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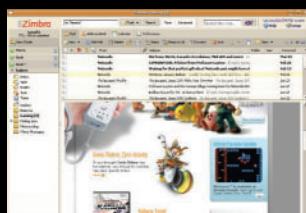
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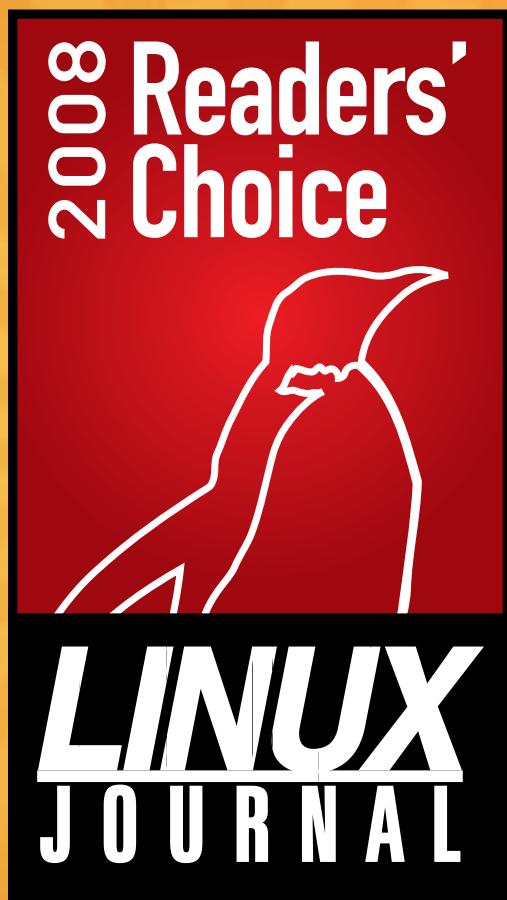


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YEAH, WE'RE WORKING ON THAT

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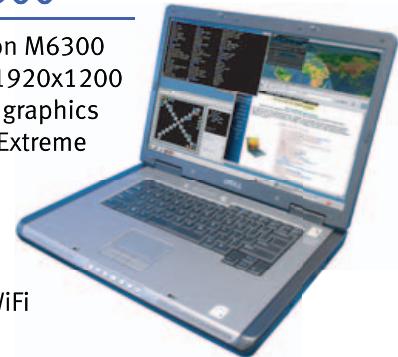
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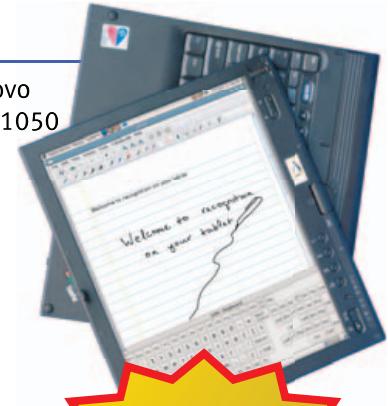
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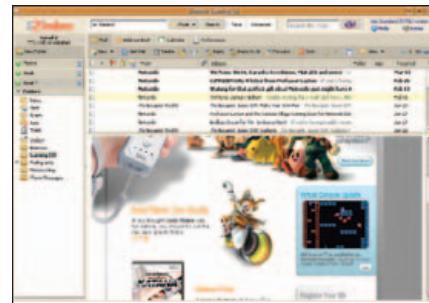
If you have ever wanted to remaster Knoppix but were frustrated with the difficult process, check out how to make custom Knoppix disks while bypassing the full remastering process.

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- 90** THIN CLIENTS BOOTING OVER A WIRELESS BRIDGE

Setting up a thin-client network, and some useful operation/administration tools.

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WEB DEVELOPMENT

Next month, *LJ* talks to Matt Mullenweg, founding developer of WordPress, about blogging, the evolution of his platform and his commitment to open source. We'll also have an introduction to Web development platform OpenLaszlo, and we'll look at creating a small, flexible content management system with PHP and TinyMCE.

James Gray has been examining Linux's inroads on the enterprise desktop, and he'll cover the latest trends and discuss the most interesting implementations to date.

As always, there's much more. Alolita Sharma reviews some current state-of-the-art digital TV tuner cards to evaluate how well they support digital television in Linux. And Kyle Rankin provides a head-to-head comparison between a standard laptop hard drive and a solid state model for those of you thinking of making the switch.

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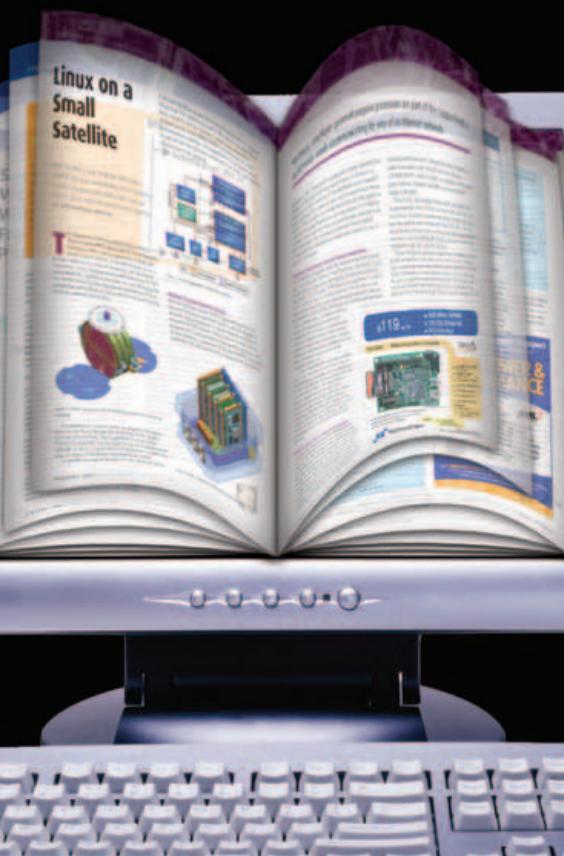
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Executive Editor

Jill Franklin

jill@linuxjournal.com

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Products Editor

James Gray

newproducts@linuxjournal.com

Editor Emeritus

Don Marti

dmarti@linuxjournal.com

Technical Editor

Michael Baxter

mab@cruzio.com

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Reuven Lerner

reuven@lerner.co.il

Chef Français

Marcel Gagné

moggagne@salmar.com

Security Editor

Mick Bauer

mick@visi.com

Contributing Editors

David A. Bandel • Ibrahim Haddad • Robert Love • Zack Brown • Dave Phillips • Marco Fioretti
Ludovic Marcotte • Paul Barry • Paul McKenney • Dave Taylor • Dirk Elmendorf

Proofreader

Geri Gale

Publisher

Carlie Fairchild

publisher@linuxjournal.com

General Manager

Rebecca Cassity

rebecca@linuxjournal.com

Director of Sales

Laura Whiteman

laura@linuxjournal.com

Regional Sales Manager

Joseph Krack

joseph@linuxjournal.com

Regional Sales Manager

Bruce Stevens

bruce@linuxjournal.com

Circulation Director

Mark Irgang

mark@linuxjournal.com

System Administrator

Mitch Frazier

sysadm@linuxjournal.com

Webmistress

Katherine Druckman

webmistress@linuxjournal.com

Accountant

Candy Beauchamp

acct@linuxjournal.com

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PC Magazine — February 2008

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"The company offers the only five-year server warranty (strictly mail-in, though) I've ever heard of. It also has a program called Aberdeen CARES, which allows customers to purchase a custom-built server, try it out for 30 days, and return it for a full refund if not completely satisfied."

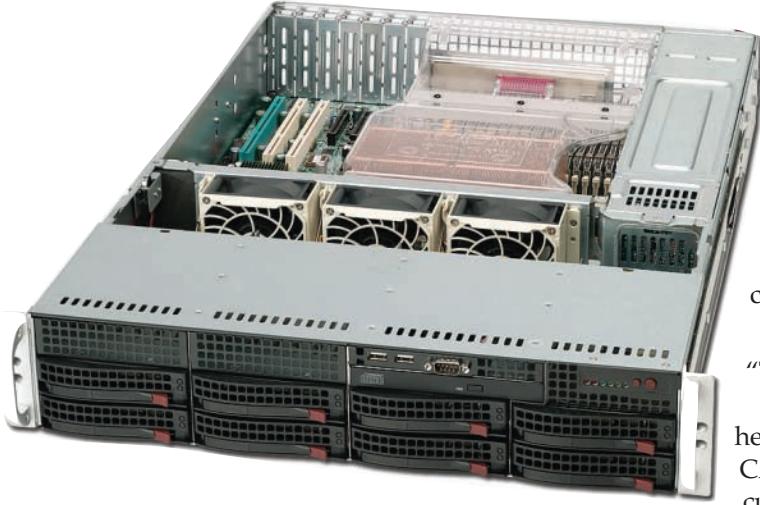
"And, make no mistake about it, the Aberdeen Stirling 229 I tested is one powerful beast."

"Aberdeen has added its own KVM-over-LAN feature—a nice convenience."

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PC Magazine — February 2008



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letters



Correction

In my article "Security Features in Ubuntu" (*LJ*, March 2008), I incorrectly characterized Novell AppArmor as "an implementation of Type Enforcement". But, as I myself explained in my earlier article "An Introduction to Novell AppArmor" (*LJ*, August 2006), AppArmor represents an approach to mandatory access controls that is fundamentally and deliberately different from Type Enforcement's, though they serve very similar purposes. I apologize both for the mistake and the self-contradiction.

--
Mick Bauer

Wine Recommendation

I especially enjoyed Marcel Gagné's March 2008 Cooking with Linux column. My wife and I discovered the Collavini Villa Canlungo Pinot Grigio on a trip to Italy, and it has become one of our favorites. I went to the cellar recently only to discover that we had finished the last of our Villa Canlungo, but we did have a few bottles of 1998 Torciano Baldassarre. I was able to finish the article while savoring a glass of Baldassarre instead. A glass of fine wine makes the Linux even smoother.

--
Glenn A. Scherb

Floating-Point Simplicity

Joao Macedo wrote a letter, published in the January 2008 issue of *LJ*, in which

the following one-liner was presented:

```
$ echo 'scale=4^J11/7' | bc
```

Joao explained that, "the ^J is obtained by issuing Ctrl-V + Ctrl-J."

^J is the keystroke that produces the ASCII LF (line feed) character, which UNIX (and, thus, Linux) uses as a line terminator. Rather than embed LF in the text, I'd like to suggest the following as a better alternative:

```
$ echo -e 'scale=4\n11/7' | bc
```

--
David Newall

Why on Earth?

I'm writing in connection with the article "The Best of Both Worlds", by Dashimir Hoxha, which appeared in the February 2008 issue of *LJ*. As the author says Linux is his favorite operating system, I can't clearly see why he chooses to run it in a virtual machine running on Windows XP. Why should Linux have its performance undermined by running on a VM? Why is Linux stability conditioned by Windows XP's stability? And finally, what's the reason for the title of the article? Is this combination really the best of both worlds for a Linux user? I have been working with UNIX environments and then also Linux environments for more than 20 years, and honestly, I use Windows only when I have no other choice.

Exactly in the same situation, some years ago when I bought a 1GB RAM Lenovo T60P notebook with preinstalled Windows XP, I kept Windows only for the time necessary to check that all the hardware was working correctly. Then, I installed my favorite distribution, which is Kubuntu, and then I installed QEMU (with kqemu) to run Windows XP, in order to be able to test software for my clients or access some home banking site that works only with Internet Explorer.

Setting aside the fact that I do not understand the choice for a Linux user of running Linux over Windows, the development of the article was very interesting and illustrative, especially in connection with the networking configuration.

A last remark, if my friends or colleagues want to use my notebook, they know they have to use Linux. This has discouraged some and has revealed a very attractive environment for others.

--
Norberto

A More Elegant Solution

In the Letters section of the April 2008 issue of *LJ*, Mike Henders gave three possible shell scripting solutions for Dave Taylor's use of inline Perl to get the ordinal value of a letter [see Dave's January 2008 Work the Shell column]. Well, I don't have much use for ordinal values in my daily life, but I found his examples interesting. However, I didn't care for the loop he used in Solution 1, nor did I like the math he resorted to in Solution 3 in order to deal with the spaces in the string.

But, Mike's use of an array in Solution 1 and his use of a variable length string in Solution 3 gave me the idea to combine the two—create a variable length array and, thus, a more elegant solution (my opinion).

First, initialize the array like before, but leave out Mike's place holder (he used a 0). At the same time, make it a variable length array by letting the value of \$letter determine the last element of the array:

```
LETTERS=$(eval echo {a..$letter})
```

Now the ordinal value (of the letter in \$letter) is equal to the number of elements in the array:

```
ordvalue=${#LETTERS[*]}
```

--
Francois Visser

Not Just Canadian

I'm a Canuck living in the great white north and have to respond to the mention of tonne as Canadian for ton in James Gray's article "Go Green, Save Green with Linux" in the April 2008 issue of *LJ*. Here in Canada, we use the metric system, which is international and to which a vast majority of countries subscribe. A tonne is equal to 2,200 lbs. (Umm, American pounds, that is.) I enjoy reading *LJ*,

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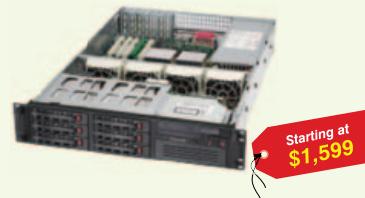
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LETTERS]

and keep up the good work.

--
Rick Martin

Always a Learning Experience

I enjoyed reading the April 2008 issue of *LJ*. I particularly wanted to check out Kyle Rankin's article "PXE Magic: Flexible Network Booting with Menus".

I have a Fedora 8 server that I use as my main SOHO server. I wanted to try the steps from the article so I could have the advantage of the utilities and the experience of doing it. So far as the doing, I guess I succeeded, because figuring out someone else's errors/omissions is always a good teacher.

Kyle Rankin wrote a great article that is certainly foundational and even inspirational, but it is missing essential information. It was easy to set up TFTP and NFS, tweak my *dhclient.conf* file, and open the firewall suitably to get this working. I now have a crude PXE bootable menu that lets me select a local disk boot (in case I don't want the PXE boot) and a *memtest86+* and a Knoppix 5.1 network boot. I look forward to exploring other options to add to this, so that I can network boot disk imaging software for backups and Linux network install tools, such as Kickstart and more.

Where Kyle fell terribly, terribly short was that for a Knoppix rescue load, he tells you to go to the Knoppix CD-ROM and fetch the *minirt.gz* and *vmlinuz* files from the *boot/isolinux* directories. Put them in your */tftpboot* directory and you're golden! Not! Major omission! After many hours of only partial boots with Knoppix (it never would find/mount the Knoppix NFS share), I came to realize that Knoppix cannot finish its boot, because it cannot NFS-mount the Knoppix CD-ROM files from the boot server, because the kernel loaded via PXE is not network-enabled! The basic kernel fetched from the CD-ROM merely loads, and lets the rest of the system startup load and start the network. When network booting, the NIC card needs to be enabled during the processing of *minirt.gz* (it has NIC card modules therein and can load them and enable the network). Hence, it then can mount the NFS filesystem

and find the Knoppix CD-ROM files and finish booting as expected.

The solution is, you get the "network-enabled" *vmlinuz* and *miniroot.gz* files by first booting to Knoppix and then drilling into the menu to start the Knoppix Terminal Server where it provides a setup dialog. You select (take the defaults) various NIC card drivers to include and let it configure the service. Apparently, Knoppix generates these files based on your selections. Then, you start a shell window and *cd* to */tftpboot* and use *scp* to copy the generated *miniroot.gz* and *vmlinuz* files off to your boot server, replacing the ones Kyle initially tells you to fetch. Once I got those files and put them into my boot server, my HP laptop network booted, and I selected Knoppix, and it proceeded to boot as fast as I could have expected. Applications seem to load and operate very responsively, etc. The system behaves just like it booted from the CD-ROM, but faster.

Although I would have liked to perform the steps accurately from the article to get this working, no such luck! However, I learned a lot along the way. I hope this feedback helps any other readers that had the same failures as I did and wanted to benefit from this article.

--
Keith Schneider

Kyle Rankin replies: You are absolutely right. The *miniroot.gz* and *kernel* from the *isolinux* directory on the CD-ROM do not match the files in the */tftpboot* directory. Traditionally, when I have added Knoppix to my PXE boot environment, it has been via the files the Knoppix Terminal Server created (I even mention grabbing the files from */tftpboot* in my book *Knoppix Hacks*), but in this article, I was trying to save the reader the extra steps of booting Knoppix and running the script, so I made the mistaken assumption that Knoppix used the same *miniroot* and *kernel* from the *isolinux* directory for its Terminal Server. I'm really sorry my mistake made you jump through a lot of extra hoops. Thanks for the feedback.

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diff -u

WHAT'S NEW IN KERNEL DEVELOPMENT

There have been some very interesting changes in the way the kernel is developed lately. In a continuing effort to keep contributors enthusiastic about participating in kernel development, **Linus Torvalds** announced he's willing to accept **less-polished driver code**. Actually, this affects code throughout the kernel, but it particularly affects driver code, because if a driver breaks, it probably won't cause problems anywhere else in the kernel. There are several benefits to making this change. For one, as Linus has pointed out, accepting code into the kernel makes it easier for others to find bugs and submit fixes. Keeping code out means that the developers must work more in isolation and get less help from those potential contributors. Another benefit is that strict code submission requirements can have a depressing effect on developers. In the even/odd stable/unstable version-numbering days, developers went through a lot of pain during the stable development cycle, because it's just more fun to write new code than to fix bugs. The transition to the 2.6 kernel and to a permanent phase of development meant that this recurring period of frustration was gone. But, there was still a lot of focus on ensuring that code was up to snuff before it could be accepted.

With the creation of the new stable series that did not interrupt 2.6 development but just ran alongside, the stage really has been set for some kind of move like this from Linus for some time. But, there certainly will be large repercussions during the coming months. For one, people who have taken it upon themselves to keep the kernel clean, remove old code, fix odd badness and so on will have a much tougher job of it now. **Adrian Bunk** is one of these, but there are others as well, and it'll be harder for them or anyone else to make the kind of progress they've been making lately.

Another repercussion has already occurred—the creation of the "**Linux Next**" **git tree**. It's a tree for subsystem maintainers to sync their code every day, so that any conflicting patches are identified and resolved quickly. The issue of subsystem conflicts actually has existed

for a while now, but Linus' new code-acceptance policies pushed **Andrew Morton** over the edge and made him start asking for volunteers to maintain a "Linux Next"-type thing. The problem is that subsystem updates don't just touch code within the subsystems themselves, they can include patches to many other parts of the kernel. So, whenever Linus would open up a new merge window, there would be many patch conflicts, and the maintainers would run around fixing them before they could get their code in through the window. With the new easier acceptance policies, this problem would have gotten worse. It was already driving the subsystem maintainers crazy. Using Linux Next, they merge their trees on a daily basis without having to wait for Linus, so all conflicts are identified right away, and folks have more time to fix them, instead of having to try to fix everything at the last minute, with no prior knowledge of any breakage. With Linux Next, as soon as the merge window opens, all the subsystem trees can be accepted into the main tree at once, with far less hassle.

Stephen Rothwell has volunteered to maintain the Linux Next tree, and so far, dozens of subsystem maintainers have joined it. There still are plenty of problems with Linux Next that need resolving. For example, the order in which the trees are merged is significant, because any trees that give conflicts will be rejected, and the maintainer of that tree will be expected to fix the conflict. Because trees merging earlier are unlikely to see any conflicts, as they merge against a more pristine tree, this means that trees merging later will be arbitrarily responsible for fixing the patch conflicts. Andrew's solution to this is to rank each subsystem by importance and merge in that order. The question of which subsystems are most important then becomes a political issue, with the potential for in-fighting and bitterness. I expect some more elegant solution to emerge, unless it turns out that subsystem rankings are very obvious to everyone involved.

Andrew's larger goal with Linux Next is to increase visibility into the code that goes into the kernel, so that Linus' new looser restrictions on patch submissions still will allow kernel folks to scrutinize those submissions after the fact, to identify

what needs to be cleaned up and decide where the most developer attention should be diverted. It's likely that Andrew and others will continue coming up with ideas to implement this increased visibility over time. In terms of the average Linux contributor, however, Linus' new policies herald a new period of freedom, as well as the chance for many of them to react to feedback from users, at a level they may not have experienced previously.

Samuel Thibault has written a driver for the **VisioBraille** device. Because the code is at the driver level and not in user space, it is intended, in this case, to handle situations where user-space Braille drivers would not be effective—for example, during boot failures. Early in the boot process, user processes can't run, but blind users still might want to read the failure messages and report bugs back to the kernel developers. The patch itself is apparently fairly ugly, but Andrew Morton at least was unable to find a way to improve it. It's likely to go into the kernel very soon.

Daniel Phillips has written **Ramback**, a new virtual block device with the speed of a RAM disk and the data persistence of a hard drive. Users see a regular filesystem, but all file activity is done in RAM and then quietly mirrored to a hard disk back end. Daniel has measured a 25-fold speed increase with this approach. The gotchas all tend to center around how and when the data migrates from RAM to the hard disk. Daniel's approach has been to focus on the behavior during clean shutdowns and restarts, but there is still a big gray area regarding what happens when the system crashes. Daniel is very excited about the possibilities for a really fast user experience, but acknowledges that there are still a lot of technical problems, and that people shouldn't be storing their data in Ramback just yet, unless they want to help debug and develop it. The biggest critic of Daniel's patch seems to be **Alan Cox**, who questions whether a virtual device even is needed. He suggests a simple RAM disk, with a user daemon that saves everything to disk on a periodic basis. So, it's unclear whether Ramback will make it into the kernel. Although with Linus' new acceptance policies, who knows?

—ZACK BROWN

1. Millions of people who access the Internet every day from a cyber café: **500**
2. Number of Linux-based Web hosting services in Netcraft's top 20: **21**
3. Number of Linux-based Web hosting services in Netcraft's top 25: **13**
4. Number of Linux-based Web hosting services in Netcraft's top 10: **5**
5. Number of Linux-based Web hosting services in Netcraft's top 1: **1**
6. Number of open-source (Linux, BSD, Solaris, F5 Big-IP) OS-based Web hosting services in Netcraft's top 50: **29**
7. Number of Windows-based hosting services in Netcraft's top 50: **12**
8. Linux percentage growth year over year in the North American POS (point-of-sales/service) terminal market: **32**
9. Millions of dollars in latest year of Linux POS sales in North America: **475**
10. Position of cost among the top IT concerns in Australia: **1**
11. Minimum billions of dollars to be spent annually on SMB (small/medium business) technology in 2012: **615**
12. Billions of dollars spent annually by the IT industry to reach and influence buyers: **174**
13. Predicted annual Linux server sales, in billions of dollars, predicted in 2004 for 2008: **9.1**
14. Billions of dollars spent on Linux servers in Q4 2007: **2**
15. Billions of dollars spent on UNIX servers in Q4 2007: **5.2**
16. Billions of dollars in combined Linux/UNIX server sales in Q4 2007: **7.2**
17. Billions of dollars spent on Windows servers in Q4 2007: **5.7**
18. Linux server sales growth rate percentage in Q4 2007: **11.6**
19. Percentage growth in server blade sales in Q4 2007: **54.2**
20. Billions of dollars Sun Microsystems paid for MySQL: **1**

Sources: 1: Jooce.com | 2–7: Netcraft.com, for February 2008 | 8, 9: IHL Group, via Linux Devices | 10–19, IDC, via TechRepublic, ITJungle, BetaNews, IDC and HitsLink | 20: San Jose Mercury News

Eee PC Gets an Upgrade

ASUS's little Eee PC notebook (or UMPC, Ultra-Mobile PC) computer, which has sold hundreds of thousands of units since hitting the streets late last year—and which ASUS expects to sell up to 5 million of in 2008—is getting a bit more capable. At CeBIT in March, ASUS unveiled the Eee PC 900. Improvements over the original (G4) include an 8.9" WSVGA (1024 x 600) display (the original was 800 x 400 WVGA), 8GB or 12GB SSD storage (up from 4GB) and 1GB of RAM (up from 512KB). Other than that, everything else is pretty much the same. It's still only two pounds, features three USB ports, card readers, wireless (802.11b/g) and wired Ethernet, a Webcam and a claimed battery life of up to four hours. It is due for release this summer, reportedly

at a price of 399 Euro, or whatever that costs in the US when you read this. It's an increase over the original model price. That one, at press time (March), was running mostly in the mid-\$300 (US) range at on-line stores. Oh, and they're "Windows-ready", but that OS costs extra. Linux still comes standard on the base model.

Resources

- ASUS Showcases Expanded Eee PC Family of PCs at CeBIT 2008: eepc.asus.com/global/news03042008.htm
- Linux-Powered Mini-Laptop Gets Larger Display: linuxdevices.com/news/NS5536771397.html

—DOC SEARLS

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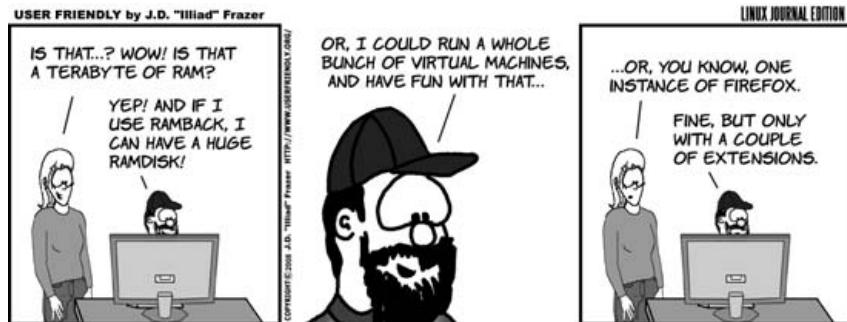
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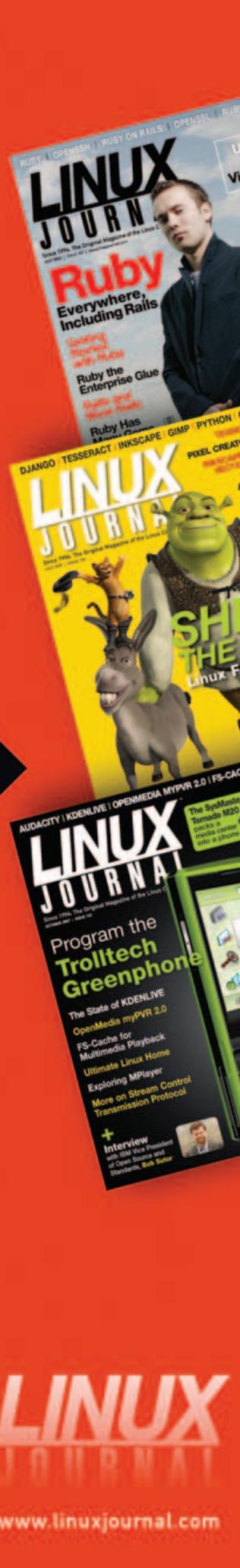
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—KATHERINE DRUCKMAN



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UPFRONT

Bravia for the GPL

A few months back, Peter Semelhack of Bug Labs mentioned to me that his new Sony Bravia flat-screen TV came with some interesting paperwork: a statement about GPL'd software. As it happened, we also own a Bravia flat-screen. Sure enough, when I looked at the pile of paperwork that came with it, there was a large folded sheet covered with small type titled REQUIRED PUBLIC STATEMENT FOR GPL/LGPL LICENSED SOFTWARE USED IN THIS TELEVISION. Above almost four pages containing the full text of the GPL v.2 and the LGPL v.2.1 licenses, Sony says:

The following GPL executables and LGPL libraries are used in this product and are subject to the GPL/LGPL License Agreements included as part of this documentation:

GPL EXECUTABLES:

- MontaVista Linux kernel
- BusyBox
- insmod

LGPL LIBRARIES:

- libuClibc.so
- ld.so
- libc.so
- libn.so
- libgcc_s.so
- libstdc++.so

Source code for these executables and libraries can be obtained using the following link: www.sony.com/linux.

