirely.

Let's start with the keyboard. Its two springy squares are divided into what you might call a bingo grid (5x5) of keys, all printed on the square and separated by raised dark lines. These serve to keep your fingers on the "keys"—an alternative to the conventional approach, which orients touch via spaces between keys and convex bowls for your fingertips. Thus, the Noahpad has just two (barely) moving "keyboard" parts, even though the two

squares also add 50 function keys to the usual QWERTY lineup.

But, that's not the half of it. Both squares are touchpads—big ones. You can go from typing to pointing without leaving the two pads. Navigation is also novel. For example, you can use the touchpad to move around the window view, expanding the perimeter of the screen desktop beyond the borders of the screen itself.

Speaking of which, the 7" backlit 1040x768 display also is a touchscreen, and it can pivot and flip around both sides of the base to become a writing pad, a display or...you decide. E-Lead suggests many possible Noahpad uses: a car GPS (with a larger screen than just about every standard built-in or aftermarket GPS), a "hangable"

multimedia player, a digital photo frame and even a jogging companion. "Classmate, roommate, travelmate", the slogan goes.

Tech details: 1GHz VIA Eden CPU, 512MB of RAM, 30GB HD, 300k pixel cam, Bluetooth, "Ethernet 10m/100M USB to RJ45 dongle", 802.11b/g, external 3.5g compatibility, Wi-Fi and Ubuntu 7.10. For more information, visit www.noahpad.com.

—DOC SEARLS



The E-Lead Noahpad UMPC (ultra-mobile PC) runs on Linux.



What Are They Using?

Angel Roman is a 24-year-old star software architect with the Bug Labs team in New York. Bug Labs (subject of an UpFront piece in the December 2007 issue of *LJ*) is becoming familiar in Linux circles as a hack-ready DIY hardware development and assembly system. At the Consumer Electronics Show in January 2008, I got some hang-time with the Bug Labs people and was especially impressed not just with Angel, but also with how he had hacked together his own personal assortment of Linux gear. Here's the rundown he provided at the constantly crowded Bug Labs booth:

- Handheld/UMPC (ultra-mobile PC): Nokia N810. "It's a great device", he says. His main everyday use of it is reading books on the subway between his home in the Bronx and Bug Labs' offices in Manhattan. "I basically use a .pdf reader, plus an e-mail client."
- Phone: Motorola E6 ROKR. "This is a Linux phone that I use as a GPRS modem for my Nokia N810 over Bluetooth."
- Laptop: Lenovo X61 tablet, running Ubuntu Linux. "I looked at the new Fujitsu 810. It was small with a resistance touchscreen, and the driver didn't work so well. But Linux has support from Wacom. So I decided to get a Wacom tablet. I previously had another ThinkPad that had Ubuntu working perfectly. So I decided to stick with Lenovo, got the X61, and installed the Wacom drivers....On an airplane, the screen re-oriens. Somebody figured that there's an



Angel Roman of Bug Labs and His Gear

accelerometer in the machine, and wouldn't it be nice if you could guide *Tux Racer* that way." Then, Angel picks up the machine and moves it around as if steering a penguin down a ski slope. "So I knew that if I stuck with Lenovo, I'd have good support for drivers. And so far, that's worked out." He makes heavy use of the X61 as a tablet. "I can make use of the whole screen area. And I found something called Cell Writer, which I can train to know my handwriting. It works really well, and it's fast. You can even suspend and resume. It's an excellent solution as a tablet."

—DOC SEARLS

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—KATHERINE DRUCKMAN

They Said It

Life is short enough without imposing corporate metrics onto your friends.

—Hugh McLeod, www.gapingvoid.com/mt/mt-tb.cgi?__mode=view&entry_id=4389

And I keep on fighting for the things I want
Though I know that when you're dead you can't
But I'd rather be a free man in my grave
Than living as a puppet or a slave

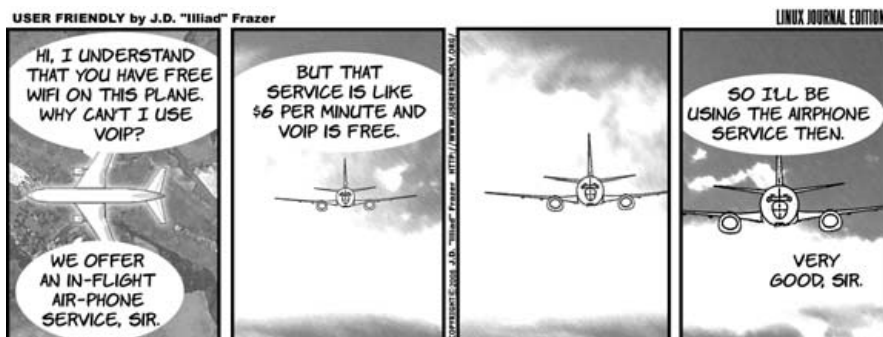
—Jimmy Cliff, www.bluesforpeace.com/lyrics/harder-they-come.htm

Creative geniuses stumble; they trip; they make horrible mistakes. Their highest and most acclaimed successes are constructed on the low rubble of humiliating failures.

—Dean Keith Simonton, blog.washingtonpost.com/achenblog/2007/11/when_genius_bombs.html

The chances are that, in the course of his lifetime, the major poet will write more bad poems than the minor.

—W. H. Auden, blog.washingtonpost.com/achenblog/2007/11/when_genius_bombs.html



Linus on Linux

In January 2008, Linus Torvalds was interviewed by Jim Zemlin for the inaugural podcast of the Linux Foundation, for which both Linus and Jim now work. Here are a few excerpts from a transcript of their dialogue, organized under headings that highlight what's changed, what hasn't and what never will, as long as Linus is leading Linux.

Code rules.

"I have a policy that he who does the code gets to decide...But at the end of the day, the only thing that matters is actual code and the technology itself. And the people who are not willing to step up and write that code, they can comment on it and they can say it should be done this way or that way or they won't, but in the end, their voice doesn't matter. The only thing that matters is code."

Corporations don't.

"...it doesn't matter at all who you work for pretty much because nobody really cares."

"...if you're in a tech company and you have interest in something like the Linux kernel, the reason you have interest in the Linux kernel probably has something to do with the kind of people you have working for you."

"I think most companies have slowly started to learn..."

We have our differences.

"...one misleading thing is thinking that people kind of share ideals and goals, and that's not true. It's quite often the case that people have completely different goals; you have commercial vendors who have their very clear commercial goals and in the Open Source, so-called community, you often find individuals who really don't like commercial entities, especially not the big ones. So, quite often, the goals are very different."

Like Yoda said.

"Trust either comes or it does not come and it largely depends on your actions."

"...it used to be a huge issue when companies kind of were talking about 'How do we interact with the community?'"

"...when the real answer always ends up being you don't interact with the community, you just act as a member of this non-existent community."

"...you don't interact with it, you are part of it."

Looks matter.

"I think the thing that more people worry about is actually interfaces."

"It makes more of a difference that the way you connect to a mobile phone is different from the way you connect to a desktop. You have a very limited keyboard, you have touchscreen issues, you have a very small screen, and I think the bigger issues tend to be in things like the UI interfaces."

Continue forgetting ABIs.

"The lack of an ABI is twofold: one is we really, really, really don't want one. Every single time people ask for a stable ABI, the main reason for wanting a stable ABI is they want to have their binary drivers and they don't want to give out source and they...certainly don't want to merge that source into the stable kernel or the standard kernel."

"And that, in turn, means that all the people who actually do all the kernel work and maintain the kernel are basically unable to work with that piece of hardware and that vendor because if there's any bugs whatsoever, we can't fix them."

"So, all the commercial vendors—even the ones who used to accept binary drivers—have moved or are moving away from wanting to have anything at all to do with binary drivers because they're completely unmaintainable."

"...other projects...have binary interfaces for one reason or another—quite often because of commercial reasons—and that just means that they cannot fix their fundamental design."

The verities still are.

"You need to have the code out there, not because of any social issues, but simply because you don't know who's going to be the one who has to fix it."

Vendor suckage may vary.

"There are certainly specific vendors

who end up having more problems than others. In fact, sometimes the same vendor may be very good in one area and very bad in another area."

"Broadcom is an example of this."

They are—they have actually been fairly good when it comes to high-end gigabit network devices, wired network devices, but...when it comes to wireless networks and other more consumer devices, they've been completely unable or unwilling to help us at all."

Practical vs. perfect.

"I'm fairly pragmatic, so I don't care, per se, about one particular license or another. I want to pick the license that makes the most sense for what I want to do. And at this point in time, Version 2 matches what I think we want to do much, much better than Version 3."

"...the GPL Version 3 reflects the FSF's goals and the GPL Version 2 pretty closely matches what I think a license should do and so right now Version 2 is where the kernel is."

"Could there be something that happens to change that? Maybe."

"...I cannot change the license on my own anymore. I mean, because I have accepted code over the last 15 years by people who kind of accepted my original choice of the GPL Version 2, I'm not just, I think, ethically bound by those people's choices. I am also actually legally bound."

It's still fun.

"...it's just a lot of fun working with people; even though, I mean, I sit in my basement all day long and actually don't meet anybody at all, but what I do is essentially communicate and it is very social..."

"...what drives, motivates me is the fun part. I mean, part of being fun is that it should be difficult enough to not be trivial. So, fun doesn't mean that it's frivolous; it just means it's interesting and exciting."

For more, visit linux-foundation.org.

—DOC SEARLS



REUVEN M. LERNER

Social Google Gadgets

How do we turn a Google Gadget into an OpenSocial application? An initial look at the OpenSocial API—what it includes, as well as what it doesn't.

The past year has seen an explosion in the growth of social-networking sites like Facebook. People have jumped at the opportunity to find existing friends, make new ones and spend time communicating and participating in group activities on-line. Facebook might be the best-known site, but LinkedIn, Ning, Hi5, Orkut and others also have become popular.

As we might expect in a competitive marketplace, each of these sites has tried to offer unique features to encourage new people to sign up. During the summer of 2007, Facebook unveiled one of the most interesting and powerful of these features in its developer platform—basically, a way to integrate third-party Web applications into Facebook.

This API has led to a torrent of applications being developed for Facebook. It's not clear whether anyone is making money off these applications or whether there are any that people find truly useful (rather than frivolous). But, there are plenty of indications that Facebook's API is an important milestone for social-networking applications and for Web applications in general. For the first time, we have a Web site that is providing an open platform for application development.

In response to the popularity of Facebook's developer API, a number of competitors announced they would be supporting a similar API, known as OpenSocial. Applications written for OpenSocial should work equally well on all compliant social networks. Thus, instead of writing one application for MySpace and another for Ning, you can write the application once and deploy it on many different networks. The exception, at least for now, is Facebook; whether Facebook decides to join the OpenSocial consortium or provide a compatibility layer remains to be seen.

The OpenSocial specification was spearheaded by Google and is based on the specification known as Google Gadgets, part of the personalized iGoogle page for some time. Last month, we looked at how to build a simple Google Gadget, which packages HTML and JavaScript into an XML wrapper.

This month, we look at how to take our simple Google Gadget and turn it into an OpenSocial-compliant application. We begin to see the pros

and cons of the OpenSocial standard and consider ways to make use of its capabilities.

Making the Gadget Social

As we saw last month, the simplest possible "Hello, world" Google Gadget looks like the following:

```
<?xml version="1.0" encoding="UTF-8" ?>
<Module>
  <ModulePrefs title="Hello world" />
  <Content type="html">
    <![CDATA[
      Hello, world!
    ]]>
  </Content>
</Module>
```

The gadget comes as an XML file, with a Module section and a Content section. The Module section allows us to specify gadget-specific preferences, using the ModulePrefs tag. The Content section, as you might expect, contains the HTML and JavaScript that will be displayed and executed for the user.

We can turn a simple gadget into an OpenSocial gadget by adding a new Require tag within our Module tag:

```
<?xml version="1.0" encoding="UTF-8" ?>
<Module>
  <ModulePrefs title="Hello world" />
  <Require feature="opensocial-0.6" />
  <Content type="html">
    <![CDATA[
      Hello, world!
    ]]>
  </Content>
</Module>
```

The Require tag indicates that our gadget is implementing the OpenSocial standard, version 0.6. (A new version undoubtedly will be released by the time this column is printed. The initial version, 0.5, was superseded by 0.6 in late December 2007.) Other than that single line, this is the same "Hello, world" widget we installed on our iGoogle page last month. In theory, we can go ahead and install

this application on the social-networking site (OpenSocial container) of our choice, and it'll work just fine.

Adding Social Functionality

"Hello, world" is boring enough as a standalone program; using it as an example of a social-networking API seems almost silly. For a gadget to become a fully fledged OpenSocial application, it needs to demonstrate an ability to interact with other people. More precisely, a socially aware application should be able to find out something about me and my friends, as well as what I (and my friends) do.

The OpenSocial API addresses this by offering three types of functionality:

- People and relationships: get information about you, your friends and the various pieces of data associated with those friends. The Person class provides access to this information.
- Activities: social-networking sites are interesting

because they let you interact with your friends in a variety of activities. These activities can range from exchanging messages to answering questions in an on-line poll to keeping up to date on the latest sports scores. OpenSocial sees an activity as a collection of actions within a particular container. The Activity class provides access to this data.

- Persistence: OpenSocial makes it possible for an application to store information between sessions. One of the most interesting aspects of this persistence API is the fact that storage is handled by the OpenSocial container, not by the application. There is no Persistence class for handling such data. Rather, the data is read and written by invoking methods on the overall opensocial object. Note that the persistence layer lets applications store data globally, as well as on a per-user or per-application instance basis, as needed.

Interactions with these three objects, as well as with the OpenSocial API in general, is done via

Expert included.

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method calls on the `opensocial` object. Typically, methods execute asynchronously, with a callback method specified as one of the invocation parameters. For example, we can get information about the person currently running (viewing) our application by creating a new OpenSocial data request and indicating what request we want to make:

```
var req = opensocial.newDataRequest();

req.add(req.newFetchPersonRequest(opensocial.DataRequest.
  ▶PersonId.VIEWER), "viewer");
```

We then send the request to our container:

```
req.send(response);
```

The response parameter is a function; as soon as the request returns a response, that function will be invoked. Moreover, when the response function is invoked, it will be passed a single parameter that contains the results from our method call.

Applications written for OpenSocial should work equally well on all compliant social networks.

We can send multiple queries within a single data-request object; all we have to do is invoke `req.add` multiple times. As you can see from the above line of code, invoking `req.newFetchPersonRequest` required that we both indicate what we want to request, and that we give it a symbolic name (`viewer`). This naming allows us to pull apart different types of response data within a single object.

You might be wondering what stops the viewer from being able to retrieve arbitrary data from the OpenSocial container. The answer is that OpenSocial defines two basic types of people: the viewer and the owner. The former, as we have seen, refers to the person who is running and viewing the operation—and might even refer to no one at all, if our system permits anonymous browsing. The owner, by contrast, must be a defined person on the system, and may very well refer to the same person as the viewer. But at least in theory, OpenSocial will provide only limited information to viewers about owners with whom they have no relationship.

Who Are Your Friends?

Perhaps the simplest type of application we can write with OpenSocial is one that shows the current user's friends. Better yet, because friends on a social-networking site typically upload their pictures, we even can display a list of the viewer's friends.

Last month, we saw how we can modify the HTML in which a Google Gadget—or an OpenSocial application—is running. Create an empty div, build up the HTML in a variable, and then set the div's `innerHTML` property to be that of the variable. For example:

```
html = "<p>Hello</p>";
div.innerHTML = html;
```

In order to display a list of the viewer's friends, we need to retrieve a list of those friends. We then can iterate over those friends, putting their thumbnail image URL in our `html` variable.

In order to retrieve a list of friends, we must do the following:

```
viewer_friends = opensocial.DataRequest.Group.VIEWER_FRIENDS;
req.add(req.newFetchPeopleRequest(viewer_friends, opt_params),
  ▶"viewer_friends");
req.send(response);
```

The above request contains a single query, which we call `viewer_friends`. (Don't be confused by the `viewer_friends` variable, which was introduced simply to make the lines easier to understand.)

When the method has finished executing asynchronously, it invokes our response function. We can define it like any other JavaScript function, and Google's documentation even indicates that you can use JavaScript libraries, such as Prototype or Dojo, inside an OpenSocial application.

Google already has included a number of useful JavaScript functions as part of its implementation of gadgets, meaning that a Ruby-like each method is available to us. That method, which typically is invoked on an array, takes a function as a parameter. The function is executed once for each element of the array, with each array element being passed to the function in turn. Thus, we can write our response method as follows:

```
function response(data) {
  var viewer_friends = data.get("viewer_friends").getData();
  viewer_friends.each(function(person) {
    var thumb =
person.getField(opensocial.Person.Field.THUMBNAI URL);
    html += '<img src="' + thumb + '</>';
  });

  document.getElementById('main').innerHTML = html;
}
```

Our response method is invoked only after the request has been sent. Its data parameter is populated with the response to our query, which we can retrieve with its name (`viewer_friends`). We then use

the `getData()` method on the resulting object to give us the data that interests us, namely an array of person objects.

Each person in OpenSocial has a few required properties, among them the URL of their personal thumbnail picture. You can see from the above example that we retrieve it by invoking the `getField()` method on a person, indicating which field we want by using a value provided by the OpenSocial framework. We can use several such values, including ID (for their unique ID), NAME (for their name) and even PROFILE_URL (for the person's home page URL on the system). Beyond those basic fields, a well-behaved OpenSocial application must query its container to make sure that it's available.

Does OpenSocial Work?

One of the biggest problems with OpenSocial is its inherent diversity and cross-platform functionality. Programmers who create desktop applications have discovered—often the hard way—that different operating systems have different conventions for

how dialog boxes, or even menus, look and feel. These often-subtle design distinctions can play a major role in the usability of an application.

Thus, it'll be interesting to see what happens when OpenSocial applications are unveiled and are supposed to work cleanly on all systems. One of the Facebook platform's great advantages is the fact that it shoehorns application content into a standard look and feel. This is missing with OpenSocial, and although it encourages diversity, I'm far from convinced this will be good for end users.

Another, and more serious, issue with OpenSocial is that it is designed to let applications run in different contexts, not seamlessly join data from diverse social-networking systems. Yes, it's nice that software developers will be able to release their code on multiple platforms at the same time. But as a user as well as a developer, I'm interested in getting a comprehensive list of all my friends/contacts/links from all the social networks to which I belong.

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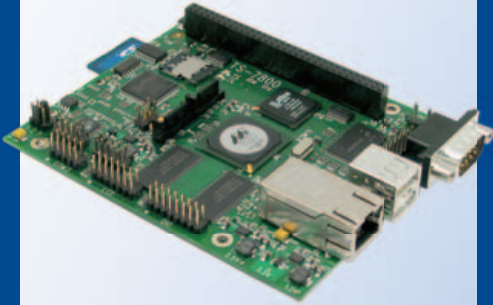
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COLUMNS

AT THE FORGE

well-known blogger Robert Scoble was kicked off Facebook for downloading his contact list into another program. (His account was reinstated within a few days.) The notion that data should stay locked within one of these systems, rather than be freely downloadable and transferable by the people who entered and approved it, is disappointing.

If I create a forum application using OpenSocial, and I use the persistence API in order to store messages, it might work just fine. But, what if I want the forum to work across different networks, such that forum postings are persistent not only across users, but also across the different OpenSocial containers? That appears to be completely unsupported by the standard. And although such capabilities would seem to be against the interests of the various social-networking companies, it is most certainly in the interest of the individual users.

Of course, given that OpenSocial is nothing more than a specification and set of JavaScript libraries, there's still hope. Perhaps someone will create a JavaScript library that allows OpenSocial client applications to store and retrieve state on a remote server (that is, not on the OpenSocial container's server) in a format that can be unpacked and used across systems easily. Such a library might be difficult to create, particularly given the various user-visibility and privacy issues. But, it would be an additional step toward not just code portability, but data portability, that many people would like to see in OpenSocial.

I should note that I'm not the first or only person to raise some of these concerns. Tim O'Reilly, among others, has expressed his disappointment with the initial versions of OpenSocial (see Resources).

Conclusion

OpenSocial provides a standard library and packaging system for applications that fit into a social-networking site. Assuming that enough sites implement the OpenSocial specification, this will greatly ease the burden from developers, who still will have to develop for Facebook.

This month, we took a short look at what the OpenSocial standard offers developers and how we can create applications that take advantage of these supports. We also saw how OpenSocial applications communicate with the enclosing containers. Finally, we saw how we can even create a simple application in only a few lines of carefully chosen code.

It remains to be seen whether OpenSocial will succeed, either on its own or as a competitor to the Facebook development platform. I do believe that it needs to become more mature before it will be truly useful. But, the intentions are definitely positive, and there is a great deal of potential for good to come out of this standard. ■

Reuven M. Lerner, a longtime Web/database developer and consultant, is a PhD candidate in learning sciences at Northwestern University, studying on-line learning communities. He recently returned (with his wife and three children) to their home in Modi'in, Israel, after four years in the Chicago area.

Resources

Examples: code.google.com/apis/opensocial/articles/firstgadget/firstgadget-0.6.html

Description of OpenSocial: blog.pmarca.com/2007/10/open-social-a-n.html

OpenSocial Screencast: blog.pmarca.com/2007/10/open-social-scr.html

OpenSocial Specification: code.google.com/apis/opensocial/docs/spec-0.6.html

Tim O'Reilly's Arguments in Favor of "Data Mobility" within OpenSocial: radar.oreilly.com/archives/2007/11/opensocial_social_mashups.html

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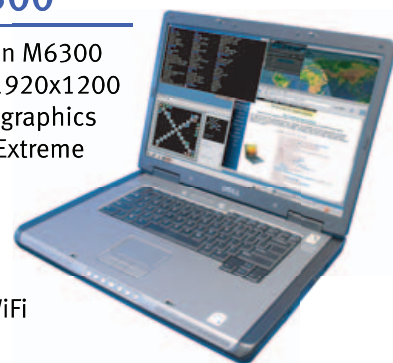
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MARCEL GAGNÉ

Happy 100th!

Does that really say 100 years?

This is indeed an exciting evening, François. This issue of *Linux Journal* marks the 100th Cooking with Linux column by your humble *patron, mon ami*. You've done an excellent job on the decorations, François. I am very impressed, but I do have one question. Don't you think there's something just slightly wrong with the giant cake you ordered for this event? You do not see it? *Mon ami*, it says, "Congratulations, Cooking with Linux, on being 100 years old!" the column is 100 issues old, not 100 years. *Mon Dieu!*

I can see our guests approaching even now, François. Please, get the door. Welcome! Welcome, everyone, to *Chez Marcel*, the meeting place of great Linux and open-source software and exceptional wines. Your tables are waiting, *mes amis*, so please sit and make yourselves comfortable.

Tonight, *mes amis*, we are privileged to count among our guests, internationally renowned wine writer, Decanter World Wine Awards chair and member of the Order of Canada, Tony Aspler. For those of you who may not know, the Order of Canada represents Canada's highest civil honor. He has graciously agreed to select a wine for us tonight. Your suggestion, Tony?

"This is a wine to drink with duck breast, for après-ski, romantic situations, wakes or software writing: Le Clos Jordanne Vineyard Pinot Noir 2005—medium ruby colour; a nose of dried flowers, minerals and raspberries; richly extracted; velvety mouthfeel; firm but elegant with a long cranberry and pomegranate finish. A lovely wine to drink now or hold for 2–3 years. Five stars!"

An excellent recommendation! Thank you! And, as it turns out, we happen to have several bottles in our cellar. François, please hurry down and fetch the wine for our guests. While my faithful waiter goes for the wine, and before I introduce the first item on tonight's menu, my sincere thanks to Tony Aspler for suggesting tonight's wine.

System administration sounds like something the computer person at your company does in the server room, but anybody using a desktop computer of any kind also plays administrator from time to time. If you've ever spent time looking for old files to clean up, you've done system administration. Have you ever added and configured a printer? Backed up your files? Created folders and reorganized your music files into categories? Installed a new game? Yes, *mes amis*, every one of those examples

represents part of what system administration is. On the surface, it may not sound like fun, and although some of it is the drudgery of keeping your system up and running properly, there is a lighter side to maintaining your system, from setting the default look and feel of your desktop to activating some serious eye candy.

Ah, François, you have returned. Please, pour for our guests.

Historically, system administration may have gotten its übergeek reputation due to the command-line-intensive nature of administration. In the sleek and modern world that is today's desktop Linux, command-line administration, though still available, is relegated to the past for most users. GNOME users can find everything they need to administer their systems in the top panel menus, starting with the System menu. If you need help, this is the place to start, because the GNOME help system is available from the System menu. You also can lock your screen with a password (when you run off for coffee or a muffin), or log out of your current Linux session.

Right at the top of the System menu is the Preferences submenu (Figure 1).

The Preferences menu is all about personalizing

Note:

The screenshot in Figure 1 is from an Ubuntu live DVD, which is why you can see that install icon and Examples folder on the screen. The Examples folder contains a number of sample documents, spreadsheets, images and multimedia files to try with your Ubuntu Linux system.



Figure 1. The Preferences submenu allows you to change your personal settings.

the user experience. Because these are personal options, none of them require administrative privileges, even though these are still considered administrative functions. You can set a screensaver, change the background and window decorations, or play with the colors. If the fonts look a little small, there's a simple option for changing the size of what you see on the screen. And speaking of your screen, changing the screen resolution is easy and doesn't require you to restart your graphical environment.

Let's take one more step down into the System menu and look at the Administration submenu (Figure 2).

Granted, when you go from Preferences to Administration, it does sound a bit scarier, but drink a little more wine, relax, and it will all seem friendlier shortly. From time to time, you will want to do things on your system that affect everyone who logs in equally. Changes made under Preferences don't affect anyone but the current user, and if your niece, Stephanie, chooses some garish desktop colors, it won't affect you when you log in. Making

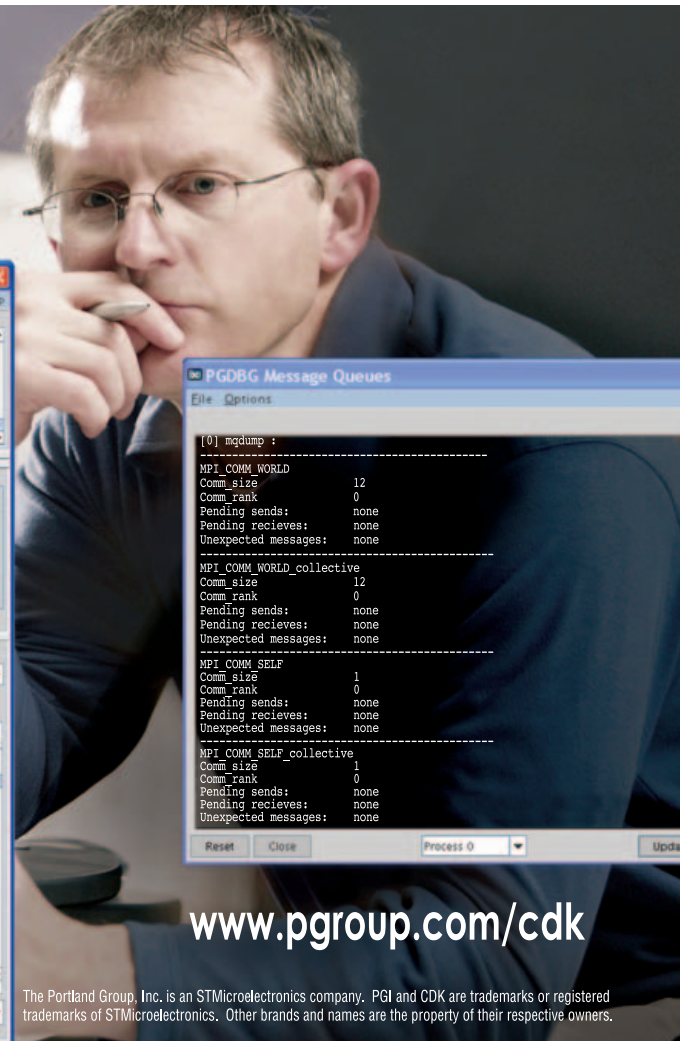
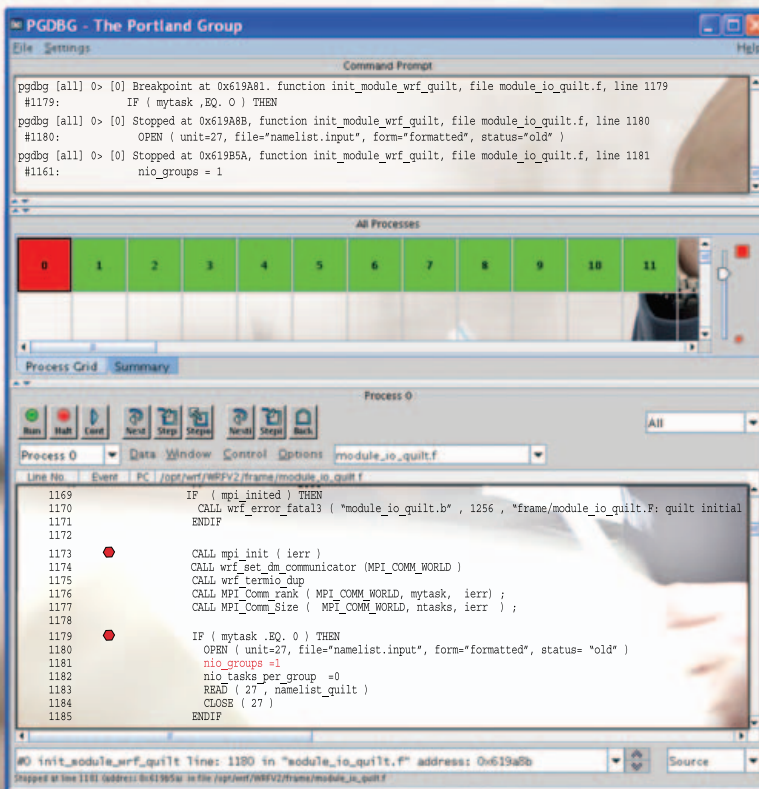


Figure 2. GNOME's Administration submenu is the starting point to configure your network, check logs, install software and more.

sure everybody gets treated equally isn't all there is to it. The Administration functions cover the gamut

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from setting up a printer to configuring your Internet access. You can share folders (so others on your home or office network can use them), look at system logs, change the look and feel of the login screen and add users.

Perhaps one of the most important functions here involves updating and maintaining the packages on your system. Staying up to date is one of the best ways to keep your system humming along nicely and securely.

All right, let's look at how KDE does things when it comes to system administration. Currently, there's a transition happening in the KDE world, and it's a fairly major one. The venerable and powerful KDE 3.5 is making way for the new, improved, and in many ways, very different, KDE 4 desktop. To ease transition, certain things started changing later in the KDE 3.5 releases. One of those things had to do with system administration, as the old KDE Control Center was slowly replaced by System Settings (command name, `systemsettings`). System Settings is more intuitive, easier to navigate and easier to work with. From System Settings, you can change the look and feel of your system, configure hardware, networking, sound, printers and a host of other things. You'll usually see System Settings directly under the program launcher menu. On KDE 4's Kickoff launcher, look for it under the computer icon. When the System Settings window appears, you'll see a two-tabbed view, with an Advanced tab in the background and the General tab selected by default (Figure 3).

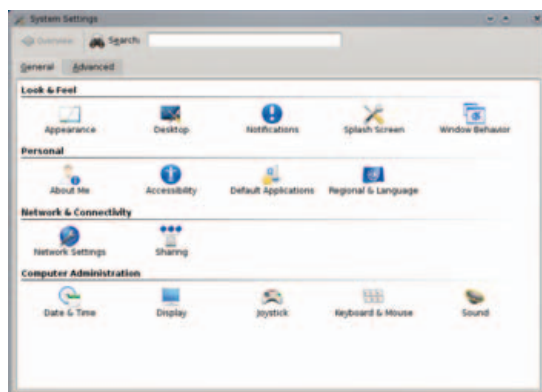


Figure 3. The Systems Settings dialog from KDE 4.0 gives you access to most desktop administration functions.

General settings are broken up into four major categories: Look & Feel, Personal, Network & Connectivity and Computer Administration (isn't it all administration?). Although many settings affect personal desktop settings, other functions that can affect the entire system do require Administrator privileges. In those cases, you'll see a button to

activate system privileges.

Of course, I did mention that administering your system could involve playing with some serious flash, pizzazz and glitzy eye candy. KDE 4 users get a serious dose of this with the new Kwin composite desktop and its plasma desktop and related toys. Simply click the Desktop icon from the General tab (under Look & Feel), then, under the two-tabbed window that appears, check Enable desktop effects. Select all the so-called common effects, then click on the All Effects tab (Figure 4).

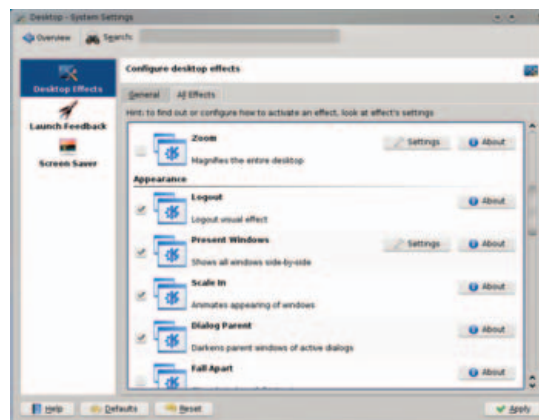


Figure 4. For serious eye candy, KDE 4 users can turn a little of their administration time over to some glitzier pursuits.

Under this All Effects section, you'll find lots of great desktop toys. Some of them are strange little special effects, and others are actually quite useful enhancements to your desktop experience. For instance, there's a magnifier tool that magnifies the section of the desktop that is under the mouse pointer. For some, trying to find the cursor on that busy desktop is sometimes difficult—a task that can be made even more taxing by your choice of color and desktop theme. Have no fear, as yet another cool desktop effect comes to your rescue. Activate the Track Mouse effect. When you next lose your cursor, activate the mouse tracker by pressing the Ctrl

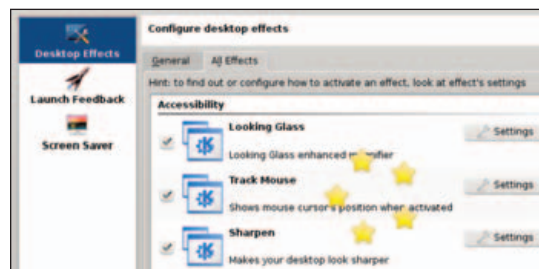


Figure 5. Lost your mouse pointer? We can find it for you, surrounded by stars.

and Meta key. Five bright yellow stars appear orbiting the mouse pointer (Figure 5).

Although there are preset key defaults, many of these can be overridden by clicking on the Settings button next to the listed effect. For instance, you may not like the key sequence provided for the Looking Glass effect (the Meta key on my notebook is the so-called Windows key, and I might not want that). Once the Settings button is clicked, a small window appears with the default keyboard shortcuts selected (Figure 6). You can click on the key sequence and make your change. If you muck things up, you always can press the Defaults button to return things to normal.

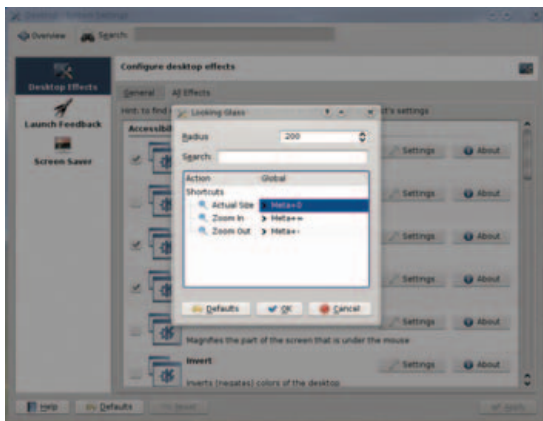


Figure 6. Default key and mouse combinations for various effects can be edited by clicking the Settings button.

Of course, useful is open to interpretation. One of the effects lets you use your mouse pointer to draw on your desktop. You can make windows and decorations translucent or have objects fade away on the screen. You can dim active windows or fade parent windows when configuration dialogs appear (Figure 6). You may find it useful to have windows explode when you close them. Or, it may be better for your productivity to have them fall into a thousand pieces (Figure 7). Be warned; if you choose the exploding or falling-apart window effect, even tooltips explode when they close.

There are several different effects to play with, all of which should impact your productivity nicely, at least for a little while. And remember, if your *patron* ever comes by your desk and asks what you are doing with all these fancy exploding windows, animations and what not, say you are doing your job—system administration.

We may well be able to change just about anything on our systems, but sadly, *mes amis*, there is little we can do to change the time on the wall. There is still plenty of wine, however, and François will be offering some of that amazing

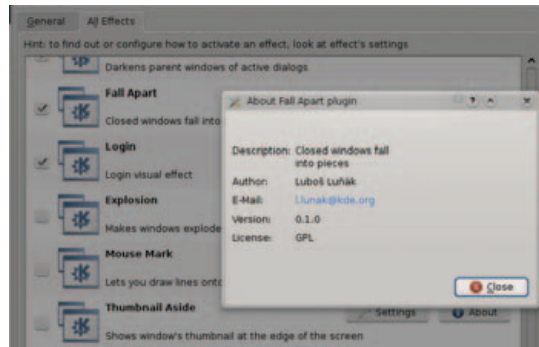


Figure 7. Windows look better when they fall apart as they close.

100th birthday cake along with some fantastic café au lait after you finish your wine. In closing this 100th Cooking with Linux, I want to thank you all for coming each and every month. My thanks also to Tony Aspler for his wine suggestion and to my ever-faithful waiter, François. When you've finished taking your bows, François, please make sure everyone's glass is refilled.

Raise your glasses, *mes amis*, and let us all drink to one another's health. *A votre santé! Bon appétit!* ■

Marcel Gagné is an award-winning writer living in Waterloo, Ontario. He is the author of the *Moving to Linux* series of books from Addison-Wesley. He also makes regular television appearances as Call for Help's Linux guy and every month on radio's Computer America show. Marcel is also a pilot, a past Top-40 disc jockey, writes science fiction and fantasy, and folds a mean Origami T-Rex. He can be reached via e-mail at mggagne@salmar.com. You can discover lots of other things (including great Wine links) from his Web site at www.marcelgagne.com.

Resources

GNOME: www.gnome.org

KDE 4 Visual Guide: www.kde.org/announcements/4.0/applications.php

Marcel's Web Site: www.marcelgagne.com

The Order of Canada: www.gg.ca/honours/nat-ord/oc/index_e.asp

Tony Aspler, The Wine Guy:
www.tonyaspler.com

Webmin: www.webmin.com

The WFTL-LUG, Marcel's Online Linux User Group:
www.marcelgagne.com/wftllugform.html



DAVE TAYLOR

Twittering from the Command Line

Incessant status updates to your cell phone from the command line? Sure, with a little help from curl and Twitter.

If you've been around the Linux and UNIX world as long as I have (is it really going on 30 years? How could that be?), you'll be familiar with the various attempts at multiperson chat that have come down the pipeline, from simple command-line tools to the curses-based "talk" program to Internet Relay Chat (IRC) chaos. Occasionally fun, but often a complete waste of time, there's still something appealing about having an open line with a circle of friends and colleagues.

A few years ago, that mantle was assumed by the status line in Facebook, where hard-core users update their status throughout the day to reflect the meetings they're attending, conferences they're involved with, dates with their spouses or significant others, concerts, fights with parents and so on. The problem is, that's useful only if the people in your circle are also rabid Facebook fanatics—a shortcoming that's true of any of these services, of course.

Simultaneously, flashmob instigators found that Web-based tools could help them organize, and services like Dodgeball were created. (A flashmob is a spontaneous gathering of people organized by cell phone or text messaging.) Dodgeball was bought by Google and then strung out to die, but the meme of status messages as a form of shared communication continued to evolve, and the latest evolution is a weird, sometimes overly voyeuristic, on-line service called Twitter (visit twitter.com).

During the past few months, I have found Twitter oddly compelling, in a manner perhaps analogous to Jimmy Stewart being unable to tear himself away from his binoculars in *Rear Window* (even while the breathtakingly gorgeous Grace Kelly was administering to him, but that's another column entirely). Twitter is immediately useful if a group of people are at a conference, allowing you to meet up easily for meals, evening activities, shared cab rides and so on, but it's also rather fun to keep a running commentary of your goings-on and know what your friends and associates are doing too.

Twitter works directly from a Web page and also is completely short message service (SMS)-compliant too, so it's extraordinarily cell-phone-friendly, adding significantly to its utility.

Okay, nice history lesson. What about some sort

of shell script, Dave?

What makes Twitter interesting to me is that like so many modern Web services, it has a public application programming interface (API) that makes it both easy and fun to hack and fiddle with. Although some of the so-called Web 2.0 services are still closed, more and more are making their back ends accessible to open queries, creating many possibilities for darn interesting shell scripts and more sophisticated software and mashups.

For this column, I want to show you how incredibly easy it is to update your Twitter status from the Linux command line, and then noodle a bit on how this could be used for useful, interesting or just mundane tasks. To tantalize you, imagine that you could launch a big software build and have it text your cell phone when it was done, rather than you having to sit at your office.

First, though, you can find the API at twitter.com/help/api. Read through it, and you'll find that just about all interactions are done with specially constructed URLs. That's good, because it's easy to manipulate and tweak a string within a shell script.

The most basic use of the Twitter API is to send a status update message to your account. Here's an example of how to do that:

```
curl --basic --user "$user:$pass" --data-ascii \
  "status=testing123" http://twitter.com/statuses/update.json
```

You can see one of the big challenges of writing this as a shell script already. User validation is done through sending an account name and password pair, and that means you're probably going to have the password embedded in your script. Never a good idea. But, prompting for it each and every time you want to send an update isn't good either.

Before we address that though, notice how I'm utilizing the wonderful curl utility—a must-have for your Linux distro. If you don't have it, grab a copy from curl.haxx.se. curl makes it very easy to work with Web pages via the command line, and I consider it essential for any modern shell script programmer.

Looking back at the command invoked, you'll notice that the URL to which we are going to send the

update is status/update.json. Read the API, and you'll notice that it supports four different output formats, all of which are a pain to parse within a script, unfortunately. One of those is json, and it re-occurs here as the update-receiving URL address.

If you've already worked with Web sites from the command line, you know there are lots of illegal characters that cannot be included in URLs and, by extension, on command lines of utilities that interact with the Web, such as curl. As a result, one of the tasks of our send.twitter.update script will be to make all of the necessary substitutions before sending the new status message to the Twitter server.

On a lightweight service like Twitter, I think it's probably crazy to go through too many hoops to ensure security, so I actually will be including the account name and password in the script. Given some of the suggested applications we'll explore later, it makes sense to create a new Twitter account just for the command-line updates, in which case, a shared password isn't that big a problem anyway.

Here's a first stab at a simple stu (sent twitter update) script:

```
#!/bin/sh

user="DaveTaylor"
pass="--mypw-- "
curl="/usr/bin/curl"

$curl --basic --user "$user:$pass" --data-ascii \
  "status=`echo $@ | tr ' ' '+'` \
  "http://twitter.com/statuses/update.json"

exit 0

In use, simply type in the script name and desired status update:

$ stu Writing makes me sleepy
{"user":{"name":"Dave Taylor","description":"Blogger, entrepreneur, public
➤ speaker, dad!","screen_name":"DaveTaylor","profile_image_url":
➤ "http://s3.amazonaws.com/twitter_production/profile_images/
➤ /35534842/dticon_normal.gif","location":"Boulder,
➤ Colorado","url":"http://www.AskDaveTaylor.com/","id":9973392,
➤ "protected":false},"created_at":"Sat Jan 12 21:31:37 +0000
➤ 2008","truncated":false,"text":"Writing makes me
➤ sleepy","source":"web","id":592217322}
$
```

Eek. That's a scary output, isn't it? So, before wrapping up this column, I strongly suggest that immediately after the invocation of curl, you append >& /dev/null, so you can discard the output. If you want to be fancy, check \$? to see whether it's nonzero, but let's talk about that level of improvement in the next column. ■

Dave Taylor is a 26-year veteran of UNIX, creator of The Elm Mail System, and most recently author of both the best-selling *Wicked Cool Shell Scripts* and *Teach Yourself Unix in 24 Hours*, among his 16 technical books. His main Web site is at www.intuitive.com, and he also offers up tech support at AskDaveTaylor.com. Follow him on Twitter if you'd like: twitter.com/DaveTaylor.



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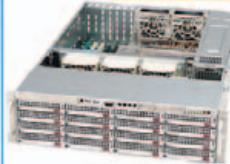
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- 1GB 667MGZ FBDIMM Installed.
- Supports 16GB FBDIMM.
- 4X250GB hswap SATA-II Drives installed.
- 4 port SATA-II RAID controller.
- 2X10/100/1000 LAN onboard.

2U Woodcrest/Clovertown Storage Server Starts at - \$3,791

- 4TB Storage installed. Max - 12TB.
- 3U Dual core 5050 CPU.
- 1GB 667MGZ FBDIMMs Installed.
- Supports 16GB FBDIMM.
- 16 port SATA-II RAID controller.
- 16X250GB hswap SATA-II Drives installed.
- 2X10/100/1000 LAN onboard.
- 800w Red PS.



3U Woodcrest/Clovertown Storage Server Starts at - \$3,991



- 4TB Storage installed. Max - 12TB.
- 3U Dual core 5050 CPU.
- 1GB 667MGZ FBDIMMs Installed.
- Supports 16GB FBDIMM.
- 16X250GB hswap SATA-II Drives installed.
- 16 port SATA-II RAID controller.
- 2X10/100/1000 LAN onboard.
- 800w Red PS.

5U Woodcrest/Clovertown Storage Server Starts at - \$6,691

- 6TB Storage installed. Max - 18TB.
- 5U Dual core 5050 CPU.
- 4GB 667MGZ FBDIMMs Installed.
- Supports 16GB FBDIMM.
- 24X250GB hswap SATA-II Drives installed.
- 24 port SATA-II RAID. CARD/BBU.
- 2X10/100/1000 LAN onboard.
- 930w Red PS.



8U Woodcrest/Clovertown Storage server Starts at - \$11,191



- 10TB Storage installed. Max - 30TB.
- 8U Dual core 5050 CPU.
- 2X5050 installed.
- 1GB 667MGZ FBDIMMs.
- Supports 32GB FBDIMM.
- 40X250GB hswap SATA-II Drives installed.
- 2X12 Port SATA-II Multilane RAID controller.
- 1X16 Port SATA-II Multilane RAID controller.
- 2X10/100/1000 LAN onboard.
- 1850 W Red Ps.

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MICK BAUER

Security Features in Ubuntu Server

Use old-school administration skills to benefit from modern tools on Ubuntu Server.

Last month, I offered a survey of security features in Ubuntu Desktop 7.10, a single-CD Linux distribution that combines the flexibility of Debian with a very easy-to-use set of graphical setup/administration tools. Ubuntu also comes in a server version, which in some ways is just a re-configuration of Ubuntu Desktop, but nonetheless, it's a different distribution in its own right.

This month, I survey some of the major security features in Ubuntu Server 7.10. Unlike Ubuntu Desktop, Ubuntu Server is probably the wrong choice for complete Linux newcomers. It's extremely command-line-centric, and its documentation is not exactly encyclopedic. Accordingly, this month's column assumes you've got a basic understanding of how Linux works and some comfort with the command prompt.

Ubuntu Server vs. Desktop

There are several key differences between Ubuntu Server and Ubuntu Desktop. First, and most obvious, is the lack of any graphical tools. Ubuntu Server doesn't install the X Window System automatically. This has become an increasingly rare approach, even with server-oriented Linux distributions. But, as I explain shortly, omitting the X Window System improves system security and performance and decreases system complexity.

Second, Ubuntu Server installs a much smaller set of packages overall than Ubuntu Desktop. (In fact, there's ample room on the Ubuntu Server CD image to add things of your own—watch this column for a future series on customizing and building your own bootable CD images.) You might think this means that Ubuntu Server offers fewer choices in server applications, but as I show here, these aren't fewer choices than on other popular server-oriented distributions. And besides, you can install additional Ubuntu packages easily over the Internet.

The last major difference worth noting is that Ubuntu Server's default kernel is tuned for server performance, whereas Ubuntu Desktop's default kernel is tuned for maximum responsiveness. An article by Carla Schroder on these differences details some specifics as to how this is achieved (see Resources).

Did Mick Just Say, "No Graphical Tools?"

Yes, you read that right. By default, Ubuntu Server is a purely console-driven distribution. On Ubuntu Server, you do things the old-school way, with shell sessions, man page lookups and the vi editor.

Of course, there's nothing to stop you from installing the X Window System, complete with a fully packed KDE desktop environment, OpenOffice.org and *Tux Racer*. Ubuntu's download repositories don't distinguish between Server and Desktop, so you can install whatever you like. However, I very strongly suggest you resist the temptation to install the X Window System on your Ubuntu Server system.

When the first edition of my book *Linux Server Security* came out (which I try not to plug here, but this is after all an article on Linux server security), one reviewer complained bitterly about my advice to omit the X Window System from server installations. But, for years I've stood firm on this advice. The X Window System increases complexity. It has a history of "local privilege escalation" vulnerabilities (that can often be exploited remotely), and it always imposes a significant performance penalty.

"Keep it simple" is one of the most important tenets of good system security. If you don't need something, you should live without it. And, in most server scenarios, when a system's primary function is to provide various network services, and wherein what little "interactive" access necessary for administration can be done remotely, it's hard to justify the increased attack surface and overall complexity that come from running X.

Besides, even in Ubuntu Desktop, many if not most serious configuration and security tasks at some point require you to open a terminal and issue commands with sudo. If you want to be an Ubuntu system administrator (or more than a novice at Linux in general), there's no getting around needing to be able to cope with the command line. So I applaud the Ubuntu team's common sense (and courage) in keeping the X Window System out of the default installation of Ubuntu Server.

If you really need a GUI experience in administering your Ubuntu Server system, there are remote administration tools you can use (Webmin, for

example—see Resources, and also see Federico Kereki’s article “Graphic Administration with Webmin” on page 64) that provide this without requiring X on the server itself.

Ubuntu Server Installation

As I’ve often said, security begins with operating system installation. This is where you decide your system’s role, what set of applications will run on the machine, and what type and degree of user access it will support. So, to what degree does the Ubuntu Server installer help system security?

The Ubuntu Server installer is very similar to the Ubuntu Desktop installer, except that the Server installer is, if anything, even more minimalist. It guides you through partitioning your hard disk, asks what category of software packages to install, walks you through creating a login account (*not* root), installs the software, and then, depending on what you installed, it may or may not ask you a few very basic questions with which it begins (barely) configuring one or more of those applications.

The good news is that the Ubuntu Server installer:

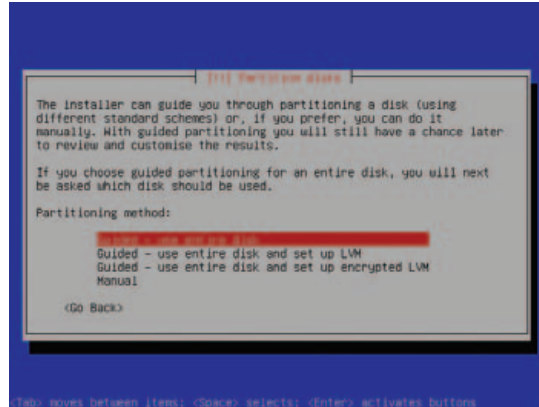


Figure 1. Ubuntu Server installer offers encrypted volumes.

- Can create encrypted disk volumes.
- Doesn’t ask you for a root password, because you never log on as root in Ubuntu.
- Is surprisingly fast, obviously thanks to its simplicity.
- Generally installs things with conservative, fairly

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secure, default settings (which is actually a function of packages' individual installation scripts).

The bad news is that the Ubuntu Server installer:

- Doesn't allow you to select specific/individual software packages; instead, it just asks you the general role the server will play (Figure 2).
- Prompts you for the MySQL administrator's password, but doesn't prompt you a second time to make sure you didn't mistype it.
- Doesn't check passwords for complexity (uppercase/lowercase, numerals and so forth).

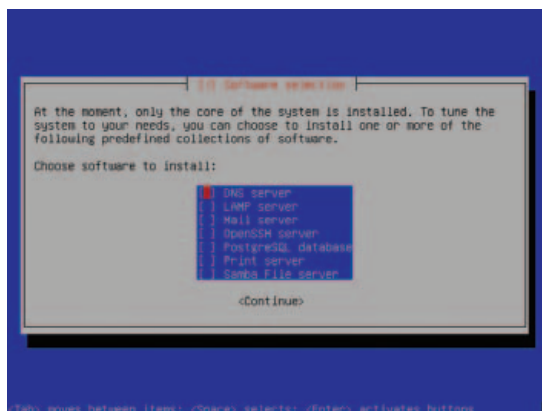


Figure 2. Selecting Server Software Bundles

After installation, you may notice that most if not all the server applications you installed (Apache, Postfix and so forth) are up and running, even though you haven't really configured them yet. You'll need to do that yourself by editing the appropriate configuration files in /etc.

On the one hand, my personal preference is that, by default, network services should be disabled initially, to make it harder for an attacker to exploit an application that has been overlooked altogether or that is still in the process of being configured. On the other hand, because Ubuntu's default application configurations tend to be fairly secure, this probably doesn't pose a huge risk.

For example, immediately after installation, Apache is started, displaying a simple "It works!" page, which announces to the world that you've just installed Apache but haven't gotten around to configuring it yet. (Ow!) But, there's no obvious way for an attacker to exploit this. You can't recurse out of the nearly empty default http root directory, default CGI scripts aren't present and so on.

If you're worried about this, you simply can shut down these newly installed services until you've con-

figured them. Or, better still, stage your new server on a protected LAN before connecting it to the Internet.

How Not to Be Root in Ubuntu

As I explained in last month's column, Ubuntu is set up so that you never can actually log on as root. Instead, you create one or more nonprivileged login accounts that are authorized to execute root-privileged commands via sudo, the "superuser do" command. This makes it harder to damage your system accidentally, and it has the security benefit of removing the root account as a viable attack vector, because root has no password and can't log in.

So, for example, whereas on a standard Debian system you might install the package foo with this command:

```
aptitude install foo
```

On Ubuntu, you'd use:

```
sudo aptitude install foo
```

After issuing any command with sudo, you'll be prompted for your own password, not root's, which will be cached for a brief period of time during which subsequent sudo commands won't require re-authorization.

If you need to change sudo's configuration (which determines who is authorized to run which commands, under what circumstances), you must use the visudo command to edit the file /etc/sudoers. The Ubuntu RootSudo Page (see Resources) provides more information.

Installing Optional Software

It's no coincidence that I used the aptitude command in the above examples. Chances are, one of the first things you'll do after installing Ubuntu Server is install some additional software, and aptitude is Ubuntu Server's best tool for this job.

Perhaps surprisingly, given that the Ubuntu Server distribution doesn't even fill a 650MB CD-ROM, there are many useful packages from which to choose on the CD in its /pool directory. When you install Ubuntu Server, the installer also automatically configures the Advanced Package Tool (apt) system, for which aptitude is a front end, with the locations of some download repositories.

In last month's column, I described the Ubuntu repository structure in detail. In case you missed that, here's a quick review:

- Main contains Ubuntu's fully supported, fully patched, free software packages.
- Restricted contains Ubuntu's fully supported, nonfree

(copyrighted) software packages.

- Universe contains Ubuntu's free but not fully supported/patched packages.
- Multiverse contains packages that are neither fully free nor fully supported/patched.

You might think that on a server system, universe and multiverse packages should be avoided, as they lack any guarantee of timely security patches or bug fixes. And, as a general rule, I think you'd be right.

But, there are some notable packages in universe and multiverse that may be worth installing and sustaining whatever risk is entailed. One such package is Bastille (in universe), a comprehensive system-hardening tool you can uninstall after it does its thing. Another *might* be Tripwire (in multiverse), which is the classic file integrity checker, though the main repository's aide packages provide the same functionality and are fully supported by the Ubuntu security team.

All of these packages are part of the main repository. Unlike with Ubuntu Desktop, however, these can be installed from the Ubuntu Server CD.

Notable Ubuntu Server Packages

Space does not permit me to include lengthy charts of security-related packages like those I provided in the Ubuntu Desktop column last month. If I did, they would be very similar except for two things.

First, I would omit security auditing tools, such as Nessus and tcpdump (though both are on the Ubuntu Server CD). You shouldn't install anything on any Internet server, or other multiuser system, that can be used by an attacker against the system itself or other systems on your network. Instead, you should run such tools from an administrative system, where they're less likely to be abused.

Second, you would see that many packages on Ubuntu Desktop must be downloaded from a main repository Web site. These are, in fact, provided on the Ubuntu Server CD under /pool. These include the following:

- aide
- auth-client-config
- apparmor
- chkrootkit
- cryptsetup
- dovecot-imapd
- exim4-daemon-heavy
- gnupg
- ipsec-tools
- libkrb53
- sasl2-bin
- libselinux1
- libwrap0, tcpd
- openssh-server
- libpam-opie
- shorewall
- slapd, ldap-utils
- squid
- vlan
- vsftpd

I'll leave it to you to explore the many other security-related packages available in the Ubuntu repositories. One of the best ways to do this is to look them up on packages.ubuntu.com.

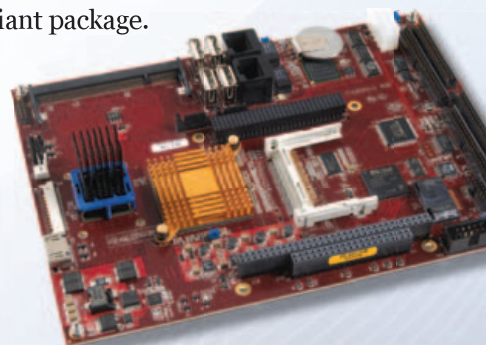
No Automatic Updates in Ubuntu Server

Given the importance of patching to maintain system security, you might be surprised to learn that Ubuntu Server

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doesn't have any specific mechanism for automatically downloading and installing security updates. I can explain why in two words: change control.

On a production server that does real work, it's a bad idea to apply any patches, even security updates, until after you've tested them on a similar server in a lab to make sure they don't break anything. Sure, you can run the commands `aptitude -y update`, `aptitude -y upgrade`, `aptitude -y dist-upgrade` and `aptitude -y autoclean` from a cron job each night. But that `-y` option, which allows aptitude to run unattended, also might cause a package update to overwrite some custom configuration file with a default configuration.

On a server, you're better off running these commands manually as needed, without the `-y` option (after first doing so on a test system if you run in a change-controlled environment). That way, you'll be prompted before any configuration files are overwritten, and you'll be able to observe firsthand the changes aptitude makes to your system as they happen. Subscribe to the [ubuntu-security-announce](mailto:ubuntu-security-announce@ubuntu.com) mailing list (via www.ubuntu.com/support/community/maillinglists) to receive e-mail notifications of security patches as they're made available.

Novell AppArmor in Ubuntu

As I discussed last month, the Ubuntu port of Novell AppArmor is installed by default in Ubuntu systems. This is true of both Server and Desktop. In Ubuntu Server, however, AppArmor is present but not configured; you'll need to activate any policies you want to enforce manually (AppArmor profiles reside in `/etc/apparmor.d`).

If you're unfamiliar with AppArmor, it's a powerful means of running applications in contained environments, such that applications' access to local resources is kept to a minimum. It's similar to SELinux, but less comprehensive and, therefore, easier to understand and administer.

However, on Ubuntu, no graphical tools are provided for this purpose, even in Ubuntu Desktop. What's more, the only Ubuntu documentation (besides man pages) is the AppArmor page on the Ubuntu User Community Wiki (see Resources), which is little more than a listing of commands and their command-line syntax; no HOWTOs or other introductory material are provided.