That link leads to a simple page with links to code behind four product categories:

- Bravia Internet Video Link
- Television
- Set-top Box
- LocationFree TV

The Bravia link leads to .tgz files for these hunks of code:

- Linux kernel
- BusyBox
- uClibc
- zlib
- curl
- libpng
- freetype
- openssl

The Television link leads to a list of TVs made in the last five years:

- 10 in 2003
- 16 in 2004
- 22 in 2005
- 40 in 2006
- 54 in 2007

I bought our TV, a KDL-40XBR2, in November 2006, and found it in the 2006 list. When I click on that link, I get to the Open Source Code 06 section of Sony's "Open Source Code—English" page. There, I see that my TV runs on the ATI GTX Linux kernel, which is a blue link that starts downloading the source code when I click on it.

I'm no hacker, so I probably won't do anything funky with our television. (More capable friends are welcome, family permitting.) Instead, I'll sit content to know there's one more Linux device in our house, and that clearly we're moving toward GandhiCon IV. That's the last stage suggested by Mohandas Gandhi's famous statement, "First they ignore you, then they laugh at you, then they fight you, then you win."

Of course, if we've won, that means that Linux in the TV is a feature and not a buried host for functions. How long before that happens?

—DOC SEARLS

Linux Makes Phones Even Cheaper

Purple Labs, a company based in France with a multinational management team, is pushing Linux mobile phones outward in capabilities and downward in price.

Positioned as "the only independent software vendor with a complete Linux solution for mass-market 3G phones", Purple Labs pushes its customers to "replace their legacy RTOS with a flexible and scalable Linux platform, accelerating development of feature-rich



3G phones while reducing investment".

The latest of these is Purple Magic, which Purple Labs calls a "reference design" for "the 1st sub-\$100 3G Linux feature phone". Features include music playback, Internet browsing, video telephony and video streaming, in addition to plain-old cell phone service.

And, as you can see from the picture, it doesn't look bad, either.

—DOC SEARLS

They Said It

Some people think innovation in technology is about how hard it is to implement, or how long it took, or how complex it is, or convoluted. They see innovation as wizardry. I see it differently. I'm impressed by the ratio of functionality to complexity. I like that number to be as big as possible, because the less complex it is, the fewer moving parts, the less likely it is to break, and the easier it will be for others to build on the idea.

—Dave Winer, www.scripting.com/stories/2008/02/18/theSimplestPodcastApiEver.html

Since 9/11, approximately three things have potentially improved airline security: reinforcing the cockpit doors, passengers realizing they have to fight back and—possibly—sky marshals. Everything else—all the security measures that affect privacy—is just security theater and a waste of effort.

—Bruce Schneier, www.schneier.com/blog/archives/2008/01/security_vs_pri.html

First, companies have to decide: either they're in or they're out. You either make meatballs, or you're part of this new regime. But if you only want to use the regime to just sell more [meatballs], you're going to fail.

—Seth Godin, www.usnews.com/articles/business/best-in-business/2008/01/10/selling-in-a-post-meatball-era.html

Patents act as a tax, an innovation tax.

—James Bessen, co-author of *Patent Failure*, from a talk at the Berkman Center, March 3, 2008

The greatest shortcoming of the human race is the inability to understand the exponential function.

—Albert A. Bartlett, PhD, Emeritus Professor of Physics, University of Colorado, www.youtube.com/watch?v=F-QA2rkpBSY

—DOC SEARLS

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What Are They Using?

I was celebrating Leap Day (February 29) at a London pub with Mark Antony Kent, Head of Technology Strategy at British Telecom, hoping also to pump his brain for insights to follow up on a contentious FCC hearing at Harvard earlier that week—one convened to visit issues around Comcast's valving of BitTorrent traffic. Mark is both a telecom and Internet veteran of long standing, and he's full of exciting ideas about how to work around the congestion issues that got Comcast into so much trouble.

In the midst of this, I learned that Mark was coincidentally a veteran Linux hacker who also packed a lot of lightweight Linux iron around with him. When he began pulling some of this stuff out and showing me what it did, I pulled out my little Canon camera to record his ad hoc demo (which later made a nice little podcast) and to document details I could share here. In brief, here's the gear he talked about and how he uses it:

1. EfficientPC generic Linux box. His came with a MythTV PCI card that comes with its own digital TV tuner and a remote control. "I just plugged it in and it works", Mark said. Signals he picks up from the BBC and other sources are recorded here, where he downcodes with...
2. MEncoder, a free GPL'd command-line tool for downloading, encoding and filtering for video. The resulting files are then transferred to his...
3. Nokia N800 UMPC (ultra-mobile PC). Here, he stores the shows on a Flash card. The N800 has two slots for these, one inside and one on the bottom. He uses one for video and the other for audio. He showed me a *Father Ted* show he had recorded, which the N800 organizes with the amazing...
4. Canola media center, which plays beautifully through MPlayer, complete with stereo sound through its little speakers or through a headset. Mark fills up several cards with video and does his telly watching on the train, on a screen far bigger than that of, say, an iPhone. He records audio



directly from the FM tuner built in to the N800, or listens live. (The FM radio is a feature sadly missing on the newer N810. Hope it comes back in future versions.) He also stores both video and audio at home on a...

5. Excito Bubba media server, which runs on Debian with the 2.6 Linux kernel. At home, his N800 sees the Bubba's Wi-Fi signal, from which Canola can discover files using the DAAP and UPnP protocols, then list and play them directly. He also has...
6. Two Nokia N770s, which are the predecessors to the N800. He liked them so much that he just had to have two. "Then, when (the N800) came out, I wanted the radio. The 770s also run Canola and play everything from the Bubba." Mark says, "The 770 has a Samba server as well, which also increases possibilities." Thanks to these lightweight items, he stopped hauling around a laptop, and instead uses the N800 as his

portable computer, thanks to a...

7. Bluetooth keyboard. At home, he also has...
8. Another Linux PC—"an ASUS thing from the EfficientPC guys", with dual flat-screen monitors. Back on the road, he also can get on the Net by blue-toothing from his handhelds over a...
9. Motorola A780, which is coincidentally Linux-based as well and uses 2.5G "edge" technology. He has also ordered an...
10. ASUS Eee PC for his son. "He's a Mac guy", Mark said, but "he saw this and really, really wanted one". Mark is "desperate to get one" as well.

Mark's enthusiasm was infectious, and I caught the bug. After I flew back home to the US the next morning, I immediately started to ramp up my own version of Mark's portfolio of cool tools.

—DOC SEARLS

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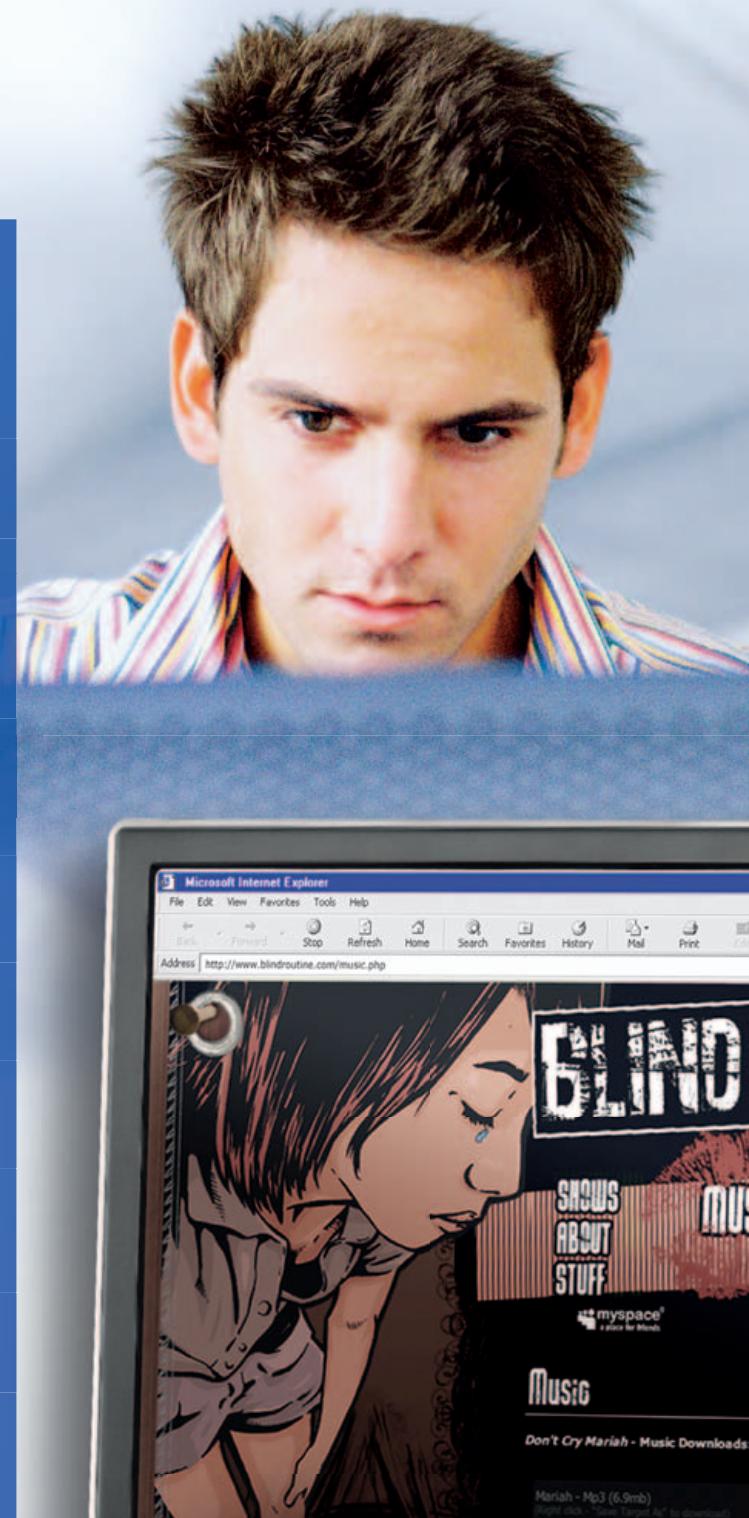
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REUVEN M. LERNER

Authenticating to a Rails Application

Do you wish that Rails came with more built-in functionality? Plugins bridge this gap, offering solutions to many common problems.

Last month, we began to look at OpenID, the open standard for distributed identification on the Internet. OpenID allows you to have a single user profile, authenticated against a provider you trust, and to use that profile with many different Web sites and Internet applications. OpenID has been growing in popularity during the past few years, after it was first developed and used by blogging company LiveJournal. Since then, it has become a more popular and open standard, and is now supported by many Web sites, as well as all popular programming languages.

I was hoping to use this month's column to show how easy it is to make a Web application compliant with OpenID—or in OpenID terminology, to make it into an OpenID consumer. It turns out that adding OpenID capabilities isn't actually that complicated or difficult, particularly with a popular framework like Ruby on Rails, for which there are many established plugins.

However, I also found that the OpenID plugin for Rails works especially well with a plugin called `acts_as_authenticated`. This plugin provides a simple, secure and highly customizable authentication system for Rails applications. So this month, we are taking a slight detour, looking at how we can use `acts_as_authenticated` in Rails applications. Along the way, we can see how to download and use Rails plugins, an important part of Web development with Rails. Next month, we'll build on what we have created, adding OpenID to our application for a truly flexible set of login options for our users.

Rails Plugins

Although Rails provides a great deal of functionality for developers, it offers few application-level features. Rather, most of its functionality is in the form of objects and methods that programmers can use to create new applications. But, there are no built-in applications, or application fragments, or even a centralized database schema that developers can expect to find in every Rails installation.

The Rails core developers have said that this is done on purpose, because every application has different needs, and it would be impossible to please

everyone. And indeed, I understand their point. Each of my applications always has needed to keep a slightly different type of information about users, let alone other types of data. Any choice the developers might make will be wrong for some people.

I happen to think there is a middle ground here. Perhaps the Rails core doesn't need to include a complete solution for users, groups and permissions. But, given the overwhelming number of applications that do define and use such objects, it would make sense to include an easily extensible skeleton within the framework itself.

Such extensions are unlikely to appear in the near future, given the strong feelings the Rails core team has expressed about them in the past. However, all is not lost. Rails includes a "plugin" system that makes it possible to download collections of code—including models, views, controllers and more—and to install them into an application. If you can find and install an appropriate plugin, you get something of a compromise solution. Once installed, the code acts as if it were an integral part of your application. And, of course, you can add only those plugins that are important to your particular application.

Because so many applications require users to register and authenticate, it should come as no surprise that there are a number of available plugins. One of the most popular is `acts_as_authenticated`, a plugin written by Rails core team member Rick Olson. The name does not refer to an actual declaration, but is rather a playful way of saying that it was designed to work with Rails. And, although the README file (displayed when you install the plugin) indicates that it has been deprecated (in favor of `restful_authentication`), `acts_as_authenticated` is popular and stable enough, and plays well enough with OpenID, that it is worth a look.

Rails plugins are installed with the built-in plugin tool, located in `script/plugin`. You can list the plugins that are available:

```
script/plugin list
```

But, this will list only those plugins located at one of the sources known to the system. To see a

list of these sources, simply type:

```
script/plugin sources
```

To add a new source to the list, simply say:

```
script/plugin source http://svn.techno-weenie.net/projects/plugins/
```

Sure enough, after doing this, running `script/plugin sources` shows the new URL. And, of course, now typing `script/plugin list` shows many new plugins, from both the old source and the new one.

Installing `acts_as_authenticated`

To install a new plugin—say, `acts_as_authenticated`—we must provide its URL to `script/plugin`. This is as easy as the following:

```
script/plugin install  
http://svn.techno-weenie.net/projects/plugins/acts_as_authenticated
```

Now, what happens when you install a plugin?

Rails installs it into the `vendor/plugins` directory, under a new directory named after the plugin. Thus, my installation of `acts_as_authenticated` installed a number of files into `vendor/plugins/acts_as_authenticated`.

In and of itself, installing the plugin doesn't change my Rails installation or add any new functionality. Rather, a plugin typically creates one or more generators, which are used to create or modify files used by the application.

In the case of `acts_as_authenticated`, it comes with two different generators, which we can see by going into the `generators` subdirectory. Here, there are two generators, named `authenticated` and `authenticated_mailer`. If we go into the `authenticated` directory, we see `authenticated_generator`, which is what defines the generator. This allows us to go to the root directory of our Rails application and type:

```
script/generate authenticated user account
```

The above tells Rails that we want to use the

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If you can find and install an appropriate plugin, you get something of a compromise solution.

authenticated plugin, which it finds in the plugin directory. The other arguments to this command indicate the model (and table name) we will use (user in this case), and the controller that should be generated to handle accounts.

The generator creates a migration file, defining the columns of the Users table using Ruby for greater database independence. In order to create the columns of the database, we must run the migration:

```
rake db:migration
```

Using my PostgreSQL database client, I now can see that the migration did its job:

```
atf_development# \d users
Table "public.users"
 Column | Type
-----+-----
 id | integer
 login | character varying(255)
 email | character varying(255)
 encrypted_password | character varying(40)
 salt | character varying(40)
 created_at | timestamp without time zone
 updated_at | timestamp without time zone
 remember_token | character varying(255)
 remember_token_expires_at | timestamp without time zone
```

Using the Plugin

Now that I have incorporated acts_as_authenticated into my application, I should be able to do several simple things:

1. Mark pages as open to the public.
2. Mark pages as private—that is, open only to registered users.
3. Allow people to register.
4. Allow users to log in.
5. Allow users to log out.

All of this is not only possible with acts_as_authenticated, but it's also quite easy. To make pages require authentication by default, we can say:

```
before_filter :login_required
```

Of course, if we require that people log in before they use the login page, users will find themselves in an infinite loop. So, we can add an exception for that at the top of account_controller.rb:

```
before_filter :login_required, :except => [:login, :signup]
```

Once this filter is in place, trying to visit any page other than login or :signup bounces us back to the login page.

I'm going to register, by entering my login name, my e-mail address and my password (twice) into the registration form. Once I click on the submit button, the application inserts my data into the database. I'm in there, with ID #1, and my plain-text data as well as my encrypted data.

Moreover, after registering with the site, I am now signed in as well. I can view any page I want, without having to log in again. My login will last until I go to the /account/logout URL. Unfortunately, the default index.rhtml page that comes with acts_as_authenticated does not make it clear when you have logged out. We can check that easily by adding a line to the top, showing the contents of non-blank notices:

```
<p><%= flash[:notice] if not flash[:notice].blank? %></p>
```

We now have a basically working version of an authenticated Web server. People can register (and log in if they are already registered), and we can add both restricted and unrestricted pages via the controller and the before_filter :login_required command.

Modifying the Default Behavior

acts_as_authenticated is good enough for many sites as it currently stands. However, there are a number of plugins, suggestions and modifications that you can use with acts_as_authenticated.

For example, many registrations systems want to stop bots from automatically creating user names or e-mail addresses, which can be used to send spam. Thus, it's common for the registration system to ask that users confirm their membership requests via e-mail. So, you enter your information at the site and receive a message that asks you to click on a link. Only after clicking on that link is your account actually activated.

This functionality, although not an obvious part of the core acts_as_authenticated plugin, comes with it and is easy to use. Basically, we use the other generator that comes with acts_as_authenticated. This creates the templates and most of the logic that we need for people to confirm their login status.

There are a wide variety of other things you

can do with `acts_as_authenticated`. For example, you can set it so that passwords are encrypted, but in a way such that it would be reversible. Another common task is to let users change their personal information, such as e-mail addresses and telephone numbers.

Conclusion

This whole discussion of `acts_as_authenticated` began because I wanted to use OpenID in a Rails application. However, I also wanted to integrate OpenID with an existing authentication mechanism, which brought me to `acts_as_authenticated`. Now that we have a working, if bare-bones, authentication system on our Web site, we can move on to the next step.

Even if you are not using `acts_as_authenticated` in your Rails application, it's useful to see how plugins work, how you interact with them and how you can use them to build your Rails application out of parts that have been contributed by other programmers.

Next month, we will look at how we can

integrate OpenID into our login system—namely, allowing people to log in using either a user name/password combination or OpenID. ■

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

If you're still new to Rails, I strongly recommend *The Rails Way* by Obie Fernandez. I have found it to be both clear and comprehensive, and one chapter in the book is dedicated to `acts_as_authenticated`.

There are a number of good resources about `acts_as_authenticated` on the Web. However, the most comprehensive is the author's Wiki, at technoweenie.stkipad.com/plugins/show/Acts+as+Authenticated.

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MARCEL GAGNÉ

Learning...Disguised

It has been said that playing is a child's work, because play is the means by which young children learn. You have to wonder if that's where the expression "mixing work and play" came from.

If I seem dumbstruck, François, it's because I'm desperately trying to decide what you possibly could be up to. *Quoi?* Of course, I know it's you. You're wearing a cheesy plastic nose, mustache and pair of glasses. You're surprised? Of course, it's not a good disguise, *mon ami*. Anyone who knows you, including everyone who regularly comes into this restaurant, would recognize you instantly. You could argue that it makes you look different, but I can't decide whether you look like Groucho Marx, a clown or Mr Potato Head. Oh, don't be offended. I happen to be a big fan of both Groucho and Mr Potato Head. What about clowns, you ask? To be honest, I've never been sure about clowns. I suppose I should ask you for an explanation for all this, but we shall discuss it later. Our guests are arriving as we speak.

Good evening, everyone, and welcome to *Chez Marcel!* Your tables are waiting, so please take your seats and make yourselves comfortable. François, please remove that silly disguise and head down to the wine cellar. Bring back the 2002 Catena Malbec from Argentina. You'll find two cases in the south wing next to the ancient Egyptian hieroglyphic tablet you ordered from Tablets Galore. Our guests, no doubt, will love this rich and intense Malbec. *Vite!*

You'll have to forgive him, *mes amis*, he is an excellent waiter, but his mind occasionally works in very strange ways. Having accused him of looking like Mr Potato Head, I'm reminded of a great Linux game called *Potato Guy*, also known as *KTuberling*. *KTuberling*, written by Éric Bischoff and others, is part of KDE's kdegames package, and as such, it is easily installed from your distribution's repositories. This is a computerized version of the potato-head game where you plug various plastic eyes, ears, noses and hats in to a plastic potato to create a funny-looking potato person (Figure 1). The official Mr Potato Head is, of course, the famous store-bought version of this game, sold by Hasbro. I must confess, *mes amis*, that I am old enough to remember when the potato wasn't included with the game. You used a real potato. But, I digress.

The screenshot you see in Figure 1 is from the KDE 4 version of the game. As you add various pieces to the potato guy, a friendly voice speaks the names of those parts: "nose", "eye", "spectacles".

Figure 1. *KTuberling*

Your kids will have a ball dressing up the spud, rearranging things, trying on different body parts and accessories. If you are in the middle of a particularly great *KTuberling* masterpiece, you can save your work and return later. If you are happy with the results and want to share your creation, you have two other options. The first is to print the image by clicking Game on the menu bar, and then Print (or click the Print icon). Alternatively, click Game, and select Save As. From here, you can export the image. *KTuberling* saves in the Targa image format (.icb extension) by default, but you can generate a different format by specifying the extension. For example, to save in PNG format, save as *picture_name.png*.

Spuds aren't your only choice, and there are, in fact, two different potato styles: the default leaner spud and a somewhat plumper, more classic tuber. Each tableau is referred to as a playground. Click Playground on the menu bar, and you'll find a moonscape to populate with spaceships, aliens and astronauts (Figure 2). Populate an ancient Egyptian scene, visit a snow-covered hill and decorate some Christmas trees, or start with a pizza crust and go

Note:

If you have an artistic side, you may want to create additional playgrounds for your own kids or to share with others. Click Help on the KTuberling menu bar, and select KTuberling Handbook. In the Technical References section, there are instructions for creating a playground and publishing the results in a theme.



Figure 2. The moon's surface is just one of several playgrounds available to decorate.



Figure 3. Catch the bouncing clowns, pop the balloons and win the day! *Circus Linux* is silly fun.

wild with toppings.

Given that I accused a certain waiter we all know of looking like a clown, it seems appropriate that I mention a great old game for the kids.

Circus Linux, from New Breed Software, is a great, and very silly, little game that takes place inside the big top of a circus, and yes, the main characters are clowns (Figure 3). At the top of the big top, colorful balloons float back and forth. A band plays, and a seal balances a ball on its nose. A juggling bear riding a unicycle makes occasional appearances, and bouncy circus music in the

background completes the effect. Your job is to move a teeter-totter back and forth to catch a bouncing clown (which, in turn, sends your clown flying). The bouncing clowns, in turn, pop the floating balloons.

If it all sounds vaguely familiar, that's because *Circus Linux* is a clone of a really old Atari 2600 game called *Circus Atari*, albeit with better graphics. The whole bit about popping balloons is further reminiscent of any of a hundred incarnations of the classic *Breakout*. *Circus Linux* is a one- or two-player game, which means you can challenge your little clown to a game. The sound effects and music can be turned off or on from the intro screen. Other options include bouncing balloons and floating obstacles on which your clowns can crash and fall to the ground.

I actually don't have anything that says "Groucho", but you already may be noticing a theme here. These programs, although they can be fun for adults, are more for the younger Linux experts among us. The next item on today's menu is called, appropriately, *Childsplay*, and calling it a game may not be appropriate, as it is actually a collection of games. *Childsplay* is an engine that handles plugins, and each game is a plugin. The games are geared for an age range of 2–7. As such, they are all fairly simple for the readers of this column but somewhat more challenging for young children.

The plugin concept means that anyone can write games for *Childsplay*, but at the time of this writing, the package consists of 11 different games, a couple of which qualify as great nostalgia trips for the parents out there. For starters, there is a very simple game of *Pong*, slowed down enough to allow small players to move the paddles into position. You'll also find an educational version of the classic *Pac-Man* game. In this one, you help the yellow smiley character chase down the letters that make up words (Figure 4).

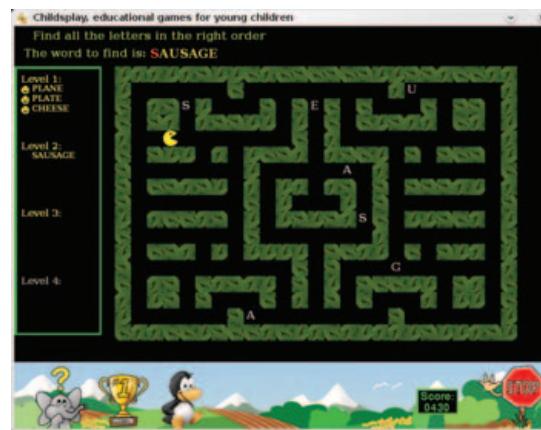


Figure 4. Chomp the letters, eat your words, and move up a level.

A little side note before I continue—Childsplay runs in full-screen mode by default, which is probably ideal for the little ones. You may, however, want to run it in windowed mode, assuming you need to keep an eye on logs or an IM chat while your child plays (`childsplay --window`). The game starts with a string of icons representing the various games (Figure 5). Click on any of the icons, and you are off to the races.



Figure 5. The main Childsplay screen lists the available games. Simply click an icon to play.

Down along the bottom of the screen, there's a little stop sign that you can click at any time to get out of the current game and return to the top. There's also a scoreboard to keep track of how you are doing. Most games come with a few different levels. When you successfully complete the game, you are congratulated with a "Woo Hoo!" or an explosion proclaiming the game over.

There's a classic memory game where you turn

Childsplay is not complex, is certainly not fast-paced, and it requires no high-end graphics card to operate.

over cards looking for two that are the same (Figure 6). A second version of this game plays sounds rather than showing pictures. The player then needs to remember which button played what sounds and match them up. Another version of the game displays a number of pictures, then plays a sound that your child must match to the picture. There are falling letters that must be typed before they hit the bottom of the screen, letters and numbers that must be clicked as they are spoken, and some simple animal pictures that make the appropriate sounds when clicked. Make sure you download the latest plugins to get an animal flash card set that



Figure 6. Childsplay contains two simple memory games.



Figure 7. GCompris' start screen lets you select activities from different categories, such as reading, numbers or puzzles.

plays a large number of animal sounds along with pictures and their position in the alphabet. For the budding pool shark, Childsplay also comes with a very simple pool game that starts out with a single ball, and then adds balls as the child becomes familiar with the concept.

Childsplay is not complex, is certainly not fast-paced, and it requires no high-end graphics card to operate. It is aimed at a very young audience, a group that still appreciates wooden shape-matching puzzles and stacking blocks. It's good, simple, educational fun for the younger set.

Along the same vein, but somewhat more polished, GCompris is another collection of games for children, geared for ages 2–10. GCompris is pronounced like the French words, *J'ai compris*, and it literally means, "I have understood". When the game starts, a colorful screen with a left-hand sidebar lets kids (or their parents) choose from a category of activities. These include reading, strategy, math, amusements, puzzles, computer



Figure 8. Young helicopter pilots are challenged to count as they fly into numbered clouds floating by.



Figure 9. GCompris has a powerful, yet simple vector drawing program.

skills, discovery activities and physical experimental activity (Figure 7). Clicking on any of these choices brings up a list of related games or activities. Some of these categories may have subcategories as well. Hover your mouse pointer over the icons, and a description of the current choice appears in the large blue bubble near the bottom of the main window. So, how many games and activities are there? GCompris comes with more than 100 different activities, making it a must for your young penguinista.