For the time being, it appears AppArmor on Ubuntu Server is for expert users only.

Conclusion

I've discussed Ubuntu's sensible omission of the X Window System in its default installations, enumerated security features in the Ubuntu Server installer, pondered the merits of the disabled root account, listed some security-enhancing software packages

available in Ubuntu Server and considered Ubuntu's fledgling AppArmor support.

My overall opinion? Ubuntu Server 7.10 is a remarkably compact, straightforward, command-line-oriented Linux distribution with a reasonably secure set of default configurations and an impressive array of fully supported, security-related software packages. (Fewer than Debian, but many more than CentOS or RHEL.) If you're an intermediate-to-advanced Linux system administrator, depending on what you need to do, Ubuntu Server may be worth checking out.

If you're a Linux newbie looking for a gentle introduction to the Linux experience, Ubuntu Desktop is a much better choice, even if you want practice setting up server applications.

That's it for now. Until next time, be safe! ■

Mick Bauer (darth.elmo@wiremonkeys.org) is Network Security Architect for one of the US's largest banks. He is the author of the O'Reilly book *Linux Server Security*, 2nd edition (formerly called *Building Secure Servers With Linux*), an occasional presenter at information security conferences and composer of the "Network Engineering Polka".

Resources

The Official Ubuntu Home Page: www.ubuntu.com

Ubuntu Server Guide: <https://help.ubuntu.com/7.10/server/C/index.html>

Christer Edwards' blog, which consists almost entirely of handy Ubuntu HOWTOs: ubuntu-tutorials.com

"Ubuntu Server: Considering Kernel Configuration" by Carla Schroder: www.enterprisenetworkingplanet.com/netos/article.php/3710641

Home Page for Webmin, a Free Web-based GUI for Remote Server Management: www.webmin.com

The Ubuntu RootSudo Page, Describing Ubuntu's sudo Implementation in Detail: <https://help.ubuntu.com/community/RootSudo>

Security Pages on the Ubuntu User Community's Wiki: <https://help.ubuntu.com/community/Security>

AppArmor Page on the Ubuntu User Community's Wiki: <https://help.ubuntu.com/community/AppArmor>

The "Securing Debian Manual", Indirectly Applicable to Ubuntu: www.debian.org/doc/manuals/securing-debian-howto/index.en.html

Bauer, Michael D. *Linux Server Security*, 2nd ed. Sebastopol, CA: O'Reilly Media, 2005. Provides detailed procedures for securing popular server applications.

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KYLE RANKIN

Mutt Tweaks for System Administrators

If digging through your server e-mail bogs you down, use these tips to organize and tweak your mutt configuration and cut through that mailbox like a letter opener through an envelope.

I am one of those people who stores everything in e-mail. Travel reservations, phone numbers—if it is in an e-mail message, I know one way or another I can find the information. That might be one of the reasons I have been using mutt as my main mail program both at home and work for years. It is difficult to beat when you need to read, search and navigate large mailboxes full of mail. That, and it has vi-style key bindings. I love vi-style key bindings.

If you are a sysadmin, there are even more reasons to love mutt. For one, you probably spend a good deal of your day in front of a terminal, so why not read your mail from there as well? A lot of administrators like to run stripped-down servers that don't include binaries for X or graphical tools, but mutt is small, and what's more, you can ssh to a server or your work desktop from another machine and check your mail.

At work, I like to segregate my e-mail into folders, based on whether a message is from a person

Essentially, it allows mutt to cache the headers from mailboxes, so that the next time you load the mailbox, it has to pull down only the new messages.

or a server (and, of course, I segregate them further from there). If you manage a lot of servers, those mailboxes can start to get rather large. Almost nothing compares to mutt when you need to open a mailbox with a few thousand new messages. This brings me to my first almost-essential mutt tweak: header caching.

Header caching is a feature that has shown up in mutt only in the past few years. Essentially, it allows mutt to cache the headers from mailboxes, so that the next time you load the mailbox, it has to pull down only the new messages. This is particularly handy with IMAP servers or even large local mailboxes.

To enable header caching, create a directory called `.muttheaders` in your home directory, then

add the following line to your `~/.muttrc`, and restart mutt or reload your mutt config:

```
set header_cache=~/.muttheaders/"
```

Separate Mutt Configs

This tweak is, in some ways, more organizational, and it's handy not only for sysadmins but also for anyone who runs mutt on multiple machines. Many mutt guides will tell you to split `.muttrc` into multiple files for different types of configuration, so you can have one file that has all of your color options, another with your key bindings and so forth. Then, you simply can add a source line to your `.muttrc` file that points to the new file, and mutt will load those options as well.

What I like to do is take it a step further and create a `.mutt` directory in my home directory and place all of those files *including* my `.muttrc` in that directory. Then, I create a new file in my home directory called `.muttrc.local`. In this file, I store any options that are specific to just that particular machine (IMAP settings, local mailbox locations and so on) and keep the rest of the options organized in different files in the `.mutt` directory. Finally, I create a symlink from `~/.mutt/.muttrc` to `~/.muttrc`, so mutt still will be able to find it. In this `.muttrc`, you would find source lines like:

```
source ~/.muttrc.local
source ~/.mutt/colors
source ~/.mutt/aliases
source ~/.mutt/mailboxes
```

The advantage to this arrangement is that once I make a change to any of the files in `.mutt`, I simply can `rsync` that entire directory to any other machine on which I run mutt, and all of my changes will be there. If I didn't segregate these to a directory and separate `.muttrc.local`, I would have to worry that any local settings from one machine would clobber the rest.

Colorize Important Words

If you read through a lot of cron, Nagios or other

e-mail your servers generate for you, it's easy to let your eyes glaze over and miss important content. What I like to do is tweak my mutt configuration so that certain words, like warning, are colored in bright yellow, and words like error and fail show up in bright red. This is surprisingly easy to do with mutt in only a few lines:

```
color body brightyellow default warning
color body brightred default error
color body white default 'no error'
color body brightred default "fail(ure|ed)?"
```

Notice the line that matches no error. I noticed that some messages said "no error" in them, and the error section still was being colored red. If this happens with your keywords, simply add a similar line in there to override the previous less-specific match. You don't have to limit yourself to just these keywords. For instance, you also could highlight certain server names with a particular color or assign different data-center locations distinct colors.

Read Important Messages First

Once I had colorized all my e-mail, it was great—I would browse through output and more critical e-mail would jump to my attention. As the number of messages started to grow though, I noticed I would spend a lot of time reading the less-important messages before I found the important ones. My solution was to use the limit feature in mutt. When you are in the index view in mutt (where mutt shows you only the From and the Subject lines), you can tell mutt to limit (the l key by default) the headers you currently can see based on a pattern.

For instance, if I wanted to see only all the headers that said Bob, I could type l and then Bob <Enter>. Then, to see all the headers again, I could type l and then all <Enter> to show all messages. You also can have mutt search within the body of messages, so I created a mutt macro that I bound to the F3 key, so that when I see the full list of headers and press F3, it limits the view only to new messages that contained error or fail in them. I could read those messages first and then change the limit back to all and tab through the rest. Here is the extra line in my .muttrc to create the macro:

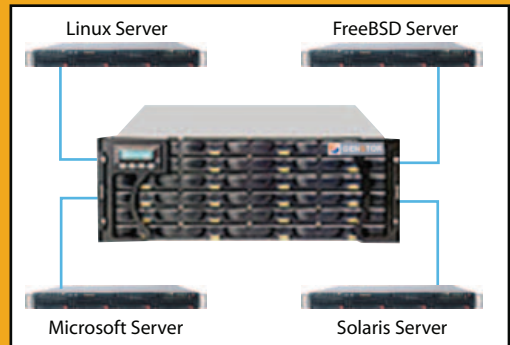
```
macro index <F3> "l-N ~b \"(\[^nN][\^o0].error|[Ff][Aa][Ii][Ll])\"<enter>"
```

I constantly am surprised with how far you can extend mutt. It is definitely one of those programs that gives your time back in gained productivity as you learn more about its configuration options. If you use your e-mail to remember things, or dig through a large stack of server e-mail every day (or even if you don't), mutt is an invaluable e-mail companion that always has new tricks. ■

Kyle Rankin is a Senior Systems Administrator in the San Francisco Bay Area and the author of a number of books, including *Knoppix Hacks* and *Ubuntu Hacks* for O'Reilly Media. He is currently the president of the North Bay Linux Users' Group.



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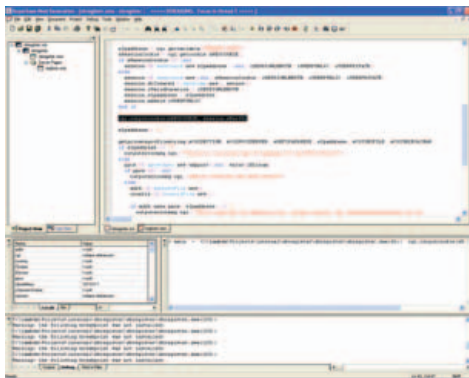
The Amanda Company's Vdex-40

The solutions growing up around the Asterisk telephony engine and toolkit are plentiful. One of the latest is The Amanda Company's Vdex-40, reputed to be the first embedded Asterisk-based system to enhance voice quality. The secret, according to the company, is "the inclusion of multiple microprocessors as well as DSPs". The Vdex-40 ships with 16 G.711, G.723.1, G.726 and G.729a/b voice codecs (a mix of 16 concurrent codecs), hardware-based G.168 echo cancellation and four built-in telecom line ports. Amanda also touts the Vdex-40's elimination of moving parts, such as fans and hard drives, which further improves the product's reliability. Despite its technological advancements, the Vdex-40 is intended to be an affordable, Internet-enabled telephone system for the needs of the small office/home office market.

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SIMPOL's Developer Kit with Desktop



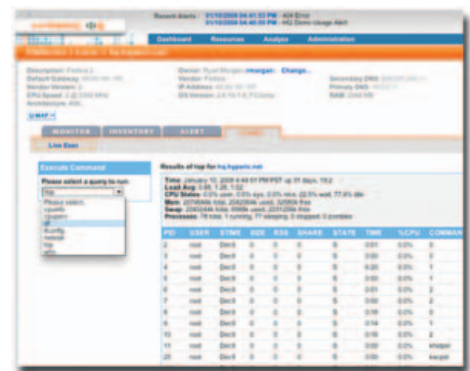
The goal of the British firm SIMPOL is to simplify cross-platform software development, which has been advanced recently with two new products: the SIMPOL Developer Kit and SIMPOL Desktop. First, the SIMPOL Developer Kit, using the SIMPOL programming language with redistributable libraries, provides the components necessary for creating applications of many types, such as desktop, Web server and standalone server. Future releases will support application development for Mac OS X, Windows CE and SymbianOS. Second, the SIMPOL Desktop, which works with the Developer Kit, is a lightweight end-user database product that enables users to build data-rich applications without programming and to modify sample applications. One can create an application based on database tables, forms and reports. Applications can be deployed by writing them as extensions to SIMPOL Desktop rather than re-inventing all the functionality over again.

www.simpol.com

Hyperic's Hyperic HQ

If you are managing high-volume Web infrastructures, check out the new version 3.2 of Hyperic HQ from Hyperic, Inc. HQ's value proposition is an open-source solution offering "hands-free monitoring and management for Web-scale systems". HQ supplies performance and event data, product coverage and the functionality operations teams need to discover, diagnose and deliver a solution in a single tool. Version 3.2 adds features, such as cross-platform diagnostic tools, Nagios support and MySQL support with up to 1.5 million transactions per minute. Hyperic also counts CNET as one of its customers. Linux support includes Red Hat and Fedora. The standard edition and a three-device trial enterprise edition of Hyperic HQ are available at Hyperic's Web site.

www.hyperic.com

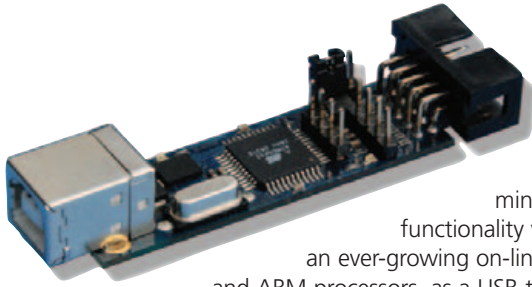


Hewlett-Packard's FOSSology

Keeping track of the licensing conditions of the complete source code of an open-source project can be a pain. Such pain stimulated HP's FOSSology Project, a tool that quickly and accurately describes how a given open-source project is licensed. FOSSology analyzes all the source code for a given project and reports all the licenses being used, "based on the license declarations and tell-tale phrases that identify software licensing", says HP. The goal of FOSSology, which literally means "the study of FOSS", is twofold. First, HP seeks to allow IT organizations to adopt open-source software confidently, as well as to uncover what open-source software is being used within their environments. Second, HP seeks to support open-source developers and distributors to create a clear licensing picture of the projects and packages they produce. The tool is available to all in order to promote a more vibrant, open community of open-source users and contributors.

fossology.org





Embedded Projects' USBprog

Developers of embedded systems are typically faced with the challenge that every new controller needs a separate debugging or programming adapter. These often either are not available or disappointing on the Linux platform.

To the rescue is Embedded Products' USBprog, a free, universal programming adapter with a bootloader and tools that allow one to change the adapter's functionality via open-source software easily. Users can install different firmware versions from an ever-growing on-line pool over USB. The adapter can be used for programming and debugging AVR and ARM processors, as a USB-to-RS232 converter, as a JTAG interface or as a simple I/O interface.

www.embedded-projects.net/usbprog

Navicron's Fusionplatform and Fusionsoftware

Pushing the envelope on mobile wireless devices, Navicron recently introduced two new products: fusionplatform, a reference, high-performance, mobile entertainment engine; and fusionsoftware, a Linux-based platform with a GTK-based front end for application development. Navicron stresses the integration value of the two products that are "designed from the ground up and optimized for wireless consumer electronics and handheld products based on Linux" or other OSes. Fusionplatform contains a powerful multimedia application processor and support for the latest wireless standards and multimedia features. Components can be added, left out and upgraded/downgraded simply. Navicron also cites advantages from using open source, which offers "unparalleled mobile multimedia experiences to consumers".

www.navicron.com



Azingo's Azingo Mobile

In yet another instance of Linux's agility on diverse devices, Azingo has released Azingo Mobile, a suite of open mobile software and services that help companies deliver rich multimedia experiences to a wider range of mobile phones. Based on LiMo Foundation specifications, the suite allows handset makers and operators to "plug in" a comprehensive and pre-integrated mobile middleware framework that provides a variety of out-of-the-box applications and an Eclipse-based SDK. Azingo says that the product accelerates time to market and allows for lower-cost phones to offer the latest multimedia and UI innovations. The Linux-based software platform also includes a feature-rich browser; a highly configurable UI; media players for music, video and photos; a mobile-optimized Linux kernel and more. Finally, Azingo says that its platform can be integrated into new handset and chipset designs.

www.azingo.com

No Tech Hacking by Johnny Long and Kevin Mitnick (Syngress)

If security is on your shoulders, you may want to get insights from the new book *No Tech Hacking: A Guide to Social Engineering, Dumpster Diving, and Shoulder Surfing* by Johnny Long and Kevin Mitnick and published by Syngress. *No Tech* is an irreverent, behind-the-scenes memoir of two professional hackers wreaking havoc. Long and Mitnick take the readers along as they break in to buildings, slip past industrial-grade firewalls and scores of other high-tech protection systems put up to thwart intruders. After hundreds of jobs, the authors reveal their secrets behind bypassing every conceivable security system. Included are photos, videos and stories that show how vulnerable the high-tech world is to no-tech attacks.

www.syngress.com



Please send information about releases of Linux-related products to James Gray at newproducts@linuxjournal.com or New Products c/o *Linux Journal*, 1752 NW Market Street, #200, Seattle, WA 98107. Submissions are edited for length and content.

SOFTWARE

VMware Server 2.0 Beta

An overview of the promising VMware Server 2.0 Beta. JES HALL

VMware Server 2.0 Beta is the next evolution in the free-as-in-beer virtualization line. It's able to run on both Linux and Windows and virtualize a wide range of guest operating systems. We tested out the beta on Ubuntu 7.10, running on an Intel Core 2 Duo 6600 at 2.4GHz with 2GB DDR2 memory.

The new features available in the beta include:

- Web-based management interface.
- New supported operating systems, including Vista Business and Ultimate (host only), Windows Server 2008, RHEL 5 and Ubuntu 7.10.
- Up to 8GB of memory per VM (up from 3.6GB).
- Up to two virtual SMP processors.
- Up to 64 VMs per host.
- VIX API 1.2—scripting API for automation.
- Support for VMI, enabling transparent paravirtualization for supported guests.

The installation routine hasn't changed from that on almost every VMware product on Linux for the last five years. The console-based wizard is relatively easy to follow. So far, the beta doesn't have any real user authentication methods; it expects the root user name and password to log in to its Web interface. Ubuntu users need to enable the root account by setting a root password to use VMware Server.

The traditional-looking VMware console has been done away with entirely, and the FAQ and release notes seem to imply that a standalone VMware console cannot be used to access the virtual machines, although we were unable to confirm this. Instead, the Web interface is intended to be the entire interaction point between the user and the

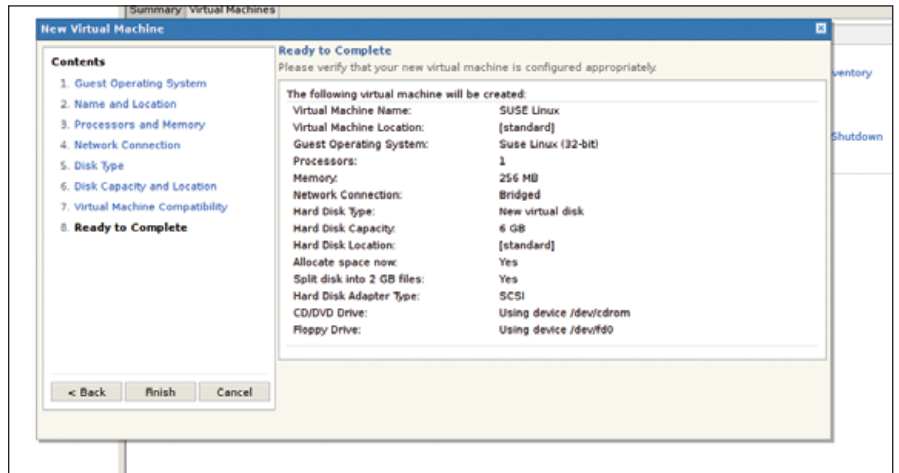


Figure 1. Defining a Virtual Machine Using the Web Interface

VMware processes.

The Web interface looks extremely professional and appears as though it has been designed specifically for Server, as it bears little resemblance to that found in VMware's flagship virtualization platform, ESX Server. The interface feels a little clunky to use and is slow to respond. Occasionally, buttons simply

However, when the plugin is working, it works exceptionally well with surprising performance—an impressive feat.

would refuse to react until the Web browser had been refreshed. The console to access virtual machines directly has been implemented as a browser plugin that the sever prompts you to install when you first attempt to navigate to the Console tab. The plugin seems to work only for Firefox running on Windows or Linux; Internet Explorer or Mac OS X users seem to be clear out of luck.

The plugin seems extremely buggy,

often requiring a refresh of the browser window before it will work again. The console also often crashes the browser—quite a major irritation. However, when the plugin is working, it works exceptionally well with surprising performance—an impressive feat. If the stability issues can be straightened out, it's an exceptionally powerful tool. On the server side, the version of Tomcat bundled with VMware Server occasionally would malfunction until the process was restarted, sending TCP RST to the browser.

When it's up, the interface to define or add virtual machines is cumbersome. First, a data store has to be defined, and the dialog to open VMs, CD images and any other file type does not support browsing outside that data store. Given that anyone logging in to VMware Server runs as root, we imagine there might be some security implications of allowing VMware access to the entire filesystem, but because VMware Server runs as root, there definitely are some security implications, as it can do whatever the heck it likes anyway. Hopefully, this design choice makes more sense when user authentication is implemented into the product later on—particularly if data stores can be defined only by a root user and can't be modified later by

HARDWARE

iPod + Rockbox = Entertainment Extravaganza

What's cooler than a box of rocks? Well, a lot, but not much is cooler than Rockbox on your iPod! SHAWN POWERS

Wouldn't it be great if you could customize an iPod and run third-party software on it? Wouldn't it be great if you could download games and applications along with the songs and videos you already have? Wouldn't it be great if all those features were open source and free? Wish no longer. Rockbox offers all those things, wrapped in an easy-to-use installer.

Rockbox is an open-source firmware replacement for a variety of music and video players. The interface is very similar, regardless of the device, and as I don't have access to anything other than an iPod, this review focuses on it. You certainly don't need an iPod to use Rockbox, but because Apple's products are so popular, I was happy to see a wide variety of iPod models are supported. Check out the Rockbox Web site to see whether your media player will work.

Installation

To get Rockbox on your iPod, the developers offer two options, automatic and manual. The automatic option appealed to my lazy nature, but unfortunately, it didn't work for me. I think this was largely because my iPod was formatted with the HFS (Apple) filesystem instead of the FAT32 (Windows) filesystem. On an iPod with the FAT32 filesystem, the automatic installer is very slick and downloads the latest version of the programs directly from the Internet. I wish the automatic installer had worked for me off the bat, because then I could have just suggested you use it (which I still do) and forget about the manual stuff.

Thankfully, the documentation is very helpful even if you are forced to use the manual method. Here's a brief overview of the procedure, but be sure to read the documentation before attempting it on your own. It's not terribly difficult, but it requires extensive use of the command line. My suggestion is

to try the automatic installation program first, and resort to the following method only if the installer doesn't work for you.

Manual Installation Steps

Go to www.rockbox.org, and click on Manual at the left. Find your specific device on the list, and go to the instruction manual provided. The installation section is helpful, and following it will ensure success. Here's a rundown of the steps:

1. If you have an iPod that was formatted for use with OS X, you need to convert the filesystem to FAT32. You either can plug the iPod in to a Windows machine and have iTunes reformat it, or follow the directions provided in the Rockbox manual to reformat it with Linux command-line tools.
2. Download the appropriate version of Rockbox from the Web site and extract it directly to the iPod. If done properly, there should be a folder on the iPod called `.rockbox` with the program inside. It should be at the root level of the iPod (not the root level of your computer), and because it starts with a dot, it won't be visible by default.
3. Next, download the font package, available from the Extras section on the Web site. The font package is the same, regardless of what media player you have, so you can't go wrong when downloading it. Just like with the Rockbox software, the fonts need to be extracted at the root level of the iPod. (The fonts actually reside inside the `.rockbox` folder, but the zip file is designed to be extracted at the root level of the iPod, and it will put



Figure 1. The Rockbox bootup screen: if you see this, you've succeeded.

them in the correct place.)

4. Finally, install the Rockbox bootloader. This is the part that causes the iPod firmware to load Rockbox instead of the original iPod software. Download the Linux version of ipodpatcher (link provided in the installation manual), and execute it as root:

```
# chmod +x ipodpatcher
# sudo ./ipodpatcher
```

Assuming all goes well, you should see a message telling you the bootloader has been installed. Feel free to do a happy dance, and then hold down Menu + Select to reboot your iPod into Rockbox goodness (Figure 1). If you have problems along the way, and corrupt the partitions on your iPod (as I did once), just plug it back in to your iTunes machine, allow it to repair itself, and start over.

Rockbox Features at Your Fingertips

Now that you have Rockbox installed, let's talk a bit about what you can do with it. Yes, with a name like Rockbox, your iPod now sounds threatening and weapon-like. And sure, if you throw it hard enough, you probably could hurt someone with it, but really, there are more productive things to do with your new media player. Let's look at a few.



Figure 2. Here's *Doom* running on the iPod Mini. No, really, it is.

Games

Apple ships iPods with a few games, and the newer models allow you to purchase additional ones, but the sheer number of Rockbox's available titles leaves the commercial alternatives in the dust. Although many of the games are the type you'd expect to see on a device the size of an iPod, one game surprised me—*Doom*. Seriously, as hard as it is to believe, id Software's *Doom* runs natively on the iPod (Figure 2). I'll admit, controlling it was a bit awkward, but there it was in all its glory.

Although high on the cool factor, *Doom* wasn't the best game available. I found *Bubbles* (much like *Frozen Bubble*) and *Jewels* (much like *Bejeweled*) to be the most fun. Just like the computer version of these games, their iPod counterparts easily will suck hours of productivity from your life. You've been warned.

Applications

Along with the games, Rockbox also includes a handful of applications. The metronome was particularly useful, and the text editor was particularly difficult. I'm impressed there is a text editor at all, but the interface is severely limited by the lack of buttons. I'd rather use a cell phone to text-message an entire novel than try to write an article of this size with the Rockbox text editor. Still,

Apple iPod Original Firmware Pros and Cons

PROS:

- Simple, intuitive interface.
- Automatic syncing with iTunes playlists.
- Ability to play DRM music from iTunes store.

CONS:

- Limited to MP3 and AAC playback.
- Proprietary database is frustrating to interface with non-iTunes programs.
- Very limited number of games and applications.
- Not expandable, except for commercial games on some models.

it's nice to have the option. One oddity worth mentioning is that there's not really a standard way to exit games and applications once they start. Sometimes, pressing the menu button exits. Sometimes, you must press the select and menu buttons. Other programs require you to press play and select in order to get back to the main Rockbox program. I'm sure this is because the different programs (or plugins, as they are called in the Rockbox interface) are developed by separate programmers, but I wish there was a standard in place regarding how to exit.

Other Stuff

Along with games and applications, there's also a group of programs called demos. If you were a computer user back in the early 1990s, you may remember hacking groups releasing what they called demos, in which they would show off their programming skills and push the graphics processors of the time to their limits. These Rockbox programs follow a similar road, and the demos mainly show off the iPod's

graphics and processor. They aren't useful for much more than oohs and aahs, but they do make for interesting conversation starters. The demos vary from

Rockbox Replacement Firmware Pros and Cons

PROS:

- Numerous games, applications and demos available.
- Customizable themes for varied look and feel.
- Supports more music formats.
- Rockbox is open for development, changes, additions and third-party plugins.
- Music quality is better—or so they claim. (I can't tell the difference.)
- Music management is simple and flexible.
- Multiple dynamic playlists can be created on the fly.
- Playlists are standard M3U files.
- Allows for dual-booting, with the option to start original iPod firmware.

CONS:

- Very complicated due to a number of features. Playing music isn't as simple as with the original firmware.
- Battery life isn't as long as with the original firmware (a solution is in development).
- Programs (plugins) don't have consistent controls, especially for exiting.
- Can't read iTunes database.
- Can't play DRM'd files.

a simple starfield simulation to a 3-D cube to a complex digital fire scene.

Oh, It Also Plays Music and Video

Rockbox has a plugin (again, that's what these add-on programs are called) that allows playback of MPEG-1 and MPEG-2 video. The main focus of the program, however, is to play music. Rockbox supports pretty much any non-DRM music file, and Rockbox claims the audio playback is better quality than with the original iPod software. Honestly, I can't tell the difference, but perhaps audiophiles will notice the improvement. Locating and playing files is done mainly by traversing the folder structure on the drive. Rockbox also can create a database of information (Artist, Album and so forth), but unfortunately, it can't read the database created by iTunes. To add insult to injury, if you try to find songs placed on the drive by iTunes, you'll find cryptically named files in equally cryptically named folders.

Playlists are created easily in Rockbox, and it's possible to create and save several playlists on the fly. They are standard M3U files, so uploading a playlist you've created on a computer is a fairly painless endeavor. Because the Rockbox iPod mounts as a standard USB drive, manipulating songs and playlists from the computer is literally as easy as dragging and dropping. Most Linux-based MP3-playing software, like Amarok or Rhythmbox, will recognize the Rockbox player as well. There's really not a best way to handle music management; it's a matter of personal taste.

The Verdict?

What Rockbox does, it does very well, and very completely. I found the installation procedure easy enough that everyone should be able to accomplish it, and yet it was geeky enough that I felt a level of satisfaction when it was complete. The number of features Rockbox has compared with the standard iPod software is astronomical, but that's only a good thing if you're looking for lots of features in your media player. Let me explain.

I installed Rockbox, and played with games, demos and applications for a long time. Then, I played some music and realized one of the advantages the original iPod software has over

Rockbox—simplicity. If you just want to listen to music, without the complexity of multiple dynamic playlists, auto/manual-generated databases, playlist queue positions and sound file gap lengths, you might want to consider sticking with the original software. Thankfully, the developers even have admitted that to themselves and offer a painless way to run the original software right alongside the new. If you reboot your iPod (hold down menu and select for 3–5 seconds) and immediately toggle the hold switch, the iPod boots the original firmware. So if you like everything about the Rockbox music player, except the way it plays music, don't worry; you can have the best of both worlds. Well done, Rockbox.

Final Thoughts

I'm sure on an iPod with a color display, the features would have been even more visually appealing. Running it on the iPod Mini was a good way to compare it to the simplicity of the Apple firmware though. Rockbox does exactly what it says it will do. It met all my expectations and exceeded them in many areas (namely, the quality and quantity of games). Oddly enough, however, more often than not I found myself booting the iPod into the original Apple firmware. That's not to say I don't reboot into Rockbox when I have time to play around, but for listening to music, I have to give the advantage to Apple. The one thing I'm thankful for, is that with Rockbox, at least I have a choice. My choice is to keep both operating systems on board, because quite honestly, they're both great. ■

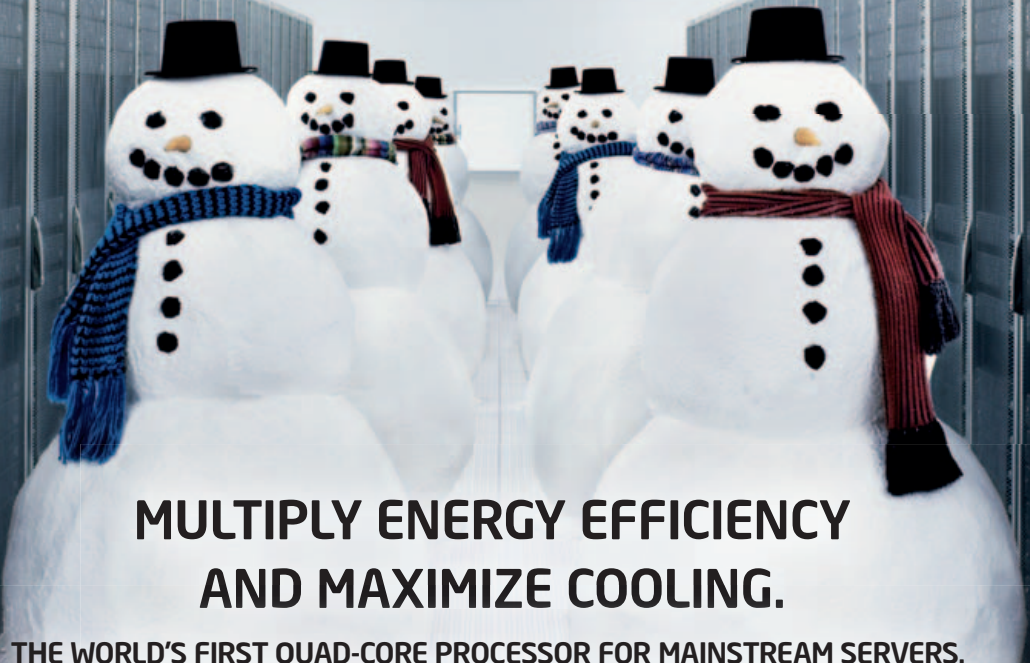
Shawn Powers is the Gadget Guy at www.linuxjournal.com. He's also the Technology Director for a K–12 school in northern Michigan. He loves to read science fiction and is quite a *Star Trek* fan. He's married to a beautiful woman and has three lovely daughters. Feel free to contact Shawn via e-mail at shawn@brainofshawn.com.

Resources

Rockbox: www.rockbox.org

Apple's iPod Page:
www.apple.com/ipod

Creators of the Original *Doom* Game:
www.idsoftware.com



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Go Green, Save Green with Linux

Put Linux to work to save energy, money and the environment.

A new age of environmental awareness appears to be upon us. The meteoric economic rise of India, China and other large countries has not only unleashed a spike in petroleum prices and the spectre of dry gas pumps in our lifetime, but also has raised fears of our fragile planet's ability to support an SUV-lifestyle for billions. Furthermore, the scientific community feeds us daily evidence of our climate changing right before our eyes. The problems seem so daunting. What can we do to fight back and do well by the planet?

Although hybrid vehicles, wind turbines and ethanol get

the green glory, many people in IT, including in our own Linux and Open Source communities, deserve attention for their green initiatives. With a global problem to solve that requires creativity, transparency and massive collaboration, who else would you call but the Linux folks? This article explains how Mother Nature's Mayday calls have inspired our community to innovate and do more with fewer resources. Whether your motivation is to green the earth or save green-backs through improved efficiency, read on to find out more about how you can go green, and save green, with Linux.

JAMES GRAY



How Is Linux Going Green?

A typical Linux server gulps about 225 Watts or more of power, meaning that the millions of Linux servers out there, now at around a 27% market share, are responsible for nearly 5 million tons of carbon emissions annually. Furthermore, Springboard Research recently reported that an average-size server has the same carbon footprint as a mid-size four-wheel-drive vehicle. In response to this and other daunting evidence, the color of Linux is purposefully going green. The number of green, Linux-based initiatives and projects is proliferating, and I'd like to share some of them with you. In this article, I discuss initiatives to save energy related to the Linux kernel, distributions and applications; virtualization; and exceptionally green Linux-based products (such as hardware).

There's Initiative in Those Initiatives

An initiative is only as good as the people and resources behind it. Three green-Linux initiatives have formed recently: two deep-pocketed ones, IBM's Big Green Linux initiative and Intel's Lesswatts.org; and a dot-org effort, the Linux Foundation's Green

Linux Initiative.

In August 2007, IBM launched its Big Green Linux initiative, intended to help its clients integrate Linux into the enterprise "as a way to reduce costs and energy consumption by building cooler data centers", says IBM. Big Green Linux is a subset of Project Big Green, a broader initiative to reduce energy consumption in the data center, both internally and for its clients. Although sparse to date, some of the Big Green Linux initiatives have included improved data-center ergonomics, encouraging server consolidation onto System p servers and System z mainframes, expanding on Linux innovations like the tickless kernel and collaboration on power management with the Linux community.

Intel is another IT titan trying to go green at both the processor and application levels. The firm readily admits that its green innovations historically have been further ahead on the hardware side than the software side. For instance, Intel first focused power management improvements on the mobile Centrino processor and is now migrating those technologies to server platforms. Regrettably, the advantageous hardware engineering often

exists but remains unexploited.

In order to bridge the gulf between hardware and software development, Intel created Lesswatts.org. The site is a nexus of collaboration on projects that "drive improvements in power consumption that will lead to a cleaner environment and allow companies to spend less money powering their IT infrastructure."

Some of the projects included on Lesswatts.org are:

- **PowerTOP:** a Linux-based tool that helps find programs that are needlessly consuming extra power when a computer is idle, as well as the magnitude of overconsumption.
- **Power Policy Manager:** a layered, system-wide power policy framework that provides a way for users to select multiple power policies to fit their systems.
- **Processor Power Management:** a project to leverage the power management features of Intel processors fully. Lesswatts.org contains all the features, solutions and enhancements related to processor power management. One example

FEATURE Go Green, Save Green with Linux

is the Intel Dynamic Acceleration Technology, which allows one processor core to deliver extra performance while the other core is idle.

- Display and Graphics Power Saving: a project that aims to exploit the power-saving features of Intel's graphics chipsets without sacrificing performance.

Besides those listed above and several other projects, Lesswatts.org contains numerous power-saving documents, whitepapers and tips, such as utilizing the Aggressive Link Power Management feature on SATA controllers or utilizing Gigabit Ethernet only when a system needs it.

Lesswatts.org is directed by Intel's Open Source Technology Center, the firm's nexus of Linux and open-source initiatives.

Over on the dot-org side of things is the Linux Foundation's (LF) Green Linux Initiative. The Linux Foundation is a product of the 2007 fusion of Open Source Development Labs and the Free Standards Group, whose mission is to support Linus Torvalds' and other efforts that move Linux forward technologically and out in the field. According to Amanda McPherson, LF's Director of Marketing, LF was inspired to set up a Green Linux Workgroup in June 2007, at its Collaboration Summit, where "concern for the planet [and] power management emerged as a top project to work on." LF, says McPherson, is pleased with how the tickless kernel, PowerTOP and other projects have progressed, adding that "developments by the community have been very impressive over the last few years" and that enterprises are gradually adopting them as the technologies are supported in the conservative enterprise distributions. "Enterprises are understandably cautious about upgrading kernel/distribution versions and taking advantage of new features. As time goes on, these features will be used more and more." The Green Group is ramped up or down according to project needs and will ramp up again this-coming June to address potential new issues, such as "Energy Star compliance and better optimization of device drivers for power management." McPherson also cited the importance of Intel and IBM

"rallying behind this topic" to move it forward.

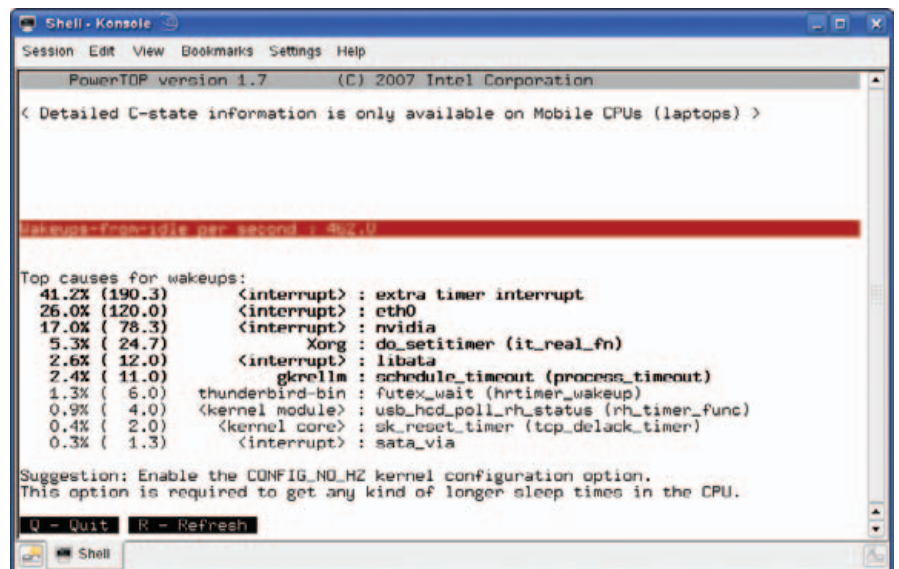
Tickless Idle in Linux

The two most significant recent innovations in Linux regarding power management are tickless idle and virtualization. The various Linux distribution makers deserve credit for supporting these innovations, integrating them into their distributions and pushing forward initiatives like Lesswatts.org.

The idea behind tickless idle is that Linux, starting with kernel 2.6.21 for 32-bit and 2.6.23 for 64-bit machines, keeps track of time in a completely new way in order to take advantage of low-power states in modern processors. The strategy involves keeping the processor in its lowest power state for as long as possible, interrupting that state only when necessary. For instance, on an Intel Core 2 Duo processor, the power states, or C states, vary between 1.2 and 35 Watts—a significant difference. Before kernel 2.6.21, Linux pulled the processor out of the lower C state with a timer tick to inform the processor of the need to perform housekeeping tasks. This tick, occurring every few milliseconds, functionally reduced the usefulness of the lower-power states. Without the tick, Linux now chills out and conserves power until the next timer event is scheduled to occur. Multisecond idle periods now are possible.

The power savings from tickless idle can have positive benefits in any type of machine—from longer battery life on brawny notebooks to significantly lower electricity bills for home users and data centers.

Although Intel, through the Lesswatts.org Project, is more public about exploiting the tickless kernel and publicizing its power management tools, representatives at AMD assured me that their less-publicized initiatives and partnerships in the Linux community are just as or more significant than Intel's. Margaret Lewis, AMD Director of Commercial Solutions and Software Strategy, asserted that the tickless-kernel features are fully supported on both AMD's 32-bit and 64-bit processors. Furthermore, Brent Kerby, Product Manager for AMD Opteron, noted that AMD's PowerNOW!, Cool'n'Quiet and CoolCore technologies, including the dynamic adjustment of individual processor-core frequencies (and not just in pairs), all function well and automatically under Linux and contribute greatly to power savings. Lewis added, "These technologies give you a lot more power management control and are cumulatively perhaps more important than the tickless kernel." AMD also emphasized its green efforts in other areas, such as the Green Grid, a consortium of companies working together to address environmental issues holistically throughout the data center, addressing hardware,



```
Shell - Konsole
Session Edit View Bookmarks Settings Help
PowerTOP version 1.7 (C) 2007 Intel Corporation
< Detailed C-state information is only available on Mobile CPUs (laptops) >

Wakeups-freq-idle per second: 492.0

Top causes for wakeups:
41.2% (190.3) <interrupt>: extra timer interrupt
26.0% (120.0) <interrupt>: eth0
17.0% ( 78.3) <interrupt>: nvidia
 5.3% ( 24.7) Xorg: do_settimer (it_real_fn)
 2.6% ( 12.0) <interrupt>: libata
 2.4% ( 11.0) gkrellm: schedule_timeout (process_timeout)
 1.3% (  6.0) thunderbird-bin: futex_wait (hrtimer_wakeup)
 0.9% (  4.0) <kernel module>: usb_hcd_poll_rh_status (rh_timer_func)
 0.4% (  2.0) <kernel core>: sk_reset_timer (tcp_delack_timer)
 0.3% (  1.3) <interrupt>: sata_via

Suggestion: Enable the CONFIG_NO_HZ kernel configuration option.
This option is required to get any kind of longer sleep times in the CPU.

Q - Quit R - Refresh
```

Figure 1. Intel's PowerTOP tool helps sleuth out applications that are consuming extra power needlessly.

software, building design, storage, cooling and more.

Attendant Applications: PowerTOP

Linus Torvalds has stated that work on the tickless kernel is mostly done and, thus, can take advantage of low-power states in processors; however, much remains to be done to maximize its effect. Although Linux gladly would remain dormant, other superfluous, busybody processes from various applications keep waking it needlessly. To solve this problem, Intel's Arjan van de Ven created PowerTOP, a tool that finds culprits in the kernel and user space that are bothering the processor needlessly and reports the energy wasted by those activities. PowerTOP also reports on the time spent in each power state.

Virtualization

Making more efficient use of existing computing resources through virtualization, such as consolidating multiple virtual servers onto fewer physical machines, has been a major trend in the Linux space. Little do we realize we are saving a great deal of juice in the process. Thus, not only does one reduce server sprawl and the expense of purchasing and maintaining more machines, but also electrical power utilization is improved by approximately 10–20 Watts per idle virtual machine, according to AMD. Additionally, as Jon 'maddog' Hall says, "Utilizing fewer systems and sharing the load is goodness."

The power savings from virtualization on Linux has been enhanced further by the arrival of tickless idle. The existence of ticks in each virtual machine would otherwise put multiple extra loads on the virtualization platform and greatly reduce efficiency and the number of VMs per machine. For instance, if you have 30 VMs on one machine, with each one creating hundreds of ticks per second, a significant load is created before any real work is done.

Beyond virtualization itself, a number of vendors are exploring ways to manage their virtualization strategies to streamline their data-center operations and reduce power usage further. One example is Cassatt Corporation's Active Power Management Technology, which has released a platform-agnostic prod-

uct to turn off servers safely when they are not needed or idle. Rather than leaving machines automatically running round the clock or relying on manual decision making, administrators can set priorities and policies to mandate how, where and when to power down idle servers, as well as power them back up. The net result is better management of both virtual and physical infrastructure. Interesting for us Linux-lovers, Active

Spokesperson, emphasized that his firm's green efforts "extend considerably beyond consolidation", including "the provision of highly optimized paravirt device drivers for fully virtualized guests." This means more and more systems will be able to be virtualized, broadening the utilization and impact of the technology.

Car also touted Red Hat's collaboration with chip vendors and Open Source

A typical Linux server gulps about 225 Watts or more of power, meaning that the millions of Linux servers out there, now at around a 27% market share, are responsible for nearly 5 million tons of carbon emissions annually.

Power Management is easy to install and nondisruptive, as it relies on internal power controllers found inside most servers rather than on installation of software on managed servers.

Scalent V/OE offers another approach, namely dynamic server repurposing. V/OE allows administrators to shift their data centers between different configurations or go from dead bare metal to live, running, connected servers in just a few minutes and without physical intervention. Scalent's Director of Marketing, Alana Achterkirchen, pointed out that Pacific Gas & Electric (PG&E), California's largest electric utility, offers rebates to companies that deploy IT virtualization projects that result in the removal of computing equipment. The incentive, says PG&E, "is based on the amount of energy saved, predicted through a calculation model" and ranges from \$150–\$300 per server. Way to go, California!

What Are the Distributions Doing?

The main distribution providers are core contributors to many a green project and are integrating them into their releases as rapidly as possible. For instance, Red Hat, Ubuntu and SUSE Linux all committed publicly to contribute to and make available the innovations from Lesswatts.org.

Nick Car, Red Hat Chief Technical

communities to optimize power consumption in areas such as:

- CPUfreq clock scaling in collaboration with Intel. Clock scaling allows for changing the clock speed of the running CPU on the fly, thus reducing the power the CPU consumes.
- AMD's PowerNow! speed throttling and power-saving technology (includes CPUfreq work).
- Intel's PowerTOP Project and using it to identify power-inefficient algorithms on all server applications, as well as to audit the kernel for pollers. Car points out that "We have been doing this work for the past year, and it has accumulated to the point where we are seeing meaningful power savings."
- Suspend/resume/hibernate work on laptops, including features such as automatic screen backlight intensity reduction as a laptop becomes idle.

Red Hat also will integrate the new tickless kernel in Fedora 9 and subsequently in Red Hat Enterprise Linux. "Red Hat has been a key developer of this technology", says Car, "which allows the kernel to properly idle itself when appropriate."

Over in Ubuntu's camp, Gerry Carr, Canonical's Marketing Manager,

FEATURE Go Green, Save Green with Linux

stressed that his company “is not directly involved in green computing per se, but indirectly we are massively involved”, adding that “we built an enabling technology for green computing without it being directly built for this purpose.” Regarding virtualization, Carr also stressed the “optimization of the kernel for paravirt ops, which is a long way of saying you can run more VMs on less iron using Ubuntu, thus saving energy there.”

Carr also highlighted the presence of Ubuntu on low-cost computers, which typically utilize less energy, such as Intel’s Classmate PC. The Classmate is targeted at students in poor countries. Similarly, Ubuntu actively supports thin-client computing through partnership with NComputing and other providers. One example is the deployment of terminal desktops for every child in the Republic of Macedonia (180,000 terminals) on only 20,000 PCs.

Carr further explained that the Xubuntu version of its distribution “is built specifically to run on older, less-powerful machines and thus extend their shelf life significantly”, and that it has evidence that “a PC running Ubuntu is significantly more power-efficient than one running Windows”.

Finally, Carr notes that “As an organisation, we are great believers in the multiplier effect, in providing the means for others to take action. We couldn’t try to directly support the number of initiatives that happen purely by providing a product that is free to use and redistribute and that we freely maintain.”

Regarding SUSE Linux, Roger Levy,

Finally, when you’re ready to upgrade, Zonbu takes back your old device and foots the bill for its recycling.

Senior Vice President and General Manager of Open Platform Solutions for Novell, noted that his company is focused on “improvements in policy-driven power management and system monitors for servers, along with better suspend functionality for laptops”.

Green PCs and Other Equipment

Just because a piece of hardware is cheap, doesn’t mean it is cheapest in the long run. Whether that hardware is expensive in environmental terms is harder to calculate, but is fortunately becoming easier as hardware providers seek competitive advantage via green credentials and tools to evaluate product impact.

The difference between running Linux with its tickless kernel on AMD or Intel processors is probably a wash. Both companies have strong commitments to environmental protection and

reducing energy consumption. A more important choice is whether your hardware solution is built with an environmental ethos in mind and offers maximum power conservation, avoidance of toxins and recycling options. A few exceptional, Linux-focused companies are worth considering in this regard.

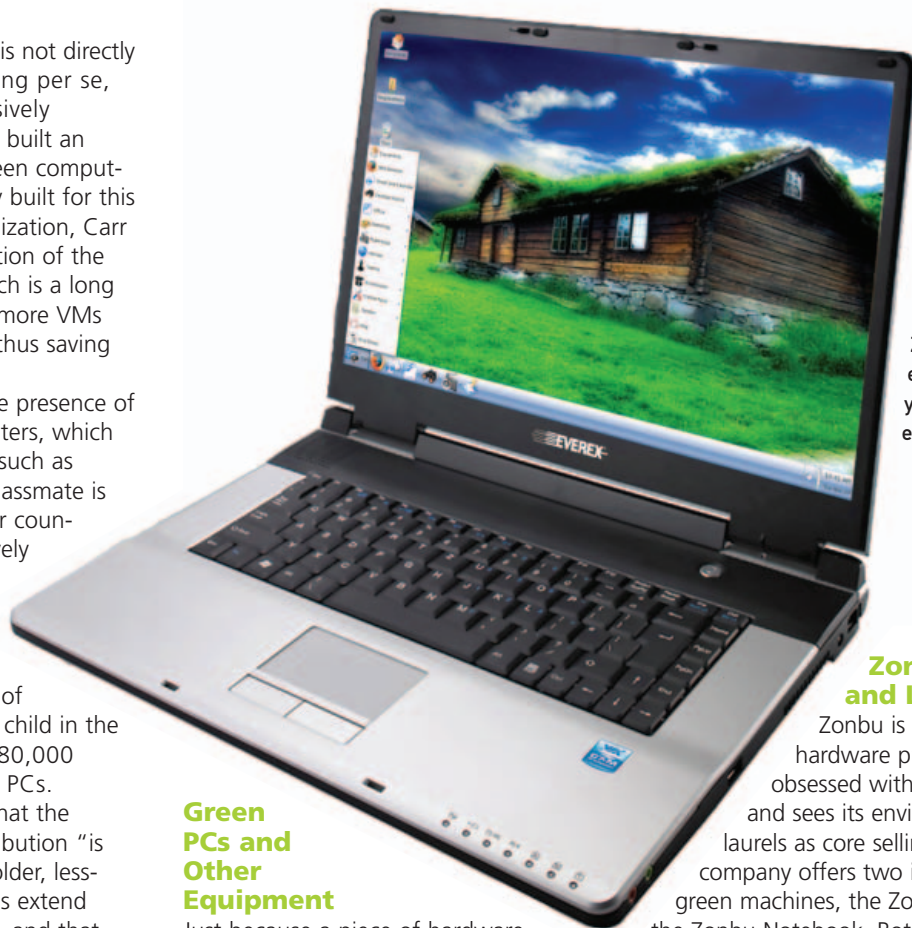


Figure 2. The new Zonbu laptop follows in the green footsteps of its older kin, the Zonbu PC. Zonbu even will offset your carbon emissions for you!

Zonbu PC and Laptop

Zonbu is perhaps the hardware provider most obsessed with being green and sees its environmental laurels as core selling points. The company offers two interesting and green machines, the Zonbu PC and the Zonbu Notebook. Both machines are pre-installed with Gentoo Linux and offer environmental advantages like few other PCs do. Zonbu also offers interesting features, such as on-line storage plans and separate versions for newbies and experienced users. (See the February 2008 issue of *Linux Journal* for a detailed review of the Zonbu desktop.)

Zonbu is attempting to cover all the environmental bases, which is summed up in its Electronic Product Environmental Assessment Tool (EPEAT) Gold rating for strong overall environmental performance. Only 12 desktop machines have reached this mark to date. The Zonbu sisters deliver significant gains in energy efficiency, achieving the US EPA Energy Star 4 rating. This translates to a power requirement of only 10–15 Watts, depending on the load. Most PCs of similar caliber (without monitor) will gulp 60–100 Watts or more, depending on numerous factors. Zonbu’s marketing people tell me that you’ll save over 1,200 kilowatt hours during the course of a year, which seems generous given their assumption that a typical PC averages 175 Watts. However, even with a more-conservative savings estimate of

600 kilowatt hours per year, you'll probably save more than \$60 on electricity during the course of a year, based on a cost of \$0.10 per kilowatt hour.

A unique Zonbu bonus involves automatic purchases of carbon offsets from the firm Climate Trust, which invests in projects that reduce net carbon emissions society-wide, such as wind energy or tree planting. In addition, Zonbu builds its hardware with recycling in mind and follows the European RoHS Directive, such that no more than 25% of the hazardous substances (such as lead, mercury and cadmium) that go into typical desktops are used. Finally, when you're ready to upgrade, Zonbu takes back your old device and foots the bill for its recycling. Zonbu says it is "determined that no Zonbu device contributes to the problem" of e-waste.

Save a Ton(ne) with Koolu

Not much different philosophically from Zonbu is Koolu, a Canadian firm that aims to save a tonne (Canadian for ton) of carbon emissions with its thin clients and Net appliances. With Jon 'maddog' Hall as Koolu's CTO and Ambassador, you are sure that the concept is robust and open source. The products run Ubuntu.

Koolu's (and many other firms') thin clients, says Hall, require only 10 Watts or less and "allow better sharing of CPU power, memory, disk and even people power". Meanwhile, Koolu claims that the fanless Net appliances will save you up to 90% on electricity costs and 50% on PC capital costs. Furthermore, like the Zonbu twins, Koolu's products are RoHS-compliant. Unfortunately, Koolu does not currently offer a recycling program, nor does it purchase carbon offsets.

Other Ways to Make a Difference

Besides the above information, there are many other ways to compute that are gentler on the environment. Here are a few suggestions:

- Avoid e-waste by avoiding Windows Vista—a 2007 study by Softchoice Corporation and amplified by Greenpeace stated that "50% of all PCs are below Windows Vista's basic system requirements" and "94% are not ready for Windows Vista Premium edition". A similar study by the British government found that Linux users

need to upgrade their hardware only half as often as Windows users.

- Investigate the environmental footprint of your next equipment purchase with Electronic Product Environmental Assessment Tool (EPEAT).
- Look for the Energy Star logo, with its tough new requirements, for energy efficiency and power management capabilities.
- Recycle your old CRT monitor—according to ViewSonic, a 19" LCD monitor sips only 40 Watts compared to 100 Watts for a comparable CRT monitor. The company estimates you'll save around \$20 annually in electricity costs.

Do It with Linux

Although most news about the environment and energy consumption is alarming, the plethora of new Linux-focused

technologies and initiatives related to green computing is a cause for hope and optimism. Many barriers, such as data-center complexity, lack of information and societal apathy, must yet be overcome, but the Linux community and many IT firms have laid a laudable foundation from which to build. The initiatives outlined in this article—IBM's Big Green Linux, Intel's Lesswatts.org, Linus' tickless kernel, virtualization, Zonbu and Koolu PCs, Energy Star, EPEAT and more—are excellent tools that can help you to do well while you do good. *Linux Journal* encourages you to keep Mother Nature in mind as you green up your data center or PC, but if you do your homework, going green likely will not be a burden to bear but a substantial long-term competitive cost advantage as well. ■

James Gray is *Linux Journal* Products Editor and a graduate student in environmental science and management at Michigan State University. A Linux enthusiast since the mid-1990s, he currently resides in Lansing, Michigan, with his wife and cats.

Resources

IBM's Big Green Linux Initiative: www-03.ibm.com/press/us/en/pressrelease/22006.wss

Intel's Lesswatts.org: www.lesswatts.org

The Linux Foundation's Green Linux Initiative: www.linux-foundation.org/en/Green_Linux

Cassatt Corporation: www.cassatt.com

Pacific Gas & Electric Rebates for Virtualization Projects:
www.pge.com/biz/rebates/hightech/htee_incentives.html

Red Hat: www.redhat.com

Ubuntu: www.ubuntu.com

Intel's Classmate PC: www.classmatepc.com

Macedonia Computer Project: www.ubuntu.com/news/macedonia-school-computers

Xubuntu: www.xubuntu.org

Zonbu: www.zonbu.com

US EPA Energy Star Program: www.energystar.gov

Climate Trust: www.climatetrust.org

Koolu: www.koolu.com

Electronic Product Environmental Assessment Tool (EPEAT): www.epeat.net

Cfengine

FOR ENTERPRISE CONFIGURATION MANAGEMENT

Cfengine makes it easier to manage configuration files across large numbers of machines.

Scott Lackey

Cfengine is known by many system administrators to be an excellent tool to automate manual tasks on UNIX and Linux-based machines. It also is the most comprehensive framework to execute administrative shell scripts across many servers running disparate operating systems. Although cfengine is certainly good for these purposes, it also is widely considered the best open-source tool available for configuration management. Using cfengine, sysadmins with a large installation of, say, 800 machines, can have information about their environment quickly that otherwise would take months to gather, as well as the ability to change the environment in an instant. For an initial example, if you have a set of Linux machines that need to have a different `/etc/nsswitch.conf`, and then have some processes restarted, there's no need to connect to

each machine and perform these steps or even to write a script and run it on the machines once they are identified. You simply can tell cfengine that all the Linux machines running Fedora/Debian/CentOS with XGB of RAM or more need to use a particular `/etc/nsswitch.conf` until a newer one is designated. Cfengine can do all that in a one-line statement.

Cfengine's configuration management capabilities can work in several different ways. In this article, I focus on a make-it-so-and-keep-it-so approach. Let's consider a small hosting company configuration, with three administrators and two data centers (Figure 1).

Each administrator can use a Subversion/CVS sandbox to hold repositories for each data center. The cfengine client will run on each client machine, either through a cron job or a

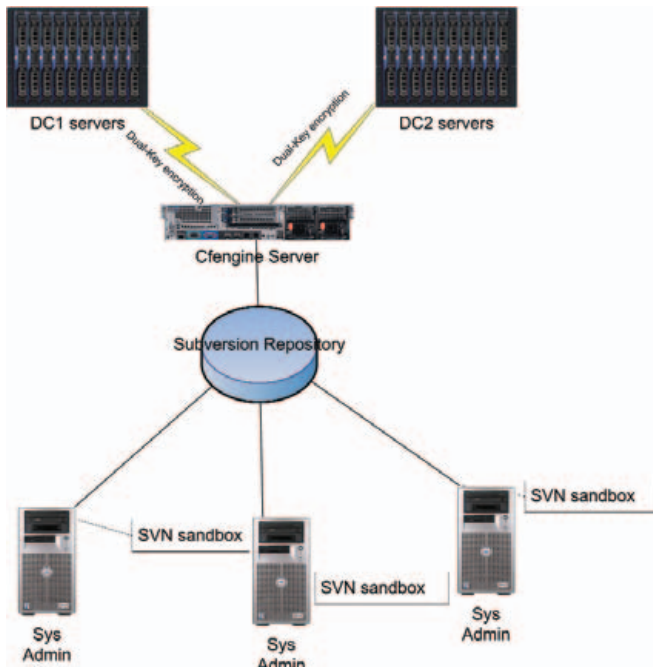


Figure 1. How the Few Control the Many

cfengine execution daemon, and pull the cfengine configuration files appropriate for each machine from the server. If there is work to be done for that particular machine, it will be carried out and reported to the server. If there are configuration files to copy, the ones active on the client host will be replaced by the copies on the cfengine server. (Cfengine will not replace a file if the copy process is partial or incomplete.)

A cfengine implementation has three major components:

- Version control: this usually consists of a versioning system, such as CVS or Subversion.
- Cfengine internal components: cfservd, cfagent, cfexecd, cfenvd, cfagent.conf and update.conf.
- Cfengine commands: processes, files, shellcommands, groups, editfiles, copy and so forth.