Reading activities include games to identify letters, match pictures to words, fill in missing letters and develop basic reading skills. Number games help players learn to count, identify numbers and do basic math. Those new to computers will find activities to develop keyboarding and mousing skills. There are lots of puzzles to work those brain cells, including several matching and memory games. Games? Yes, there are just plain-old games too.

Kick a soccer ball into the goal, navigate a maze, go parachuting or pilot a submarine. In case you thought learning was anything but fun, check out the cool *Numbers in Order* game (Figure 8), which requires young pilots to fly into numbered clouds as they learn to count (the clouds do not necessarily appear in order).

See? Learning is fun.

GCompris also has some surprisingly capable little applications hidden beneath the surface, which sometimes mimic adult applications. For instance, there is a word processor, complete with built-in styles, ready to unleash your child's inner author. A built-in instant-messaging application means kids can chat with their friends (but they do have to be on the same network, so a classroom environment works well here). There's even a great little vector drawing application (Figure 9), just like Mommy and Daddy's, except more fun.

This is the time, *mes amis*, where I must say, enough kidding around, closing time is here. Stay a little longer though, and the adults among you can enjoy another glass of wine before you head out. François will happily refill your glasses one more time before we say our final good-nights. While you sip that last glass, try another game or decorate another tuber, and remember that you're never too old to enjoy some simple, silly fun.

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 marcel@marcelgagne.com. You can discover lots of other things (including great Wine links) from his Web site at www.marcelgagne.com.

Resources

Childsplay: childplay.sourceforge.net

Circus Linux: www.newbreedsoftware.com/circus-linux

GCompris: www.gcompris.net

KTuberling: games.kde.org/game.php?game=ktuberling

Marcel's Web Site: www.marcelgagne.com

The WFTL-LUG, Marcel's Online Linux User Group: www.wftl-lug.org



DAVE TAYLOR

Resizing Images, Sort Of

What are shell script programmers to do when they finds themselves constantly scaling image dimensions for their blogs? Write a script to automate the process, of course!

This might be a peculiarity of how I work with the Web, taking screenshots and then wanting to scale them to fit my page (especially when they're full-screen images), but I find that I spend a lot of time calculating how to reduce and scale images down evenly.

For example, I might take a full-size screen capture of the window within which I'm writing this particular column just to find that it's 722 x 719 pixels across and down, respectively. But if I were to include it on my Weblog, I would want to reduce it down to no more than 600 pixels so that it doesn't break my site layout.

I actually could reduce the image within the screen capture application or use a secondary graphical app, but it turns out that Web browsers can scale images up or down based on explicit

Instead, what I'd really like is a utility that can figure out the current height and width of an image and then automatically scale it to the new value I desire based on a scaling factor.

"height" and "width" attributes. For example, let's say that the doc window is called edit.png. Then, I could include the image on a Web page with:

```

```

and it would work fine. To scale, it's easy, simply add those height and width parameters. To make it match the image itself, I'd use:

```

```

However, as I said, it turns out that you actually can calculate different values, and the browser will scale it to match. To reduce the image 50%, for example, I would tweak it to read:

```

```

So that's what I do on my site, and frankly, it's a pain.

Instead, what I'd really like is a utility that can figure out the current height and width of an image

and then automatically scale it to the new value I desire based on a scaling factor. That's what we'll dig into for this column.

Calculating Image Size

There are some terrific image manipulation packages available in Linux, most notably ImageMagick, but we don't need anything that fancy because the pedestrian, old, undersung file command can do the job for us. I'm going to be looking at only PNG (progressive network graphic) files, as those are very much the best for most Web uses, but it's worth noting that many Linux file commands have a harder time calculating image dimensions for JPEG images.

Here's an example:

```
$ file edit.png
edit.png: PNG image data, 722 x 719, 8-bit/color RGB, non-interlaced
```

That's quite a bit of information actually, including the key elements—the dimensions of the image file itself. In this case, it's width x height, so 722 is the width, in pixels, and 719 is the height. These can be extracted from the output in a variety of ways, but the easiest is to use cut:

```
width="$(file $filename | cut -f5 -d\ )"
height="$(file $filename | cut -f7 -d\ )"
```

If you try this, however, you'll find that the height is wrong. It has a trailing comma because cut is using spaces as the delimiter (which is what the weird-looking -d\ is specifying). The backslash escapes the shell interpreting the space as an arg delimiter. When you type this in, you'll want a space after the backslash and before the closing parenthesis for just that reason. It's fixable though, by using sed:

```
sed 's/,//'
```

Now that we have numeric values, how do we scale them automatically? I like using the bc binary calculator, even though its interface is so crusty. Multiplying 722 by 0.50 (which is, of course, 50%), is done like this:

```
echo 722 * 0.50 | bc
```



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except that the * will be expanded. So, in fact, some judicious use of quotes addresses the problem neatly:

```
width="$(echo "$width * $multiplier" | bc)"
```

That's certainly more shell-scripty, and it works fine, except I found that with some implementations of bc, even adding scale=0, which theoretically should remove the trailing fractional element that results from the multiplication, didn't give us an integer return value. Again, a simple fix gives us the final script line:

```
width="$(echo "$width * $multiplier" | bc | cut -d. -f1)"
```

The same thing gives us the newly calculated "height", and if the user specifies a multiplier that's less than one, it scales down. If you specify a greater value, you just as easily can scale up.

Making It Work as a Script

Here's the basic script at this point:

```
filename="edit.png"
multiplier="0.75"

width="$(file $filename | cut -f5 -d\ )"
height="$(file $filename | cut -f7 -d\ | sed 's/,//')"

width="$(echo "$width * $multiplier" | bc | cut -d. -f1)"
height="$(echo "$height * $multiplier" | bc | cut -d. -f1)"

echo "$filename scaled: width=$width height=$height"
```

Testing it with the filename specified produces the following:

```
$ sh scale-image.sh
edit.png scaled: width=541 height=539
```

That's not really exactly what I want, however. First, I want to be able to specify the filename and multiplier on the command line. Second, the output needs a slight tweak to be more useful—the values need to be surrounded by quotation marks.

Here's what I'd like to see:

```
$ sh scale-image.sh 0.75 edit.png
edit.png: width="541" height="539"
$
```

That's not too hard to accomplish given the basic script we already have. See if you can do it yourself.

Tip: I actually use a "for name; do; done" loop to step through the file scaling, so I can specify a group of images and calculate them all en masse. Try it, coupled with the shift command, to remove the multiplier value once it's saved into a named variable.■

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.



MICK BAUER

Customizing Linux Live CDs, Part II

Use encrypted folders with your custom live CD.

Last month, I described a simple procedure for customizing the standard Ubuntu Desktop 7.10 live CD. We got as far as uninstalling software packages to make room for other things, installing some of those other things and updating all packages on the live CD image.

This month, I go a step further by creating a TrueCrypt-encrypted Documents directory that you can mount from a USB drive, in conjunction with your live CD. Although that's handy in and of itself, you'll be able to use the same method, with only minor modifications, to encrypt other important directories as well.

As with last month's article, here I use Ubuntu both as the master system to customize and repackage our live CD and for the source of the live CD ISO image we'll customize. It's a popular and surprisingly compact mainstream distribution. So, also like last month's column, much of what follows will apply directly to other squashfs-based distributions, such as Linux Mint, SLAX and BackTrack (not to mention Ubuntu variants, such as Kubuntu and Edubuntu), and indirectly to most other live CD distributions.

I'm going to avoid the temptation to make this article a ground-up tutorial on volume encryption in general or TrueCrypt specifically. Either topic would make a substantial article all by itself. Maybe I'll tackle those at a later date, unless I can persuade the Paranoid Penguin's Minister of Cryptographic Outreach, Tony Stieber, to tackle them for me. (You may remember Tony's articles "GnuPG Hacks" and "OpenSSL Hacks" in the March 2006 and July 2006 issues of *Linux Journal*, respectively). But, I will show you how to install TrueCrypt on Ubuntu systems, and how to create and mount TrueCrypt volumes.

Installing TrueCrypt

Although I just disclaimed the intention of making this a TrueCrypt primer, a little introduction is in order. TrueCrypt is a free, open-source, cross-platform volume-encryption utility. It's also highly portable. The TrueCrypt binary itself is self-contained, and any TrueCrypt volume can be mounted on any Windows or Linux system on which the TrueCrypt binary will run or compile. TrueCrypt can be run either from a command line or in the X Window System.

TrueCrypt is becoming quite popular and is held in high regard by crypto experts I know (it appears to be a sound implementation of known, good algorithms

like AES and Twofish), but its license is a bit complicated. For this reason, TrueCrypt hasn't yet been adopted into Debian or Ubuntu officially, even though Ubuntu 8.10's universe packages easycrypt and gdecrypt depend on it (see the Ubuntu 7.10 vs. 8.4 sidebar).

So, to install TrueCrypt on an Ubuntu system, you need to download it directly from www.truecrypt.org/downloads.php. When I was writing this article, TrueCrypt version 5.1 was current, and the Ubuntu deb file I downloaded was called truecrypt-5.1-ubuntu-x86.tar.gz, though by the time you read this, it may be something else. Besides an Ubuntu deb package, TrueCrypt also is available as a SUSE RPM file (that also might work on other RPM-based distros) and as source code.

Now, it's time to install TrueCrypt. You're going to need to install TrueCrypt in at least two places: on the master system you're using to create your custom live CD and either on the live CD image itself or on whatever removable media (such as a USB drive) you're going to keep your encrypted volume.

First, let's install TrueCrypt on the master system. Open a command shell, unpack the TrueCrypt archive in your home directory, and change your working directory to the directory that gets unpacked:

```
bash-$ tar -xzvf ./truecrypt-5.1-ubuntu-x86.tar.gz
```

```
bash-$ cd truecrypt-5.1
```

Next, use the dpkg command to install the deb file:

```
bash-$ sudo dpkg -i ./truecrypt_5.1-0_i386.deb
```

With TrueCrypt 5.1, only three files are installed on your system: its license and user guide, both in /usr/share/truecrypt/doc/, and the binary itself, /usr/bin/truecrypt. TrueCrypt doesn't require any special kernel modules; it's a monolithic process. This means that if you copy /usr/bin/truecrypt to the same Flash drive on which you keep your encrypted volume, you won't need to install it on your Ubuntu live CD.

You may prefer doing so anyhow. Here's how:

- Follow steps 00–12 in the procedure I described last month for mounting your custom ISO and chrooting into it (see Appendix).

Ubuntu 7.10 vs. 8.4

2. From a different, non-chrooted shell, copy the TrueCrypt deb package `truecrypt_5.1-0_i386.deb` into the ISO root you just chrooted into (`isonew/custom/` in last month's examples).
3. Back in your chrooted shell, run `dpkg -i ./truecrypt_5.1-0_i386.deb` (no sudo necessary here, as you're already root).
4. Finally, follow steps 19–33 from last month's procedure to clean up, unmount and repackage your custom live CD image. And, of course, use your CD-burning application of choice to burn your image into a shiny new live CD

Creating an Encrypted Volume

Now, you can create an encrypted volume. For our purposes here, it will be a simple "file vault" to mount as a subdirectory of your home directory. But, it just as easily could be an *entire* home directory that you mount over the one your live CD uses. Come to think of it, you also could do that with /etc. For now, however, I'll leave it to you to explore the technical

I based the customized live CD in this article's examples on Ubuntu 7.10, aka Gutsy Gibbon. When I wrote the article, 7.10 was current, but due to *Linux Journal*'s printing schedule, by the time you read this, Ubuntu 8.4 (Hardy Heron) should be available. However, most, if not all, of the example commands herein should work fine with Ubuntu 8.4.

Note that Ubuntu 8.4 includes the packages `easycrypt` and `gdecrypt`, two graphical front ends for TrueCrypt, but no packages for TrueCrypt itself, on which both `easycrypt` and `gdecrypt` depend (though the latter, even without TrueCrypt, can create non-TrueCrypt-compatible encrypted volumes). So the instructions I give here on downloading and installing TrueCrypt itself still are applicable to Ubuntu 8.4.

subtleties of those usage scenarios (see Resources for some pointers on home directory encryption).

TrueCrypt can be run either in text mode, via the `truecrypt -t` command (followed by various options) or in graphical mode. For now, let's stick to graphical mode. To start it, simply type the following from within a terminal window:

```
bash-$ truecrypt &
```



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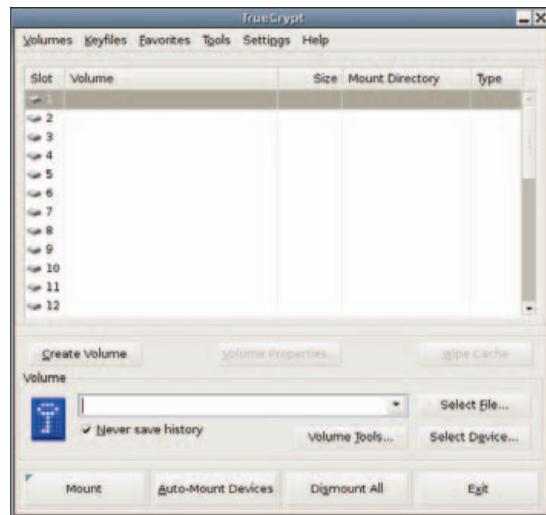
Expert included.

Kevin is a software installation engineer at Silicon Mechanics. He builds the tools that ensure your servers have an automated, scalable installation of BIOS, firmware, and software. Lately he's been working with the new Silicon Mechanics Storform iS707 iSCSI/NAS storage appliance. Kevin is impressed with the iS707's capabilities, including file sharing, storage consolidation, backup, recovery, and replication. He likes the 24 high-capacity SATA disk drives which can store up to 24TB, and the performance of its industry-leading, hardware-based RAID.

Kevin knows that this storage appliance offers outstanding performance for the price. But Kevin is a software guy, so what really has his attention is the powerful, intuitive, web-based management interface, powered by Open-E. The Storform iS707 boasts management, tuning, consolidation, and data protection features typically reserved for higher-priced products.

When you partner with Silicon Mechanics, you get more than a feature-rich storage solution — you get an expert like Kevin.

Figure 1. TrueCrypt 5.1 GUI for Linux



And, you should see what's shown in Figure 1.

Click Create Volume to start the TrueCrypt Volume Creation Wizard. We'll create a standard TrueCrypt volume, not a hidden one (you can hide one TrueCrypt volume inside the "empty" space of another, as all unused space in a TrueCrypt volume is filled with random characters). So, click Next.

In the wizard's next screen, you can specify the path and name of the file in which your encrypted volume will be stored or the name of an entire disk partition to encrypt. Here, we're creating a file-hosted volume, and in our example scenario, this file will be /home/ubuntu/realhome2 (no file extension is necessary). After typing that path, click Next.

In the wizard's third screen, we must specify the volume's size. In this example, I'm creating a 500MB volume.

After clicking Next, you can choose an Encryption Algorithm and a Hash Algorithm. The defaults, AES and RIPEMD-160, respectively, are good choices. You also can click the Test button to make sure TrueCrypt's built-in cryptographic functions work properly on your system.

The next step is to set a volume password. Choose a strong one! You also can specify and create keyfiles—files that TrueCrypt will look for every time you mount this volume. If any keyfile is missing, or if its contents have changed in any way since you created the volume, TrueCrypt won't mount the volume. Properly used, keyfiles can provide another level of authentication to your encrypted volume. But, we aren't going to use any in this example. Enter a password (twice) and click Next.

Important note: TrueCrypt has no back doors of any kind. For this reason, if you forget your volume's password, or if any of its keyfiles are lost or corrupted, you will *not* be able to recover the contents of your encrypted volume. By all means,

choose a difficult-to-guess volume password, but make sure you won't forget or lose it yourself!

Now we come to the Format Options screen, which asks a subtle question: which filesystem? The choices here are FAT, which is actually the Windows 95 vfat filesystem (MS-DOS FAT16 with long filenames), and None. If you select FAT, TrueCrypt will format your new encrypted volume for you. However, vfat isn't a journaling filesystem; it isn't very resilient to file corruption and other filesystem errors.

Worse, strange things can happen if you store certain kinds of Linux system files on a vfat partition, because vfat can't store certain Linux file attributes. The only reason to choose vfat is if you intend to use the volume with both Linux and Windows systems. If you're going to use it only on Linux, especially if you're going to use it as a home directory (or /etc), you should choose None, and format the virtual partition yourself, which I'll show you how to do in a minute.

For now, click Next to proceed to the Volume Format screen. This is your chance to generate some entropy (randomness) with which TrueCrypt can initialize its crypto engine, pursuant to encrypting your volume. To do so, move your mouse randomly within the window a while, and then click Format.

That's it! You've created /home/ubuntu/realhome2 and now are ready to format it. Click Exit to close the Volume Creation Wizard.

Formatting the Volume

My personal favorite native-Linux journaling filesystem is ext3, so that's what we use here. Before we format our new volume though, we need to have TrueCrypt map it to a virtual device. This isn't really mounting per se, but that's the TrueCrypt function we need to use.

Back in the TrueCrypt GUI (Figure 1), type the full path of our new volume (/home/ubuntu/realhome2) in the text box next to the key icon (or navigate to it using the Select File... dialog), and click Mount. In the box that pops up, enter your volume's password, and then click Options >. Here's where things get a little strange. Click the box next to Do not mount (Figure 2). Now you can click OK.

Why, you may wonder, are you telling TrueCrypt "do not mount" in the middle of the Mount dialog? Because, of course, you can't mount an unformatted partition. But, TrueCrypt can map it to a virtual device, and this is, in fact, what TrueCrypt has just done.

Back in the TrueCrypt main screen, your volume file now should be listed in Slot 1. To find the virtual device to which it's been mapped, click Volume Properties. As shown in Figure 3, realhome3 has been mapped to /dev/loop0.

Now, we can format the new encrypted volume. In your terminal window, type:

```
05-$ sudo mkfs.ext3 /dev/loop0
```



Figure 2. Not Mounting Our Unformatted Volume

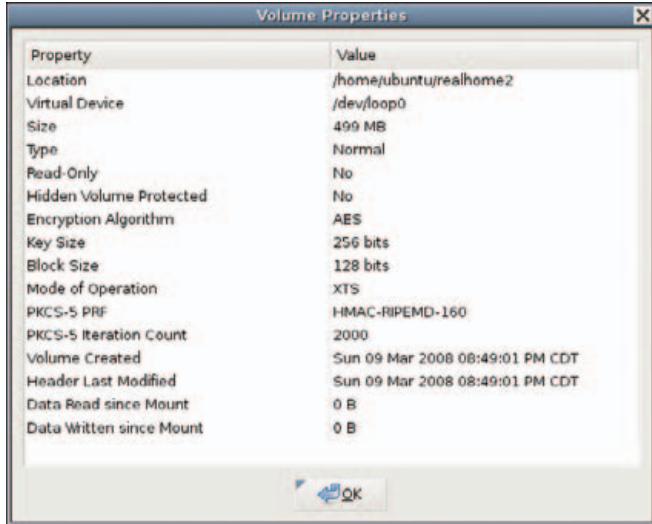


Figure 3. Volume Properties

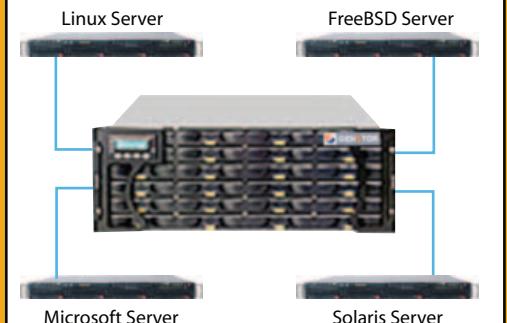
Volume Ownership

Voilà! You now have a mountable, usable encrypted virtual volume! If you want to test it or begin populating it with confidential data you intend to use with your live CD, you can mount it "for real" by going back to the TrueCrypt GUI, clicking Dismount, and then clicking Mount (the same button; it's context-sensitive). (This time, do *not* select the Do not mount button.) If you don't specify a mountpoint, TrueCrypt automatically creates one called /media/truecrypt1.

Note that if you mount different TrueCrypt volumes in succession, the mountpoints will be named /media/truecrypt1, /media/truecrypt2 and so on, where the trailing digit corresponds to the Slot number TrueCrypt uses in creating virtual device mappings (Figure 1). Note also that when mounting a TrueCrypt volume from the GUI, you may need to click on an empty slot number before clicking the Mount number, if one

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TrueCrypt 5.x Idiosyncracies

With version 5.0, TrueCrypt added a GUI to the Linux version that is very similar to that of the Windows version (in prior versions, TrueCrypt for Linux was command-line-only). But, TrueCrypt versions 5.0 and 5.0a for Linux both had serious limitations and bugs, including the omission of the -c option that allows you to create TrueCrypt volumes from a command line and of the TrueCrypt man page.

Toward the end of the day that I submitted this article for publication, TrueCrypt 5.1 was released, and the -c option has been restored in this version. Other bugs in 5.0/a may or may not be fixed (some users have complained of performance problems and even TrueCrypt-induced system crashes with the Linux version). Although I have changed the filenames in this article's examples to reflect the new version, I didn't have time to test version 5.1 myself, so I can't tell you how significant an improvement it is.

So, be forewarned. On the one hand, there doesn't appear to be any serious security issues with TrueCrypt 5 for Linux. Obviously, as I've devoted most of this article to it, I think it's useful and trustworthy enough for the purposes described herein.

But, TrueCrypt historically has been a very Windows-oriented project, and this still appears to be the case. So, as with anything, be sure to test TrueCrypt thoroughly before depending on it in any kind of production or mission-critical context. One alternative to consider is TrueCrypt version 4.3, a known, stable release that's still available (at the time of this writing) on the www.truecrypt.org Web site. But, it's seldom a good idea to trust obsolete software for too long.

isn't selected already.

By default, TrueCrypt mounts your ext3-formatted TrueCrypt volume with root ownership. Depending on how you plan to use it, that may be appropriate. But, as a matter of principle, you don't want to use root privileges for ordinary tasks like word processing. If you're going to use this volume as your Documents directory, it's going to need to be usable by some unprivileged user.

The custom live CD image we created last

Resources

The TrueCrypt Home Page: www.truecrypt.org

Tombuntu's "Disk Encryption with TrueCrypt 5 on Ubuntu" HOWTO: tombuntu.com/index.php/2008/02/07/disk-encryption-with-truecrypt-5-on-ubuntu

Some hints on automatically mounting a TrueCrypt 5.0 volume as your home directory on Ubuntu systems: ubuntuforums.org/showthread.php?t=645247

Mark Longair's enlightening "HAL and Device Management", a concise and helpful introduction on how GNOME automounts devices: www.mythic-beasts.com/~mark/random/hal

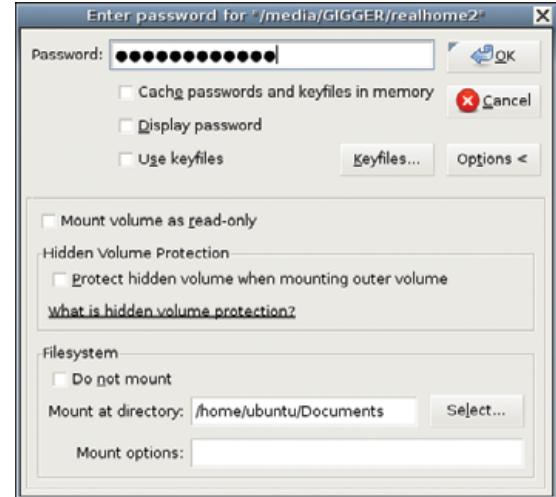


Figure 4. Mounting Your Volume on /home/ubuntu/Documents

month has only the default Ubuntu accounts on it. For now, let's stick with those—that way, you'll be able to use this encrypted volume with *any* Ubuntu 7.10 live CD, not just your custom image. Here's how to make your volume usable by the default live CD user account *ubuntu*.

First, create, map, format and mount your volume as described above. I'll assume that TrueCrypt mounted it to /media/truecrypt1.

Open or switch to a terminal window. If you do an ls -l of /media, the listing for your volume should look like this:

```
drwxr-xr-x 3 root      root  1024 2008-03-09 23:21 truecrypt1
```

As you can see, only root can use this directory. Because we want it to be usable by our live CD's *ubuntu* account, and because that account's user ID (UID) and group ID (GID) are 999 and 999, respectively, we issue this command:

```
05-$ sudo chown -R 999:999 /media/truecrypt1
```

This performs a bit of magic. The user/group ownerships you just specified are now embedded in your TrueCrypt volume's filesystem. From this point on, wherever you mount this volume, regardless of the mountpoint's ownership and permissions when it isn't in use, your volume will be mounted with UID and GID both set to 999.

If you subsequently mount the TrueCrypt volume on a system on which some user or group other than *ubuntu* has a numeric ID of 999 (per its local /etc/passwd and /etc/group files), then that user or group will own the mounted volume, even if that system has an account or group named *ubuntu*. And, if on that system the UID 999 doesn't correspond to any

Appendix

Here's the complete procedure I described last month for adding and removing packages in a custom Ubuntu live CD, in the form of a raw list of all commands described in this article. The \$ prompts indicate commands executed as an unprivileged user; the # prompt shows commands that are executed by root:

```
00-$ dd if=/dev/cdrom of=./ubuntu-7.10-desktop-i386.iso
01-$ mkdir -p ./isomount ./isonew/squashfs ./isonew/cd
  ./isonew/custom
02-$ sudo mount -o loop ./ubuntu-7.10-desktop-i386.iso ./isomount/
03-$ rsync --exclude=/casper/filesystem.squashfs -a ./isomount/
  ./isonew/cd
04-$ sudo modprobe squashfs
05-$ sudo mount -t squashfs -o loop
  ./isomount/casper/filesystem.squashfs ./isonew/squashfs/
06-$ sudo rsync -a ./isonew/squashfs/ ./isonew/custom
07-$ sudo cp /etc/resolv.conf /etc/hosts ./isonew/custom/etc/
08-$ sudo cp /etc/apt/sources.list ./isonew/custom/etc/apt/
09-$ sudo chroot ./isonew/custom
10-# mount -t proc none /proc/
11-# mount -t sysfs none /sys/
12-# export HOME=/root
13-# apt-get remove --purge `dpkg-query -W --showformat='${Package}\n'
  |grep openoffice`
14-# apt-get remove --purge `dpkg-query -W --showformat='${Package}\n'
  |grep gimp`
15-# apt-get update
16-# apt-get install tor privoxy
17-# apt-get dist-upgrade
18-# apt-get clean
19-# rm -rf /tmp/*
20-# umount /proc/
21-# umount /sys/
22-# exit
23-$ chmod +w ./isonew/cd/casper/filesystem.manifest
24-$ sudo chroot ./isonew/custom dpkg-query -W --showformat='${Package}
  ${Version}\n' > ./isonew/cd/casper/filesystem.manifest
25-$ sudo cp ./isonew/cd/casper/filesystem.manifest
  ./isonew/cd/casper/filesystem.manifest-desktop
26-$ sudo mksquashfs ./isonew/custom
  ./isonew/cd/casper/filesystem.squashfs
27-$ sudo rm ./isonew/cd/md5sum.txt
28-$ sudo -s
29-# cd ./isonew/cd
30-# find . -type f -print0 | xargs -0 md5sum > md5sum.txt
31-# exit
32-$ cd ./isonew/cd
33-$ sudo mkisofs -r -V "Ubuntu-Live-PrivateSurf" -b
  isolinux/isolinux.bin -c isolinux/boot.cat -cache-inodes -J -l
  -no-emul-boot -boot-load-size 4 -boot-info-table -o
  ~/Ubuntu-Live-7.10-PrivateSurf.iso .
```

user, you'll need to be root in order to use the mounted volume. (But, in that case, you'll be no worse off than if you had skipped the chroot exercise!)

Using the TrueCrypt Volume with Your Live CD

And now, the moment of truth. To use your encrypted TrueCrypt volume with an Ubuntu live CD, such as the one we modified last month, simply boot a system off that CD; insert the USB drive; execute the truecrypt binary from the USB drive or from the CD, if you installed TrueCrypt on your custom image; and mount your encrypted volume, specifying a mountpoint of /home/ubuntu/

Documents (Figure 4).

If TrueCrypt prompts you for an administrative password, leave it blank and click OK. By default, the ubuntu account on Ubuntu CDs has no password.

This brings me to the topic of next month's column: further securing and customizing your encrypted-Documents-enabled live CD image. Until then, 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".



KYLE RANKIN

Lightning Hacks

Instead of one large hack, this month, I cover a few of my favorite smaller hacks to manage windows, switch my display to a projector and perform binary diffs on large files.

One of the more interesting parts of any conference is the lightning talks. If you haven't experienced one, a lightning talk typically features a number of different speakers, each giving a short (5–20 minutes) presentation. Lightning talks take advantage of the fact that often a speaker has an interesting topic to present, but the topic won't fill an entire hour time slot. So, lightning talks round up each of these speakers one after the other in the same time slot. Because of the variety of information and the fast nature of lightning talks, they can be really informative, interesting and definitely fun.

As I was considering what topic to cover for this month's column, I realized I had a number of different hacks I'd like to mention, but none that could really fill a full column. In the spirit of lightning talks, I decided to put all of these hacks together in true rapid-fire fashion.

Move Windows to Their Default Location

In the March 2008 issue of *Linux Journal*, I introduced the wmcctrl tool and discussed how to use it to move, resize, shade and do all sorts of window management tasks from the command line. I

This script goes from desktop to desktop (or because I use Compiz, viewport to viewport) and moves and resizes windows per my specifications.

also introduced a few scripts I had written and bound to keys to resize and shade a few different windows on my desktop. Near the end of that article, I mentioned:

My next project is to create a "reset" script that moves all the windows on all of my desktops to precise locations and sizes, in case they all get moved around and resized. Sure, I could do all this by hand, but then I'd miss this great opportunity for automation.

Well, shortly after I wrote that, I completed my reset script. This script goes from desktop to desktop (or because I use Compiz, viewport to viewport) and moves and resizes windows per my specifications. I've added comments to explain particular sections:

```
#!/bin/sh

# First save my current viewport so I can return
# to it after I'm done
SAVED_VP=`wmcctrl -d | perl -ne '/VP: (\d+,\d+)/; print $1;'` 

# Then, move to the first viewport (at 0,0). Because it
# can take a second or two for this to take effect,
# I've opted to create a while loop that will
# continue to attempt to switch to that viewport
# until it detects it is actually there.
VP=0,0
while [ `wmcctrl -d | perl -ne '/VP: (\d+,\d+)/;
  print $1;` != $VP ];
do
  wmcctrl -o $VP
done

# Now resize, move, and change state of particular
# windows (see the wmcctrl man page, or my wmcctrl
# column for more information on the options).
wmcctrl -r 'Eterm Main 1' -e '0,0,0,645,420'
wmcctrl -r 'Irssi Term' -e '0,469,0,810,500'
wmcctrl -r 'Irssi Term' -b add,shaded
wmcctrl -r 'Irssi Term' -b add,below
wmcctrl -r 'gkrellm' -b add,sticky
wmcctrl -r 'Irssi Notify Term' -e '0,1180,550,100,230'

# I now switch to the second viewport. As my screen
# is 1280x768, the second viewport is at 1280,0.
# If I wasn't sure, I could switch to that viewport
# and check the output of wmcctrl -d for the proper coordinates.
VP=1280,0
while [ `wmcctrl -d | perl -ne '/VP: (\d+,\d+)/;
  print $1;` != $VP ];
do
  wmcctrl -o $VP
done

wmcctrl -r "Mozilla Firefox" -e '0,5,0,1040,708'
```

```
# Finally I switch back to my original viewport
# so I'm back where I started.
wmctrl -o $SAVED_VP
```

Although there are certainly a lot of commands in that script, it actually didn't take long to write. Most of the script is simply one wmcctrl command after another, and I spent a majority of the time actually fine-tuning the locations of each window and figuring out the best way to switch viewports. If your desktop environment uses multiple desktops instead of one desktop with multiple viewports, you would use the -s option to change desktops instead of the -o option, which is used for viewports. You also would need to change the logic in the while loop to something more like:

```
DESKTOP=1
while [ `wmcctrl -d | perl -ne '/^(\d+).*\?$/;
  print $1;` != $DESKTOP ];
do
  wmcctrl -s $DESKTOP
done
```

Toggle My Display for Presentations

Although I normally use my laptop with its own built-in screen, I frequently give presentations, so I need to display on both the LCD and the external VGA connector. Unfortunately, my laptop's function keys to toggle between those states don't currently work in Linux, so I've had to put it into a script paired with a keybinding.

The xrandr program works great with my laptop to toggle between displays, so my script first examines the output of xrandr to see whether the VGA port is connected, and if so, it adds it as a display. Otherwise, it disables VGA. I also added a line to echo some text to osd_cat. I installed this program so that I would get some output on the screen to let me know which mode my script had chosen. When I'm ready to output to a projector, I just connect it to my laptop and run the script. When I'm finished with the presentation, I disconnect it and run the script again:

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```

if xrandr | grep -q 'VGA connected'; then
    echo "LVDS + VGA" | osd_cat --shadow=2 --align=center
    ↪--pos=bottom --color=green --delay=2
    ↪--font=lucidasanstypewriter-bold-24 --offset 40 &
# choose my laptop screen's resolution by default,
# if that fails try the auto-detected mode
    xrandr --output VGA --mode 1280x768@60 || xrandr
    ↪--output VGA --auto
else
    echo "LVDS only" | osd_cat --shadow=2 --align=center
    ↪--pos=bottom --color=green --delay=2
    ↪--font=lucidasanstypewriter-bold-24 --offset 40 &
    xrandr --output VGA --off &
fi

```

I also created a separate version of the script that spans across both screens instead of mirroring. I chose to span below my current screen (with the --below LVDS option), but most people probably will prefer to use --right-of or --left-of:

```

#!/bin/sh

if xrandr | grep -q 'VGA connected'; then
    echo "LVDS + VGA span" | osd_cat --shadow=2 --align=center
    ↪--pos=bottom --color=green --delay=2
    ↪--font=lucidasanstypewriter-bold-24 --offset 40 &
    xrandr --output VGA --mode 1280x768@60 --below LVDS || xrandr
    ↪--output
    VGA --below LVDS --auto
else
    echo "LVDS only" | osd_cat --shadow=2 --align=center
    ↪--pos=bottom --color=green --delay=2
    ↪--font=lucidasanstypewriter-bold-24 --offset 40 &
    xrandr --output VGA --off &
fi

```

What's the Difference?

Recently, I was working on a remastered Knoppix DVD that I had sent out to a few people. After I had sent out the full remastered DVD, I found out that I needed to change a few small files on the DVD. Even though my home DSL speeds are pretty fast, the upload is still slow enough that it

What's better is that rdiff works with any binary—you can use it for any large binary files from DVD images to virtual disks to multimedia files.

took overnight to transfer the 3GB+ DVD image. I didn't want to go through that again, especially as I had made only minor changes to the DVD.

I knew that binary diff tools existed, but I discovered that not all of them are equal. Some binary diff tools require enough RAM to store multiple copies of the file, which certainly wouldn't work with a 3GB image. Lucky for me, I found rdiff, a tool that works well with large files and doesn't require a lot of RAM. What's better is that rdiff works with any binary—you can use it for any large binary files from DVD images to virtual disks to multimedia files.

rdiff works via a three-stage process. In this example, I have two files, old.iso and new.iso, that have minor differences from each other. For the first stage, you create a signature file that rdiff uses to represent your original file:

```
$ rdiff signature old.iso old.signature
```

Now that you have a signature file, use it with rdiff to create a delta file that represents the differences between the old and new files:

```
$ rdiff delta old.signature new.iso new.delta
```

This new.delta file is now all that anyone needs to convert old.iso to new.iso. For me, this file ended up being around 150Kb, because I had made only a few changes. The delta file was much simpler to send around than the full image. If you want to test that the delta file will work, first create an md5sum of new.iso:

```
$ md5sum new.iso
```

Then, use rdiff to patch the old file with the delta to create the new file. This is the same command that everyone else with the original file will use:

```
$ rdiff patch odl.iso new.delta newtest.iso
```

Now that you have newtest.iso, create an md5sum of that file and compare it with the one you made for new.iso:

```
$ md5sum newtest.iso
```

As I said before, this method works not only with ISOs, but also with any binary file large or small. It's worth noting that rdiff works with the same binary diff method rsync uses. rdiff just lets you use the algorithm step by step on the command line.■

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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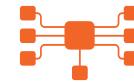
Security



Sysadmin



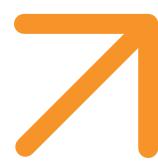
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SpectSoft's RaveHD Basic

SpectSoft LLC has long provided its high-end, uncompressed video solution RaveHD to the big Hollywood studios. Now, the company aims to reach smaller studios with a number of lower-cost solutions in its new RaveHD Basic product line. RaveHD, says SpectSoft, is a "solid deck replacement"—that is, a Linux-based turnkey solution that offers the storage and tools needed to "bridge the film, video and data gap", with source code available to its users for integration. Some key features include uncompressed capture and playout of frame-based sequences (DPX), native database and configurable metadata, configuration for SAN support, batch capture and more.

www.spectsoft.com



virus and spyware infections, thus reducing legal risk. The products provide integrated URL filtering, malware detection, instant messaging and peer-to-peer application control, as well as bandwidth optimization to secure and control Web access completely. It also may be deployed as either a hardware or virtualized appliance and managed through a single browser-based GUI.

www.astaro.com

SlickEdit's Core for Eclipse

Eclipse users keep getting more treats, the latest being SlickEdit Core Version 3.3. The product is a plugin for Eclipse that allows developers to use the SlickEdit code editor as the default within Eclipse. SlickEdit Core consists of the SlickEdit editor, seven additional views and the DIFFzilla differencing engine. The combined functionality is said to "offer greater editing power and better speed in navigating code, allowing even the most accomplished power programmers to be more productive". The new version is for Eclipse 3.3 and CDT 4.0.

www/slickedit.com



Protecode Plugin

Protecode has unveiled the Protecode plugin, a software development tool that unobtrusively manages IP by detecting and logging 100% of the content entering a software project. Protecode logs, identifies and reports pedigree and licensing information associated with external content in any stage of software development projects. Protecode automatically creates a software "bill of materials" and manages compliance with an organization's IP policies, offering a clean pedigree that ensures developers/contributors are using licenses accurately. Protecoding (coding with the Protecode plugin as part of the development environment) frees developers from having to understand open-source rules and licenses. Initially launched for Eclipse with Java and C/C++, the plugin will expand later into other languages and infrastructures.

www.protecode.com

XAware Open Source Data Integration Plugin for Salesforce.com

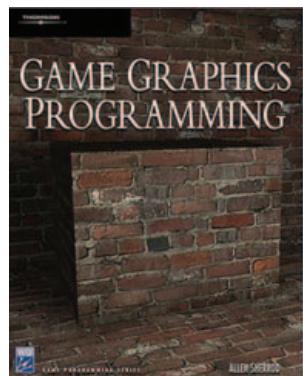
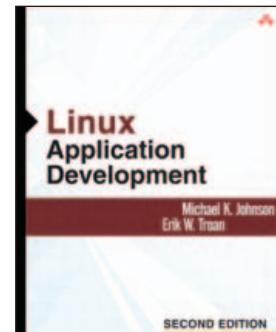
Illustrating how everyone can use a little open source, XAware announced a new plugin for Salesforce.com users that enables additional control over customer data and extension of capabilities of the popular SaaS platform. One can "migrate, manage, share and mashup data from various systems", says XAware. XAware also features an Eclipse-based design environment and an Eclipse plugin to the many developers who use it as their standard development environment. The XAware plugin is available at the company's Web site or from Salesforce.com's AppExchange.

www.xaware.org

Michael K. Johnson and Erik W. Troan's *Linux Application Development* (Addison-Wesley)

Michael Johnson and Erik Troan have spiffed up their book *Linux Application Development* enough to warrant this new, second edition. Published by Addison-Wesley, the book presents key APIs and techniques one needs to create robust, secure, efficient software or to port existing code to Linux. It further offers "deep coverage of Linux-specific extensions and features". The new edition has been updated for the Linux 2.6 kernel, the GNU C library version 2.3, the latest POSIX standards and the Single Unix Specification, Issue 6.

www.informit.com



Allen Sherrod's *Game Graphics Programming* (Charles River Media)

Suddenly Charles River Media is on a tear to get out more Linux and open-source book titles worthy of your attention. Case in point is Allen Sherrod's *Game Graphics Programming*, which the publisher claims is the only book that teaches the fundamentals of game graphics programming. The title covers topics such as an overview of game graphics, 2-D and 3-D through shaders, software rendering, ray tracing, mapping surfaces, reflections and refractions, lighting, global illumination, optimization, shadows, high-dynamic range and other special effects. A software rendering system and ray tracer are included, allowing users to work through the projects and demos in each chapter. All demos (except DirectX) have Linux, Mac and Windows versions.

www.charlesriver.com

CodeWeavers' CrossOver Games Beta

Okay, game geeks, you're getting your wish. CodeWeavers is now shipping CrossOver Games, a download-only application that allows you to play tons of popular Windows-based games on either a Linux or Mac OS without the need for a Windows license. Some of the titles you can play include *Team Fortress 2*, *World of Warcraft*, *Civilization 4*, *Guild Wars*, *EVE Online*, *Peggle*, *Counterstrike Source* and others. CodeWeavers is one of the lead sponsors of the Wine Project, on which the company's products are based. The purchase price includes 12 months of free product support and software updates.

www.codeweavers.com



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Fresh from the Labs

A look at promising software in development. JOHN KNIGHT

Minirok

(chistera.yi.org/~adeodata/code/minirok)

This is a lovely little application that gives you very little grief. Think halfway between Amarok and Kaboodle, and you'll get the idea. For those of you who just want to play a few files at a time and hate fancy music players with more features than you could ever want, Minirok is for you. The player is minimalist and dressed-down, but it still allows for features, such as playlists, skinning, Last.fm support, keybindings and DCOP support for KDE integration. According to Minirok's Web site:

Minirok is a small music player for the K Desktop Environment. As its name hints, it's modeled after Amarok, but with a reduced set of features. In particular, it is designed to cover all the needs and wishes of the author, leaving everything else out. The look and feel is almost identical to Amarok's, though. The main interface is a tree view of the filesystem, with a playlist that can be populated only via drag and drop. There is no collection built from tags, so it's targeted at people whose collections are already structured in a tree at the filesystem level. Searches can be performed both in the tree view and the playlist.

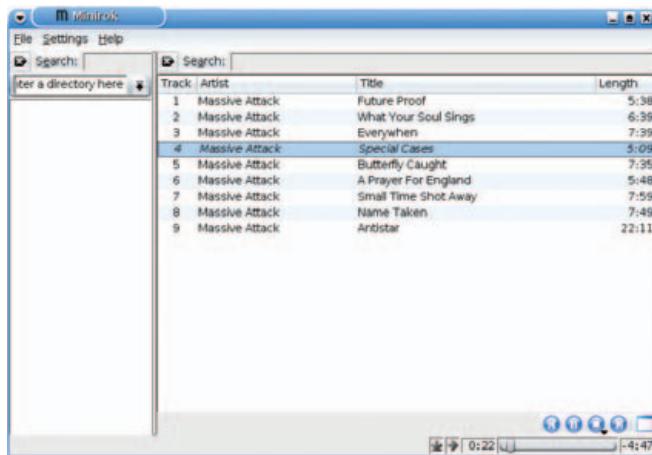


Figure 1. For those sick of do-it-all players, here's the wonderfully simple Minirok.

Installation If you head to the Minirok Web site, both tarballs and .debs are available (the Debian packages are a little bit older than the source tarballs). As far as dependencies go, aside from PyQt and PyKDE, the only dependency that's relatively obscure is python-mutagen—a Python module that handles audio metadata. Apt users should be able to install the module via the following:

```
# apt-get install python-mutagen
```

After this command, the .deb should install, and the tarball should build with no trouble. To install the .deb package, open a terminal to the directory the .deb sits in, and use the command:

```
# dpkg -i minirok_0.7-1_all.deb
```

To install via source, download and extract the tarball. Open a terminal in the new directory, and enter the command:

```
# ./setup.sh install
```

Usage Minirok should be in your menu under Multimedia. If not, simply run the command `minirok`. Once you're in, just click and drag a folder or MP3 into the window pane on the right. As far as controls go, the button on the bottom right that looks like a window clears the playlist, so if you've made everything cluttered and want to start fresh, there's your button. Otherwise, it's a simple case of skip forward or back a track, stop, play/pause and a slider bar. On the left are two buttons: the first, a downward-pointing arrow, is for repeat, and the second, a right-pointing arrow, is for randomizing. And, that's about it—really, really nice and minimal!

For the moment, things are fairly stable due to a minimal interface, with only the occasional bug. I found that it didn't like some kinds of MP3s, and sometimes it doesn't lead onto the next track on a playlist, but those issues seemed to be fixed in the latest tarball. Overall, this project's been my favourite this month. It fills a niche and doesn't give you all that installation grief.

Perfect Match

(pmatch.rubyforge.org)

If you're looking for a good tool for finding duplicate files, this is it. I've been researching these tools for a while, but I didn't trust any to touch my filesystem, as many of my duplicate files are there on purpose. Perfect Match (or pmatch for short) is non-destructive. Using the default options simply prints out a list of what files are duplicated and lets you decide for yourself which ones you'd like to remove.

As for goals and aspirations, according to author Tomasz Muras' Web site:

Some time ago, I was looking for a utility that would find (and possibly remove) duplicate files. I have found a few of them but none was complex enough for what I wanted...hence the idea of Perfect Match! My main requirements were quick compare—that is, first compare files based on size, then hash—and to perform some logic when choosing which duplicate should be removed.

Installation For the moment, there is no installer available for pmatch, so you'll have to take a few steps here and there, but thankfully, not too many, as it's a small project. The main dependency is Ruby, and a subproject called RubyGems—a system for managing Ruby software libraries. Chances are that RubyGems already is in your distribution's repository, so doing a simple:

```
# apt-get install rubygems
```

will work for most people. If not, check out the RubyGems home page (rubgems.org). Once RubyGems is installed, you'll need a gem called log4r. Use the following command:

```
# gem install log4r
```

Once those two steps are out of the way, you're ready to download pmatch. Head to the project's Web site, and save the tarball to your hard drive. For some reason, none of my GUI archive tools liked the tarball, so open a terminal to the directory it sits in, and enter the command:

```
$ tar -jxf pmatch_0.2.tar.bz2
```

From here, pmatch is ready to use, but only locally via the command ./pmatch. To install pmatch system-wide, enter the following two commands:

```
# cp pmatch /usr/local/bin/  
# chmod 755 /usr/local/bin/pmatch
```

From here on, any user should be able to use pmatch at any time.

Usage To use pmatch in its basic form, enter the command pmatch followed by the directory you want to examine. As an example, after doing so, I received the following shell output:

```
nhoj@ubuntu:~$ pmatch musostuff/storm-day/  
rm musostuff/storm-day//verse2/raw-drums.wav  
rm musostuff/storm-day//sessions/steve-17-06-06/verse-drum-track.wav  
rm musostuff/storm-day//sessions/nhoj-session-26-2-06/session2.wav  
rm musostuff/storm-day//sessions/nhoj-session-26-2-06/session1.wav
```

Don't freak out when you see an rm followed by a file-name. These are purely recommendations for the moment. If you actually want to perform these changes, you can do so by piping the command through to bash, like so:

```
$ pmatch musostuff/storm-day/ | bash
```

Now these commands actually will execute and remove said files. For more advanced usage and information on how pmatch works, check the Usage section of the Perfect Match home page.

Overall, this is a handy little project, which probably will make it into many users' toolkits and hopefully into distro archives. Once the project has fully matured, I wouldn't be surprised to see some GUI front ends making their way to our desktops.

FpcBol

(fpcbol.sourceforge.net)

I thought I'd finish this article with what has to be one of the quirkiest and most colorful projects I've come across—FpcBol. A desktop for children, FpcBol (or bol for short) is designed to be colorful and easy to use, with icons only (no menus), along with parental controls, and it's trim enough to work on older PCs. That all sounds cool, and some of it we've seen before, but the desktop and interface are the strangest I've come across and unlike anything I've used before—not necessarily a bad thing! Are you as intrigued as I was? Follow me....

Installation First things first, the installation side of things is unfinished and in a state of flux. Florence Mathias (the project maintainer) and I were actually working together in a way on this one. He was changing the installation scripts daily while I gave him feedback. I thoroughly recommend checking out the How-To section on the project's Web site (itself simply a collection of colorful pictures and screenshots). With bol being based on Free Pascal and



Figure 2. The Gorgeous Visuals of FpcBol



Figure 3. FpcBol Transformed in Its Crazy Help Mode

SDL, there are a number of obscure requirements and the How-To section has pictorial instructions of steps to take on individual distributions.

When you're ready to download the source tarball, click on the FpcBol picture on the Web site, which will take you to the SourceForge page's file archive. Once downloaded, extract the tarball, and open a terminal in the new directory. To any users of Debian-based systems, such as Ubuntu, MEPIS and so on, I thoroughly recommend running the `install_debian` script—it downloads all of the needed dependencies and will save you a great deal of frustration:

```
# ./install_debian
```

To start the installation, use the self-proclaimed ugly install script as follows (as root or sudo):

```
# ./install
```

The script will go through a series of dependency and configuration checks. To start, it will see if you have something called bol.icon and download the latest for you if you don't (you won't, unless you've been through this process before). This is about 20MB, so go make a cup of tea and come back again.

A tricky error that probably will come up is a message saying:

```
jedi-sdl not present
Untar sdl.tar.gz (tar xvfz sdl.tar.gz) under
/usr/lib/fpc/<version>/units/<cpu>/sdl
```

Look in the sources directory of bol, and you'll find a file called `sdl.tar.bz`. As root, copy it to your needed directory (`/usr/lib/fpc/2.0.4/units/i386-linux` in my case), change to that directory and extract the archive. Rerun the install script, and you should make it past this stage. If not, check that you have extracted `sdl.tar.bz` to the right directory.

If you receive the error, "Xmuu library not present !!!!!", check your local file `/etc/ld.so.conf` to make sure it has the following lines:

```
/lib
/usr/lib
/usr/local/lib
/usr/X11/lib
```

If these areas have all passed, a lovely little part of the program pops up with a spinning cube to test whether certain parts of bol will work in advance. Click on the small cube, and answer Y if it worked. If not, you're probably missing some needed libraries. After this, the script will ask you for the path to your mail reader and provide an example path for you. Enter the path for your favored mail application, and this should be the end of the script. Note that a script to install local configuration files for individual users is also provided. If you want to do this to make the first run cleaner, run the script by entering the following:

```
# ./install_users
```

Phew! That was a long one, but a cleaned-up installer is on

the to-do list for this project and may well be perfected by the time you read this. Some instructions are provided in the script, along with README files on how to integrate bol into your login menu, but I'll let you read that yourself.

Usage You can fire this up straightaway on top of another desktop, so let's go through that for now, and you can take it from there. Open a terminal, and enter:

```
$ /usr/local/bol/lance_bol
```

A bunch of initialization info will pass through the terminal before you're suddenly greeted by a crazy rotating cube in full-screen. I think this may be some kind of loading screen (I don't know), but the cube is cool. After a few seconds, your desktop will start changing, with a new background and a translucent rectangle (the workbench) at the top of your screen. The workbench is the part that drives bol, so let's concentrate on that.

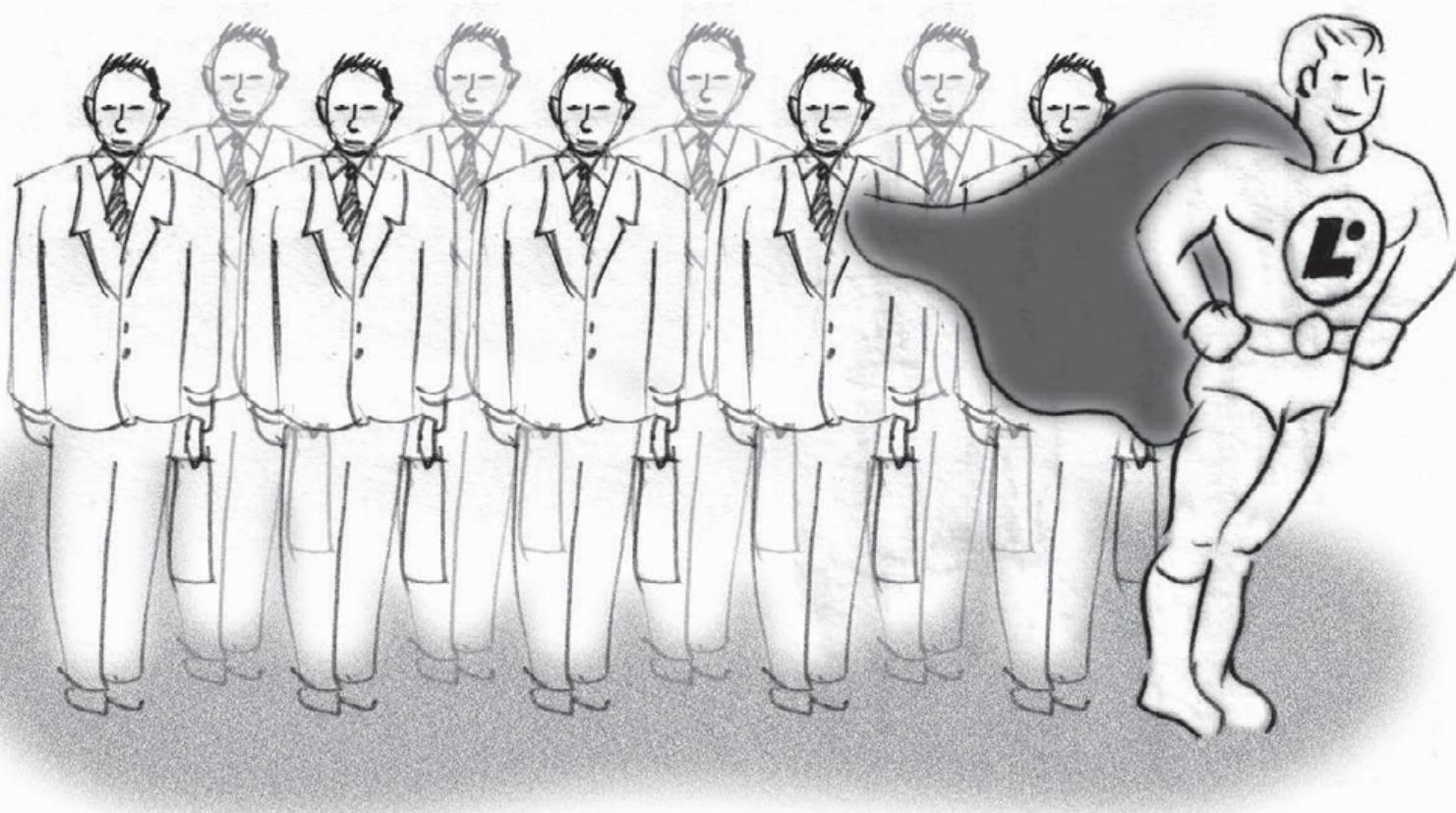
The lower icons are application buttons. Hover your mouse over them, and they'll do a cool animation, and the name of the application will appear at the top of the workbench. Left-clicking on it will launch it. The heart icon represents favorites. Clicking it will change the lower icons to a favorite applications list. If you want to clear up your screen from clutter, the icon fifth from the right will show only the desktop and minimize everything else. What's the important button? Click the blue one with a question mark, third from the right—it's the help button! Your screen will suddenly be taken over by an assortment of writing and colors—it was so crazy I had to take a screenshot.

When you've had enough, double-click the red button on the right, and a confirmation screen will take over the workbench, telling you to right-click to exit (you'll see what I mean). Upon exiting the desktop, you'll be greeted by the cube again, but this time in reverse...groovy!

FpcBol is one of the craziest projects I've seen in a while. Its lack of menus may appeal to noncomputer-literate users. The graphical intensity will appeal to children, with moving icons, gorgeous colors and changing desktop backgrounds of interesting scenery. All in all, everything is gorgeous-looking and very...French! Kids will love it. The end result is definitely worth it, even if the installer is cumbersome at times. At the time of this writing, FpcBol just hit 1.0 alpha, and it may hit full release by the time this prints. Florence could do with a hand to complete things, particularly with improving the English and the installation scripting, so if any coders out there are fond of the project, why not help him out? There also isn't much documentation for the GUI and some of the cooler aspects like Parental Control and its log files, so I'd be keen to see how FpcBol turns out after gaining a decent audience.■

John Knight is a 23-year-old, drumming- and climbing-obsessed maniac from the world's most isolated city—Perth, Western Australia. He can usually be found either buried in an Audacity screen or thrashing a kick-drum beyond recognition.

Brewing something fresh, innovative, or just a little crazy?
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Figure 1. One
Tricked-out XO at
Studio Dave

HARDWARE

Sounding Out with the OLPC XO

Look (and listen) in on the OLPC's laptop audio designs. DAVE PHILLIPS

In January of this year, I received an XO laptop from the One Laptop Per Child (OLPC) Project, thanks to a kindly recommendation from my friend Dr Richard Boulanger, professor of music synthesis at the Berklee College of Music. Rick knows that I maintain a private teaching studio and that many of my students are youngsters who would love to play with the XO. He also knows that I have a twin interest in Csound and Linux audio development, two rather significant aspects of the machine. Thus, this article focuses on my experiences so far with the XO's audio subsystem and its sound and music software. My students have had

only brief exposure to the machine, but I conclude with some remarks concerning their interaction with the XO and its audio capabilities.

General Overview of the XO

There's plenty of material on the Web that describes the XO in minute detail, so here I recap only the most salient features of the machine.

The XO laptop (Figure 1) is small and lightweight without feeling flimsy or poorly constructed, and the few mobile parts are connected firmly at their joints. The display swings up from the base and can be rotated 180 degrees left or right in its upright position. It

also can be tilted slightly backward. The keyboard is a single rubber membrane, designed for kid-size fingers, but ham-handed adults like yours truly can plug in a USB keyboard if necessary. A two-button touchpanel replaces the mouse, though currently only one panel and one button are active. That's not a problem, because only the pointer control and an entry button are required to navigate the GUI.

I'm impressed by the thought that has gone into the design of the XO. At every level, I find consideration for the user's experience, from the design of its battery pack to the excellence of its display resolution. In fact, when I've

shown the machine to friends, they've all especially admired the handle and wondered aloud why their laptops didn't include one.

On the software side, the XO is powered by a modified version of Fedora Core with a 2.6.22 Linux kernel. The GUI is the renowned Sugar, a Python-based graphic interface that is singularly unlike the typical Linux desktops with which I'm familiar, and the Linux command-line is easily available at any time.

Audio Hardware and Capabilities

The XO's CPU is a 433MHz AMD Geode LX-700. The laptop's multimedia capabilities are provided by the Geode CS5535/CS5536 companion chipset. According to the Wikipedia page on the Geode, the CS5535 is a "...Southbridge for Geode GX and Geode LX...[that] integrates four USB ports, one ATA-66 UDMA controller, one infrared communication port, one AC97 controller, one SMBUS controller, one LPC port, as well as GPIO, Power Management, and legacy functional blocks". The processor's AC97 controller is of central importance to this article, along with the possibilities afforded by the USB support, so let's consider exactly what that AC97 is and what it does.

In 1997, Intel developed an audio codec to provide high-quality audio services for motherboards, modems and sound hardware. The AC97 defines a high-quality audio architecture with a sampling rate of up to 96kHz for stereo and 48kHz for multichannel digital audio recording and playback, with bit depths up to 20 bits. The AC97 became very popular with manufacturers and is found on most desktop machines, though it has been superseded recently by Intel's HDA (high-definition audio). The codec is divided into a digital controller and an analog stream handler, effectively combining the analog-to-digital and digital-to-analog converters in a single package (an appealing feature for hardware designers). By the way, Intel's use of the word codec here refers to the encoding/decoding of analog-to-digital and digital-to-analog streams, as distinct from binary compression/decompression codecs such as MP3, Ogg or WMA/WMV.

The AC97 implementation for the CS5535 comes from an integrated

Analog Devices AD1888 chipset that provides up to six channels of digital or analog audio output. The AD1888 is notable also for its direct connection to the core CPU, a cost-saving factor that accords nicely with the XO's overall design. The XO also uses another Analog Devices chipset (the SSM2211) for audio amplification.

So much for audio on the inside. On the outside, we find an integrated microphone, two integrated speakers and jacks for stereo audio output (to headphones or other speakers) and for a monaural microphone-level input. The jacks are standard consumer-grade sound-card connectors that take 3.5mm mini-plugs, and I'm happy to report that connections to those jacks are firm and steady. The jack functions also are redefinable with the alsamixer utility, but I did not experiment with this feature. See the OLPC Wiki page on the XO's audio hardware for more information about redefining the audio I/O ports.

The XO also includes three USB ports. Obviously, these ports can be used to expand the machine's audio capabilities by adding a MIDI interface or a higher-quality digital audio interface.

The Software Side: System Audio Support

My machine runs the ALSA sound system in version 1.0.14. Running `dmesg` reports that the ALSA device list consists of the CS5535 audio hardware at base address 0x1480 on IRQ5, and `modinfo` reports that the cs5535audio driver includes only one significant option, a workaround for certain faulty AC97 implementations.

Under normal circumstances, ALSA is completely transparent to the user. Activities (that is, the XO's programs) access the kernel sound services with no intervention from the user, and sound pours forth from the speakers. The expected ALSA utilities are all available from the command prompt, though only to the root user. Alsamixer correctly identifies the CS5535 as the sound card and the AD1888 as the audio chipset, and the range of mixer controls is impressive, particularly with regard to the surround sound capabilities of the AC97. Given this transparency, there isn't much else to add regarding ALSA on the XO. However, readers who want

to know more details about the CS5535 audio driver should read the papers by Jaya Kumar, developer of the cs5535audio driver (see Resources for links to his presentations at the Linux Audio Conference 2007 and at FOSS/India 2006).

Sound and Music Activities

The XO is designed for the explorative mind. With regard to basic sound, the default system provides activities for simple audio recording and playback in various formats. However, the system's real audio attractions are found in the TamTam activities.

TamTam is a suite of four programs designed for exploring and experimenting with sound and music creation. At first glance, they may seem to be attractive toys, but I can verify that these applications are powerful enough to keep experienced musicians busy with their possibilities. The TamTam designers have created a unique blend of Python and Csound and presented the concoction to the user in an interface that completely conceals its technical foundations. The GUIs are easy to comprehend, and users need no knowledge of Csound or Python or even music to start composing, jamming and making their own sounds.

Alas, there isn't space in this article to describe each program in the suite fully, so I present each application briefly and advise interested readers to listen to the XO audio demos I've posted at linux-sound.org (see Resources).

The TamTam Mini (Figure 2) is an introductory-level program for very young users. The Mini is essentially a preset-style synthesizer played with the computer's keyboard. Users select an instrument from the display, and then play it by pressing the keys Z through M (lower octave) and Q through I (higher octave). A drum set can be added to create a looping play-along beat (with the start/stop button), and further controls include sliders for master volume, tempo, beat complexity and number of beats per bar. Sliders also are included for balance (that is, panning) and a reverb effect. All controls are usable in real time, and users' jams can be recorded for later playback. Finally, in accord with the XO's design philosophy, Mini also supports collaborative play between multiple machines, with all

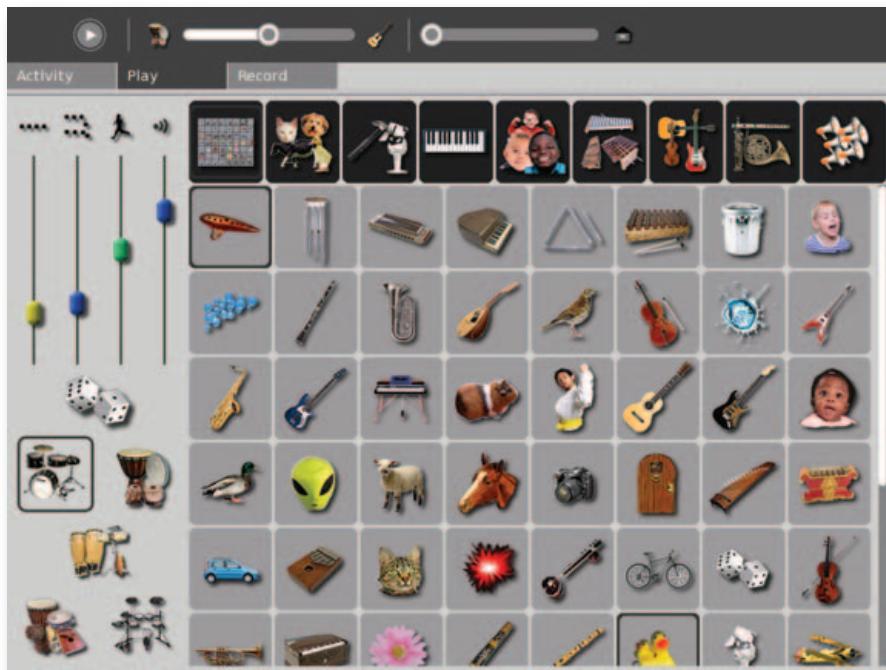


Figure 2. TamTam Mini

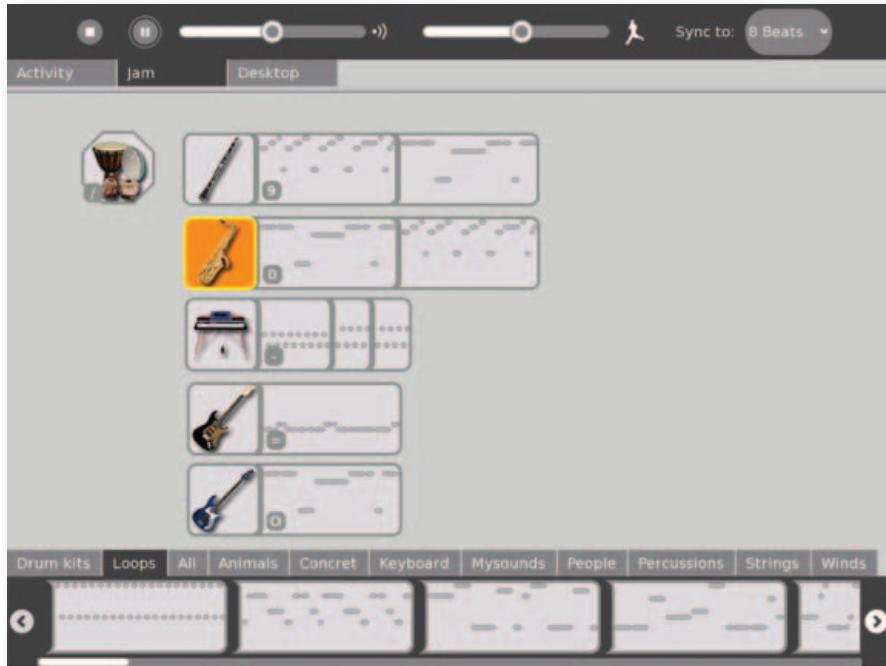


Figure 3. TamTam Jam

players synchronized to a shared beat. TamTam's Mini may be simple in its operation, but it is a sophisticated learning tool that succeeds at being instructional and fun—a winning design for enticing children into learning more about music and sound.

The TamTam Jam (Figure 3) is the

XO's main music performance activity. As with the Mini, users select sounds from the display and play them via the computer keyboard. A beatbox-style drum machine is available for accompaniment grooves, and a sequencer is provided for recording phrases played on the keyboard. Jam also is targeted at

younger users, but it is a much more sophisticated program. Polyphonic playing is supported, and users have full control over the accompanying sequences and their instrumentation. A virtual band can be formed with a drum set and up to five instruments, and each instrument is coupled to a series of sequence loops selected from the Loops display. These loops can be added or deleted in real time, and right-clicking on the loop invokes its editor. The loop editor controls the number of beats within the loop and its "regularity" (a randomization control), and a mini-piano roll editor lets users redefine the notes and their order within the loop. It won't take long before users realize that Jam is a powerful MIDI sequencer that can make music in almost any style or degree of complexity.

TamTam's Edit (Figure 4) is a music composition/generation program that can be employed as a more-or-less conventional five-track MIDI sequencer or as a user-definable musical automaton. Beyond its transport controls, Edit's toolset differs between its two modes. Compose mode includes Select, Draw and Paint tools; volume and tempo sliders; and controls for recording from the computer keyboard and saving your work as an Ogg file. Generate mode includes only three tools, a Generate Tune toggle and dialogs for the music generation parameters and for other general properties of the sequence. The generation dialog has a cool interactive graphic interface for setting the conditions for each generated event's rhythm, pitch and duration. Pitch material can be defined further with selections from seven scales and four randomization modes, any of which can be defined in real time.

Playback can be limited to a single sequence to create a real-time loop composition environment. Sequences can be selected in noncontiguous order with a Ctrl-left-click, although playback is always from left to right. Hold and sweep with the same key combination selects multiple continuous sequences.

Edit is an impressive toolkit for serious music composition, whether in real time or off-line. I've worked with dozens of music generation programs in text-based and graphic interfaces, and few of them are as well designed as Edit. In software reviews, the word



Figure 4. TamTam Edit

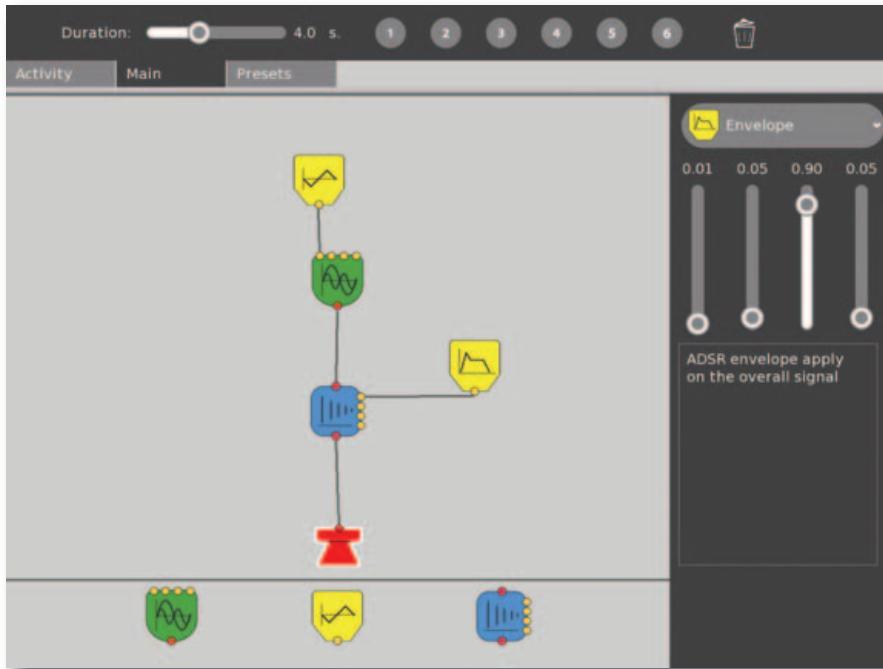


Figure 5. TamTam SynthLab

flexible is usually overworked jargon, but it applies neatly to Edit. The program supports a variety of approaches to music composition, from the strictly deterministic to the utterly aleatoric, and it presents itself with an interface that welcomes interactivity. Edit has its limits, but within those limits, it is one

of the coolest music programs I've used to date.

The TamTam SynthLab (Figure 5) is a sound design laboratory for advanced students. According to the TamTam Wiki, the SynthLab is modeled on the famous Max/MSP, a graphic environment for music composition and

multimedia development, but it reminds this reviewer of PatchWork, an ancient editor for Csound instruments. In SynthLab, as in the older program, icons representing synthesis primitives are wired together to create a patch—that is, a new sound. SynthLab provides modules for sound generation (FM, sample playback, granular synthesis), modulators (LFO, envelopes) and effects processors (delay, reverb, chorus) that can be wired together in arbitrary connections to create new sounds, all in real time, of course. These sounds can be played on the computer keyboard and/or saved to any of eight slots reserved for use in TamTam Mini.

The TamTam suite is a great achievement, particularly when considered in its hardware context. It certainly proves a point about efficient program design, and there were many times when I forgot that the TamTam software was doing its stuff on a machine with a 433MHz CPU. It also proves a few other points about leveraging the power of contemporary Csound and Python. Those languages have been developed for excellent real-time performance, a factor well exploited by the TamTam programs. Vast thanks and praise must go to Jean Piche, TamTam's master architect and to his crew of talented developers for coming up with this most fascinating, instructive and hugely fun group of activities and for giving it to the children of the world. (And, yes, that includes children of all ages.)

Media Players

I knew that the XO was able to play media files in various formats, but at first I was mystified as to how to access such files. The Sugar interface doesn't provide a file manager à la Nautilus or Konqueror. Instead, the Journal activity lists all work done on the machine in a kind of diary. All saved work also is listed there, including recordings and other media files, and I needed only to double-click on an item to view or listen to it.

Players are invoked automatically for a selected file. On the base system, I had no trouble playing MP3, Ogg and WAV audio with the players in the eToys and Browser activities (Figure 6). I also played video files in AVI, MPG and Ogg formats, with the understanding that playback was not likely to be cinematic with a 433MHz CPU. However, videos made on the XO

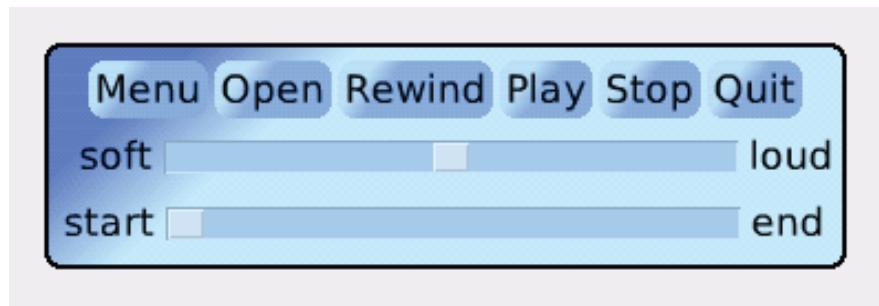


Figure 6. The eToys MP3 Player

are recorded at 30 frames per second and played smoothly (in their original 640x480 resolution) when transferred to my more powerful desktop machines.

Simple Recording