The cfservd is the master daemon, configured with `/etc/cfservd.conf`, and it listens on port 5803 for connections to the cfengine server. This daemon controls security and directory access for all client machines connecting to it. cfagent is the client program for running cfengine on hosts. It will run either from cron, manually or from the execution daemon for cfengine, cfexecd. A common method for running the cfagent is to execute it from cron using the cfexecd in non-daemon mode. The primary reason for using both is to engage cfengine's logging system. This is accomplished using the following:

```
*/10 * * * * /var/cfengine/sbin/cfexecd -F
```

as a cron entry on Linux (unless Solaris starts to understand `*/10`). Note that this is fairly frequent and good only for a low number of servers. We don't want 800 servers updating within

the same ten minutes.

The cfenvd is the "environment daemon" that runs on the client side of the cfengine implementation. It gathers information about the host machine, such as hostname, OS and IP address. The cfenvd detects these factors about a host and uses them to determine to which groups the machine belongs. This, in effect, creates a profile for each machine that cfengine uses to determine what work to perform on each host.

The master configuration file for each host is cfagent.conf. This file can contain all the configuration information and cfengine code for the host, a subset of hosts or all hosts in the cfengine network. This file is often just a starting point where all configurations are stored in other files and "imported" into cfagent.conf, in a very similar fashion to Nagios configuration files. The update.conf file is the fundamental configuration file for the client. It primarily just identifies the cfengine server and gets a copy of the cfagent.conf.

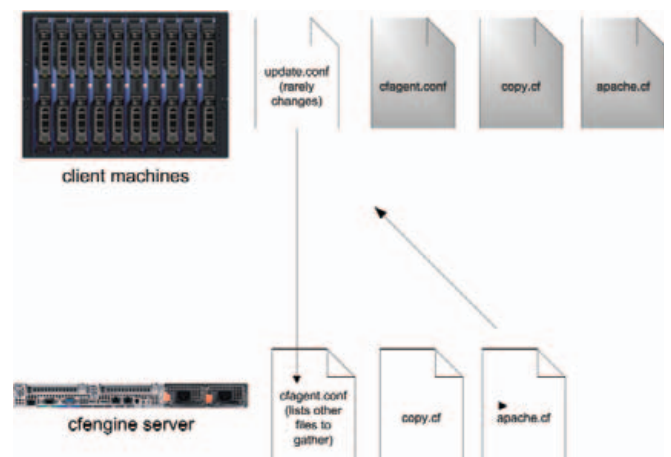


Figure 2. Automated Distribution of Cfengine Files

The update.conf file tells the cfengine server to deploy a new cfagent.conf file (and perhaps other files as well) if the current copy on the host machine is different. This adds some protection for a scenario where a corrupt cfagent.conf is sent out or in case there never was one. Although you could use cfengine to distribute update.conf, it should be copied manually to each host.

Cfengine "commands" are not entered on the command line. They make up the syntax of the cfengine configuration language. Because cfengine is a framework, the system administrator must write the necessary commands in cfengine configuration files in order to move and manipulate data. As an example, let's take a look at the files command as it would appear in the cfagent.conf file:

```
files:
/etc/passwd mode=644
    owner=root action=fixall
/etc/shadow mode=600
    owner=root action=fixall
```

This would set all machines' `/etc/passwd` and `/etc/shadow` files to the permissions listed in the file (644 and 600). It

FEATURE Cfengine for Enterprise Configuration Management

also would change the owner of the file to root and fix all of these settings if they are found to be different, each time cfengine runs. It's important to keep in mind that there are no group limitations to this particular files command. If cfengine does not have a group listed for the command, it assumes you mean any host. This also could be written as:

```
files:
  any::
    /etc/passwd mode=644
      owner=root action=fixall
    /etc/shadow mode=600
      owner=root action=fixall
```

This brings us to an important topic in building a cfengine implementation: groups. There is a groups command that can be used to assign hosts to groups based on various criteria. Custom groups that are created in this way are called soft groups. The groups that are filled by the cfenvd daemon automatically are referred to as hard groups. To use the groups feature of cfengine and assign some soft groups, simply create a groups.cf file, and tell the cfagent.conf to import it somewhere in the beginning of the file:

```
import:
  any::
    groups.cf
```

Cfengine will look in the default directory for the groups.cf file in /var/cfengine/inputs. Now you can create arbitrary groups based on any criteria. It is important to remember that the terms groups and classes are completely interchangeable in cfengine:

```
groups:
  development = ( nfs01 nfs02 10.0.0.17 )
  production = ( app01 app02 !development )
```

You also can combine hard groups that have been discovered by cfenvd with soft groups:

```
groups:
  legacy = ( irix compiled_on_cygwin sco )
```

Let's get our testing setup in order. First, install cfengine on a server and a client or workstation. Cfengine has been compiled on almost everything, so there should be a package for your OS/distribution. Because the source is usually the latest version, and many versions are bug fixes, I recommend compiling it yourself. Installing cfengine gives you both the server and client binaries and utilities on every machine, so be careful not to run the server daemon (cfservd) on a client machine unless you specifically intend to do that. After the install, you should have a /var/cfengine/ directory and the binaries mentioned previously.

Before any host can actually communicate with the cfengine server, keys must be exchanged between the two. Cfengine keys are similar to SSH keys, except they are one-way. That is to say, both the server and the client must have

each other's public key in order to communicate. Years of sysadmin paranoia cause me to recommend manually copying all keys and trusting nothing. Copy /var/cfengine/ppkeys/localhost.pub from the server to all the clients and from the clients to the server in the same directory, renaming them /var/cfengine/ppkeys/root-10.11.0.1.pub, where the IP is 10.11.0.1.

On the server side, cfservd.conf must be configured to allow clients to access particular directories. To do this, create an AllowConnectionsFrom and an admit section:

```
#cfservd.conf

control:
  AllowConnectionsFrom = ( 192.168.0.0/24 )

admit:
  /configs/datacenter1 *.example1.com
  /configs/datacenter2 *.example2.com
```

To test your example client to see whether it is connecting to the cfengine server, make sure port 5803 is clear between them, and run the server with:

```
cfservd -v -d2
```

And, on the client run:

```
cfagent -v --no-splay
```

This will give you a lot of debugging information on the server side to see what's working and what isn't.

Now, let's take a look at distributing a configuration file. Although cfengine has a full-featured file editor in the editfiles command, using this method for distributing configurations is not advised. The copy command will move a file from the server to the client machine with .cfnew appended to the filename. Then, once the file has been copied completely, it renames the file and saves the old copy as .cfsaved in the specified directory. Here's the copy command syntax:

```
copy:
  class::
    <<master-file>>

    dest=target-file
    server=server
    mode=mode
    owner=owner
    group=group
    backup=true/false
    repository=backup_dir
    recurse=number/inf/0
    define=classlist
```

Only the dest= is required, along with the filename to save at the destination. These can be different. Here's another example:

```
copy:
  linux::
```

```
${copydir}/linux/resolv.conf
```

```
dest=/etc/resolv.conf
server=cfengine.example1.com
mode=644
owner=root
group=root
backup=true
repository=/var/cfengine/cfbackup
recurse=0
define=copiedresolvdotconf
```

The last line in this copy statement assigns this host to a group called `copiedresolvdotconf`. Although we don't have to do anything after copying this particular file, we may want to do some action on all hosts that just had this file successfully sent to them, such as sending an e-mail or restarting a process. As another example, if you update a configuration file that is attached to a daemon, you may want to send a SIGHUP to the process to cause it to reread the configuration file. This is common with Apache's `httpd.conf` or `inetd.conf`. If the copy is not successful, this server won't be added to the `copiedresolvdotconf` class. You can query all servers in the network to see whether they are members and, if not, find out what went wrong.

A great way to version control your config files is to use a

cfengine variable for the filename being copied to control which version gets distributed. Such a line may look something like this:

```
copy:
    linux::
        ${copydir}/linux/${resolve_conf}
```

Or, better yet, you can use cfengine's class-specific variables, whose scope is limited to the class with which they are associated. This makes copy statements much more elegant and can simplify changes as your cfengine files scale:

```
control:
    # ${resolve_conf} value depends on context,
    # is this a linux machine or hpux?
    linux:: resolve_conf = ( "${copydir}/linux/resolv.conf )
    hpux::  resolve_conf = ( "${copydir}/hpux/resolv.conf )
copy:
    linux::
        ${resolve_conf}
```

Here is a full `cfagent.conf` file that makes use of everything I've covered thus far. It also adds some practical examples of

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FEATURE Cfengine for Enterprise Configuration Management

how to do sysadmin work with cfengine:

```
# cfagent.conf

control:
    actionsequence = ( files editfiles processes )
    AddInstallable = ( cron_restart )
    solaris:: crontab = ( /var/spool/cron/crontabs/root )
    linux:: crontab = ( /var/spool/cron/root )

files:
    solaris::
        ${crontab}
        action=touch
    linux::
        ${crontab}
        action=touch

editfiles:
    solaris::
        { ${crontab}
        AppendIfNoSuchLine "0,10,20,30,40,50 * * * * *
        ↪ /var/cfengine/sbin/cfexecd -F"
        DefineClasses "cron_restart"
        }
    linux::
        { ${crontab}
        AppendIfNoSuchLine "0,10,20,30,40,50 * * * * *
        ↪ /var/cfengine/sbin/cfexecd -F"
        #linux doesn't need a cron restart.
        }

shellcommands:
    solaris.cron_restart::
        "/etc/init.d/cron stop"
        "/etc/init.d/cron start"
```

```
import:
    any::
        groups.cf
        copy.cf
```

The above is a full cfagent configuration that adds cfengine execution from cron to each client (if it's Linux or Solaris). So effectively, once you run cfengine manually for the first time with this cfagent.conf file, cfengine will continue to run every five minutes from that host, but you won't need to edit or restart cron. The control section of the cfagent.conf is where you can define some variables that will control how cfengine handles the configuration file. actionsequence tells cfengine what order to execute each command, and AddInstallable is a variable that holds soft groups that get defined later in the file in a "define" statement, such as after the editfiles command where the line is DefineClasses "cron_restart". The reason for using AddInstallable is sometimes cfengine skips over groups that are defined after command execution, and defining that group in the control section ensures that the command will be recognized throughout the configuration.

Being able to check configuration files out from a versioning system and distribute them to a set of servers is a powerful system administration tool. A number of independent tools will do a subset of cfengine's work (such as rsync, ssh and make), but nothing else allows a small group of system administrators to manage such a large group of servers. Centralizing configuration management has the dual benefit of information and control, and cfengine provides these benefits in a free, open-source tool for your infrastructure and application environments. ■

Scott Lackey is an independent technology consultant who has developed and deployed configuration management solutions across industry from NASA to Wall Street. Contact him at slackey@violetconsulting.net. www.violetconsulting.net.

TECH TIP Java JNI and Linux

Do you have code for Linux written in Assembler, C, C++, FreePascal or any other native-compiled language that surfaces a Java JNI interface?

Have you had problems with crashes from time to time? It could be that your native code is improperly, from Java's point of view anyway, using signals. Even if your code is not explicitly using signals, the Run-Time Library (RTL) linked into your Java JNI Shared Object may be using signals "for" you.

The answer to your problems may lie in a Shared Object named libjsig.so that comes with later versions of Java. Basically, libjsig.so makes it easy to implement something called signal chaining that allows the Java JVM, and your Java JNI native code that uses signals, to interact with one another properly.

There are a couple ways to use libjsig.so, but one quick way to find out whether libjsig.so will benefit you is to use the wonderful Linux LD_PRELOAD capability discussed in the November 2004 issue of *Linux Journal* in the article "Modifying a Dynamic Library without Changing the Source Code" by

Greg Kroah-Hartman (www.linuxjournal.com/article/7795).

To give it a go, in a bash shell, use the following technique to execute your Java application:

```
export LD_PRELOAD=/path/to/libjsig.so; java YOUR_JAVA_CLASS
```

For more information on libjsig.so try:

- Signal Chaining: java.sun.com/javase/6/docs/technotes/guides/vm/signal-chaining.html
- Revelations on Java signal handling and termination: www.ibm.com/developerworks/java/library/i-signalhandling/
- Signal Handling on Solaris OS and Linux: java.sun.com/javase/6/webnotes/trouble/TSG-VM/html/gbzbl.html

—PAUL WHITTINGTON

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Continuous Data Protection	✓	Not Supported	Not Supported
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Restore Linux Software RAID	✓	Not Supported	Not Supported
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PXE MAGIC

Flexible Network Booting with Menus

Set up a PXE server and then add menus to boot kickstart images, rescue disks and diagnostic tools all from the network.

KYLE RANKIN

It's funny how automation evolves as system administrators manage larger numbers of servers. When you manage only a few servers, it's fine to pop in an install CD and set options manually. As the number of servers grows, you might realize it makes sense to set up a kickstart or FAI (Debian's Fully Automated Installer) environment to automate all that manual configuration at install time. Now, you boot the install CD, type in a few boot arguments to point the machine to the kickstart server, and go get a cup of coffee as the machine installs.

When the day comes that you have to install three or four machines at once, you either can burn extra CDs or investigate PXE boot. The Preboot eXecution Environment is an open standard developed by Intel to allow machines to boot over a network instead of from local media, such as a floppy, CD or hard drive. Modern servers and newer laptops and desktops with integrated NICs should support PXE booting in the

BIOS—in some cases, it's enabled by default, and in other cases, you need to go into your BIOS settings to enable it.

Because many modern servers these days offer built-in remote power and remote terminals or otherwise are remotely accessible via serial console servers or networked KVM, if you have a PXE boot environment set up, you can power on remotely, then boot and install a machine from miles away.

If you have never set up a PXE boot server before, the first part of this article covers the steps to get your first PXE server up and running. If PXE booting is old hat to you, skip ahead to the section called PXE Menu Magic. There, I cover how to configure boot menus when you PXE boot, so instead of hunting down MAC addresses and doing a lot of setup before an install, you simply can boot, select your OS, and you are off and running. After that, I discuss how to integrate rescue tools, such as Knoppix and memtest86+, into your PXE environment, so they are available to any machine that can boot from the network.

PXE Setup

You need three main pieces of infrastructure for a PXE setup: a DHCP server, a TFTP server and the syslinux software. Both DHCP and TFTP can reside on the same server. When a system attempts to boot from the network, the DHCP server gives it an IP address and then tells it the address for the TFTP server and the name of the bootstrap program to run. The TFTP server then serves that file, which in our case is a PXE-enabled syslinux binary. That program runs on the booted machine and then can load Linux kernels or other OS files that also are shared on the TFTP server over the network. Once the kernel is loaded, the OS starts as normal, and if you have configured a kickstart install correctly, the install begins.

Configure DHCP

Any relatively new DHCP server will support PXE booting, so if you don't already have a DHCP server set up, just use your distribution's DHCP server package (possibly named `dhcpcd`, `dhcp3-server` or something similar). Configuring DHCP to suit your network is somewhat beyond the scope of this article, but many distributions ship a default configuration file that should provide a good place to start. Once the DHCP server is installed, edit the configuration file (often in `/etc/dhcpd.conf`), and locate the subnet section (or each host section if you configured static IP assignment via DHCP and want these hosts to PXE boot), and add two lines:

```
next-server ip_of_pxe_server;
filename "pxelinux.0";
```

The `next-server` directive tells the host the IP address of the TFTP server, and the `filename` directive tells it which file to download and execute from that server. Change the `next-server` argument to match the IP address of your TFTP server, and keep `filename` set to `pxelinux.0`, as that is the name of the syslinux PXE-enabled executable.

In the subnet section, you also need to add `dynamic-bootp` to the range directive. Here is an example subnet section after the changes:

```
subnet 10.0.0.0 netmask 255.255.255.0 {
    range dynamic-bootp 10.0.0.200 10.0.0.220;
    next-server 10.0.0.1;
    filename "pxelinux.0";
}
```

Install TFTP

After the DHCP server is configured and running, you are ready to install TFTP. The `pxelinux` executable requires a TFTP server that supports the `tsize` option, and two good choices are either `tftpd-hpa` or `atftp`. In many distributions, these options already are packaged under these names, so just install your distribution's package or otherwise follow the installation instructions from the project's official site.

Depending on your TFTP package, you might need to add an entry to `/etc/inetd.conf` if it wasn't already added for you:

```
tftp          dgram  udp    wait    root    /usr/sbin/in.tftpd
/usr/sbin/in.tftpd -s /var/lib/tftpboot
```

As you can see in this example, the `-s` option (used for `tftpd-hpa`) specified `/var/lib/tftpboot` as the directory to contain my files, but on some systems, these files are commonly stored in `/tftpboot`, so see your `/etc/inetd.conf` file and your `tftpd` man page and check on its conventions if you are unsure. If your distribution uses `xinetd` and doesn't create a file in `/etc/xinetd.d` for you, create a file called `/etc/xinetd.d/tftp` that contains the following:

```
# default: off
# description: The tftp server serves files using
# the trivial file transfer protocol.
# The tftp protocol is often used to boot diskless
# workstations, download configuration files to network-aware
# printers, and to start the installation process for
# some operating systems.
service tftp
{
    disable = no
    socket_type = dgram
    protocol = udp
    wait = yes
    user = root
    server = /usr/sbin/in.tftpd
    server_args = -s /var/lib/tftpboot
    per_source = 11
    cps = 100 2
    flags = IPv4
}
```

As `tftpd` is part of `inetd` or `xinetd`, you will not need to start any service. At most, you might need to reload `inetd` or `xinetd`; however, make sure that any software firewall you have running allows the TFTP port (port 69 udp) as input.

Add Syslinux

Now that TFTP is set up, all that is left to do is to install the syslinux package (available for most distributions, or you can follow the installation instructions from the project's main Web page), copy the supplied `pxelinux.0` file to `/var/lib/tftpboot` (or your TFTP directory), and then create a `/var/lib/tftpboot/pxelinux.cfg` directory to hold `pxelinux` configuration files.

PXE Menu Magic

You can configure `pxelinux` with or without menus, and many administrators use `pxelinux` without them. There are compelling reasons to use `pxelinux` menus, which I discuss below, but first, here's how some `pxelinux` setups are configured.

When many people configure `pxelinux`, they create configuration files for a machine or class of machines based on the fact that when `pxelinux` loads it searches the `pxelinux.cfg` directory on the TFTP server for configuration files in the following order:

- Files named `01-MACADDRESS` with hyphens in between each hex pair. So, for a server with a MAC address of `88:99:AA:BB:CC:DD`, a configuration file that would target only that machine would be named `01-88-99-aa-bb-cc-dd` (and I've noticed it does matter that it is lowercase).



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FEATURE PXE Magic: Flexible Network Booting with Menus

to provide extra documentation at boot time (this is handy if you are like me and create custom boot arguments for your kickstart servers). In this example, I could create a `/var/lib/tftpboot/f2.msg` file and add a short help file.

Although this menu is rather basic, check out the `syslinux` configuration file and project page for examples of how to jazz it up with color and even custom graphics.

Extra Features: PXE Rescue Disk

One of my favorite features of a PXE server is the addition of a Knoppix rescue disk. Now, whenever I need to recover a machine, I don't need to hunt around for a disk, I can just boot the server off the network.

First, get a Knoppix disk. I use a Knoppix 5.1.1 CD for this example, but I've been successful with much older Knoppix CDs. Mount the CD-ROM, and then go to the `boot/isolinux` directory on the CD. Copy the `miniroot.gz` and `vmlinuz` files to your `/var/lib/tftpboot` directory, except rename them something distinct, such as `miniroot-knx5.1.1.gz` and `vmlinuz-knx5.1.1`, respectively. Now, edit your `pxelinux.cfg/default` file, and add lines like the one I used above in my example:

```
label 1
kernel vmlinuz-knx5.1.1
append secure nfsdir=10.0.0.1:/mnt/knoppix/5.1.1 nodhcp
    ➤ lang=us ramdisk_size=100000 init=/etc/init 2
    ➤ apm=power-off nomce vga=normal
    ➤ initrd=miniroot-knx5.1.1.gz quiet BOOT_IMAGE=knoppix
```

Notice here that I labeled it 1, so if you already have a label with that name, you need to decide which of the two to rename. Also notice that this example references the renamed `vmlinuz-knx5.1.1` and `miniroot-knx5.1.1.gz` files. If you named your files something else, be sure to change the names here as well. Because I am mostly dealing with servers, I added 2 after `init=/etc/init` on the `append` line, so it would boot into runlevel 2 (console-only mode). If you want to boot to a full graphical environment, remove 2 from the `append` line.

The final step might be the largest for you if you don't have an NFS server set up. For Knoppix to boot over the network, you have to have its CD contents shared on an NFS server. NFS server configuration is beyond the scope of this article, but in my example, I set up an NFS share on 10.0.0.1 at `/mnt/knoppix/5.1.1`. I then mounted my

One of my favorite features of a PXE server is the addition of a Knoppix rescue disk.

Knoppix CD and copied the full contents to that directory. Alternatively, you could mount a Knoppix CD or ISO directly to that directory. When the Knoppix kernel boots, it will then mount that NFS share and access the rest of the files it needs directly over the network.

Extra Features: Memtest86+

Another nice addition to a PXE environment is the `memtest86+` program. This program does a thorough scan of a system's RAM and reports any errors. These days, some distributions even install it by default and make it available during the boot process because it is so useful. Compared to Knoppix, it is very simple to add `memtest86+` to your PXE server, because it runs from a single bootable file. First, install your distribution's `memtest86+` package (most make it available), or otherwise download it from the `memtest86+` site. Then, copy the program binary to `/var/lib/tftpboot/memtest`. Finally, add a new label to your `pxelinux.cfg/default` file:

```
label 3
kernel memtest
```

That's it. When you type 3 at the boot prompt, the `memtest86+` program loads over the network and starts the scan.

Conclusion

There are a number of extra features beyond the ones I give here. For instance, a number of DOS boot floppy images, such as Peter Nordahl's NT Password and Registry Editor Boot Disk, can be added to a PXE environment. My own use of the `pxelinux` menu helps me streamline server kickstarts and makes it simple to kickstart many servers all at the same time. At boot time, I can not only indicate which OS to load, but also more specific options, such as the type of server (Web, database and so forth) to install, what hostname to use, and other very specific tweaks. Besides the benefit of no longer tracking down MAC addresses, you also can create a nice colorful user-friendly boot menu that can be documented, so it's simpler for new administrators to pick up. Finally, I've been able to customize Knoppix disks so that they do very specific things at boot, such as perform load tests or even set up a Webcam server—all from the network. ■

Kyle Rankin is a Senior Systems Administrator in the San Francisco Bay Area and the author of a number of books, including *Knoppix Hacks* and *Ubuntu Hacks* for O'Reilly Media. He is currently the president of the North Bay Linux Users' Group.

Resources

tftp-hpa: www.kernel.org/pub/software/network/tftp

atftp: ftp.mamalinux.com/pub/atftp

Syslinux PXE Page: syslinux.zytor.com/pxe.php

Red Hat's Kickstart Guide: www.redhat.com/docs/manuals/enterprise/RHEL-4-Manual/sysadmin-guide/ch-kickstart2.html

Knoppix: www.knoppix.org

Memtest86+: www.memtest.org

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GRAPHIC ADMINISTRATION WITH Webmin

Administering a Linux server might be complicated, but Webmin can help you work quickly and safely.

FEDERICO KEREKI

When you start administering a Linux system, one of the biggest challenges is learning exactly what to do, and how to do it. There simply are too many tools, settings, parameters, configuration files, daemons and what have you to consider. Obviously, if you ever want to become a full-fledged sysadmin on your own, you have to learn everything. But, until you get to that point, you still need to get things done, and you would do well by installing and using Webmin, a Web-based, comprehensive administration tool for Linux systems.

Webmin runs on your server and presents a Web-based interface, allowing you to do all sorts of system administration tasks—from the very simple to the very complex ones—without ever touching a configuration file or restarting any process

or daemon on your own. As an aside, it isn't just any run-of-the-mill tool. If you mention Webmin at a Linux Users Group reunion, it's guaranteed to raise a lively argument—much akin to the “using closed graphics drivers” or “banning all non-open-source software from distributions” discussions on forums and chat channels.

For some people, the idea of using anything but the command line to manage a server is barely short of heretical, and they believe you should not even consider using Linux if you plan on employing such a tool. (A Linux user I know once said dismissively, “If you want to use graphic tools, use Windows.”) However, for other people, any tool that helps them avoid mistakes or the need to memorize a lot of parameters is a welcome addition to their toolset.

Webmin won't let you avoid actually learning about Linux though. You can't merely start using it and change configuration settings without knowing perfectly well what you are doing. If you know what needs be done and how to do it, Webmin can save you from having to memorize lists of parameters or configuration files, and it will help you get things done quickly and safely. On the other hand, don't ever use Webmin as an experimentation tool. It's quite likely you could really mess things up.

Webmin runs not only on Linux, but on UNIX and FreeBSD as well. Here's a partial list of supported systems and distributions: Asianux, Caldera, Debian, FreeBSD, Gentoo (and Sabayon), HP-UX, IBM AIX, LinuxPPC, Lycoris, Mac OS X, Mandriva (and Mandrake and Conectiva), MEPIS, NetBSD, OpenBSD, PCLinuxOS, PlayStation Linux, Red Hat (and CentOS and Fedora), Scientific Linux, SCO OpenServer and UnixWare, Slackware, Sun Java Desktop System, Sun Solaris, SUSE and OpenSUSE Linux, Turbolinux, Ubuntu (and derivatives like Kubuntu or Xubuntu), Xandros, Yellow Dog Linux and Yoper Linux.

If your favorite distribution isn't included, some Webmin modules might not work, so be careful. If you are using a distribution derived from one that is on the list, it's a fair bet you won't have any problems, but don't say I didn't warn you.

By the way, why this state of affairs? The problem is a lack of standardization. Distributions use different locations for various configuration files, and if Webmin can't find them, it

won't be able to function. This may change for the better over time, when (if) all distributions fully embrace the Linux Standard Base (LSB) and comply with the standards related to file placement. But, that certainly hasn't happened yet. To mention a simple example, I'm currently using OpenSUSE, and it uses /srv/www/htdocs as the root for Web sites. Most other distributions use /var/www/html. So, you can see that a configuration module might have serious problems finding Web files if it didn't know about this difference.

What do you need to run Webmin? Just a browser, Perl, a Java Runtime Environment (JRE) for some functions and the root password. After you become familiar with Webmin, you'll be able to forget about ever editing configuration files (like all those in the /etc directory) or starting, stopping and reloading services. If you set up Webmin correctly, you even will be able to administer your server from a remote machine.

Installation

Webmin is available under the GPL, so you can get it without any problems. The latest version (as of the time of this writing) is 1.380, and it's being developed actively. The easiest way to install Webmin is with your favorite package manager. Even though I am an OpenSUSE user, I prefer Smart to YaST, so a simple `smart install webmin` command did the job for me. If you don't get the latest version this way, don't worry. You can fix that just by using Webmin itself; keep reading.

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The other method of installation is to go to the download site, download the appropriate version for your system, and follow the instructions on the left side of the page. There are two options here. You can get the full package (with all available modules), or you can get the minimal edition and add the modules you require afterward, using Webmin's own update features.

After installing Webmin, you need to start a service. Working as root (use `su`), do `chkconfig webmin on` (to ensure that Webmin starts every time you turn on your machine). Then do `/etc/init.d/webmin start` to start it immediately. You're all set.

Using Webmin is simple. Open your favorite browser, and navigate to `http://localhost:10000` (or the equivalent, `http://127.0.0.1:10000`), and you'll see Webmin's login page. Next, enter the user name and password for the system administrator (in many distributions, that would be root, but Ubuntu and others grant `sysadmin` rights to specific users instead), and click the Login button. You could check the Remember login permanently box, but that's a security risk, so I recommend not doing that.

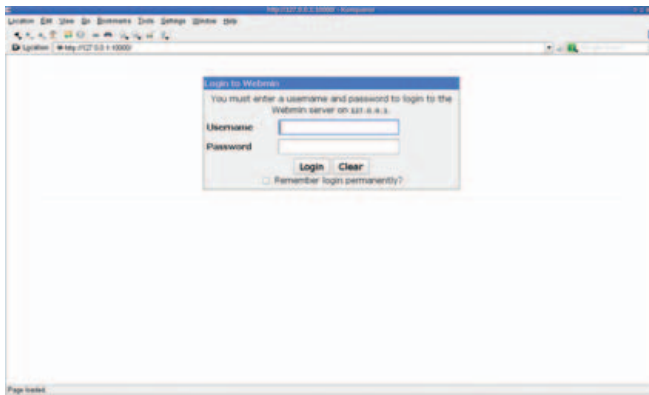


Figure 1. Initial Webmin Login Screen

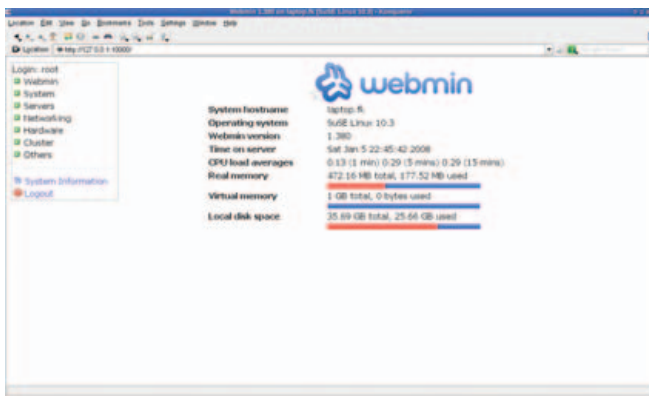


Figure 2. After logging in, you'll see a menu and system information on the screen.

If you want to save yourself some typing, save that address as a bookmark. For example, in Firefox, either press `Ctrl-D` or go to `Bookmarks`→`Create new bookmark`. Alternatively, for even less typing, create a desktop icon. If you use KDE,

right-click on your desktop, select `Create New`→`Link to Location` (URL), enter the URL above, and click `OK`. (The process is similar if you use GNOME.) You can make it even snazzier by right-clicking on the newly created icon and changing its image to `/usr/libexec/webmin/images/webmin.xpm` (this path might be different for distributions other than OpenSUSE).

Upgrade

Once you have Webmin installed correctly, upgrading it or adding more modules is a breeze. On the left-side menu, select `Webmin`→`Webmin Configuration`, and you'll see a screen full of icons. If you click `Upgrade Webmin` (the up-pointing blue arrow), you can upgrade Webmin itself from the Internet. Note that you can click on `Scheduled Update` to set up a cron task that will connect to the Web and download all needed updates on its own. This is a safe option (for you'll definitely get all updates and bug fixes as soon as possible), but it's also an unsafe one (should the Webmin Web site itself ever be hacked). So, I leave it up to you to decide whether you want to do this.

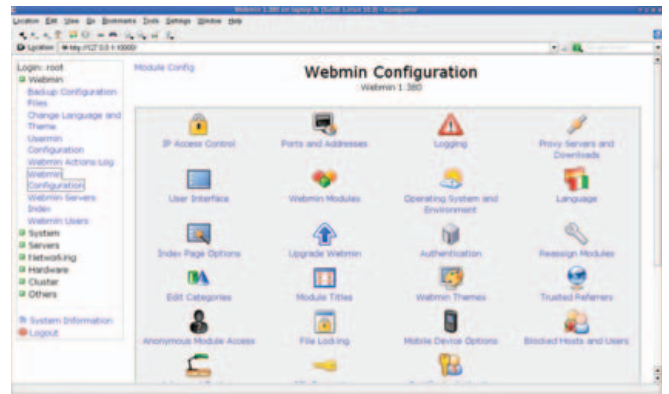


Figure 3. Webmin Configuration Screen



Figure 4. You can upgrade Webmin or add new modules without any other tools.

On the same Webmin Configuration page, if you click the `Webmin Modules` icon (the one with small boxes), you can browse all available modules on the Webmin site or even download third-party modules from other sites. Choosing the `Standard Module` option provides a pop-up window with

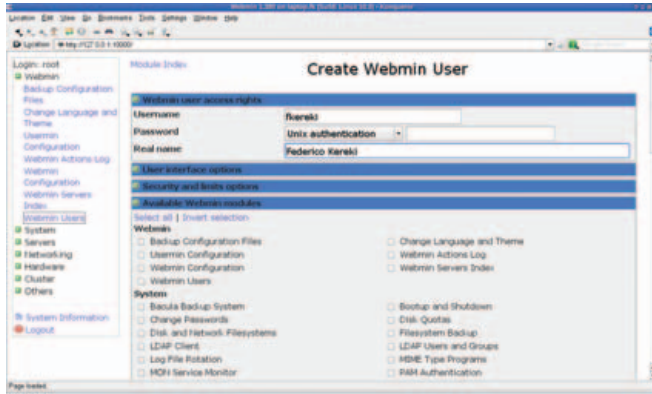


Figure 5. Webmin has its own database of users.



Figure 6. Using password restrictions provides higher security levels.

dozens of modules (I haven't been able to figure out whether there's a method to the list's organization). If you click a module name, and then click Install Module, Webmin downloads it and sets it up for you.

Users and Groups

Before moving on, let's talk about security and users. Webmin has its own users, which are not the same as the operating system users. The very first time you log in, it

automatically creates a root user. You shouldn't let every user work with this account. It's safer if you create specific accounts and restrict each one to needed functions. To do this, click Webmin on the left-side menu, and then Webmin Users.

When adding users, you can opt to give them a specific Webmin password or use "Unix authentication". The former option is usually safer (but only if users choose a password different from their standard passwords), and the latter option

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Usermin: A TOOL FOR END USERS

Usermin is a close relative of Webmin, designed to allow end users to manage several administrative functions on their own, such as changing passwords and user details, managing mail (though a standard e-mail client is a better solution) and more. Usermin is available by default when you install Webmin. You can access it by navigating to `http://127.0.0.1:20000`, where you'll see an interface very much like Webmin's, but with far fewer functions. In fact, you can configure which functions will appear with Webmin. Start that program, go to Webmin→Usermin Configuration→Available Modules, and select which modules should be available via Usermin. You don't need to log in to use Usermin; it will assume the rights of the current user.

is the friendliest one. The Password Restrictions screen lets you set specific controls, so users can't use too short, simple or easy-to-guess passwords.

Instead of assigning rights to each user, you can create groups. Go to Webmin→Webmin Users, and click Create a new Webmin group. Select what functions should be allowed to members of this group, and finish by clicking Create. From now on, when you create new users, you can specify to which group they belong, and their rights will be assigned automatically.

You also should take a look at the Unix User Synchronization option, which allows the automatic synchronization of

Once you have Webmin installed correctly, upgrading it or adding more modules is a breeze.

Linux users and Webmin users. You can set it up so that every time a Linux user is created/deleted, a corresponding Webmin user also is created/deleted. The Unix User Authentication option also might be of interest if you have many users who should be allowed access to Webmin. Additionally, you can use the View Login Sessions to check whatever the users might have done.

Using Webmin

Using Webmin is quite simple, as you might already have guessed from the examples above. Choose a category from the menu on the left side of the screen, and it opens up,

showing a list of available modules. The main page for each module usually includes a Module Config link on its top-left corner, which lets you do some configuration, and a Help link that provides documentation on the module's functions. Here are the categories:

- **Webmin:** provides general configuration, including language and theme selection (you can use Webmin in more than 40 languages), upgrades, module installation, logging options, log browsing and more. If you want to make your installation more secure, check the Authentication option (allowing, among other things, protection against brute-force password-cracking attacks), and also check IP Access Control and Blocked Hosts and Users. If you have the Servers module installed, you can use it to scan for other Webmin servers and administrate them remotely—although it won't be as speedy.
- **System:** covers many different functions. You can control backups with the third-party option for the Bacula backup system or with a far simpler filesystem backup that uses either tar or the dump-and-restore family of commands to save directories to tape or to a file on another filesystem. Bootup and Shutdown lets you specify which services will be run at which levels, and also (obviously) to reboot or shut down the system. For user management, check Users and Groups (which allows you to create, edit or delete both users and groups) and Change Passwords, whose function is obvious. The Disk and Network Filesystems module lets you mount or unmount devices and filesystems, and Disk Quotas will be of interest if you have assigned file space quotas to users. You can schedule commands to run once (think atd) or have periodical jobs (think cron). You can get a top-like display of processes (but it won't refresh on its own) with the Running Processes option, and you can find plenty of information by clicking on a process id. Finally, to cut the list short, the Software Packages option allows you to install or remove a software package on the server remotely.
- **Servers:** this category has to do with all the possible servers you might be running, including Web-related functions, such as Apache or FTP; mail functions (Fetchmail, Postfix, Qmail, Sendmail) and filters (ProcMail, SpamAssassin); file sharing (Samba); databases (MySQL, PostgreSQL); network functions (DHCP, SSH, DNS, SLP); proxying (Squid); and several similar functions. There are several options for each of these modules, so you'll want to click on each of them to see the available features.
- **Networking:** covers more-specific network-related options, including configuration (interfaces, routing, gateways, DNS client, host addresses); services; connection (ADSL client, Bandwidth Monitoring, PPP, SSL tunnels, VPN); security (Kerberos5, IPsec); firewalls (the Linux Firewall provides an iptables-based configuration, and there's an option for the Shoreline shorewall firewall too); and more, including NFS and NIS.

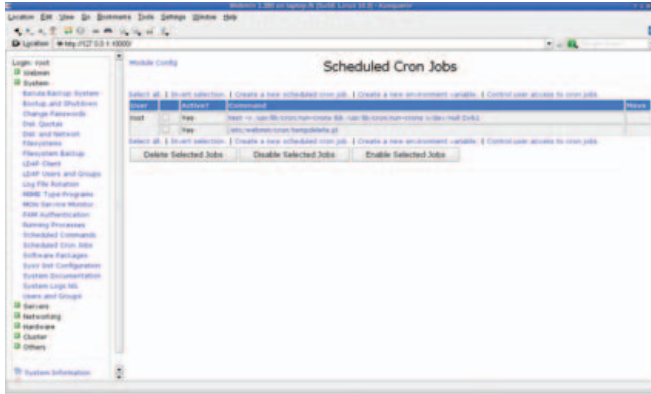


Figure 7. You can manage future (cron) jobs easily.



Figure 8. You can configure Apache fully with Webmin. Here, you can edit the default server attributes.



Figure 9. Webmin provides an alternative to PHPMyAdmin for configuring MySQL databases.

- **Hardware:** lets you control disks and volumes (including LVM, RAID and disk partitions; you also can use Smart to check the status of your disk units); printers; CD burning; and the system clock. If you are using GRUB, you can edit its options from here too.
- **Clusters:** includes several options you will use only if you are running two or more machines forming a cluster, with the Heartbeat monitor—a rather more

specialized setup, which proves once again that you need to know what you're doing before starting to mess with Webmin.

- **Others:** a catchall for several options, including a command shell (implemented via a Java applet) for full console access, or Custom Commands, which allows you to set up and execute commonly used commands, with optional parameter substitution—a fine tool if you need to make some commands available to inexperienced users. There also is a File Manager (another Java applet), SSH/Telnet remote login, an HTTP tunnel for accessing Web pages, data files upload and download, and more.

Conclusion

Can you benefit from Webmin? Who should use it? Jamie Cameron, Webmin's creator, said this program "may be better suited for less-experienced users who are unfamiliar with configuration file formats than for enterprise sysadmins who already have a detailed understanding of UNIX". I fully agree with that opinion, although I'd add that even if you are quite familiar with configuration files and the like, you might welcome an easier (and sometimes quicker) way of doing things.

Webmin packs a quite impressive, always growing, number of functions, but it allows you to use only what you require, through clear menus and forms, and it detects possible errors before they can do any harm. You should at least consider it for its learning value, because you can examine configuration files before and after each change, and, thus, learn how something was (or should have been) done. You can't avoid learning about each function before diving in, but Webmin provides at least an easier road to becoming a more proficient sysadmin. ■

Federico Kereki is an Uruguayan Systems Engineer, with more than 20 years' experience teaching at universities, doing development and consulting work, and writing articles and course material. He has been using Linux for many years, having installed it at several different companies. He is particularly interested in the better security and performance of Linux boxes.

Resources

Webmin and Usermin: www.webmin.com

Webmin Download Site:
www.webmin.com/download.html

Linux Standard Base: www.linux-foundation.org/en/LSB

Smart: labix.org/smart

LJ pays \$100 for tech tips we publish. Send your tip and contact information to techtips@linuxjournal.com.

Backups to the Future: Eliminate Tape Backups with FreeNAS and Bacula

The future of backups is here, but unfortunately, there aren't any Delorians.

JERAMIAH BOWLING

Backups in today's environment are in a state of flux. Tapes have been the mainstay of most organizations for years—and in some cases, decades. However, as the cost of hard drives decreases and their capacity increases, conventional wisdom about backups and tapes is changing. Although tapes still prove useful for archiving and offsite storage, inexpensive disk-based technology slowly is creeping into areas that tape has traditionally dominated.

Many enterprises find it's just as easy and reliable to back up data over their network to near-line storage, such as a Storage Area Network (SAN) or Network-Attached Storage (NAS), instead of tape. Also sometimes referred to as disk-to-disk (D2D) backups, the benefits of near-line storage are many—especially speed and capacity. When deciding to go near line, you really have only two choices: SAN or NAS. Of the two, NAS is more cost-practical for most shops. In this article, I explain how to implement a near-line backup to a NAS to illustrate how easy it is to begin the transition from tapes to disks.

I've chosen two programs for reaching the goal of a tapeless backup: FreeNAS (to create a networked storage area for backup files) and Bacula (to automate backups and provide a pseudo-daily, weekly and monthly rotation).

To keep things simple, let's build two systems, one running FreeNAS and one running Bacula on top of Fedora 8. All configuration done on the Bacula system for this article was performed as root, but it also could be done with sudo. Bear in mind, the options covered in both programs here represent only a handful of their full capabilities.

FreeNAS

FreeNAS is one of the simplest programs I have ever deployed. It's small enough to run a system from a CD or USB key. However, for this example, let's install it on our server to the local hard disk. On your system, I suggest at least 256MB of memory and SATA drives for decent performance. If you want to use RAID on your drives, use hardware-based solutions. They are faster, and there have been issues with the built-in software RAID capabilities of FreeNAS. If you opt to use hardware RAID, check the FreeBSD hardware compatibility list, on which FreeNAS is based, before making a purchase.

Download the latest ISO from the FreeNAS site, and burn it to CD (version .684b at the time of this writing). Boot the

system from CD, and when you come to the options menu (Figure 1), select option 7 to install the server image to a local hard disk. Next, select option 2 to create two UFS partitions. UFS is the native filesystem in FreeNAS, and as we plan to access our data on the disk via a networked protocol (NFS), any system should connect to it. Select these options to create a small partition for the server software, and use the rest of the space for a second data partition. When prompted, enter the name of the CD drive (acd0 in my install), and then enter the destination drive (da0). When the install routine is complete, enter 3 at the prompt to return to the main menu, and then enter 1 to assign an interface. Accept the default interface, and give it an IP address (unless you are using DHCP). Once assigned, return to the main menu, and reboot the machine. Remove the CD, and the system now should boot from the system partition on the disk.

```

LAN -> IncB

FreeNAS console setup
*****
1) Assign Interfaces
2) Set LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Reboot system
6) Ping host
7) Install on HD/CF/USB Key
8) Shell
9) PowerOff system

Enter a number: 7

FreeNAS Install
*****
1) Install on HD, CF or USB key: Create 1 UFS partition
2) Install on HD: Create 2 UFS partitions (FreeNAS and DATA)
3) Return to main menu

Enter a number: 2

```

Figure 1. FreeNAS Install Options

Once the system is back up, open a Web browser from another system, and enter the IP of the FreeNAS machine as the URL to access the management site. At the prompt, enter admin as the user name and freenas as the password. From this management site, you can change a multitude of settings, but for now, we need to change only our hostname (Figure 2), mount the auto-created DATA partition and enable NFS.

Click the Management link under the Disks section of the Web page. You should see a message saying that you need to add your hard drive to the disk list. Click the + icon to add it (Figure 3). Leave all the options at their defaults, except



Figure 2. Setting the Hostname on the FreeNAS Management Page



Figure 4. Mounting the DATA Share



Figure 3. Adding the Disks

PreFormatted FS. Set this to UFS, as FreeNAS already has done the work for us. Once you click the Apply Changes button, the status column of your disk will change to ONLINE.

Now click the Mount Point link, and click the + icon again on this page to edit the Mount Point properties (Figure 4). From this screen, change the partition to 2, as partition 1 is the system partition, which cannot be used. Leave the File System as UFS, and enter DATA as the share name. Click Add when finished. This takes you back to the original Mount Point page. Click Apply Changes.

Under the Services links, click NFS. Check the Enable box to turn NFS on, and type your network address range in

CIDR notation. Click the Save button, and your NAS build is complete.

Bacula

With the FreeNAS system in place, let's start building the Bacula system. The test system used here was built on Fedora 8 (Werewolf) with GNOME, because it includes Bacula and its dependencies in its core RPM library. To add the necessary packages and related dependencies, all you need to do is use the Add/Remove Software utility under the Applications menu. When ready, install the following packages:

- bacula-client
- bacula-common
- bacula-console
- bacula-gnome
- bacula-console-gnome
- bacula-console-wxwidgets
- bacula-director-common
- bacula-director-mysql
- bacula-docs
- bacula-storage-common
- bacula-storage-mysql

FreeNAS is one of the simplest programs I have ever deployed. It's small enough to run a system from a CD or USB key.

- bacula-traymonitor
- mysql

When the installs are complete, start `mysqld`, and set it to start runlevel 5 from the Services utility in GNOME or use `chkconfig`. If you're using a different distribution, you need to use the Bacula source files and make/configure the install to get to the next step. This can be more challenging than using an RPM, because of the numerous command-line install options available.

Next, open a terminal to create the MySQL tables needed for Bacula to operate. Run the following scripts created by the Bacula RPM:

```
/etc/alternatives/create_bacula_databases
/etc/alternatives /make_bacula_tables
/etc/alternatives /grant_bacula_privileges
```

After setting up the database, create a local mountpoint (like `/mnt/freenas`), and mount the FreeNAS share created previously. An easy way to do this on every startup is to add the following line to your `/etc/fstab` file:

```
FreeNASServerHostName:/mnt/DATA /mnt/freenas nfs defaults0 0
```

To mount the partition immediately, type `mount -a`.

Before moving on to editing Bacula's configuration files, here's how Bacula works. The Bacula program is composed of three separate daemons: the director, the storage daemon and the file daemon. The director is the boss. It's the main server daemon that defines jobs, pools, schedules and most of the important settings related to backups. As such, the majority of setup deals with its configuration file `/etc/bacula/bacula-dir.conf`. The storage daemon (SD) controls the media written to by Bacula, usually either tapes or disks. These items are configured in the `bacula-sd.conf` file. The file daemon (FD), also referred to as the client, runs locally on any system you want to back up. Two other related utilities used here are the GNOME console (`gnome-console.conf`) and the tray-monitor (`tray-monitor.conf`) utility.

With this basic knowledge of Bacula's interoperation, open your `/etc/bacula/bacual-dir.conf` file, and add the following lines (for brevity, I have added only those sections used in our scenario):

```
JobDefs {
    Name="UserHomes" Type=Backup Client = bacula-fd
```

```
FileSet =
    "UserHomeFolders" Storage = File Messages = Daemon
}

Job {
    Name = "WeeklyHomeBackups"
    JobDefs = "UserHomes"
    Level = Full
    Schedule = WeeklyFullandDiffs
    Pool = Weekly
    Priority = 10
    Write Bootstrap =
"/var/spool/bacula/WeeklyHomeBackups.bsr"
}

Job {
    Name = "MonthlyHomeBackups"
    JobDefs = "UserHomes"
    Level = Full
    Schedule = MonthlyFull
    Pool = Monthly
    Priority = 10
    Write Bootstrap =
"/var/spool/bacula/MonthlyHomeBackups.bsr"
}

Schedule {
    Name = "WeeklyFullandDiffs"
    Run = Level=Full Pool=Weekly sun at 3:00
    Run = Level=Differential Pool=Diffs mon-fri at 3:00
}

Schedule {
    Name = "MonthlyFull"
    Run = Level=Full Pool=Monthly 1st sat at 3:00
}

FileSet {
    Name = "UserHomeFolders"
    Include {
        Options {
            compression=GZIP
            signature = MD5
        }
        File = /home
    }
}

Pool {
    Name = Weekly
    Pool Type = Backup
    Recycle = yes
    AutoPrune = yes
    Volume Retention = 6 days
    Maximum Volumes = 5
```

```

Label Format = Bkup-Full
}

Pool {
Name = Diffs
Pool Type = Backup
Recycle = yes
AutoPrune = yes
Volume Retention = 23 hours
Maximum Volumes = 1
Label Format = Bkup-Diff
}

Pool {
Name = Monthly
Pool Type = Backup
Recycle = yes
AutoPrune = yes
Volume Retention = 364 days
Maximum Volumes = 12
Label Format = Bkup-Monthly
}

```

Although it may seem odd to start at the bottom and discuss the Pool section, it is vital that it is configured correctly. A pool is simply a collection of volumes. Volumes are tapes or disks to which the backup files are written. A pool can contain any number of volumes, but it must have at least one volume. Here, we have set up three pools: a weekly full, a differential and a monthly. This allows us to maintain backups for the current week up until the previous day and a 12-month rotation for our monthly backups.

Then, going from the top section down, there is a Job Definitions (JobDefs) section, and two Jobs modeled around our backup strategy. The JobDefs section defines common properties that several jobs share, like a template. In it, we have listed settings common to both jobs. The Schedule section defines when a given job runs and how often. The schedules listed here run weekly backups every Sunday, daily differentials Monday through Friday and a monthly backup the first Saturday of every month. The Fileset section lists what folders and files to back up and with what options. For this example, we have set Bacula to back up the local users' home folders, a common scenario for backups. Recursion is enabled by default on FileSets, so we need to specify only the parent folder. The backup files also are set to compress using gzip and to hash/encrypt themselves using MD5. Doing both is good practice.

Before saving and closing the file, go through and change any instance of @@Password@@ or like entries to a common password. Rather than cover how each Bacula daemon authenticates with the other, it's easier simply to change all of them to the same password for the time being and get the system

Running a backup is quite simple, as you already have done most of the work by editing the bacula-dir.conf file.

up and running. You can change these passwords later if desired. Change any other password-related fields in the following files to the common password as well: bacula-sd.conf, bacula-fd.conf, bconsole.conf, gnome-console.conf and tray-monitor.conf. After changing the passwords, you also need to change any references to your host in all the .conf files, so each daemon can communicate with each other. If all of the daemons run locally, you can use localhost. You also could use an FQDN or IP address. The field you want to edit is listed under each section as Address. So, for example, change the line:

```
Address = server.example.com
```

to:

```
Address = localhost
```

You also could search for the client.example.com and storage.example.com entries to find some of the other entries that need to be changed. Once the passwords and Address fields have been set, open the /etc/bacula/bacula-sd.conf file in your editor, and comment the following line in the Device section of the Filestorage device:

```
Archive Device = /tmp
```

Then, add the line below in its place to associate the locally mounted FreeNAS partition with the storage daemon so you

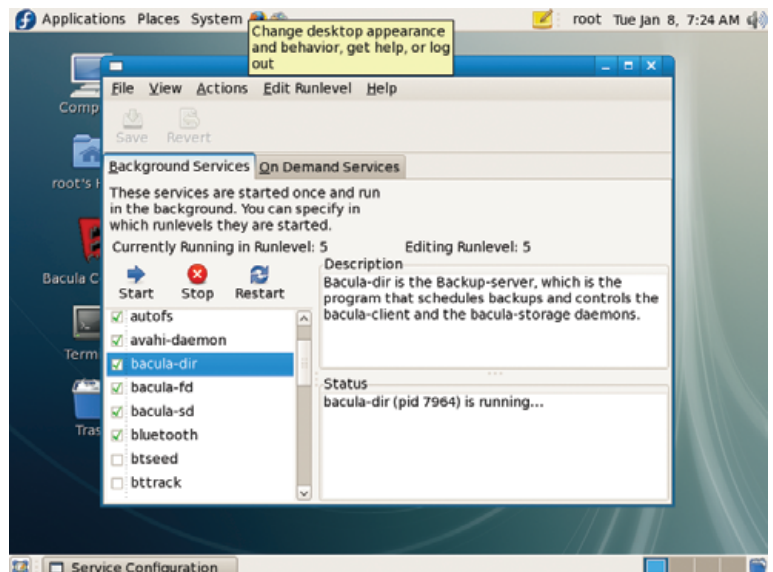


Figure 5. Start all three Bacula daemons, and set them to runlevel 5.

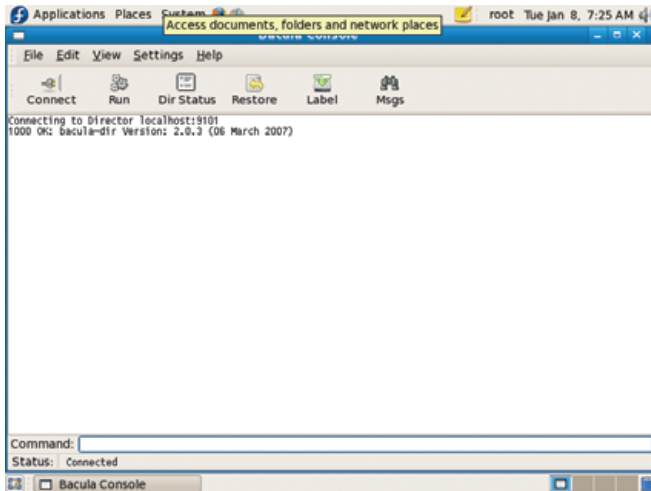


Figure 6. The GNOME Bacula Console

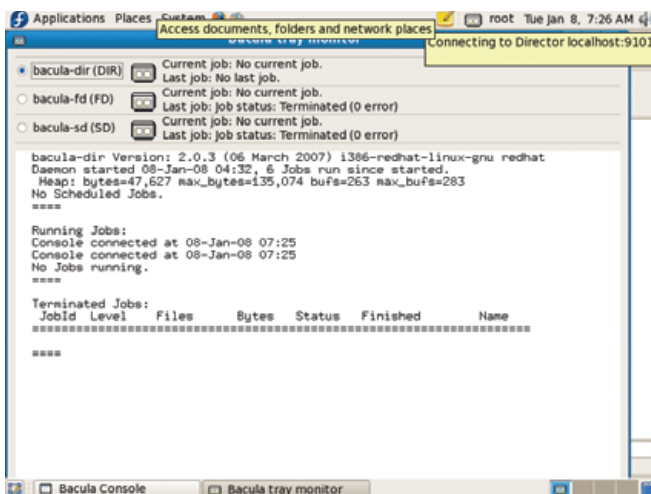


Figure 7. The Bacula Tray Monitor

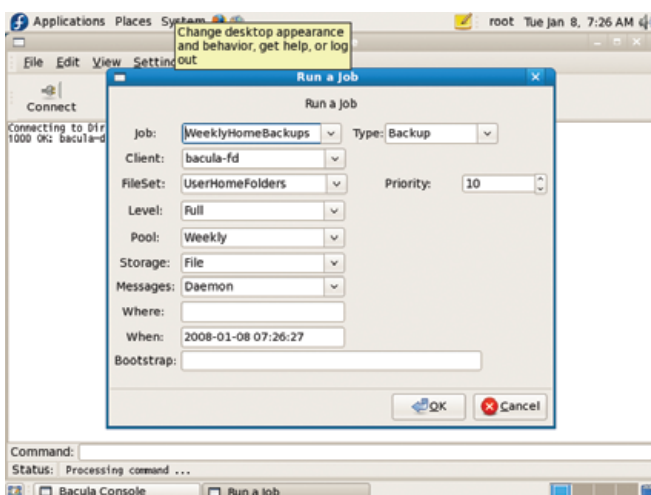


Figure 8. Running a Backup Job from the GNOME Console

can back up to it:

```
Archive Device = /mnt/freenas
```

The final step is to open the Services utility under System→Administration, and check the box to set bacula-dir, bacula-sd and bacula-fd to start on runlevel 5 (Figure 5). You now can use the syntax:

```
service bacula-dir|sd|fd start|stop|restart
```

to control the daemons. On other distributions, you can start the daemons directly from /usr/sbin and use chkconfig to set the runlevel.

Running a Backup Job

Running a backup is quite simple, as you already have done most of the work by editing the bacula-dir.conf file. Start the Bacula console from the Applications→System Tools Menu (Figure 6) in GNOME. You may need to edit the launcher, as I did, to point it to the correct /etc/bacula/gnome-console.conf file. Start the Tray Monitor utility from the System Tools menu as well. The Tray Monitor (Figure 7) is nice, because it gives you a quick glance at the status of the daemons and any running jobs. This is helpful when you are multitasking or have jobs that run nightly and you want to check their status the next morning. Return to the console, and click the Run button to bring up the backup job dialog window. Under job, select WeeklyHomeBackups (Figure 8). This pre-fills the field selections with the items specified in your .conf file. You could change any of these options at this point, but they must first exist in the .conf file or they will not appear in the fields. In other words, you can't create a job from the drop-downs without populating the Job section of the .conf file.

Up to this point, there are no volumes, which as previously mentioned, need to exist before you can run a backup. Typically, you would have to use the label command from the console's command line to create a volume in a pool manually, but because of our settings, the system will create them automatically, auto-name them and recycle them when the volume retention period triggers. I like this better than manually creating the volumes, as you are less likely to encounter naming errors. Click OK to run the job, and view the results in the console.

If you were to change the Volume Retention setting on the same pool, restart the daemons and run the job again, you would see the system auto-recycle a volume in the pool for the next job. Otherwise, it will prompt you to create a new volume, as no existing volumes can be recycled due to retention settings. You can run these jobs manually as often as you want, but they also will run according to the schedule defined in the bacula-dir.conf file.

Restoring a File

Restoring a file in Bacula also is remarkably simple. You can use either the Restore button on the console toolbar

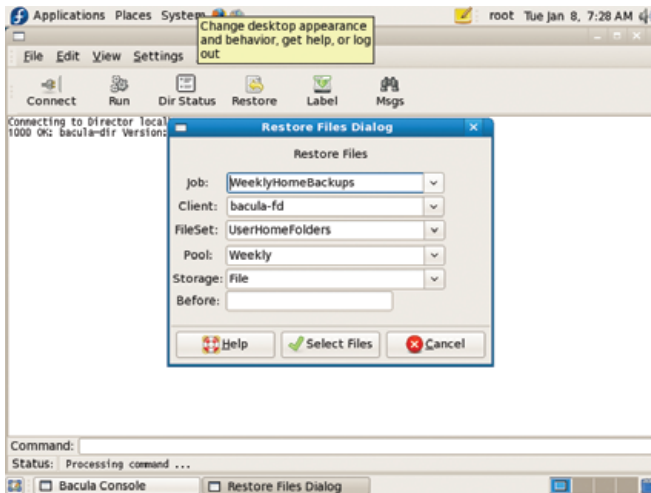


Figure 9. Bacula's Restore Options Dialog Window

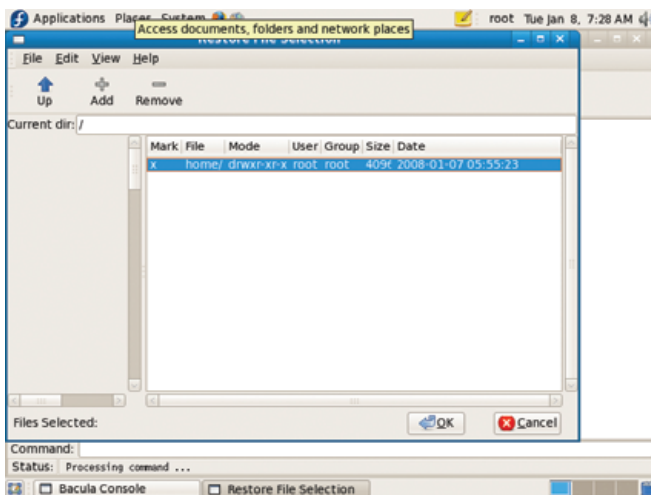


Figure 10. Marking the Files to Restore

or the restore command. Both are easy to use, but the restore command provides more options. To keep it simple, let's use the Restore button. When the dialog opens, select a job, client, pool and so on from which to restore (Figure 9), then click Select Files to mark the files/folders you want to restore (Figure 10). Before the restore job runs, you will be prompted to confirm your options, at which point you could type yes, mod or no. Typing mod provides more options over the job, including the option to restore to a different path from the original one.