Audio recording on the XO is done with the Recorder activity, a simple utility for capturing pictures, video and sound. After selecting the particular media task, a "ready to record" icon appears (an eye for video and lips for audio). Click the icon to start recording, and click it again to stop the process. The file is named and saved automatically, and it can be previewed directly from the Recorder.

I tested the audio recorder with the internal microphone and with an inexpensive external mic. To its credit, the internal mic recorded with less noise and a stronger signal. I've since decided to do all casual recording on the XO with its own microphone. Settings for the microphone input level (and all other audio channel levels) can be managed with alsamixer or any similar sound card mixer, but I found the default levels to be adequate under relatively calm acoustic conditions.

A Word about the Speakers

The XO's internal speakers are okay for basic purposes, but they will not provide high-fidelity sound. For a better audio experience, I suggest either good-quality headphones or a set of powered external speakers. Surround sound playback is supported by the XO's audio chipset, so you may want to attach a 5.1 system. Alas, I was unable to find technical specifications on the integrated speakers, but it's obvious on listening that bass response is almost nil, which gives the audio a thin and tinny sound. This is especially unfortunate with regard to the TamTam software—it simply sounds far better on external speakers.

The Csound/Python Connection

Thanks to the pioneering work of Michael Gogins, Steven Yi and other developers, Csound now includes a number of Python-related opcodes. Python is rather ubiquitous in the XO's software structure, and Csound is the audio engine for the machine, so it's a wrap that the XO might be an excellent platform for experimentation with the world's most powerful music and sound programming language. Alas, I've run out of space to describe adequately the XO's Csound/Python potential in this article, but I can recommend interested readers to the OLPC Wiki page on Csound. A few pointers to relevant projects and activities can be found there, and further information can be discovered in the Csound mailing list and its archives. Jean Piche and Rick Boulanger are Csound gurus, so I have great expectations for working with the language on this machine. If TamTam is any indicator, the creative possibilities are truly impressive.

Critical Remarks

I loaned the machine to two students, both of whom had trouble figuring out how to save their work. They discovered how to use the Recorder and other activities with little difficulty, but the Save procedure was dark to them until I explained the Journal and its functions. Documentation is entirely Web-based, and the students said it was a hassle to switch between the Web browser and their current activity. Of course, once they learned how to use the Journal, all was well.

The only other problematic area for me was the wireless connectivity. Connections are hard to come by in my area, and I would have been happier with an Ethernet port. However, I understand the design consideration, and my USB-to-Ethernet adapter is already on order.

If you've been waiting to purchase one machine for yourself or thousands for children in the remoter parts of the globe, just do it. The XO is intended to spread happiness and joy throughout the world, but the project needs your help to achieve this lofty goal. See the OLPC Wiki for more information on how you can get on board.

So, do I like the XO? I love this machine, and I heartily recommend it to anyone anywhere. It squeezes more juice from a relatively low-powered CPU than I would have thought possible, the TamTam software's performance is nothing short of astonishing, and the fun factor scales right off the charts. The XO gets five stars for overall excellence, and if I had to choose a single word to describe the machine and the experience of using it, that word would be joyous. ■

Dave Phillips is a professional musician and writer living in Findlay, Ohio. He's been using Linux since the mid-1990s and was one of the original founders of the Linux Audio Developers group. He is the author of *The Book of Linux Music & Sound* (No Starch Press, 2000) and has written many articles on Linux music and sound issues for various journals and on-line news sites. When he isn't playing with light and sound, he enjoys reading Latin literature, practicing t'ai chi, chasing shar-pei puppies and spending time with his beloved Ivy.

Resources

A TamTam Mini Example (Ocarina Jam):
[linux-sound.org/audio/
tamtam-mini-example.ogg](http://linux-sound.org/audio/tamtam-mini-example.ogg)

A TamTam Edit Example (Default Compose): [linux-sound.org/
audio/tamtam-edit-example.ogg](http://linux-sound.org/audio/tamtam-edit-example.ogg)

Jaya Kumar's Paper for LAC 2007:
[www.kgw.tu-berlin.de/
~lac2007/papers/lac07_kumar.pdf](http://www.kgw.tu-berlin.de/~lac2007/papers/lac07_kumar.pdf)

Jaya Kumar's Slides from FOSSIN 2006:
[https://foss.in/2006/cfp/slides/
ALSA_and_OLPC_audio_82.pdf](https://foss.in/2006/cfp/slides/ALSA_and_OLPC_audio_82.pdf)

The OLPC Wiki: [wiki.laptop.org/go/
The_Olpc_Wiki](http://wiki.laptop.org/go/The_Olpc_Wiki)

Wikipedia on the XO:
en.wikipedia.org/wiki/OLPC_XO-1

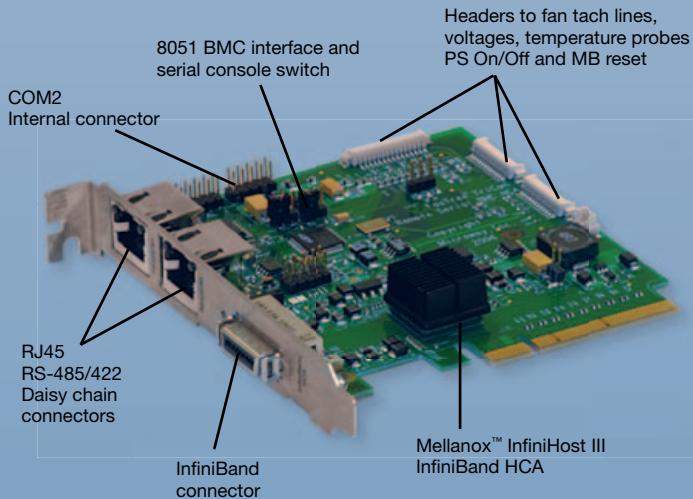
See also YouTube for video demonstrations of various aspects of the XO.

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Need a Script?

Take a hike. ScriptBuddy. Move over, Final Draft. It's CeltX's turn in the spotlight. DAN SAWYER

Of all the things a body can write, a great number of them these days require something a little different from the good-old word processor. Podcasts, corporate video presentations, radio and television advertisements, short and feature films, stage plays, animations, training videos and television shows all require scripts. More than that, they require scripts written to particular formatting standards.

Those formatting standards are stringent—an improperly formatted script won't be looked at twice by people who are used to working with proper scripts. When one is writing a book or an article, most of the work can be done in a simple text editor—almost everything that comes with a modern word processor is related to typesetting, which can be done as a whole separate step if one so desires. With scripts, the story is somewhat different. When you write for a script-based medium, the physical format of the script dictates a series of storytelling conventions that are enforced by the typesetting structure. Attempting to write a script without effective typesetting is a pain—the formatting gets in the way of the creative process.

In the bad-old days, there basically were two options (other than writing it out by hand and having a minion type it for you):

1. You could format on the fly as you go using tabs, carriage returns and spaces.
2. You could create a template for OpenOffice.org or a comparable word processor.

The former, as I alluded to already, is a major pain. The latter has the problem of not giving you the full range of flexibility sometimes needed in scripts, such as subscript or superscript annotation or simultaneous dialogue.

Writing a proper script requires a

DOROTHY, TIN MAN, SCARECROW and TOTO walk through a thick forest in the Land of Oz. Dorothy carries a basket, the Tin Man carries an axe and an oil can. The road is paved with yellow brick and is covered with dried branches and dead leaves. The Emerald City is seen far in the distance.

DOROTHY
It's really scary in these woods!

They hear a deep growl from wild animals in the trees!

DOROTHY (cont'd)
What was that?

SCARECROW
Hopefully not a beast who likes to eat straw!

Toto stands at attention with his ears perked up.

DOROTHY
How much longer before we are out of this forest Tin Man? I don't like it here!

TIN MAN
I really can't say. I've never been to the Emerald City. My Father told me that it is a long and dangerous journey! I am not worried because I have my oil can for my joints. Besides, you have the kiss from the Good Witch. That will protect us from harm!

Figure 1. A Properly Formatted Industry-Standard Screenplay

specialized tool, and specialized tools are expensive. In recent years, a number of commercial tools have grown up to address this need. However, the resulting commercial tools, such as Final Draft, are expensive and many have a reputation for being difficult to use and (in some cases) unreliable. None of these tools run on Linux without a bottle full of Wine and a couple good shots of whiskey, and even then your mileage may vary.

Last summer, however, a new tool emerged from a tortuous two-year beta period and attained usability—CeltX.

CeltX is the brainchild of a Newfoundland-based company that formed in 2005 and aimed to create the ultimate open-source screenwriting and

preproduction program. After some early failed experiments with proprietary file formats, the project settled on an open system based on Mozilla and using XML, HTML and open-standards graphics formats to do its work.

Far more sophisticated than a mere document template, CeltX has all the tools a writer needs to develop a script from a single line concept through to a salable final draft. Beginning with a "text editor" that works more like a stripped-down version of OpenOffice.org Writer than it does like gedit, writers can input their notes organized in whatever way they find most useful—for example, creating a separate text file for every subplot or for every character's individual arc, in

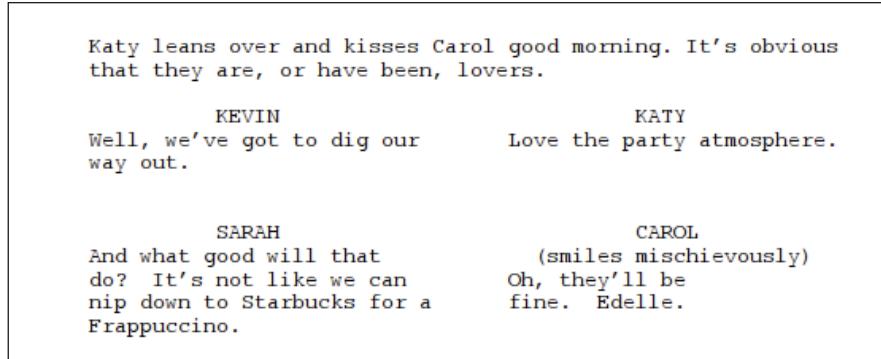


Figure 2. Simultaneous Dialogue from the Forthcoming ArtisticWhispers Film *Down From Ten*

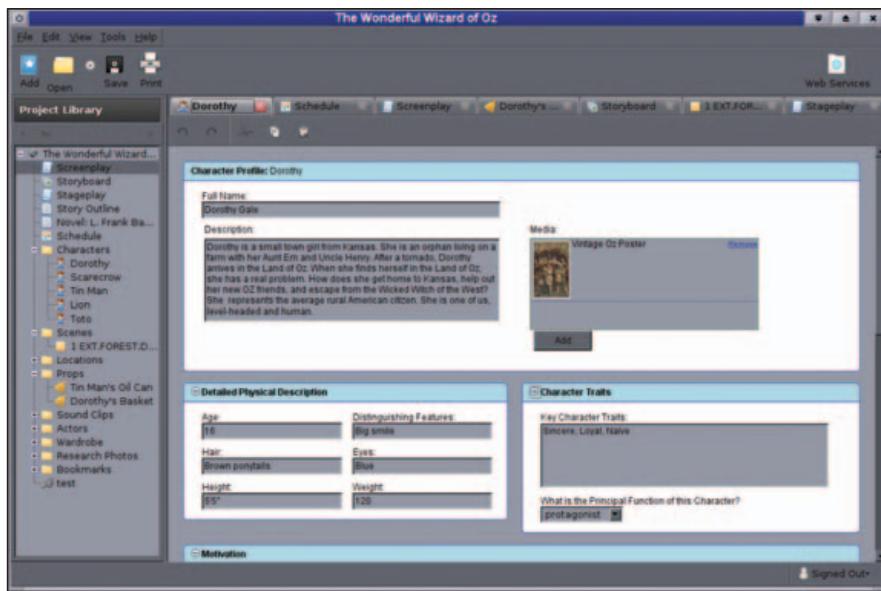


Figure 3. A character dossier from CeltX's "Wizard of Oz" sample project—notice the hierarchical project tree in the sidebar to the left.

order to concentrate on the different threads of the story before marrying them together.

This ability to organize different items hierarchically doesn't stop with the text sheets—a number of writing

wouldn't—physical description, a graphics field for a photo or concept sketch, the role(s) that the character plays in the drama, motivations, goals, family background, education, habits and vices, and likes and dislikes.

None of these tools run on Linux without a bottle full of Wine and a couple good shots of whiskey, and even then your mileage may vary.

aids are available for adding to the pile and to make organization easier. For example, detailed forms for creating character dossiers are included. The forms have fields for everything you'd expect, and a few things you

Similar forms are available for building detailed scene descriptions from one's notes, listing out setting, duration, protagonist/antagonist relationships, and the description of the action and character development that must

happen in the scene. Because CeltX is based on Mozilla, it includes things like a tabbed interface that lets users keep their relevant character dossiers, scene descriptions, text snippets and scripts open side by side, so that they can reference notes and dossiers quickly while working on the script proper. Used to their full advantage, good writers can plan the entire film except for the spoken dialogue before they ever begin the actual script, and then easily refer to those notes during composition.

When it comes to the work of actually creating the script, CeltX does a marvelous job. Built-in templates for the four major types of scripts in common usage are included: Screenplays, Stage Plays, Radio Plays and A/V scripts (these are used for advertisements and other narrated visual media). Adding one of these (or a number of them) to any point in the project is a two-click enterprise and very straightforward.

Once inside the script editing module proper, users have the option of typing into the template, which formats things properly on the fly, or using the index cards outlining feature—something veteran script writers will find very useful.

In the old days when we had to work by hand or wrestle with word processor templates, a lot of screenwriters would begin by scribbling one- to two-sentence scene descriptions on index cards and sticking them to a corkboard. We'd then rearrange things until we got a dramatic structure that seemed to work, and then use the order we settled on as the rough outline for the script. CeltX made good use of this paper-world convention by including an Index Cards screen for laying out the scenes and shuffling them around into the correct order before diving in and writing the dialogue. The shuffling feature continues to work after the script has been written, making post hoc rearrangement of the script a breeze. Once the writing is done, the script can be exported to PDF or HTML, retaining its proper formatting, or to plain text (which, alas, loses much of the formatting).

However, CeltX is not merely a tricked-out word processor. It aims to be a full-fledged preproduction suite, and it succeeds famously. It has forms for describing every prop, every set

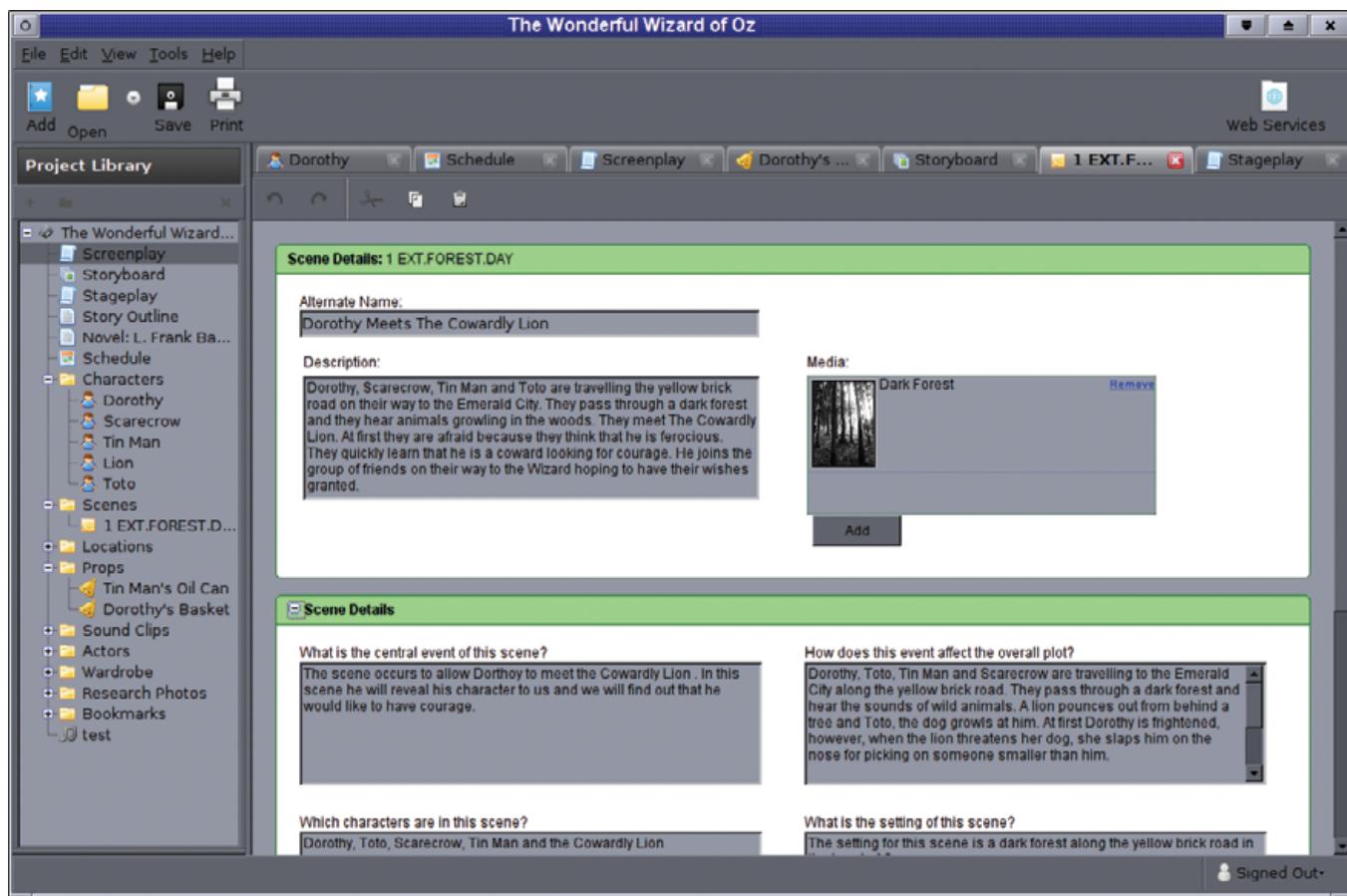


Figure 4. The scene element, which actually continues on for quite a bit longer than can fit in a screenshot. All of CeltX's description elements are similarly thorough.

design, every location, every piece of lighting and camera equipment, and every actor. Further forms are available for greenery, practical effects, explosives, digital effects, production vehicles, character vehicles, animals, craft services, and just about everything else a

calender for production scheduling, as well as a couple other invaluable tools for pushing the production forward. Planning a project for production has a long and detailed set of challenges, not the least of which is the translation of the written word into visual images. To

director and the director of photography), and these storyboards are then used in the budget breakdown—the planned camera angles and motion help the photography directors ascertain the equipment (lenses, dollies, steadicams, cranes and so forth) that they'll need to shoot the film successfully. The storyboards also often are taken on set to guide the director of photography as the film is shot to make sure the production team covers all the proper camera angles and performances.

CeltX contains a very usable storyboarding module. A storyboard can be constructed with imported images (scanned illustrations, photographs from rehearsals or what have you) on a per-sequence basis, and then played back in an included flipbook to give the approximation of an animatic, helping the director get a feel for the timing of a scene before it's shot.

Of course, CeltX is a commercial enterprise, and its business model

body could ever need to produce a motion picture, stage play or other performing arts piece. Using these forms to annotate the script, it's very simple to create a production breakdown—the first step toward budgeting and scheduling a project for shooting.

Although CeltX does not contain a budgeting system, it does contain a

this end, filmmakers have traditionally employed storyboards.

Storyboards are, for lack of a better description, a comic-book version of the screenplay drawn up from directions contained in the script. The camera angles, movement and editing are planned out in as detailed a manner as possible (usually with the input of the

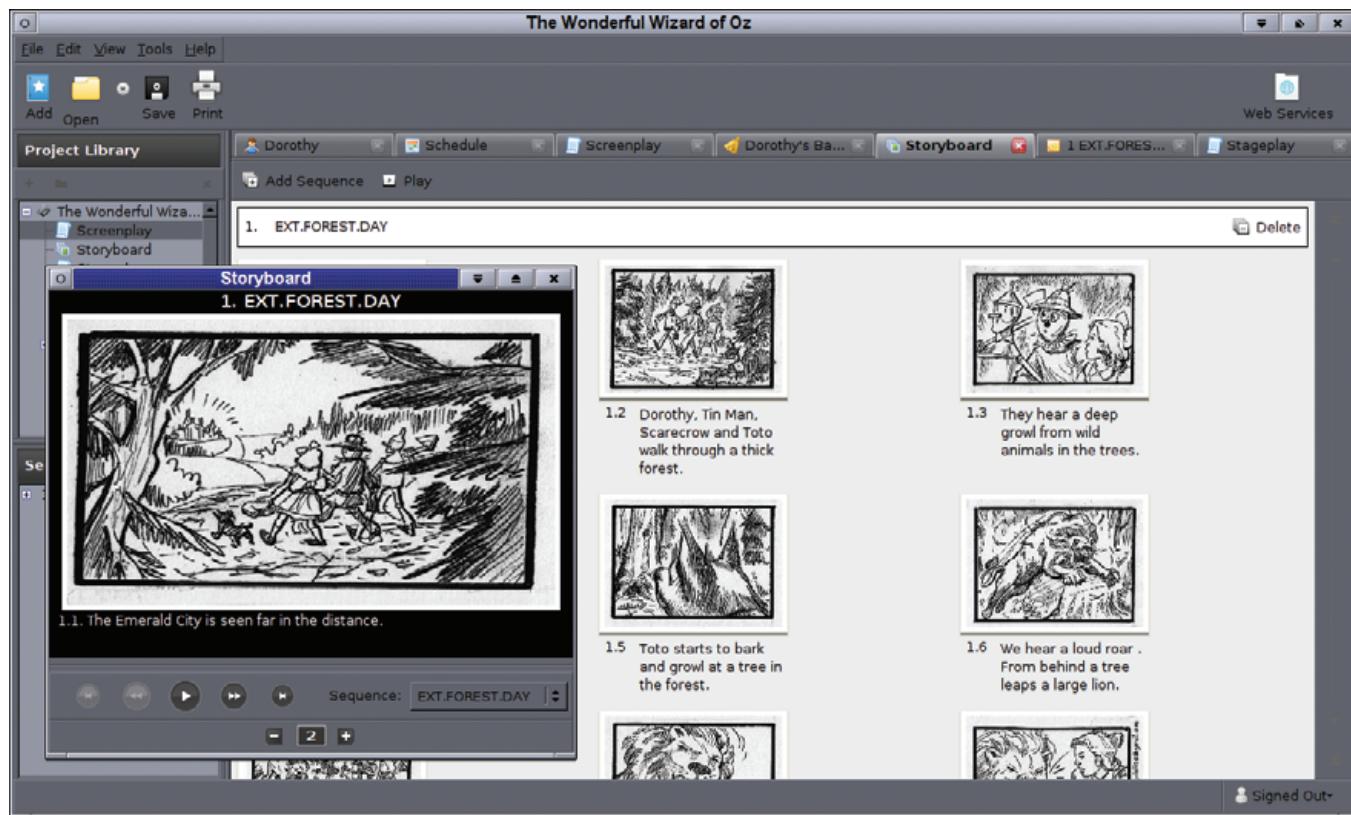


Figure 5. The Storyboard Window, with Flipbook Player Displayed

revolves around a raft of Web services that it offers through CeltX Project Central. Although the CeltX folks intend to add premium features as the user base grows, the basic membership is free, and for that freedom, users get quite a powerful program. By signing up for the account, users have the option of creating a private or a public publishing account. A public account lets users show their script to the CeltX community to solicit comments and compare notes, while a private account shared among a small group allows for group collaboration on the script and production breakdown.

If, for example, your storyboard artist, producer or client, and your director need to work together on a production breakdown, each can be given access to the project. The director can annotate the script and the storyboard cells that the storyboard artist draws, the producer can give notes for the screenplay content and budget, and they can collaborate on revisions and breakdown in real time (or in delayed time ad hoc, which is much more convenient). This kind of collaboration

reduces the number of necessary production meetings and greatly facilitates the collaborative process—and it, like the software, is free.

I should emphasize, however, that one need not be a member at CeltX Project Central in order to use CeltX in-house, or to export its results to open formats. Membership at Project Central is both free and optional—it's a value-added service for CeltX users, not a lock-in tactic, which makes it the best of all worlds.

Now, the coup de grâce. All of the additional elements, including storyboards and music, can be used to mark up the script. By referencing these elements in the script, everything is tied together for producing production breakdown reports on a scene-by-scene basis, giving the prospective producer and director everything they need to produce a film (other than the actual money, personnel and equipment).