The Beginning of the Future

Although we have simplified the near-line backup process here, it's only the beginning. Our simple setup has accomplished what we set out to do: back up our data to a networked disk. To replace tapes completely in most backup strategies, you need some sort of offsite storage/synchronization scheme, which I've not addressed here. However, once you

see much faster backups and how much more data you can store on a disk, you'll be itching to make the move and get rid of those tapes. ■

Jeremiah Bowling has been a systems administrator and network engineer for more than ten years. He works for a regional accounting and auditing firm in Hunt Valley, Maryland, and holds numerous industry certifications including the CISSP. Your comments are welcome at jb50c@yahoo.com.

Resources

FreeNAS Main Site: www.freenas.org

FreeBSD Hardware Compatibility Checklist:
www.freebsd.org/releases/5.1R/hardware-i386.html

Bacula: www.bacula.org

Bacula Download Site: sourcefort.net/projects/bacula

Bacula Documentation: www.bacula.org/rel-manual/index.html

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- Cirrus Logic EP9302 ARM9 200 Mhz Processor
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FRANCIS LACHAPPELLE AND LUDOVIC MARCOTTE

This article is a follow-up to “Linux Groupware Roundup”, published in *Linux Journal* in July 2005. As you might know, a few things have changed since 2005:

- CalDAV has been adopted by the IETF as a proposed standard, and open-source projects, such as Bedework, OSAF Chandler Server (Cosmo), Zimbra and SOGo, implement the protocol.
- The Sync4j Project, a PIM-data synchronization server, is now called Funambol. It also has received major enhancements in the past few releases.
- In 2006, Novell retracted all full-time employees from the Hula Project. In 2007, Messaging Architects announced the acquisition of NetMail, from which Hula is derived. Thereafter, faithful contributors to Hula forked the source code in a new independent project named Bongo.
- The latest version of Apple Mac OS X Server (code-named Leopard) is shipped with a CalDAV server called Calendar Server.
- OpenOffice.org's groupware client named Glow is being replaced by a Mozilla-based PIM suite.
- A new project named Zimbra obtained considerable attention, especially from Yahoo!, who bought the company in September 2007.

The open-source collaboration servers mentioned in the 2005 article have all survived the competition:

- Both OpenGroupware.org (OGoo) and Open-Xchange (OX) remain good servers for companies that want to continue using Microsoft Outlook, even though these products have not integrated any new appealing features during the past three years.
- Citadel has improved its GroupDAV support, but the authors still refuse to implement CalDAV.
- Bedework has forked the UW Calendar Project and quickly brought the project to maturity.

This article focuses on Scalable OpenGroupware.org (SOGo), a complete open-source groupware that integrates all requirements one would expect from a collaboration suite: accessibility, consistent interfaces, scalability and stability.

Scalable OpenGroupware.org

Based on OpenGroupware.org, a project with more than ten years of maturity, Scalable OpenGroupware.org provides a complete groupware solution oriented toward scalability instead of depth in functionality. SOGo offers all standard groupware features, including the following:

- Personal and shared calendars with events and tasks.
- Personal and shared address books with LDAP sources.
- Personal and shared e-mail mailboxes.

It also stores calendar information using the iCalendar standard and contact information using the vCard format. This avoids information loss when exchanging over protocols supported by SOGo, such as CalDAV, CardDAV and GroupDAV.

In development since 2004, the project has greatly improved during the past few months. Inverse, developers on the project, contributed many improvements, such as CalDAV, CardDAV and ACL support. Furthermore, it re-created SOGo's Web interface so that it matches the look and feel of Mozilla Thunderbird and Lightning (or its standalone equivalent, Sunbird). The interface now also makes use of Ajax. Although CalDAV and IMAP take care of the calendaring and e-mail integration of the Mozilla suite with SOGo, address books also needed to be synchronized. Inverse created a plugin for Thunderbird named SOGo Connector that adds this functionality among others.

These contributions allow SOGo to provide Web and native interfaces sharing the same look and feel, features and data—a considerable advantage and uncommon characteristic compared with other FOSS groupware solutions.

Installation

SOGo depends on a few core components, such as Apache, PostgreSQL, an LDAP server and an IMAP server (preferably Cyrus IMAP Server, Dovecot or Courier) that uses the LDAP server as the authentication back end. You need to install those (or reuse existing installations) and get them running properly before continuing with the SOGo installation instructions. SOGo supports other database back ends, but for this article, we assume the use of PostgreSQL and that all components, including the LDAP server, are installed on the same server. Furthermore, SOGo depends on the following components:

- GNUstep make and base for compiling and installing the project and subprojects.
- SOPE, for server-side Web application development.

Start with obtaining GNUstep make and base. If you're using Debian, you can install both components with apt-get:

```
% apt-get install gnustep-make libgnustep-base1.13
↳ libgnustep-base-dev
```

Then, retrieve the SOPE and SOGo's sources from the official Subversion server:

```
% svn co http://svn.opengroupware.org/SOPE/trunk/ SOPE-trunk
% svn co http://svn.opengroupware.org/SOGo/inverse/trunk/ SOGo-trunk
```

SOPE needs to be patched so that it works well with SOGo. Once you have pulled SOPE from the trunk successfully, apply the SOPE patch included with SOGo:

```
% cd SOPE-trunk
% patch -p0 < ../SOGo-trunk/SOPE/sope-patchset-*.diff
```

Prior to compiling SOPE and SOGo, make sure to source the GNUstep.sh script that comes with GNUstep make. This will define some environment variables used by GNUstep make when building the packages. When using

SOGo integrates well with the Mozilla suite. Sunbird provides a complete client-side calendaring application, and Lightning provides a calendaring extension to Thunderbird.

the Debian packages, this script is located in /usr/GNUstep/System/Library/Makefiles/GNUstep.sh. Once sourced, compile and install SOPE, as follows:

```
% ./configure --with-gnustep --enable-strip --disable-debug
% make && make install
```

And, finally, compile and install SOGo, its Web templates and resources:

```
% cd ../SOGo-trunk
% ./configure --with-gnustep --enable-strip --disable-debug
% make && make install
% cp -a UI/WebServerResources UI/Templates $GNUSTEP_LOCAL_ROOT/
↳ Library/SOGo-0.9/
```

Configuration

The first step in SOGo's configuration is creating a sogo user.

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Listing 1. Apache Configuration

```
Alias /SOGo.woa/WebServerResources/ \
<GNUSTEP_LOCAL_ROOT>/Library/SOGo-0.9/WebServerResources/

AliasMatch /SOGo/so/ControlPanel/Products/(.*)/Resources/(.*) \
<GNUSTEP_LOCAL_ROOT>/Library/SOGo-0.9/$1.SOGo/Resources/$2

<LocationMatch "^/SOGo*">
    AddDefaultCharset UTF-8
    SetHandler ngobjweb-adaptor
    SetAppPort <sogod-0.9 port>
</LocationMatch>

<LocationMatch "^/SOGo/so/ControlPanel/Products/.*/UI/Resources/*.png">
    SetHandler default-handler
</LocationMatch>

<LocationMatch "^/SOGo/so/ControlPanel/Products/.*/UI/Resources/*.gif">
    SetHandler default-handler
</LocationMatch>

<LocationMatch "^/SOGo/so/ControlPanel/Products/.*/UI/Resources/*.css">
    SetHandler default-handler
</LocationMatch>

<LocationMatch "^/SOGo/so/ControlPanel/Products/.*/UI/Resources/*.js">
    SetHandler default-handler
</LocationMatch>
```

The SOGo daemon runs under this user:

```
% adduser sogo
```

Once you've created the user, you need to configure Apache. Do `echo $GNUSTEP_LOCAL_ROOT`, and remember the value, as it will be required shortly. Create the file `/etc/apache2/conf.d/SOGo.conf` (elsewhere if you are not using Debian) with the content shown in Listing 1.

You must replace `<GNUSTEP_LOCAL_ROOT>` with the echoed value of `$GNUSTEP_LOCAL_ROOT` (`/usr/GNUstep/Local` under Debian). Once the file has been created, restart Apache.

Now you can proceed with the SOGo database creation. Because we use PostgreSQL here, perform the following steps:

```
% su - postgres
% createuser --no-createdb --no-adduser --encrypted --pwprompt sogo
% createdb -O sogo sogo
% exit
```

Before starting SOGo, configure it with a basic set of configuration parameters. The configuration file is located in `$HOME/GNUstep/Defaults.GNUstepDefaults`, where `$HOME` is the home directory of your sogo user. Create this file with the content shown in Listing 2.

Listing 2. SOGo Configuration Parameters

```
NSGlobalDomain = {
};
"sogod-0.9" = {
    AgenorProfileURL = "http://sogo:sogo@127.0.0.1:5432/sogo/
↳sogo_user_profile";
    NGUseUTF8AsURLEncoding = YES;
    OCSFolderInfoURL = "http://sogo:sogo@127.0.0.1:5432/sogo/
↳sogo_folder_info";
    SOGoAppointmentSendEmailNotifications = YES;
    SOGoAuthenticationMethod = LDAP;
    SOGoDefaultLanguage = English;
    SOGoDefaultMailDomain = example.com;
    SOGoDraftsFolderName = INBOX.Drafts;
    SOGoFallbackIMAP4Server = localhost;
    SOGoLDAPSources = (
        {
            CNFieldName = displayName;
            IDFieldName = cn;
            UIDFieldName = cn;
            baseDN = "ou=example,dc=com";
            bindDN = "cn=superuser,ou=Users,dc=example,dc=com";
            bindPassword = 0xdeadk0w;
            canAuthenticate = YES;
            displayName = "Corporate Directory";
            hostname = 127.0.0.1;
            id = public;
            isAddressBook = YES;
            port = 389;
        }
    );
    SOGoMailSpoolPath = "/var/spool/sogo";
    SOGoMailingMechanism = smtp;
    SOGoOtherUsersFolderName = "Other Users";
    SOGoSMTPServer = 127.0.0.1;
    SOGoSentFolderName = INBOX.Sent;
    SOGoServerTimeZone = Canada/Eastern;
    SOGoSharedFolderName = "Shared Folders";
    SOGoSpecialFoldersInRoot = YES;
    SOGoTrashFolderName = INBOX.Trash;
    SOGoUseLocationBasedSentFolder = YES;
    WOMessageUseUTF8 = YES;
    WOParsersUseUTF8 = YES;
    WOPort = 25000;
    WOUseRelativeURLs = NO;
};
}
```

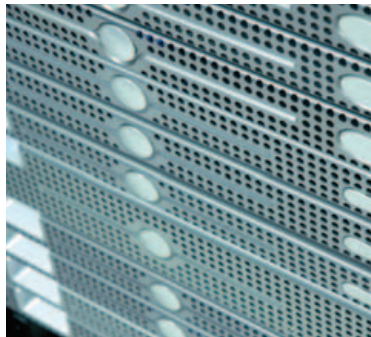
For now, the most important parameters in the configuration file from Listing 2 are `AgenorProfileURL` and `OCSFolderInfoURL`, which must point to your PostgreSQL database server. `SOGoLDAPSources` must point to your LDAP server. In this example, the LDAP source will be used not only for authentication but also to provide a shared address book

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called Corporate Directory, which will be accessible both from the Web and native interfaces.

Finally, launch the SOGo daemon:

```
% /usr/local/sbin/sogod-0.9
```

From Firefox, you now can access <http://localhost/SOGo>. You will need to provide the user name/password that you normally use for IMAP. Figure 1 shows SOGo's login window.

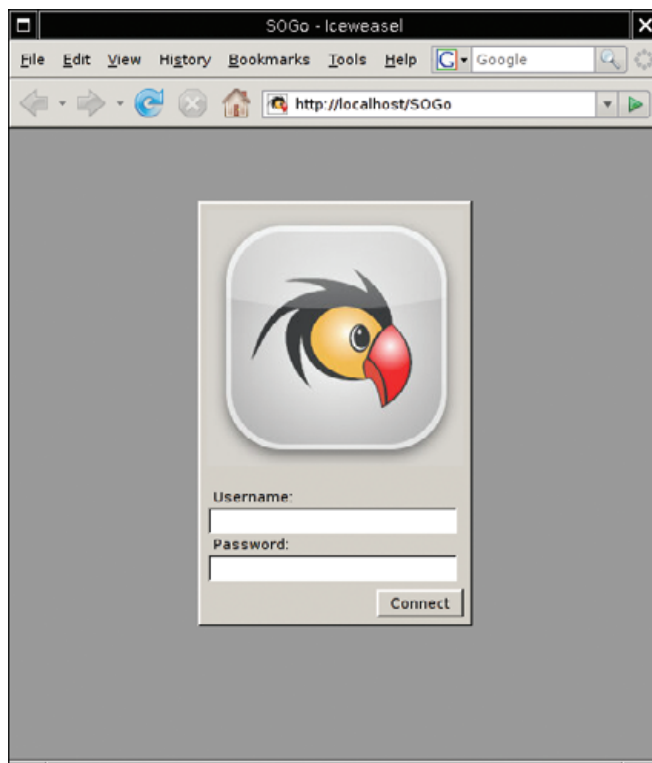


Figure 1. Login Window

Mozilla Integration

SOGo integrates well with the Mozilla suite. Sunbird provides a complete client-side calendaring application, and Lightning provides a calendaring extension to Thunderbird. Combining Lightning and Thunderbird results in a complete PIM solution for managing e-mail, calendars (events and tasks) and contacts efficiently.

To connect the Mozilla PIM suite to SOGo, first install and configure Mozilla Thunderbird to use the IMAP protocol. Then, download the latest releases of Lightning and the SOGo Connector extension. From Thunderbird's Tools menu, choose the Add-ons option, and install the extensions you just downloaded. Restart Thunderbird to activate the extensions.

The next step is to configure Lightning's CalDAV connector. From Thunderbird's File menu, choose New→Calendar, and create a network calendar of type CalDAV. Specify the appropriate URL to connect to your SOGo server. Usually, it should be <http://localhost/SOGo/dav/<username>/Calendar/personal/>. Next, configure the SOGo Connector Thunderbird. From the Address Book's File

menu, choose New→Remote Address Book. Give your address book a name, and as the URL, specify something like <http://localhost/SOGo/dav/<username>/Contacts/personal/>.

You also can use the shared address book provided by SOGo (which uses your LDAP server, named Corporate Directory) from Thunderbird. To do so, repeat the procedure to create a remote address book, but as the URL, specify <http://localhost/SOGo/dav/<username>/Contacts/public/> and check Read Only.

Once completed, your personal calendar and address book are now fully synchronized with SOGo. Events, tasks, contacts or e-mail are now accessible from either SOGo's Web interface or from Mozilla Thunderbird/Lightning.

Figure 2 shows SOGo's Web interface with one personal and one shared calendar. Figure 3 shows the same information,

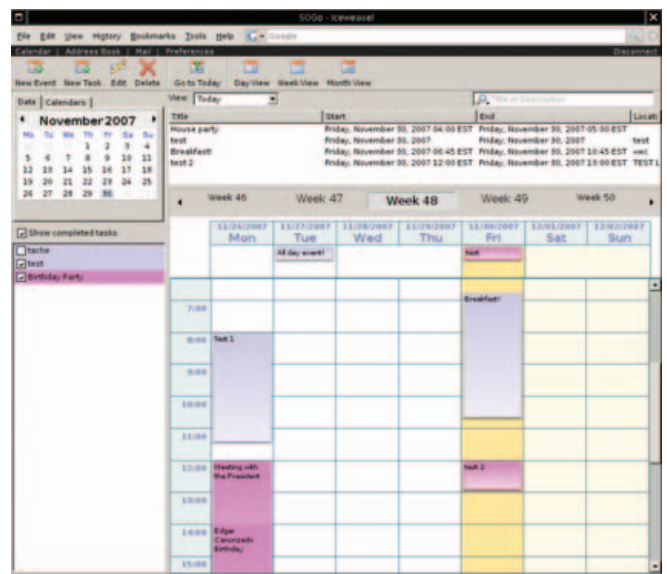


Figure 2. SOGo as Seen from a Web Browser

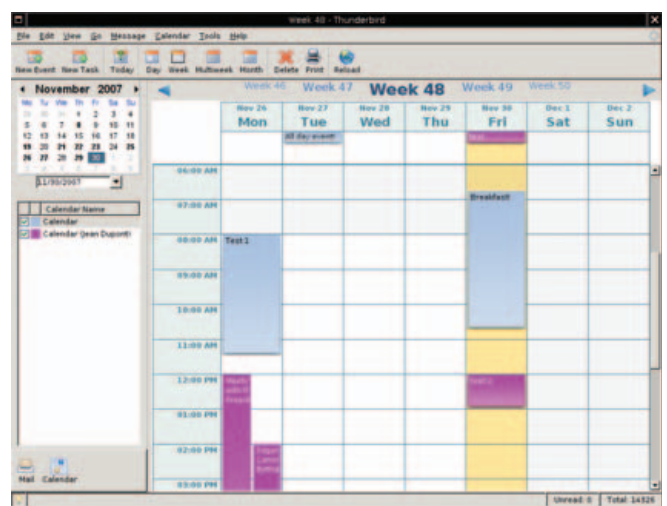


Figure 3. SOGo as Seen from Thunderbird and Lightning

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but using the Thunderbird and Lightning extension.

Mobile Access

Although SOGo's Web interface allows you to access all information from virtually any computer connected to the Internet, some power users need access from their mobile devices, such as cellular phones or personal digital assistants. Supporting the plethora of devices out there is almost impossible, but the SyncML standard finally emerged as an efficient protocol for synchronizing PIM-related information between your mobile devices and groupware platform.

Funambol, formerly known as Sync4j, is middleware that sits between a groupware server and SyncML-capable devices. Luckily for SOGo, a native connector is available for Funambol. This plugin lets you connect the middleware to SOGo, so users can synchronize their contacts, events and tasks with the SOGo server.

Mobiles devices require a SyncML client to synchronize data through Funambol. Most cellular phones have a built-in client, but PDAs or smartphones lack one. The recommended clients are as follows:

- Synthesis SyncML standard if you're using PalmOS-based devices.



Figure 4. SOGo from a PDA

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- Nexthaus SyncJe if you're using a BlackBerry.
- Funambol Windows Mobile clients if you're either using Windows CE on a PDA or a smartphone.

There also are clients for other applications, such as Microsoft Outlook. The latter allows you to synchronize contacts, events and tasks fully with SOGo through the Funambol middleware.

Figure 4 shows a PalmOS-based device insync with our SOGo server.

Migrating from Legacy Systems

Whenever you're replacing an existing solution with a new one, data migration is a must for your users. Because SOGo stores its data directly using the iCalendar and vCard standards, migration is relatively easy if the legacy system speaks the same language.

For example, in Microsoft Exchange, you can obtain data from it through WebDAV. If you are trying to use a simple WebDAV client, such as cadaver, however, you will not be able to obtain the data, as the client does not specify in its requests a required HTTP header. You need to set the HTTP translate header to false if you want to obtain the data from the Microsoft Exchange server. Using wget, if you do:

```
wget --user=ludovic --password=***** --header "Translate: f"
➤http://exchange/Exchange/ludovic/Calendar/foo.EML
```

you will obtain the event with a summary "foo" in the foo.EML file. The EML file is actually an RFC 2821 message with a text/calendar part. That part can be extracted and imported into SOGo easily. WebDAV is de-emphasized in Microsoft Exchange 2007, so hurry and migrate from it.

A similar approach can be used with Oracle Calendar. A demo program bundled with Oracle's SDK provides an excellent starting point for becoming familiar with the shared library named capi. With this library, you can retrieve a user's events formatted with the iCalendar standard. As with Microsoft Exchange, the migration process is simply to push all events in SOGo through WebDAV. The Oracle Calendar's only limitation is related to recurring events; even though a series of events can be identified clearly, there is no easy way to retrieve the original recurrence rule definition. This frustration surely will be attenuated by the advantages of SOGo, such as endless recurring events and a much more modern Web interface.

Conclusion

Standards, such as CalDAV and SyncML, finally have emerged that improve interoperability between native groupware clients and various servers. Open-source developers have proven their commitment in supporting those standards and created competitive alternatives to commercial solutions.

The Scalable OpenGroupware.org Project always has followed the same motivation—to offer an open-source, scalable groupware solution that integrates nicely with the Mozilla PIM suite, while not neglecting mobile users. This article should help you get started with SOGo, so you can test its functionalities for yourself. Join the mailing list to discuss your experience with the developers. ■

Francis Lachapelle (flachapelle@inverse.ca) holds a Bachelor's degree in Computer Engineering from McGill University. He is currently a senior systems architect for Inverse, Inc., an IT consulting company located in downtown Montréal that specializes in the deployment of infrastructures based on free and open-source components like PacketFence and SOGo.

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Resources

Scalable OpenGroupware.org (SOGo):
www.scalableogo.org

SOGo Connector for Thunderbird: www.inverse.ca/english/contributions/sogo_connector.html

Funambol: www.funambol.org

Funambol SOGo Connector: www.inverse.ca/contributions/funambol.html

Nexthaus SyncJe for BlackBerry: www.nexthaus.com

Synthesis SyncML Standard for PalmOS:
www.synthesis.ch

TECH TIP Take a Screenshot from an X Terminal

To take a screenshot of the entire screen and save the image as screenshot.png, use the command:

```
$ import -window root screenshot.png*
```

To select an area to capture with a crosshair, use import without the -window option.

To take a screenshot of a specific area of the screen,

use the -crop, option along with the dimension in pixels, for example:

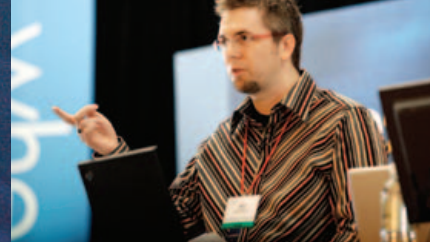
```
import -crop 300X250
```

The import utility is part of the ImageMagick suite of tools.

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Hacking the Eee PC

How to tweak your Eee PC. JES HALL

ASUS' diminutive sub-notebook, the Eee PC, has so far exceeded expectations and is sold out virtually everywhere. Its simple interface and wallet-friendly pricing have contributed to making the Eee the most popular gadget this season.

It's in the hands of the power user that the Eee really shines. With hardware support already taken care of, the Eee offers an opportunity for beginning-to-intermediate Linux users to customise themselves a flexible Linux-based tool using the Eee's easy or full desktop mode.

In this article, we take you through tweaking your Eee, although in the interest of preserving your warranty, most of the hacks here are focused on software. The first and most important hack is to read the manual that came with your Eee to make sure you're completely up to date on everything. When you read the manual (because you are going to read it, right?), you'll notice that ASUS mentions the keyboard shortcut Ctrl-Alt-T to launch a terminal. Gaining root on the default Eee install is as simple as issuing the command:

```
sudo -s
```

There is no password; any person who can open a terminal is able to gain root.

ASUS' easy mode uses a customised IceWM (www.icwm.org), a standard X11 window manager that's been around for a very long time. It's relatively easy to customise to your liking. The first step is creating a directory for local modifications. Open a terminal using the aforementioned keyboard shortcut, and type:

```
mkdir ~/.icwm
cp /etc/X11/icwm/* /home/user/.icwm/
```

This creates a local customisation directory and copies the ASUS IceWM configuration into it, ready for you to modify. As not all of the software that ships with the Eee is accessible through the easy mode launcher, the first useful thing to

With hardware support already taken care of, the Eee offers an opportunity for beginning-to-intermediate Linux users to customise themselves a flexible Linux-based tool using the Eee's easy or full desktop mode.

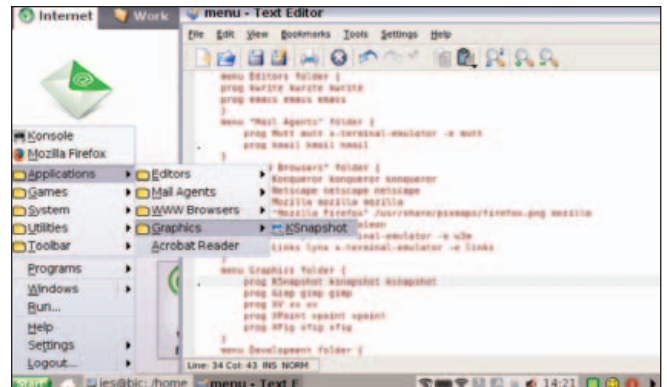


Figure 1. The IceWM Menu, with the Menu File in the Background

tweak on the Eee is to add the IceWM panel menu and edit it to add those applications that aren't exposed through the easy mode interface.

To enable the menu, edit `~/.icwm/config`, and scroll down to the option named `TaskBarShowStartMenu`. Change the 0 in the uncommented value to 1, and save the file. You need to restart your Eee for the menu to show up:

```
# Show 'Start' menu on task bar
# TaskBarShowStartMenu=1 # 0/1
TaskBarShowStartMenu=1
```

To edit the menu, open `~/.icwm/menu` in your favourite editor. The menu format is pretty simple, following the syntax:

```
prog label icon command
```

where `label`, `icon` and `command` are replaced with the appropriate entries for the application you want to launch. For example, to add an entry that launches Konsole, the KDE terminal emulator, you would create an entry as follows:

```
prog Konsole konsole konsole
```

Submenus are described with the following syntax:

```
menu "Label" {
}

```

Program entries or further submenus are defined between the curly braces.

The first thing we all thought on using the Eee when we first received it was "the Windows XP theme doesn't look

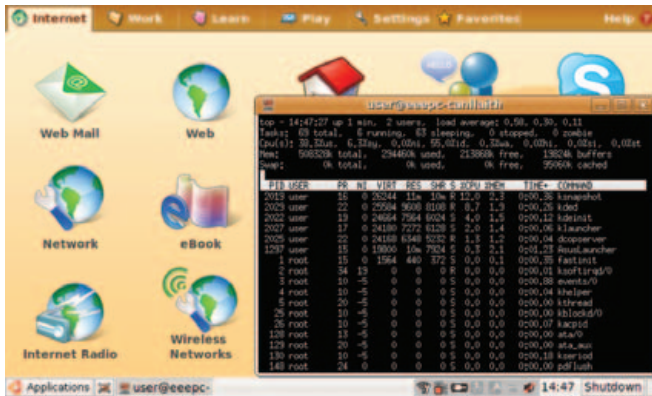


Figure 2. A broad selection of attractive themes are available for IceWM.

attractive on XP, let alone on Linux. How the heck do we change this abomination?"

You'll be pleased to know that this is extremely simple, now that the menu is enabled. The biggest theme repository for IceWM is at themes.freshmeat.net/browse/925, with hundreds of themes from which to choose. Once you've downloaded a theme, create the folder `~/icewm/themes`, and extract the theme to that folder. It will now be selectable from the IceWM menu under Settings→Themes.

You can find a wide range of other customisations by reading the comments in the `~/icewm/preferences` file. Some notable ones are showing the workspace switcher on the panel and adding a CPU meter. Traditional window manager settings, such as focus model, are available as well.

With a built-in Webcam, it's a shame that the Eee PC didn't ship with the Linux beta of Skype that allows video calling. It is, however, easy to install by hand. Navigate to www.skype.com/download/skype/linux, and elect to download not the current stable version, but the beta. When it asks you to select your distribution, download the package for Debian Etch. Once you've downloaded it to disk, open a terminal and navigate to where the file was saved. Type the following to install the package:

```
dpkg -i skype-debian_2.0.0.27-1_i386.deb
```

The version number of the package may have changed since the time of this writing. As this upgrades the version of Skype already installed, the Skype launcher will launch the new version.

During the course of adding applications to the menu, the observant will notice that the Eee ships with most of KDE installed. During its development phase, the Eee exposed an option to enable a full desktop mode with a complete KDE 3.4 desktop. The most elegant solution for enabling the full desktop is to install a package that does the configuration for you from wiki.eeuser.com/howto:getkde. This package essentially downloads the packages for kicker and ksmserver, and modifies the ASUS startup scripts. It adds an option to log in to full desktop mode from the easy mode shutdown dialog. To get back into easy mode, there is an option in the K menu.

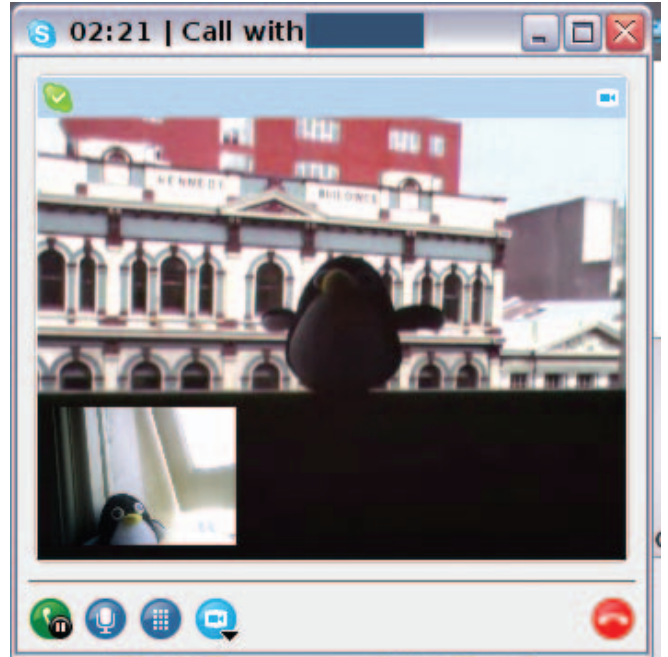


Figure 3. Some Linux mascots take time out from their busy schedule to test video calling for us.

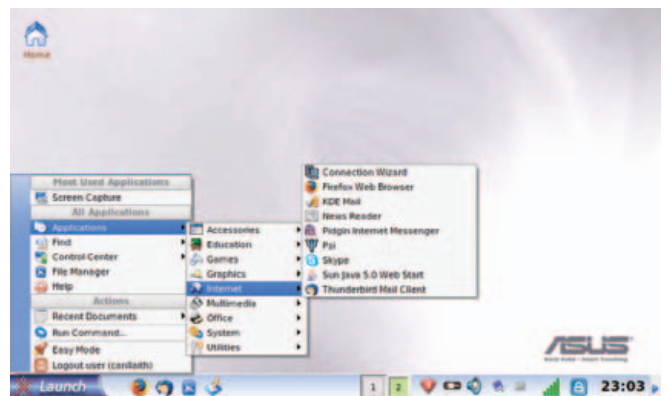


Figure 4. A Full KDE Desktop

This page also details the manual methods for enabling full desktop mode.

Adding more software from a Xandros or Debian repository is the next logical step in customising the operating system that ships with the Eee. For us, the Eee requires only the addition of Emacs and Subversion to be a great portable hacking tool. You can use any Debian Sarge repository or a Xandros 4.0 one, as shown below. There are a few caveats though. As the Xandros running on the Eee is heavily customised by ASUS, it's very easy to end up with the Eee in an unbootable state if you allow apt to upgrade too much. Although it's not a complete solution, apt pinning can be used to ensure that the ASUS repository always takes priority for a package.

Add your repository to `/etc/apt/source.list` with your favourite text editor as root, either your local Debian Sarge

As not all of the software that ships with the Eee is accessible through the easy mode launcher, the first useful thing to tweak on the Eee is to add the IceWM panel menu and edit it to add those applications that aren't exposed through the easy mode interface.

repository or the Xandros one below:

```
deb http://xnv4.xandros.com/4.0/pkg xandros4.0-xn main
↳ contrib non-free
```

Then, create the file `/etc/apt/preferences`, and add the lines:

```
Package: *
Pin: origin update.eepc.asus.com
Pin-Priority: 999
```

As apt sources default to a lower priority, this ensures that packages from the ASUS repository are prioritised. It's still possible though to break your Eee by installing packages willy-nilly. If it looks as though an action is going to upgrade a large number of packages, especially if it looks like what it's upgrading is all of KDE, cancel the change.

This limitation can be extremely frustrating if you want to make more drastic changes to your Eee PC's installed packages. Another option is to install a generic Linux distribution on the Eee. eeeXubuntu (wiki.eeuser.com/ubuntu:eeexubuntu:home) is a version of the Xubuntu 7.10 distribution with Eee-specific drivers integrated and tweaks for low-resolution displays. It's an excellent choice if you want a more modern distribution on your Eee but would prefer not to compile the drivers from ASUS by hand.

The wiki page has in-depth instructions on how to create a bootable USB stick for your Eee. Boot your Eee from the USB

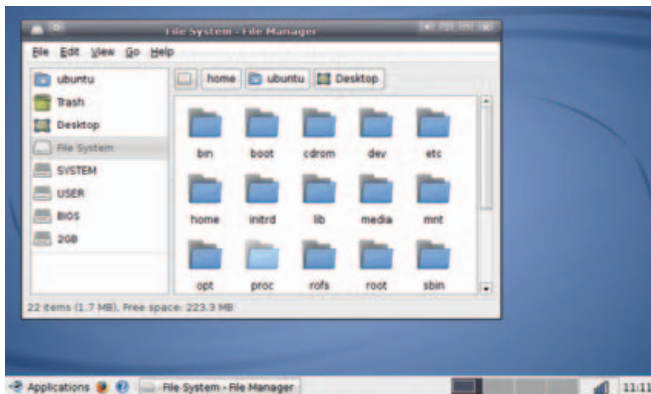


Figure 5. eeeXubuntu is a customised Xubuntu for the Eee PC.

stick by pressing Esc at boot time to get to the boot options menu, and from the GRUB bootloader, select the option to load eeeXubuntu with Eee-specific drivers and fixes. From there, it's all very familiar. Click the Install icon on the desktop once the live CD loads, and navigate your way through the Ubuntu installer.

If your Eee has 512MB or more of memory, you probably can get away with not creating a swap partition. In our testing, running Firefox, Pidgin and Thunderbird, the Eee was using approximately 300MB of memory, minus buffers/caching. If your Eee has 1,024MB or more of memory, you'll never notice the difference.

Opting out of swap, however, does have the side effect that hibernate to disk is disabled. The Eee does have suspend to RAM support under eeeXubuntu, but this level of suspend does consume a fair amount of battery. Leave your Eee suspended for 24 hours, and expect to see your battery down to half when you resume it.

The simplest and most rewarding Eee hardware mod is upgrading the built-in memory. Note: this mod requires removing a sticker that claims its removal will void your warranty. According to a public statement by ASUS at usa.asus.com/news_show.aspx?id=9223, this is not the case, and upgrading your memory will not void the warranty on your Eee. However, *Linux Journal* takes no responsibility for any damages to your Eee or loss of warranty incurred by following this advice.

The Eee PC takes a single SODIMM of DDR2667, in either 512, 1,024 or 2,048MB. That's right, the Eee PC can be upgraded to an impressive 2GB of memory.

To upgrade the memory on your Eee, you need a set of small electronics screwdrivers and a clean surface that's safe for handling static-sensitive equipment.

If you haven't installed memory before, *Linux Journal* recommends you enlist the help of a professional or a hardware-minded friend.

Ensure that the Eee is shut down (not suspended), and unplug it from the power. Turn the Eee upside down and remove the battery.

Using a very small Phillips screwdriver, remove the two



Figure 6. Removing the Module

screws in the memory panel. One is covered by a sticker that will tear easily if you simply remove the screw as though the sticker was not there.

Use a small flatblade screwdriver very carefully or a fingernail to lever up the memory compartment. Put the memory compartment cover and the screws to one side.

To remove the memory that shipped with your Eee, carefully use a pair of small screwdrivers or your fingers to lever the clips outward. The memory module will pop upward when it is free of the clips. Remove the module from the slot, taking care to touch only the very outside edges of the module.

Place the module aside in a static-safe place, and remove the new module from its packaging. Place it in the slot at a 45-degree angle, as shown in Figure 7, taking care that the notch on the module matches the key on the slot. When the module's base is securely slotted in, it can be carefully lowered into position by pushing the top corners of the module backward with your fingers, so that it lies flat against the Eee's motherboard. The metal clips should snap over the sides of the module with a satisfying click when it's properly in place. Once the memory is secure, replace the memory compartment cover



Figure 7. Installing the New Module

and ensure that all sides have clicked down.

If you're anything like us, at this point, you'll hunt all over the desk searching for the screws only to find them 20 minutes later stuck to the magnetic closure on the MacBook. Replace the two screws to secure the memory compartment cover, and insert the battery again. It's always a good idea to run memtest86 over any new memory you install, which is an option from any recent Ubuntu live CD or the eeeXubuntu bootable USB stick if you made one earlier.

It's pretty easy to see how the Eee has taken the personal computer market by storm. It's cheap, friendly and oh-so-very hackable, with something for everyone. There are myriad other hacks not covered here, from installing Linux distributions and adding the drivers yourself to soldering additional gadgets to the motherboard. In fact, that's what we're off to do right after we submit this article—solder a mutilated Bluetooth dongle to the motherboard, as now we won't get in trouble if we break it.

Have fun hacking your Eee, but remember—installing Windows is cruel to Eee PCs and not endorsed by *Linux Journal!* ■

Jes Hall is a Linux Technical Specialist and KDE developer from New Zealand. She's passionate about helping open-source software bring life-changing information and tools to those who would otherwise not have them.



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Puppy Linux

Exploring everyone's pet Linux. LOUIS J. IACONA

It would be fair to say that the Linux landscape is somewhat cluttered with distributions, each offering a slight value delta to consider. So, I didn't expect to be evaluating yet another distro any time soon. Recently, however, I went hunting for an embedded Linux solution for small devices, and along the way, I stumbled on something that offers much more general value than what I was looking for—a Linux distribution called Puppy Linux (hereafter referred to as PL).

PL is getting a lot of attention and steadily gaining popularity, and it seemed worthy of further examination. At first glance, PL is a distribution praised for being small, fast and stunningly complete for its size—just as complete and secure as most desktop distributions. It also has the relatively unique distinction of being usable from live bootable removable media—CD/DVD or even a USB Flash device.

PL was developed and organized by Barry Kauler in 2003 as a fresh-start Linux Distribution Project—that is, it did not grow out of an existing distribution. Its goal and identifying characteristics have been consistent—offer a small, efficient distribution that doesn't sacrifice on user features or ease of use. PL's lightweight footprint makes it practical to use directly from a portable bootable image rather than needing to install it onto a fixed internal disk. In fact, PL can be booted and used effectively from any medium, ranging from a floppy disk to a network server.

Prerequisites

To try PL, you need access to a CD/DVD R/W drive and disk writer software capable of burning ISO images and a host PC/laptop with the following:

- Pentium II-class processor.
- Removable media (CD/DVD or USB device).
- BIOS that will allow the computer to boot from CD or USB—this device needs to appear before internal drives or other active boot options.
- RAM: 128MB–256MB (at minimum).
- Internet connection.

The machine I primarily used for testing is now a dedicated PL host. On the surface, this machine was ready for the scrap heap—a vintage Pentium III, 600MHz processor with 384MB of RAM. The PL community has suggested that a 100MHz-class machine with a minimum of 64MB of RAM will support PL. That may be, but I would expect it to be very tight and recommend more memory and a faster processor.

What Breed Is This?

So what does the PL distribution contain? Given the size of the bootable image—the latest 3.0.1 release is smaller than 100MB—you might be surprised to see the completeness of PL. PL includes utilities and applications for anything a desktop user typically expects and needs to do—browse and communicate on the Web, view and manipulate digital photos and other media files, create documents, play games and so on. Specifically, the default core distribution includes the following:

- Desktop control, filesystem browser and command-line console.
- Choice of two X servers and the JWM (Joe's Window Manager).
- Language interpreters: Perl, TCL/TK and the bash-compatible shell.
- An assortment of media players and burners.
- Office applications: word processor, spreadsheet and PDF writer.
- Internet client tools: base Mozilla browser (Seamonkey), chat, FTP, e-mail, secure shell/Telnet, a wiki and a Web-authoring tool.
- Network services, including an FTP server and firewall.
- System administration utilities to manage and monitor disks/filesystems, job scheduling, printers, processes and memory usage.
- Drawing/graphics applications.
- A handful of games and dozens of utilities for managing PL's activities, life cycle and appearance.

Additionally available packages include:

- Web server.
- Gaim chat client.
- GIMP photo editor and other image manipulation and viewing tools.
- Additional development tools, including additional TCL/TK tools/libraries, Python and full bash 3.1 interpreters.



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- Additional media applications.
- C/C++ compilers and libraries.
- And, too many more applications to list here.

Not bad! And, you don't need to start with the standard core set of applications. Through a process documented under "Puppy Linux Unleashed" (www.puppyos.com/puppy-unleashed.htm), you can create a customized distribution from more than 500 packages designed to run under PL. The PL community puts the total number of available applications at more than 1,000.

Get Up and Barking

Not just making a "puppy" quip here—if PL was able to configure your audio device during the boot process, you'll hear the sound of a gentle dog bark, "woof, woof". If not, a sound wizard can be launched from Menu→Setup→Wizard Wizard to attempt a manual sound card setup.

The two most impressive things I discovered about PL was how quickly I able to have a functioning PL desktop and how well it performed. GUI applications launched instantaneously and seemingly without stepping on each other. For now, let's concentrate on getting PL running on the closest laptop or workstation.

Obtain a PL ISO image by downloading it from the Web or purchasing CD media. As it's smaller than 100MB, you can download it quickly over a broadband Internet connection. Or, you can purchase bootable media for a few dollars at www.linuxonline.biz/index.php?cPath=137_149.

Downloading the ISO Image

The complete set of live ISOs and other PL artifacts are available at ibiblio.org/pub/linux/distributions/puppylinux. Higher-level information about PL offerings is available at puppylinux.net/download/downpage.htm. I strongly suggest using the latest release—3.0.1, at the time of this writing. It's a stable, much-improved release compared to 2.x: ibiblio.org/pub/linux/distributions/puppylinux/puppy-3.01-seamonkey.iso.

Creating Bootable Media

Now, write the ISO to a CD/DVD disk using an application that can deal with ISO images, such as K3b on Linux or Roxio on Windows. The primary files on the ISO needed to boot and host PL are the following:

- vmlinuz—the kernel.
- initrd.gz—a compressed RAM disk image used during the boot process.
- pup_300.sfs—contains other system files packaged outside the RAM disk image (the largest file by far).
- zdrv_300.sfs—contains a complete set of drivers and firmware.



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The First Boot

I attempted to boot the PL media from every PC I could access—five laptops and three workstations. I didn't need to do anything special in any of these instances. Assuming the ISO image is burned correctly and your system is set up to boot from CD, you're ready to start your PL experience. If not, check the contents of the ISO through an explorer, and make sure the system's BIOS boot sequence includes the CD/DVD drive before other bootable drives. A desired BIOS boot sequence will be something like this:

- USB—if available. An older system with USB interfaces may still not offer USB as a boot option. In that case, if you're interested in configuring a USB resident PL boot image, you might be able to resolve this by updating the BIOS.
- CD/DVD.
- Floppy.
- Internal disk.
- Network boot.

PL Boot Cycles

During the first boot process, PL automatically determines a lot about the underlying hardware, but it prompts the user for additional guidance. Once the X server and window manager are functioning, you'll see an initial desktop that looks something like what's shown in Figure 1.



Figure 1. The Initial Puppy Boot Desktop—Complete with Coaching Text

PL now is ready to be used. Some devices need to be configured manually (through GUI utilities), and users likely will want to apply customizations, create data files and perhaps install additional packages. At the first graceful reboot or power cycle, users are asked where such data should be persisted between sessions, so subsequent reboots are typically non-interactive.

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First Boot Life Cycle—Details

During the first PL boot, users are prompted as follows:

Screen 1: select keyboard layout locale (US is generally the default).

Screen 2: the Puppy Video Wizard prompts for two preferences:

- Step 1: X Window System server choice, select X server. X.org is heavier-weight but more capable, and may not work well with older, more obscure video devices. This is usually the better choice. Xvesa is lighter-weight, has a fixed refresh rate and supports a narrower set of input devices. If X.org proves problematic, try Xversa.
- Step 2: select screen resolution. Driven by the perceived capabilities of the discovered graphics card/monitor, a set of resolution choices will be presented, usually between 860 and 1,400+.

What's on the desktop? By default, the desktop launch icons for the commonly accessed applications are organized as follows:

- Row 1: system setup and administration utilities.
- Row 2: office-related applications, such as a word processor.
- Row 3: network client applications, such as a browser and chat tool.
- Row 4 (and below): personal tools, such as a calendar, contact organizers and multimedia tools.

Access to the complete set of applications is provided through the lower-left menu button. Here's an overview of its organization:

- Desktop: basic desktop settings, window manager control, set time/date.
- System: printer management, system monitoring, boot manager configuration.
- Setup: application installation, network tools, remaster live PL media.
- Utility: shell prompt, backup.
- FileSystem: file browsing/searching, disk mounter.
- Graphic: paint, graphics editing, screen capture.
- Document: dictionary, word processor, Web authoring.
- Calculate: calculators, personal finance.
- Personal: Wiki, address book, password setting.

- Network: firewall and other network services.
- Internet: browser and all other network clients.
- Multimedia: CD creation, photo, video and sound view and editing.
- Fun: games.
- Help: help topics and system documentation.
- Shutdown: session control and restarting fundamental desktop services like the X Window System and the window manager.

The first thing you'll likely want to do after booting is launch the Puppy Disk Mounter. Refer to the upper-right section of Figure 1. It can be launched through the top-row drives icon. Notice that drive partitions hda1 and hda2 are mounted under the /mnt directory. The output of the `df -h` command shows the following:

Filesystem	Size	Used	Available	Use%	Mounted on
tmpfs	219.9M	6.9M	213.0M	3%	/initrd/pup_rw
tmpfs	77.9M	77.0M	916.0k	99%	/initrd/mnt/tmpfs
/dev/loop0	77.0M	77.0M	0	100%	/initrd/pup_ro2
unionfs	219.9M	6.9M	213.0M	3%	/
shmfs	87.0M	0	87.0M	0%	/dev/shm
/dev/hda1	5.0G	3.3G	1.7G	66%	/mnt/hda1
/dev/hda2	50.9G	32.3G	18.5G	64%	/mnt/hda2

Apart from the RAM Disk and shared memory entries, notice the two drive partitions under /mnt. The very next thing you'll want to launch is the Internet Connection Wizard through the Connect Globe desktop icon (lower-left section of Figure 1) or the Menu→Setup→Network Wizard. This lets you configure and set up a cabled or wireless network interface. For example, you'll probably configure the eth0 interface to obtain an address automatically through a DHCP server. You need to do this only once—network settings can persist across sessions (Figure 2).

If you select a wireless interface (such as ath0), use the



Figure 2. Network configuration made easy.



Figure 3. Managing Applications with PETget

Scan button in the next dialog box to locate your network. Again, you'll probably want to select Auto DHCP. Once a network interface has been configured, you can test basic network access by launching the browser, chat client or other network application. Then, you can choose to install any additional packages to suit your needs. The launched PETget Package Manager is shown in Figure 3.

PETget is very straightforward to work with. Typically, it's used to download updates and additions from the network (using wget), and it finds and resolves dependencies fairly seamlessly. The PETget operations can be very interactive, and the dialogs present a lot of information. Be sure you understand what's being installed or updated, and that you'll need to restart the window manager (Menu→Shutdown→restart-JWM) before new applications are added to the Menu button structure. Also, depending on what's been installed, because so much of the runtime is maintained on the RAM disk for efficiency, the system may need to be rebooted. So, take time to read the PETget dialogs.

Just as noteworthy as the first boot is the first terminated session. Here's some detail on a sample interaction the first time the system is rebooted or powered down:

- Screen 1: save changes to file: Yes/No. Specify yes if you want the changes you've applied to be carried to subsequent sessions.
- Screen 2: if you've decided to save your changes, you'll be asked for a target—what mounted filesystem or removable media?

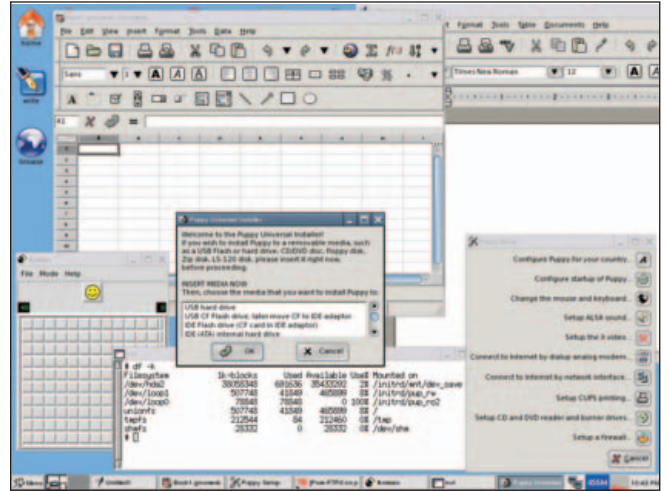


Figure 4. Puppy Linux at Work

- Screen 3: by default, your working session data is saved to a standalone ext2 filesystem file called pup_save.2fs. You'll be given an opportunity to override this name.

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- Screen 4: apply encryption—choices are none, weak or strong. If you're saving data you care about on removable media, it might make sense to select an encryption level, allowing you to assign a password, which you'll need to provide at subsequent boots.
- Screen 5: specify an initial size for the standalone ext2 filesystem file that will contain PL customization data; 512MB is the default and recommended size, but larger is better.
- Screen 6: if you're saving the session data on faster media than the boot CD/DVD (such as an internal IDE drive), you will be given the option of saving some PL runtime files to speed up the boot process going forward.
- Screen 7: review/confirmation—opportunity to change details or cancel.

Housebroken Puppy

On subsequent PL boots, you'll notice a few differences. (You need to attach removable media if that's where your customizations have been saved.) You'll find that PL has maintained its network configuration (assuming it was saved), the initial desktop (Welcome, woof, woof!) has been replaced with a plain-color backdrop, the applications you've installed are now accessible through the Menu structure, and an additional filesystem has been mounted under `/initrd/mnt/dev_save`. As before, all mounted devices appear under `/mnt`. See the updated output of `df -h` below:

Filesystem	Size	Used	Available	Use%	Mounted on
<code>/dev/hda2</code>	50.9G	32.9G	17.9G	65%	<code>/initrd/mnt/dev_save</code>
<code>/dev/loop1</code>	495.8M	73.3M	422.5M	15%	<code>/initrd/pup_rw</code>
<code>tmpfs</code>	77.9M	77.0M	916.0k	99%	<code>/initrd/mnt/tmpfs</code>
<code>/dev/loop0</code>	77.0M	77.0M	0	100%	<code>/initrd/pup_ro2</code>
<code>unionfs</code>	495.8M	73.3M	422.5M	15%	<code>/</code>
<code>tmpfs</code>	55.0M	96.0k	54.9M	0%	<code>/tmp</code>
<code>shmfs</code>	46.1M	0	46.1M	0%	<code>/dev/shm</code>

For convenience, a symbolic link to `/initrd/mnt/dev_save` has been created at `/mnt/home`. This is the where all system changes and other PL-specific data have been persisted as per your first reboot. On my dedicated PL host, the contents of `/mnt/home` appear as follows—it's basically the entire contents of my hard drive:

```
Downloads RJE junk lost+found notes zdrv_300.sfs LJ
pup_300.sfs pup_save.2fs
```

PL depends on the following files to persist user data across sessions and perform better:

- `pup_save.2fs`: the standalone ext2 filesystem containing all session data—that is, cumulative changes applied to the base system.
- `zdrv_300.sfs` and `pup_300.sfs`: the embedded 300 refers to the release. These two files were copied to the hard drive at the end of the first session. They also reside on the PL-bootable ISO image, but having them here allows the system to start and operate more efficiently.

PL will never access or modify any file other than the PL-specific files on its own.

Tricks—What's This Puppy Good For?

Given its basic features and content, several potential niches immediately come to mind, even without exploring beyond the surface material covered here.

PL can be used as a portable computing environment. There's something very intriguing about carrying a computing desktop around on a key chain in a shirt pocket. PL's Universal Installer can remaster a current system snapshot on a USB drive (providing it's large enough), and that carry-along drive can be used to boot your customized PL and user data onto any PC that's capable of booting from a USB device. An overview of the USB setup process is available at www.pendrivelinux.com/2006/03/25/puppy-linux-on-usb.

If Windows or some other installed OS becomes inoperable, that could present an untimely dilemma—making your basic desktop services unavailable and blocking access to the data residing on the system drives. Booting PL from removable media and gaining access to those drives provide the core of a data recovery tool and a temporary (at the very least), usable desktop environment. Even if you're not dealing with an emergency now, it's a good idea to obtain and test a bootable PL image just to make sure you can boot it and see your system devices—your internal disks, the network and removable media devices. You'll be that much closer to data recovery and/or a functioning desktop platform should an emergency arise.

PL would be an excellent framework for any academic coursework that revolves around software development, system internals or small device control and the like. Advanced PL customization topics are well documented at puppylinux.net/puppy-unleashed.htm. A base PL image can be assembled from scratch and can be as inclusive or limited as your requirements dictate. Meanwhile, for those assignments that call for digging deeper into PL, kernel configuration/build-related topics are available at puppylinux.net/development/compilekernel.htm.

As I mentioned previously, my dedicated PL host was a proverbial paperweight. What modern OS could I practically operate on a Pentium III-class machine with "matching" resources? PL provides an excellent vehicle for getting these vintage platforms working again. Thinking more globally, this inexpensive platform (PL plus older generation hardware) can put a lot of computing power in the hands of people who might otherwise have none. Considering that this rich, but free, OS can operate reasonably well on seven- or eight-year-old hardware, PL presents some interesting opportunities. There are efforts afoot to address the so-called digital divide, and PL can be a facilitator both locally and worldwide. Nonprofit organizations, less-affluent educational institutions and all

Resources

Puppy Linux: www.puppylinux.com

PL Distribution Home Page: www.puppylinux.org

PL FAQ: puppylinux.com/faq.htm

PL User Manuals: puppylinux.com/manuals.htm

PL Discussion Forums: www.murga-linux.com/puppy

PL for Developers: puppylinux.com/development/developer.htm

PL News: www.puppylinux.org/wikka/LatestNews

PL Video Tutorials: rhinoweb.us

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individuals sensitive to technology costs would be excellent PL candidates.

I haven't noticed anything that would necessarily make PL a bad choice for general-purpose desktop needs—providing you feel comfortable with a few manual configuration steps (which is often the case with most distributions anyway) and installing a few desired packages that might be excluded in the default distribution.

Conclusions

I see some potential here, and I would wager that PL continues to gain more attention and popularity. PL's agility and surprising completeness make it far from a one-trick puppy (okay, that'll be the last silly puppy quip). Given what PL offers, the ease of getting started and the almost stunning performance on vintage hardware, there is something here worth watching. A common experience in a desktop upgrade path is obtaining more powerful hardware, only to experience the same or slightly better performance. Imagine going the other way—regressing several generations of hardware and realizing better performance.

Who should test-drive PL? If you were interested enough to read through this material, you're a good candidate. It requires a small investment of your time and none of your money. And, its usefulness as a data/system-rescue

utility is something every desktop user should keep in mind.

This article represents information that I was able to glean after kicking the tires for 40 odd hours—taking PL in directions that interested me. For completeness, I'll offer a bit of subjective criticism. PL is not a flawless desktop. I thought a few utilities could use a face-lift as they presented screens that looked a bit toyish—long on text and short on intuitive functionality. Because of that, there were a couple instances when I felt I either experienced a minor bug or committed a pilot error—couldn't really be sure. That's forgivable, because overwhelmingly, things worked as expected and as documented on the first attempt. I'm sure noticeable kinks will be addressed over time. For now, PL may very well stand alone within its sweet spot. ■

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Solutions might be useful, but problems are what make stories interesting. That's why I like reading the Linux-Kernel Mailing List (LKML) and the Kernel Trap Web site. I'm no hacker, and most of the work that's discussed there is too arcane for me. But, there still are problems to follow, and most of them lead somewhere.

Take the thread New Kernel Bugs, started by Natalie Protasevich on November 13, 2007. Andrew Morton followed by noting "no response from developers" after most of the bugs, concluding:

So I count around seven reports that people are doing something with and 27 that have been just ignored.

Three of these reports have been identified as regressions. All three of those remain unresponded to.

After many posts about particulars, David Miller added, "I think you like just saying 'No response from developers' over and over again to make some point about how developers are ignoring lots of bugs. That's fine, but at least be accurate about it."

Andrew replied, "Do you believe that our response to bug reports is adequate?"

David came back with:

Do you feel that making us feel and look like shit helps?

...When someone like me is bug fixing full time, I take massive offense to the impression you're trying to give, especially when it's directed at the networking.

So turn it down a notch Andrew.

Andrew replied:

That doesn't answer my question.

See, first we need to work out whether we have a problem. If we do this, then we can then think about what to do about it.

I tried to convince the 2006 KS attendees that we have a problem and I resoundingly failed. People seemed to think that we're doing OK.

But it appears that data such as this contradicts that belief.

This is not a minor matter. If the kernel *is* slowly deteriorating, then this won't become readily apparent until it has been happening for a number of years. By that stage, there will be so much work to do to get us back to an acceptable level that it will take a huge effort. And it will take a long time after that for the kernel to get its reputation back.

So it is important that we catch deterioration *early* if it is happening.

Ingo Molnar followed with a long post that ended with:

Paradoxically, the "end product" is still considerably good quality in absolute terms because other pieces of our infrastructure are so good and powerful, but QA is still a "weak link" of our path to the user that reduces the quality of the end result. We could *really* be so much better without any compromises that hurt.

Much discussion among many participants followed, about the "new development model" and about policies and practices around bug-fixing, patching and, in general, debugging the debugging process. The thread ran to more than 100 posts, near as I can bother to count, over two days.

What stands out for me is how participatory it all is. Even its disorganization has organized qualities to it. What organizes it, I think, is respect for actual contribution. If it doesn't help, the principle says, it doesn't matter. There is gravity there. It keeps conversation grounded in the realities of actual contribution.

Linus has been saying this kind of thing for years. You can hear it again in the interview excerpted in the UpFront section of this *Linux Journal* issue. You also hear something new concerning the social side of kernel development. Here's what Linus says:

So, the technical sides are often easier in the sense that I don't get frustrated. Okay, we've had a bug and we've hit our head against a technical bug for a couple months and, yes, that can

be slightly frustrating, but at the same time, you always know it's something that you are going to solve and...I never worry about that.

The social side is maybe a bit more difficult in the sense that that can be really frustrating and sometimes you don't solve the social problems and people get upset, and I think that's very interesting too. I mean...if everybody was easy and everybody was all pulling in the same direction, it wouldn't be as fun and interesting. And it's different and also it changes from time to time. Sometimes we concentrate on technical problems and then occasionally, happily fairly seldom, there comes this perfect storm of social issues that start up, and one flame war perhaps brings out some other issues that people have had and have been kind of simmering under the surface....

Outside this small world it has become fashionable to talk about "social networks" and point to Facebook and MySpace, with their millions of users and zillions of posts, as examples of those. Perhaps they are. But there's a difference between those and the societies of constructive problem-solvers who create the infrastructure on which civilization relies. One welcomes, and even values, noise. The other one doesn't. Which would you rather build on?

The trick is knowing what goes into what you rely on. With open-source code, and open development methods—including discussion among developers themselves—you can do that. You can know. Or at least try to know.

At their best, humans are creatures that try to know what's going on. But humans also aren't perfect. No species is. Life is experimental. Behavior, like the beings that commit it, is all prototype. So are developments amidst crystals, weather, geology, stars and galaxies. All is alpha and beta, and we never get to omega. Nor should we. Getting better is far more interesting than being perfect. You can build toward the ideal. But you use what's real. ■

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