There are times when those of us determined to travel in the land of open source must settle for "good enough". This is particularly the case in

the realm of multimedia production. With CeltX, that's not the case. By combining several industry-standard document template formats with a well thought-out preproduction system offering thorough production breakouts and top-rate reports, CeltX has leapt right to the head of the pack. My only regret is that there isn't a basic book template included, as many of the included tools also are indispensable to novelists, and I'd very much like to use it for my next book. However, its open nature means that the document templates are editable. Now, if I could just learn the XML API it uses, perhaps I could extend the capabilities of this system just a little bit further.

Excuse me, I believe I have some software modification to do. ■

Dan Sawyer is the founder of ArtisticWhispers Productions (www.artisticwhispers.com), a small audio/video studio in the San Francisco Bay Area. He has been an enthusiastic advocate for free and open-source software since the late 1990s, when he founded the Blenderwars filmmaking community (www.blenderwars.com). He currently is the host of "The Polyschizmatic Reprobates Hour", a cultural commentary podcast, and "Sculpting God", a science-fiction anthology podcast. Author contact information is available at www.jdsawyer.net.

Zimbra Desktop

An alternative e-mail client. DANIEL BARTHOLOMEW

Zimbra Desktop is an alternative e-mail client. I don't mean that it is yet another choice in e-mail client-land. It is more than merely another choice. Zimbra Desktop is an attempt to blur the lines between a browser-based Web application and a traditional desktop application. In many ways, it is similar to applications like Evolution, Outlook or KMail—what Zimbra refers to as "fat" clients—but in other ways, it has more in common with browser-based e-mail platforms, such as Gmail, Hotmail and Yahoo mail. In a nutshell, Zimbra Desktop is the Web-based Zimbra Ajax Web client running inside a custom Prism install (for more about Prism, see the What Is Prism? sidebar).

At first blush, I thought to myself, "Why would someone want to do this? What's the point?" Well, the point, I came to discover, is that desktop e-mail suites have certain advantages over browser-based e-mail suites, and vice versa.

The main advantage desktop e-mail clients have over their browser-based brethren, in my opinion, is the ability to read saved e-mail when you are not connected to the Internet. There is also, in corporate settings especially, the advantage of integration with LDAP directory servers and scheduling functions through shared calendars and the like. On the other hand, the main advantage that browser-based e-mail clients have over desktop e-mail clients is that they run exactly the same, or very nearly the same, on multiple browsers and operating systems. There also is no lengthy install process; you simply go to the site and there it is. The aim of Zimbra Desktop is to give you the best of both worlds.

Installation and Configuration

Unfortunately, because Zimbra Desktop acts like a traditional application, there is an installer. The installer itself is an approximately 40MB shell script. Actually, it is a 340-line shell script cat'ed to an approximately 40MB tar.gz file. The script extracts the tar.gz file from itself,

One of my favorite features in Zimbra Desktop (which is also one of my favorite things about Gmail) is the extensive availability of keyboard shortcuts.

gunzips and untars it, and then runs the Java-based installer that lives inside. This sort of installation bootstrapping, by extracting a file stored inside a shell script, is something

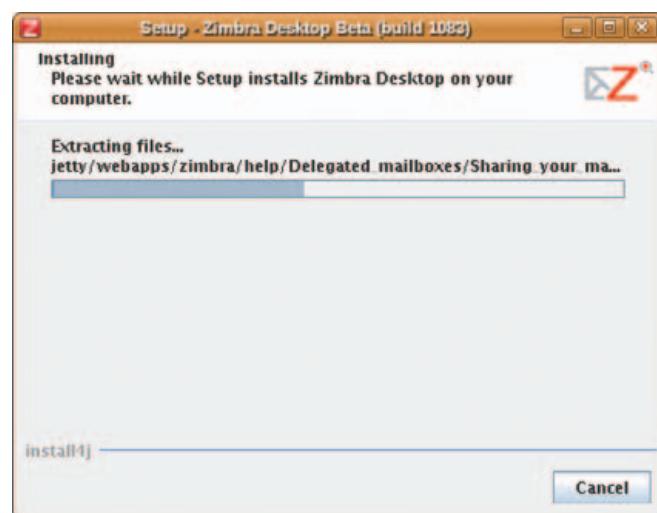


Figure 1. Zimbra Desktop Installer

commercial Linux software seems to prefer doing, and I have to say, it does work.

The GUI installer is nothing special. It uses install4j, and it gets the job done.

At the end of the installation process, you'll have a zimbra folder wherever you instructed the installer to put it. The home folder of the user that performed the install is the default location. Optionally, you also will have a desktop icon, if you did not uncheck the Create Desktop Shortcut box.

Double-click the desktop icon, and Zimbra Desktop launches and prompts you to enter in the settings for an e-mail account of your choosing. Zimbra Desktop supports Zimbra Collaboration Suite (ZCS), Gmail, Yahoo Mail Plus and standard POP and IMAP accounts. I tested with Gmail and ZCS, as those are what I have.

E-mail on Zimbra Desktop

The initial sync of my Gmail account took about an hour from start to finish. I just left it alone while it downloaded my mail. I didn't have much mail in my ZCS account, so that sync was almost instantaneous.

Using Zimbra Desktop reminds me a lot of using Evolution or Thunderbird. You can drag and drop e-mail messages from one folder to another, right-click on single messages or groups of messages and perform various actions (such as forward, filter, tag, mark as read or unread and so on), and you can do many of the other things that you would expect. It was easy to forget that the entire interface is built using HTML and JavaScript.

The e-mail composer has all the features I expect from a modern client. You can compose in HTML or plain-text format, and in HTML mode, you have all of the usual control over fonts, lists, colors, text size and so on.

The e-mail viewing interface has the familiar three-pane view that most clients default to, and the HTML e-mail messages I used for testing rendered the same as in other clients.

On the whole, using Zimbra Desktop is quite plain. It feels like what I'm used to with standard "fat" desktop mail clients. The interface is easy to navigate around, and things are generally about where I expect them to be, and when I wanted more information, the integrated help system was very useful.

One of the biggest differences between Zimbra Desktop and a standard client is that there aren't the normal File, Edit, View, Search (and so on) drop-down

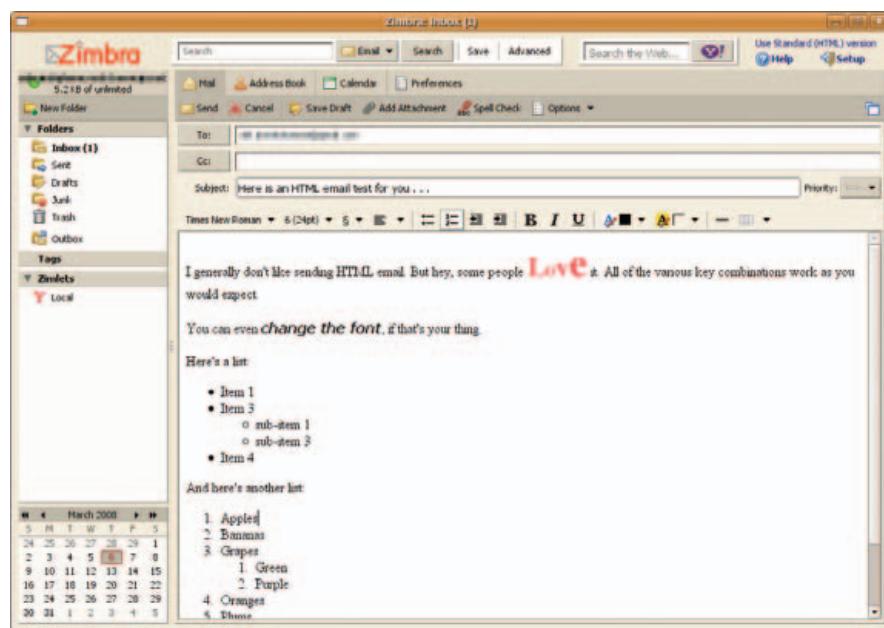


Figure 2. The Zimbra Desktop composer window offers all the features you would expect.

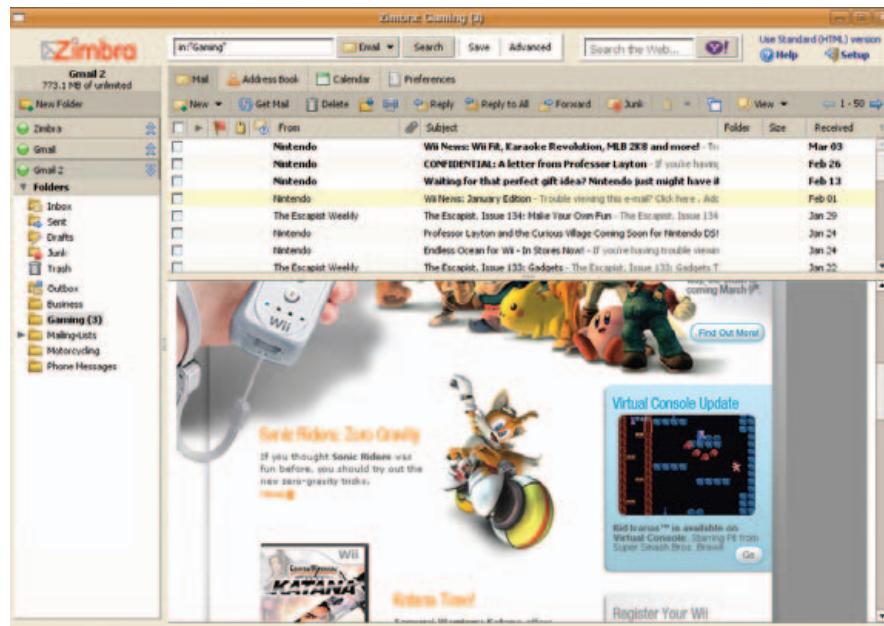


Figure 3. Zimbra Desktop has no trouble rendering HTML e-mail messages.

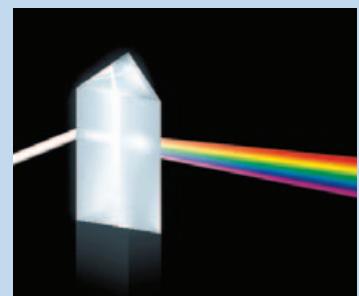
What Is Prism?

Prism is a Mozilla Labs project. Its aim is to allow you to split Web applications out of your browser and run them directly on your desktop. In reality, it allows you to run your Web application inside a stripped-down Firefox window, with no buttons or bars to get in the way.

The reason this is useful is because of one of Firefox's design decisions. In order to save on memory and processor usage, all of your browser windows run under a single Firefox process. This generally works well, except when Firefox crashes. Because of the design, a crash in one Firefox window affects all other Firefox windows. Prism lets you separate Web applications into their own processes. In this way, they behave more like traditional desktop applications—for example, if my Prism Gmail application dies, it doesn't affect the other Web applications I have running or close the Web sites I currently have open.

Development is ongoing, and new features are coming out all the time. For example, a new plugin for Firefox 3 recently was released that allows you to convert a Web site into a desktop application simply by clicking Tools→Convert Website to Application.

More information about Prism is available at labs.mozilla.com/featured-projects/#prism.



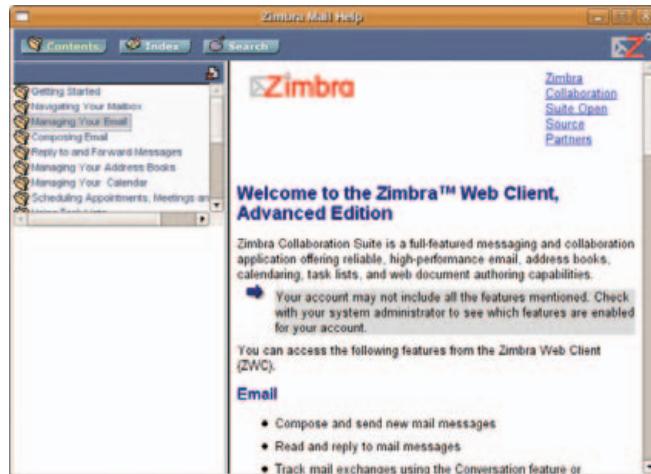


Figure 4. Help is just a click away.

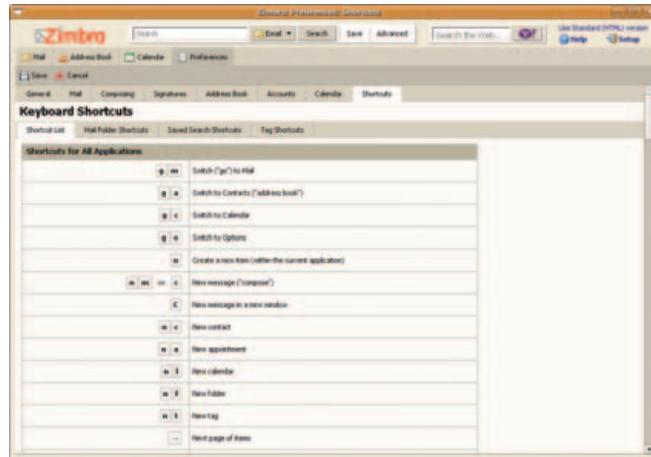


Figure 5. Zimbra Desktop has a lot of shortcuts.

menus arranged into a nice menu bar. This is not a limitation as such, it's just different. In normal, everyday use, I didn't miss them.

One of my favorite features in Zimbra Desktop (which is also one of my favorite things about Gmail) is the extensive availability of keyboard shortcuts. In fact, many of the key combinations are similar, if not the same, so I quickly felt at home. This is something fat clients could learn from their browser-based cousins—easy keyboard shortcuts, such as pressing J to move down in the list of messages and K to move up, are great time-savers. The complete list of shortcuts is available under Preferences→Shortcuts.

Calendaring

The calendaring component of Zimbra Desktop is very nice. It's much better, in my opinion, than Google Calendar, if not quite as good as some of the other desktop calendar apps I have used.

You can create appointments by a click and drag on the calendar, and you can move appointments by selecting them with the mouse and moving them where you want. You can create

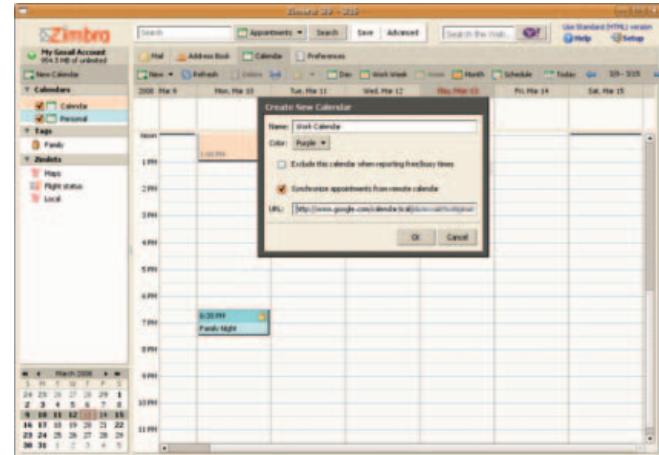


Figure 6. Zimbra Desktop can subscribe to remote ical calendars.



Figure 7. Zimlets are a nice way to extend your e-mail interface.

new calendars simply by clicking the New Calendar button.

The shared calendars and scheduling features work only with ZCS accounts, so keep that in mind if you are thinking of using Zimbra Desktop in a multi-user setting. If you are using Zimbra Desktop with an e-mail account other than ZCS, the calendar works like a standard desktop calendar. You also can subscribe to shared ical calendars.

Address Book

As far as the address book goes, it's an address book. If you're using ZCS, you likely will have access to a shared address book. There's nothing special here.

Zimlets

One thing that Zimbra Desktop has that other clients don't are Zimlets. Because the Zimbra Desktop's entire interface is based on HTML and JavaScript, it makes sense to include other pieces of on-line content into the client, and Zimlets are what allow this. Included with Zimbra Desktop are Yahoo Maps and Yahoo Local Zimlets. More Zimlets are available at gallery.zimbra.com that can do things like track flights and

add support for Flickr to the e-mail composing window, but installing them is nowhere near as easy as say, installing a Firefox extension, and if anything, they should be easier to install. They're a neat idea though, and they enable functionality that you just can't get in traditional e-mail clients.

What I Don't Like

On the whole, I was impressed with Zimbra Desktop. But, there were some things I really didn't like. As Zimbra Desktop is in beta, take these criticisms with a big grain of salt, because they might have disappeared by the time you read this.

Setting Zimbra Desktop to connect to my Gmail account was an easy process, but using it was not so easy. When connecting to Gmail via IMAP, your Gmail labels show up as folders, and the first time you click on any folder other than the Inbox you get a "This folder is currently not syncing. Click here to sync this folder" message. This is silly, because if I did not want to view the messages in the folder, I would not have clicked on the folder. The very action of me clicking on the folder indicates that I want to sync the folder, so there is no need to ask me. In addition to this, after you click on the link, you are sent back to the Inbox for some reason. Clicking on the folder again finally gets you the folder you wanted. Three clicks just to view one folder seems excessive, and the effort involved in getting my entire Gmail tree syncing was unnecessary. I will grant that I have a lot of labels, and thus, a lot of folders, but Zimbra Desktop could have been smarter with its default behavior.

Another annoyance is that in the Zimbra Desktop interface you can view only one account at a time. Because of this, dragging e-mail from one account to another one is impossible, as far as I can tell.

Each account also has its own calendar and contact list. I have a work e-mail and a few personal e-mail accounts, and both work and home calendars. In Zimbra Desktop, there does not appear to be a way to view all contacts from all accounts at the same time. Ditto for calendars.

Another minor quibble about the calendar is this: because I'm using Zimbra Desktop with my Gmail account, when I saw the calendar, I thought to myself, "hey, this probably will sync in both directions to my Google Calendar". It doesn't. Zimbra Desktop can read and show your Google Calendar by subscribing to the ical link you can get from Google Calendar, but it is read-only. The writeable calendar is only in Zimbra Desktop. I suppose I can't complain too much, as Zimbra never said the calendar would sync with Google Calendar, but I'm still sad it doesn't. Maybe in a future version?

On the topic of missing functionality, I was not able to get the touted off-line capabilities working with either Gmail or the ZCS server I set up for testing. I tested the feature simply by unplugging my computer from the network and then launching Zimbra Desktop. Instead of showing my e-mail messages, I received a message stating that the document could not be displayed in front of a blank window. This should improve with future releases and may well be fixed by the time this article is published.

There also is a daemon that must be running for Zimbra Desktop to start. If it is not running, you'll get an error message.

This daemon lives at `zimbra/zdesktop/zdesktop` and must be launched with a single `start` argument. The installer does



Figure 8. This error message would be more useful if there were a File menu in Zimbra Desktop, but there isn't.

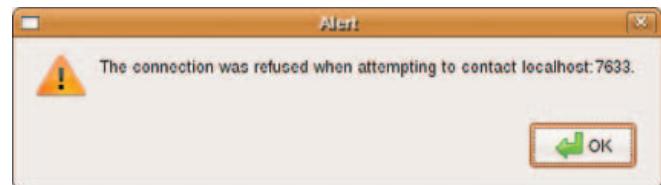


Figure 9. The `zdesktop` daemon must be running for Zimbra Desktop to work.

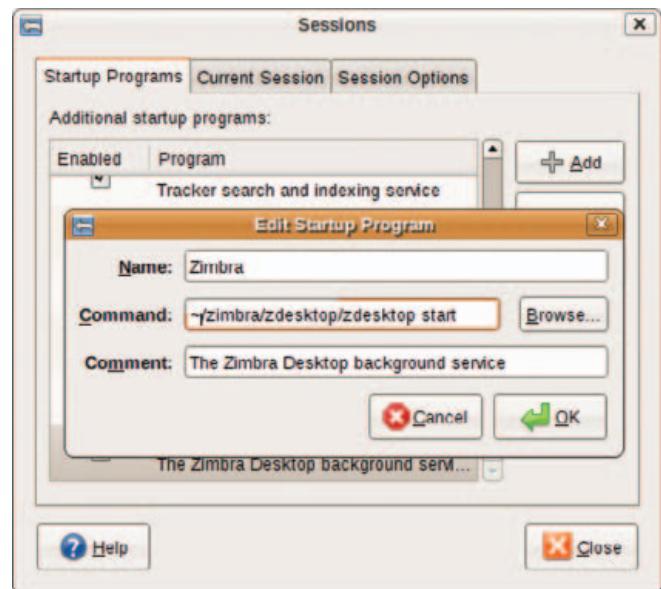


Figure 10. A simple startup entry ensures that `zdesktop` starts whenever I log in.

tell you about it, but it does not set it to start automatically, so in order to make sure it was always running when I was logged in, I created a Startup Program entry for it. This is a small annoyance, and one that hopefully will be automated in a future version of the installer.

One final thing to be aware of when using Zimbra Desktop with Gmail that I found is annoying is that if an e-mail does not have a label assigned to it and it is not in the Inbox, you won't be able to see it. So if you plan on using this with Gmail, label everything.

Conclusion

Will I be ditching other e-mail clients and switching over to using Zimbra Desktop full-time? In a word, no. Zimbra Desktop is a very nice e-mail client. It has the features I expect a modern client to have, it can handle multiple accounts easily, and everything is rolled up into a nice easy-to-install package. But being "just as good" as other e-mail clients is not enough.

Zimbra Collaboration Suite

The documentation for Zimbra Desktop states that you have to have a Zimbra Collaboration Suite (ZCS) to connect to. This is not technically true, as you can use Zimbra Desktop with Gmail, Yahoo mail or any POP or IMAP server without a ZCS in sight. However, the integration with Zimbra server is, naturally, very strong, so if you run your own e-mail server, the ZCS + Zimbra Desktop combination is very compelling.

One of the main benefits of running ZCS as your e-mail server is that the installation is easy when you compare it to setting up your typical SMTP + IMAP +

to make me switch. Even the coolness of Zimlets is not enough.

The integration of Zimbra Desktop with the Zimbra Collaboration Suite is, naturally, very good, and if I were using ZCS as my primary mail server, the choice to use Zimbra Desktop would be obvious. I would. And, that is, I suppose, my final recommendation. If you are using ZCS, Zimbra Desktop lets you access your messages, contacts and calendars even when you're off-line (that's the promise, anyway), and you can use it for all of your other e-mail accounts too.

Even if you do not use ZCS, you still might want to give it a try. The download and install process is easy, and you'll be up and running quickly. I think you'll find, as I did, that alternatives, such as Evolution, Thunderbird or Gmail work equally as well, and that there is no compelling reason to move away from what you are already using—in which case, there is a nice uninstaller.

But, then again, maybe you'll love it and never want to use a traditional e-mail client again. ■

Daniel Bartholomew lives with his wife and children in North Carolina.

ClamAV + LDAP server installation.

ZCS comes in both a commercial Network edition and an open-source Community edition. Both have excellent documentation, which is great help in getting it up and running.

More information on the Network edition is available at www.zimbra.com/products. And, more information on the Community edition is available at www.zimbra.com/community.

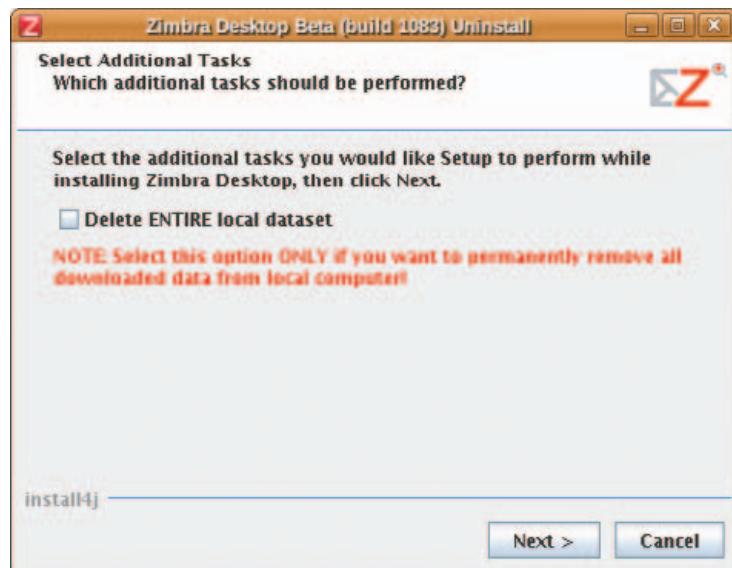


Figure 11. If Zimbra Desktop is not for you, there is a handy uninstaller located in the zimbra folder.

TECH TIP Tagging Command History for Rapid Recall

When you are hunting for a configuration problem with services like Apache and MySQL, you may have to execute a sequence of commands repeatedly, such as:

```
/etc/init.d/apache stop
/etc/init.d/mysql stop
/etc/init.d/mysql start
/etc/init.d/apache start
```

You can create a script to do this, or you can put all the commands on one line separated by semicolons:

```
/etc/init.d/apache stop; /etc/init.d/mysql stop; \
/etc/init.d/mysql start; /etc/init.d/apache start
```

However, as you do other things, you sometimes lose "quick" access to the command line in the shell history. To avoid this, "tag" the line with a comment that will make it easy to find:

```
/etc/init.d/apache stop; /etc/init.d/mysql stop; \
/etc/init.d/mysql start; /etc/init.d/apache start; #apmy
```

Now, to recall the command, simply do Ctrl-R + apmy, and you should have the command, as long as you've chosen your "tags" wisely.

—CARLOS PANTELIDES

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HARDWARE

The COWON iAudio 7

A Flash-drive, mini-portable media player that plays nice with Linux. PHILIP RAYMOND

I was on the prowl for a new portable media player. I wasn't happy with just a music player though. I wanted something that would play videos, FM radio, show pictures, display text, record my voice, record old LPs via a line-in jack, record FM radio *and* play music—not just MP3s, but Ogg, FLAC and (yuck) my few WMAs. Finally, it would be great if it sounded better than, and had double the battery life per charge of, an iPod Nano. And, I found it, the COWON iAudio 7. This Swiss-Army knife of multimedia players comes in 4GB, 8GB and 16GB varieties of Flash drives that cost \$150, \$200 and \$300 retail, respectively, but you easily can find one for less at most on-line retailers that sell this player. Best of all, this player is very Linux-friendly.

Its default setting is for use as a UMS device out of the box. That means you can move your media in and out of this player easily by dragging and dropping to and (unlike many other players) from this device. You don't need to install any software to do this, just turn it on, plug it in to any of your computer's USB ports, and within seconds, it mounts as an external drive. You will see an icon pop up on your desktop when it mounts. Open it, and navigate to whatever folder you wish to move

Its default setting is for use as a UMS device out of the box. This means you can move your media in and out of this player easily by dragging and dropping to and (unlike many other players) from this device.

files to and from, and when you're done, simply right-click and unmount it.

Videos do require re-encoding prior to loading them for playback on the iAudio 7, and there is an open-source Linux solution for this purpose. This is necessary, due to the small size of the



Figure 1. COWON iAudio 7

iAudio 7. Smaller than a credit card, it's about the same size as a large pack of gum. The screen measures 1.3", 160 x 128 dot and is a 260,000 color TFT LCD. Small as this screen is, it has good detail and color saturation. This makes it relatively enjoyable to view a TV show or even a movie. An hour of

encoded in xvid-.avi at 256–384kbps, at no more than 15fps. I provide a step-by-step rundown on how to re-encode later in this article.

The iAudio 7's best feature is its sound quality. It puts most other players to shame. The earbuds COWON packs with this player are of average quality. To really appreciate the sound quality this player puts out, you need to buy better earphones, like the Shure e2cs I own or any other \$100+ brand of your choice. Another way to hear this player's outstanding audio quality is to plug it in to your car's radio, if it's equipped with an MP3 player (line-in) jack, like many newer models now have.

Its equalizer is called Jet Audio, which is a software branch of COWON. This little player has the most elaborate choices for equalization I ever have seen on any player. If you can't find a setting you like listening to, you might want to consider buying a hearing aid instead—it's that good.

Controlling the iAudio 7 is done

video after re-encoding is about 178MB, so it's possible to carry quite a few TV shows or movies in this player and still have room for your music library too. If you think you'll be carrying a lot of videos, you might want to opt for the 16GB version. Videos need to be

with a touch interface to the right of the screen. It's called a swing-bar, and it's fairly easy to learn how to use, but it can be a bit difficult getting used to the touch sensitivity. You can make it better by going to Settings→General and changing the touch sensitivity to low. Fortunately, it does have a lock switch, so when it's locked, you can run it in your pocket without fearing it will switch to something you don't want to hear. To use the swing-bar, simply stroke the bar up or down, or hold your finger down at one end or the other to scroll through the menu. Tapping either end of the bar tells it to skip to the next file. The play arrow opens any file or function, whether it's music, video, radio station and so on. You can shuttle forward or reverse with videos or music, using the swing bar. This is useful if you recorded a TV show off-air with commercials or if you just want to shuttle over a segment of video. If the shuttle speed is too slow for your liking, you can make it faster by going to Settings→General and increasing the scan speed.

There also are three control buttons on the top of the player. The left button is power on/off/hold. The center button is the master menu control, which switches between all folders and playlists. The right buttons are for volume up and down. On the left side are the earphone and line-in jacks, and on the right side is the USB port, with a sturdy rubber flap covering it.

Speaking of playlists, you may be thinking that because you would be using it in UMS mode, you wouldn't be able to save custom mixes of your favorite songs. You would be wrong. The iAudio 7 has a feature called DPL, for Dynamic Playlist. To use this feature, simply hold the play button while playing a song until you see a small box that has a choice of DPL, Bookmark or Lyrics. Choose DPL, and it saves that song to the DPL folder. You can arrange the songs in that folder in any order you like, up to 200 songs. Just remember, the last song added always ends up at the bottom of the list.

You also can create subfolders on your computer for DPL, if you want to have special mixes of songs. Simply load the mix folder to the Music folder on the player. Then, on the player's main menu, click on Music, navigate to that

folder, hold down the play button, and choose DPL on the drop-down menu. To get to the DPL folder, simply navigate to the Music folder on the main menu (using the top-center button), scroll down and click on Dynamic Playlist.

I'm sure you're curious about those other choices that appear in the menu box. Bookmark simply bookmarks your song or video where you paused it, if you want to navigate away to another song or folder. Lyrics displays the lyrics to the song you are playing. (This works only for songs that have this feature.)

The line-in, voice and FM recording features also are a nice touch, and they do make quality recordings. I did find it odd that with the support for Ogg, FLAC and Xvid open-source files for playback on this player, it records only line-in, voice and FM radio in unprotected WMA with a limit of 128kbps. In spite of this, the recordings sound surprisingly good, thanks to the Jet Audio equalizer. Voice recordings are done through a built-in mic, which sounds fine on the higher bit-rate settings. Line-in recording is one of those functions I feel all media players should offer. Maybe it's because it appeals to those like myself, who are old enough to have a large collection of music on vinyl LPs. In any case, you can digitize all your old vinyl records by recording directly into the iAudio 7 from your analog stereo amp. Simply connect your amp using standard RCA A/V

plugs connected to an RCA-to-mini-plug conversion jack, and connect the mini-plug end to the line-in jack on the iAudio 7. If you want to burn a CD of the music you digitized, simply drag the songs out of the player and on to your computer for burning.

The FM radio has good signal pick-up and can be used in several ways. You can scan for stations manually if you want, but it's easier to auto-scan all the stations it can pick up in your area and then assign presets for the stations you like. As for recording FM radio, you can do it on the fly, or you can use the timer settings in the Settings menu and preset a time to record a station—like a TiVo for radio. This same timer also can be used to lull you to sleep with your stored music or to wake you up with the FM radio—like a clock radio.

The picture and text display functions are pretty straightforward. Both can be displayed separately as your music plays. To load text or pictures, simply drag and drop into the appropriate folder, just like all other content stored on the player. Pictures are resized automatically as they load. They also can be used as wallpaper for your screen, or you can hold down the play button while the picture is displayed to add it to a slideshow of your own creation.

Video Encoding Tutorial

I know video encoding is a bit of a pain for some of you, but the pay-off is in the quality of the video on a

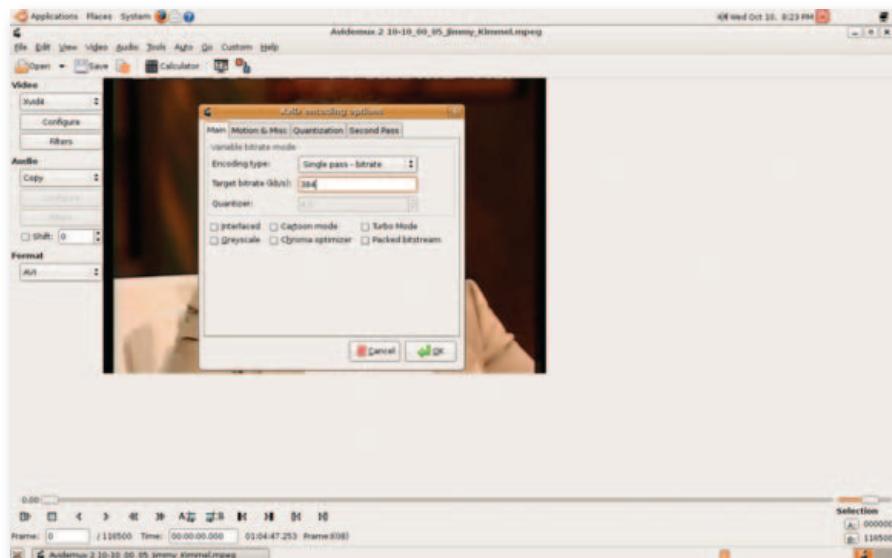


Figure 2. Setting the Bit Rate

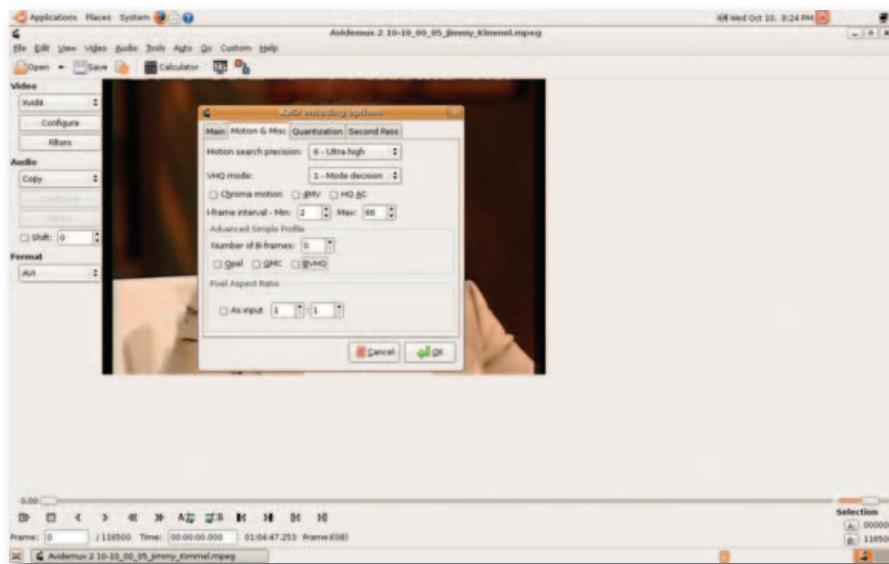


Figure 3. Motion & Misc Settings

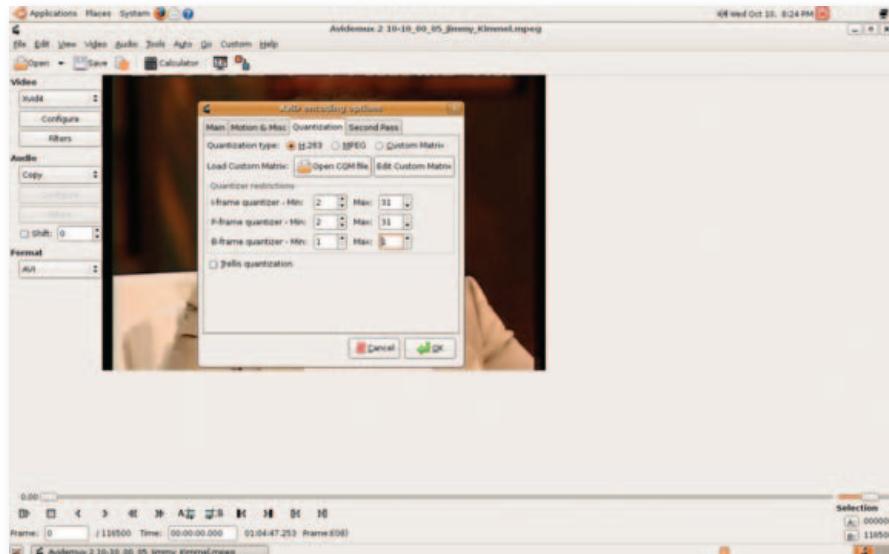


Figure 4. Quantization Settings

player this small and portable. You may want to watch video on a player this small on a camping trip or commuting on a crowded train or plane.

In any case, you can digitize all your old vinyl records by recording directly into the iAudio 7 from your analog stereo amp.

For me, it beats lugging around a laptop just to watch a video. I get most of my videos by recording off a cable box at home using Freevo

or by downloading a video podcast using Rhythmbox (yes, Rhythmbox can catch video podcasts, it just can't play them).

Encoding is a two-step process that begins by using Avidemux. Avidemux is great for converting most video codecs, and it works

very well for what we're doing here too. The second step involves taking the finished video conversion to Xvid AVI using Avidemux and reprocessing it, using a tool called i7remux 0.1. This is necessary, because the iAudio 7 will play only videos made with I frames; b frames are removed by Avidemux. i7remux is a free, open-source converter made just for the iAudio 7 (see Resources for the download link).

Compiling and installation after extracting from a zip file are easy. Simply open a terminal, and type `./configure`, `make`, then `sudo make install`. i7remux rearranges the internal structure of a given AVI file and rebuilds the indices. Once i7remux does this, and it does it much faster than the first encoding using Avidemux, the video is ready to be loaded into the player. It doesn't take as much time as it may seem, a one-hour show takes about 30 minutes to encode using these two processes.

First, in Avidemux, open the video file you want to encode. If it's a TV show recorded with a capture card, it will be an MPEG-2 file. Avidemux runs an indexing for the video before it's loaded for the next step. Many video podcasts, however, are m4v files and h264 codec. Avidemux will pop up a dialog box that says it has detected h264 and will use another mode to bypass B frame referencing. You don't need to use this alternate mode that loses frame accuracy, because you will be getting rid of the B frames later anyway, so choose Cancel to keep the frame accuracy.

Next, choose Xvid4 for conversion, select the Configure box, and on the Main tab, choose single pass bit rate, and change the default bit rate to 384 (Figure 2).

Next, choose the Motion & Misc tab, and uncheck all the boxes. Change the I frame interval to min 2, max 66 (the maximum interleaving time), and reduce the default amount of B frames to 0 (Figure 3).

Then, under the Quantization tab, reduce the B frame quantizer to 1 for both min and max (the lowest setting). Then, click OK, and go to the Filters box (Figure 4).

Choose MPlayer Resize, and pro-

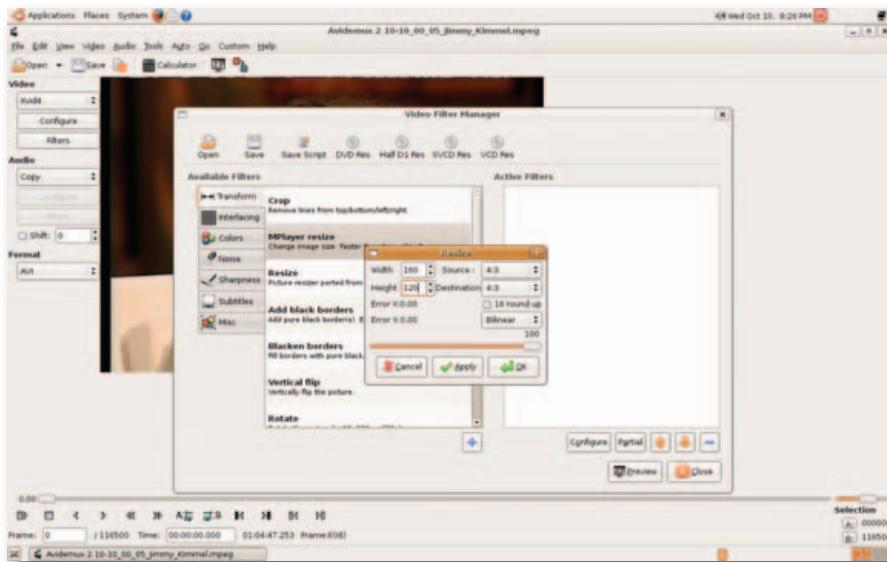


Figure 5. MPlayer Resize

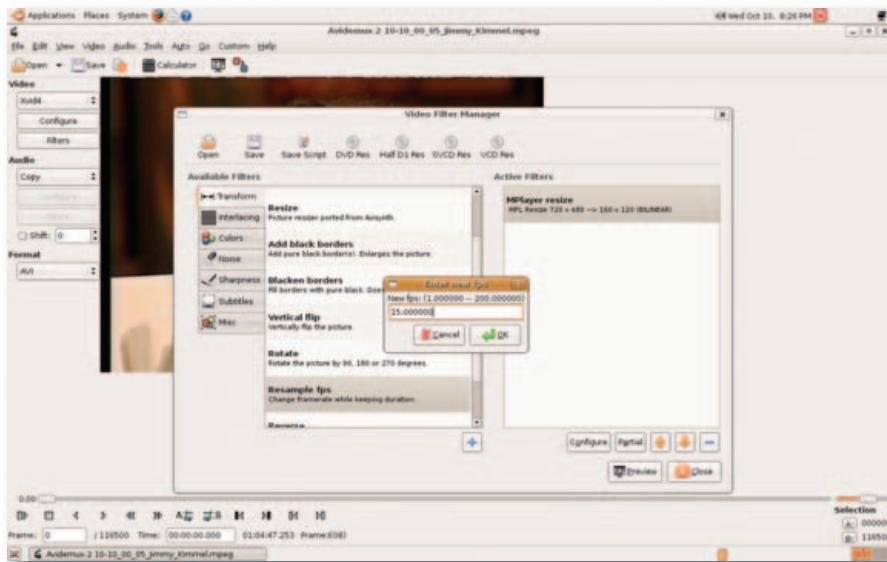


Figure 6. Resample FPS

gram 4:3 for source and destination, and program width 160, height 120, and click OK. Do not click Apply. For some reason, Apply doesn't seem to function; I think it's a bug in Avidemux.

i7remux rearranges the internal structure of a given AVI file and rebuilds the indices.

Also, if you have a video recorded in 16:9 ratio, simply change the source setting to 16:9, and program a width of 160 and a height of 90. That way, the images will not be distorted

(Figure 5).

Next, choose Resample FPS, enter 15.000000, and choose no linear blend (Figure 6).

For audio, choose Lame for MP3

encoding, and click Configure. The default settings should be 128kbps CBR 2 channel stereo, and if they are, don't change them. Then, under Filters, choose Resample, and set it to

44100Hz. Finally, save your project to whatever folder you want, and be sure to give it a name ending with .avi. Click OK, and Avidemux now will convert your video to xvid4. When it's done, close Avidemux, and move on to the next step.

Now, you're ready to use i7remux to finish encoding your video. This is a command-line program, so open a terminal and simply type i7remux (no need for sudo), then copy and paste the name of your video from the video created by Avidemux. Next, copy and paste again, only this time change the filename of the video by adding a random letter or number to it, then press Enter. If you don't add a letter or number, it won't let you encode. i7remux then creates the video you will load to the player when it's done; this should take about 10–20 seconds. i7remux sends it to the same folder to which Avidemux sent your video.

Next, plug in the player to any USB port, and click and drag the video you created with i7remux to the Movie folder in the player. When you navigate to Videos in the player's main menu, you should see your video. Simply highlight it, and touch the play button. You might hear only audio for a few seconds before the video shows up in the screen. If this bothers you, pause the video and start it again.

Firmware Updates

Firmware updates for the iAudio7 are available from the support link at cowonamerica.com. To install one, download it to your desktop and extract it. Plug in the player to a USB port, and drag the firmware to the Root folder of the player. Then, unmount the player, and it will power off. Turn it back on, and it begins to install the firmware update. When it's done, after about 20 seconds, it turns itself off. When you power it back up, you should see the new firmware installed, indicated by the new version number on the boot splash. Firmware updates are a good idea, as the player always is being tweaked by COWON with improvements. However, a firmware update deletes all content on the player prior to the update. So, be sure to have a backup of your content on your computer or an external

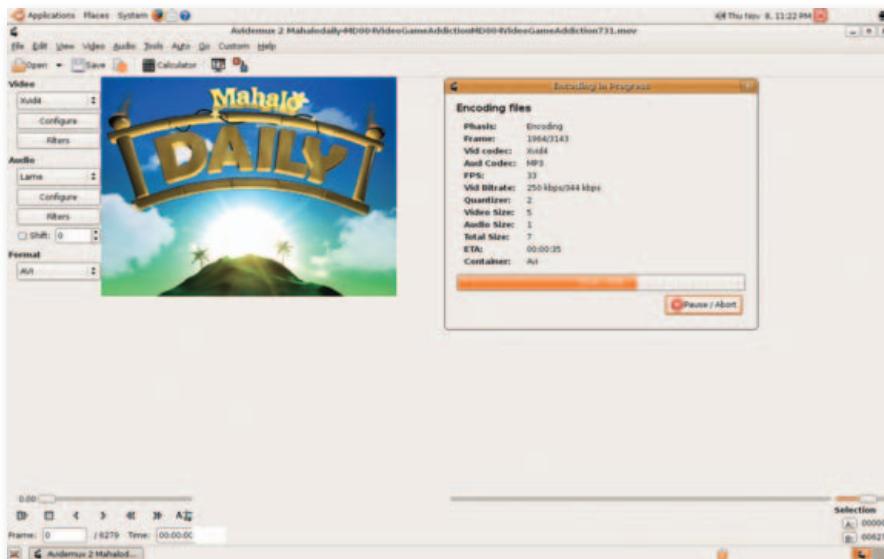


Figure 7. Avidemux Encoding

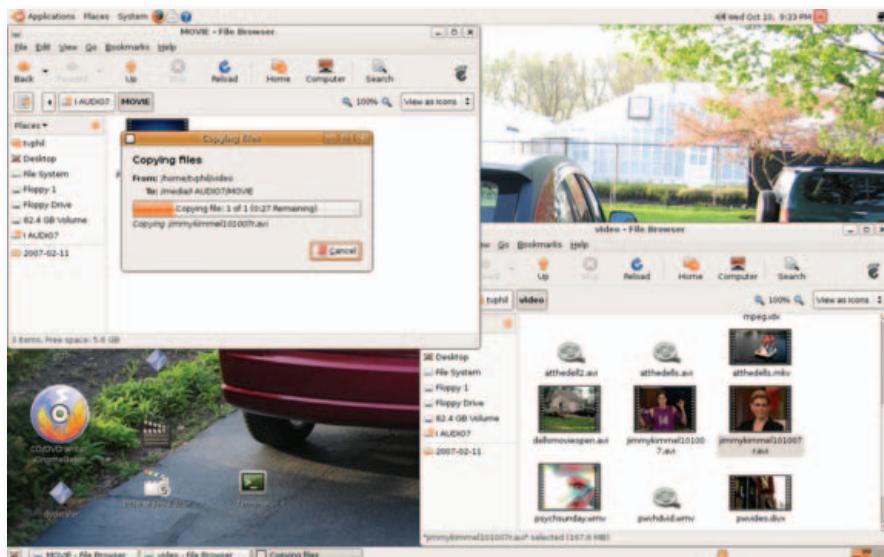


Figure 8. File Copying

drive before updating. If you don't think the update is worth the hassle, just don't do it, the player still will run fine.

Conclusion

This, obviously, isn't the only multimedia player that functions with Linux. In fact, COWON's D2 player is a good choice if you want a larger 2.5" screen, but it's also a larger player, so there's a size trade-off. Another player worth considering is the iriver clix, which now can be used as a UMS device, unlike last year's model, so it too can function on Linux. The reason I chose to buy the iAudio 7

is that it had the most bang for the buck, and it slips into my pocket very easily. I have the 8GB version, but the 4GB and 16GB versions give everyone a wide range of choice for personal storage needs, and they're all priced

competitively. Not to mention, a 16GB Flash drive player of any sort is rare, though more are coming in the near future. It also gives me some peace of mind, using a player that supports open-source codecs. The best part is not having any DRM restrictions on how I can use the player for my own personal use.

I mentioned my desire to have longer battery life at the start of this article. COWON claims its internal lithium-ion battery will last up to 60 hours on one charge. This claim is based on using it almost exclusively for music playback. Video playback will knock this claim down to about 40 hours per charge. Regardless of how you use it, it's a superior amount of battery power when compared to the competition. It also accounts for why the iAudio 7 is about three times thicker than an iPod Nano, but that's a trade-off I don't mind making. It's still relatively thin, as I measured it to be only .75" thick. The COWON iAudio 7 is a mini-marvel of a media player that also lets you cast your vote in supporting products that function in an open-source environment, and that environment just got more inviting with this player. ■

Philip Raymond has been using several Linux distros during the last four years. He has worked professionally as a Broadcast Technician for 34 years, the last 23 at WFLD-Fox Television in Chicago. He also is the Webmaster and co-creator of thepulsechicago.homestead.com, a Web site focused on the Chicago music scene, past and present. He can be contacted at tvphil@yahoo.com.

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Resources

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i7remux-0.1 Download: www.powerwebvideo.homestead.com/files/i7remux-0.1.zip



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can we keep him?”*

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2008 Readers' Choice



**LINUX
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Readers' Choice Awards 2008

THE READERS' CHOICE AWARDS TAKE THE CURRENT PULSE OF THE LINUX COMMUNITY. HERE ARE THE TOOLS YOU USE EVERY DAY IN YOUR WORK AND PLAY.

Back in January and February, we surveyed you, our readers, to find out what Linux-based products, tools and services you prefer these days. More than 5,900 of you completed the survey, and your favorites are the worthy recipients of the 2008 Readers' Choice Awards. Although some results are predictable, many are certain to both interest and surprise you.

In this year's competition, we designated only one winner per category, with strong contenders receiving honorable mention awards. For instance, in the categories where a cluster of formidable contenders followed the outright winner, we designated up to three honorable mentions. However, if one product

clearly dominated a category (for example, OpenOffice.org with 85% in Favorite Office Program or Apache with 92% in Favorite Web Server), and the contenders were barely on the radar, there were no honorable mentions.

The developers among you will want us to weigh in on how we dealt with languages. We created two categories: Favorite Programming Language and Favorite Scripting Language. See Technical Editor Michael Baxter's reasoning in the sidebar, as well as the category contents and winners. Please let us know what you think of our approach.

And now, without further ado, we present the 2008 *Linux Journal* Readers' Choice Awards.

James Gray

**FAVORITE PRIMARY
LINUX DISTRIBUTION
OF CHOICE****Ubuntu** (37.4%)

Honorable Mentions

Mandriva (13.9%)**Fedora** (11.1%)

In the last *LJ* Readers' Choice awards, many readers were "shocked" and "flabbergasted" that the upstart Ubuntu handily took the crown for favorite distribution. This year, however, there is little surprise that Ubuntu has won again, garnering nearly triple the votes of its most able challenger, Mandriva—supposedly the forgotten distro? Clearly Ubuntu has morphed from the "little distro that could" to the "big distro that did". How would the results differ if we asked for your favorite distribution for servers?

**FAVORITE DESKTOP
ENVIRONMENT****GNOME** (45.7%)

Honorable Mention

KDE (42.5%)

Clearly independent decision making is in ample supply in our community, because (despite Nick Petreley's anti-GNOME rants over the years) GNOME is your Favorite Desktop Environment. GNOME barely edged out its also-popular desktop rival, KDE. The result makes sense given that the GNOME-defaulting Ubuntu trounces all other distributions. However, the fact that GNOME won by just a few percentage points perhaps means that many of you use Ubuntu's sister distribution, the KDE-based Kubuntu?

**FAVORITE WEB BROWSER****Firefox** (86%)

Given our readers' extreme penchant for tinkering, it's no surprise that we love Firefox and its ever-growing treasure trove of extensions [see "Must-Have Firefox Extensions", page 80]. Firefox wins Favorite Web Browser with 86% of your votes. But where, oh where, have the very capable Opera and Konqueror gone? Fewer than 5% of you named them your favorite browser. Honorable mention for most creative response in this category goes to "All I know is that IE7 is worse than dreadful."

**FAVORITE E-MAIL CLIENT****Mozilla Thunderbird** (44.9%)

Honorable Mentions

Gmail Web Client (19.7%)**Evolution** (13.4%)**KMail** (10.1%)

Although Mozilla Thunderbird did not vanquish its opponents as decidedly as its sibling Firefox did in the browser category, it had more than twice the support of its nearest rival, the Gmail Web Client, to win Favorite E-Mail Client. We were a bit surprised to see that only about 7% of you are still using text-based e-mail clients, such as Alpine (formerly Pine) and Mutt.





FAVORITE OFFICE PROGRAM

OpenOffice.org (85.1%)

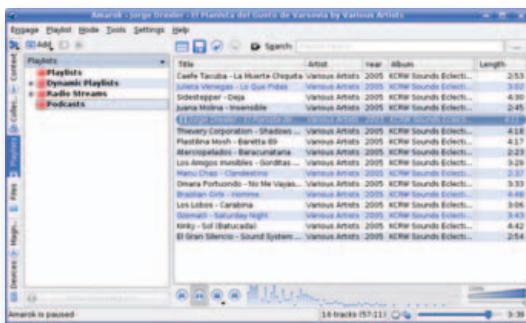
OpenOffice.org garnered a whopping 85% of the votes to win Favorite Office Program, while competitors AbiWord and KOffice squeaked in a barely perceptible 3% each. Nor did EOffice, a program that has received much praise

in our pages in the past, register more than a few votes. OpenOffice.org has become the de facto default office suite for Linux.

FAVORITE AUDIO TOOL

Amarok (40.5%) Honorable Mentions XMMS (18.1%) Audacity (12.3%) Rhythmbox (11.9%)

Perhaps the most feature-rich audio player on any platform, Amarok has won most of your hearts and minds for Favorite Audio Tool. Meanwhile, the applications XMMS, Audacity and Rhythmbox each have their loyal constituencies of a bit lesser but similar size, making each worthy of an honorable mention.



FAVORITE MEDIA PLAYER

MPlayer (34.6%) Honorable Mention VLC (27.4%)

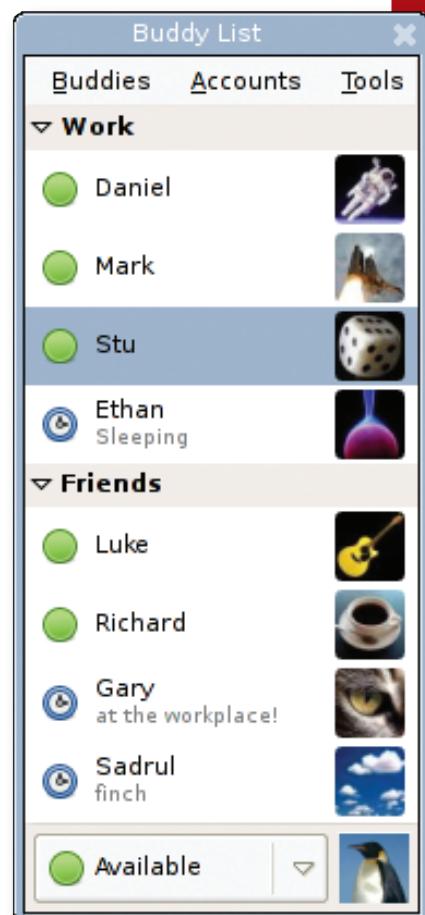
This close race in the Favorite Media Player category may be as much a testament to MPlayer's legacy to thankful Linux users everywhere as a vote for excellence. When playing nonfree media content was still a problem for Linux users, MPlayer was there, leveling the field and making sure we could play anything our Windows-using friends were playing and then some. VLC, a close second, is growing in popularity for its friendly interface and equally adroit ability to play pretty much any format you can throw at it.



FAVORITE COMMUNICATIONS TOOL

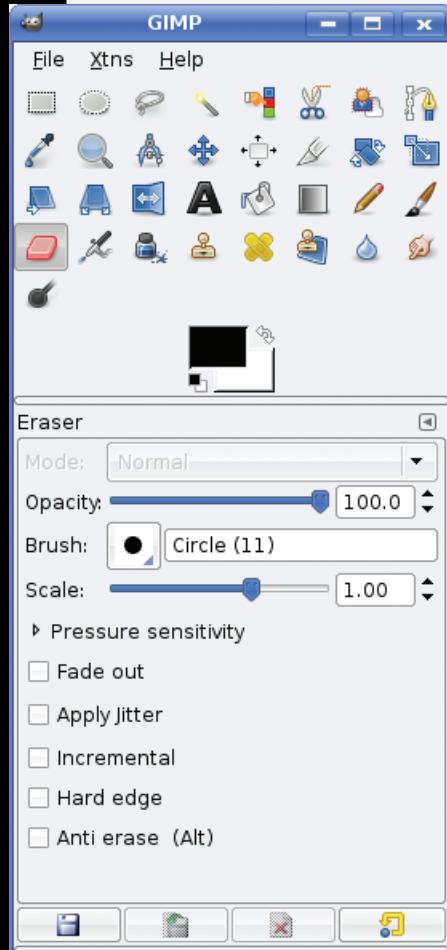
Pidgin (42%) Honorable Mentions Skype (17.8%) Kopete (12.8%)

Pidgin, the messaging tool formerly known as Gaim, readily handled all of its competitors, garnering 42% of your votes. Pidgin users appreciate the ability to monitor all of their messaging accounts using one tool. Currently 15 protocols are available, including AIM, Google Talk, Novell GroupWise, ICQ, MySpaceIM, Yahoo and others. Despite Skype's popularity, it remains in Pidgin's long shadow—maybe because its closed-source credentials tug at our consciences?

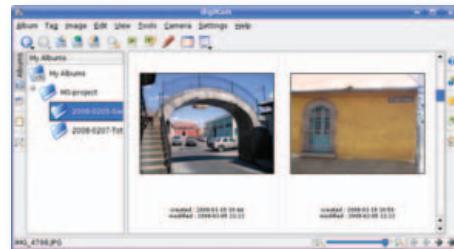


FAVORITE GRAPHICS/DESIGN TOOL**The GIMP** (76.4%)

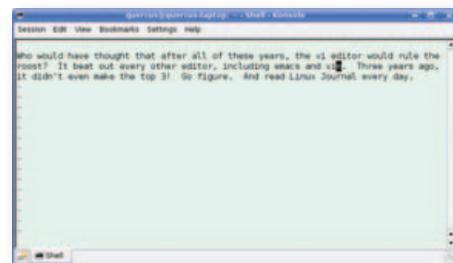
If anything qualifies as a legendary piece of Linux software, then The GIMP certainly has earned that mantle. Winning 76.4% of the votes, The GIMP wins for Favorite Graphics/Design Tool. As for the others? "Ouch!" is the collective cry from the other graphics applications, such as Inkscape, Scribus and Blender, each of which reached percentages only in the single digits. Notable for its absence is the increasingly impressive KDE graphics tool, Krita.

**FAVORITE DIGITAL PHOTO MANAGEMENT TOOL****digiKam** (24.9%)*Honorable Mention***Picasa** (24.5%)

digiKam, at 24.9%, edged out its image-organizer rival Picasa from Google by a mere 13 votes. Picasa's excellent functionality is powerful enough to make up for its deficits—its non-FOSS status and Wine-based emulation. Like its e-mail cousin Gmail, Picasa is an interesting choice given that it is not a Linux application, per se. Gmail exists only in Google's cloud, and Picasa is—gasp!—a Windows application.

**FAVORITE TEXT EDITOR****vi** (35.3%)*Honorable Mention***gedit** (15%)

Who would have thought that after all these years, the vi editor would rule the roost? It beat out every other editor, including Emacs and vim. Three years ago, it didn't even make the top three! Go figure. It is interesting to note that Emacs, KWrite and Kate all scored about evenly, clustering around the 10% mark.

**FAVORITE LINUX GAME****Frozen Bubble** (19.2%)*Honorable Mentions***Doom** (12.3%)**Tux Racer** (11.7%)

It is beginning to seem that no game will ever knock *Frozen Bubble* from its lofty perch as Favorite Linux Game. Not only does *Frozen Bubble* lure you in with its pure simplicity, but also those penguins are just too darn cute! *Doom* and *Tux Racer*, which won honorable mentions, are two more of your favorites.



FAVORITE VIRTUALIZATION SOLUTION

VMware (38.7%)

Honorable Mention

VirtualBox (20.4%)

Given VMware's meteoric rise during the past few years, it's no surprise to see it win the gold for Favorite Virtualization Solution. More surprising is VirtualBox's showing, the application that a fellow publication called "The best virtualization program you've never heard of" in late 2007. VirtualBox's patron, innotek of Germany, was acquired by Sun Microsystems earlier this year, giving VirtualBox the marketing injection it needed to match its technical prowess. Wine and Xen fared decently in this category too.



FAVORITE BACKUP SYSTEM

Simple Linux Backup (25.5%)

Honorable Mentions

Amanda (16.1%)

Bacula (16.1%)

In this year's competition, we differentiated between comprehensive applications, or systems, and specific utilities. Regarding the Favorite Backup System category, most of you prefer the no-frills, low-budget approach over corporate solutions—that is, the application Simple Linux Backup. The open-source applications—Amanda, with the Zmanda interface for server backup, and Bacula, for network-based backup—also got many of your votes. Backup also is the category in which the most readers roll their own script-based solutions.

FAVORITE BACKUP UTILITY

tar (35.4%)

Honorable Mentions

rsync (22.4%)

k3b (15.1%)

For Favorite Backup Utility, the perpetual winner is the workhorse tar, tallying 35.4% of the vote. Enough of you love rsync and the CD/DVD-authoring application k3b to warrant honorable mentions.

FAVORITE DATABASE

MySQL (62.7%)

MySQL is not only the world's most popular open-source database, it's your favorite as well. Although PostgreSQL, SQLite, Firebird and others registered votes, the competition was not fierce. It doesn't hurt that MySQL runs on more than 20 different platforms.



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FAVORITE PROGRAMMING LANGUAGE

C (26%)

Honorable Mentions

C++ (25.7%)

Java (22.9%)

'Twas the battle of the Cs in the Favorite Programming Language category, with C taking first prize, C++ landing in second and Java in the third spot. Don't see your own wildly favorite language here? You wouldn't believe the number of "WTFs" we got when readers didn't find Python, Ruby or other languages here but rather in the scripting language category. Check out that category's results, as well as Michael Baxter's explanation in the sidebar for how we differentiated between programming and scripting languages. (No doubt we'll see you in the on-line comments section too!)

Programming Languages and Scripting Languages

We received a lot of feedback about our on-line survey of favorite languages. A particular point from this feedback has been why some languages were called scripting languages, and others not. A criterion was used to decide this, as will be explained. A plethora of issues was raised in the responses we received, so highlighting some of the issues will contextualize how the criteria emerged for this survey.

One simple way of distinguishing computer programming languages is whether they are compiled or interpreted, which several *Linux Journal* readers pointed out. However, even that is an issue. Java is considered as a general-purpose programming language, but nominally the runtime environment is a Java Virtual Machine. This is very similar to a variety of scripting languages actually, including Emacs Lisp. However, Java also can be compiled to native machine code. So, for the interpreted versus compiled issue, one might ask, "What kind of compiled?"

A scripting language could generally be a language that is hosted by another environment. In other words, it's "running on top of something", whether that be a byte-code interpreter or, in the case of embedded application use, as an adjunct to another software application. One also might ask whether the breadth and representative power are obtained by libraries, or because of built-ins to the language?

Scripting languages also can have object features and work at a higher level, or work more like a dynamic language, such as Lisp, which does manifest typing. AWK and Python or Perl are arguably scripting languages, but they are quite different in their utility. One might think of AWK as slightly easier to use than bash, with the particularly nice facet of associative

arrays. But, Python or Perl (via strong libraries) are much more powerful, and they are glued to numerous layers in the complete FLOSS stack. So, the "grain size" of a scripting language tends to matter as to its utility.

One of the scripting languages that was omitted in the original survey was Tcl, and this was a mistake. Tcl is very popular, especially in certain application domains, such as CAD tools, where it is a de facto scripting language. Similarly, upon further reflection, it might be argued that the general-purpose programming language BASIC that is most in use today is not really a later variant of Kemeney and Kurtz' 1964 original, but rather Visual BASIC, arguably a scripting language. However, that language generally does not run well on Linux, and efforts to bring this particular language to Linux have provoked some controversy.

Based on comparative technical criteria, one could make the case that Java is a scripting language. Its runtime implementation is strikingly similar to Python, though there are clearly very divergent language syntax and semantics in both: Python is much less strongly typed. The problem is that Java users really don't use it as a scripting language, and its promoters don't promote it that way either. It's much more ubiquitous in any of its roles, such as middleware, for complete applications, or as a standalone embedded platform. So, a leading clue is that what defines a "scripting language" is not necessarily decided along strictly technical lines.

Perhaps the motivating factor behind what determines whether a language is a scripting language or programming language is ultimately how a critical mass of users tend to use it. Other factors include how it's promoted, whether it's standardized, how the user community is responded to with

emergent problems or technical issues, and how the primary maintainers allow the language to "evolve" where necessary. A really good way to see this is to compare the number of technical book titles on computer languages and associated libraries or environments in a modest bookstore.

Finally, it was this "tendency of use" that was the primary litmus test to assert which language was selected as a programming language versus as a scripting language. Some respondents have rightly pointed out that this was relatively "arbitrary", and that there were numerous dissonances along the axis of "compiled" versus "interpreted". They are right. This arbitrariness is borne out, in fact, by the usage patterns seen; the mass of users themselves really have decided the use models. Practical and reasonable

programmers, in fact, do disagree on such distinctions.

Such divides cut across much more than compiled or not. A larger divide would appear to be strongly typed versus dynamic languages. Another would be functional versus imperative. One divide that seems to be waning is whether object-oriented is good; we generally seem to believe that it is. Despite this general consensus, C is not going away any time soon. C is viewed as the most portable high-level "assembly language" there is.

I think a conundrum about languages is benign, and actually good news, because it reflects the diversity of choice and utility. If the absolute ultimate runtime performance is not relevant to a programming problem, modern scripting languages are a strong play. One can get

more done with fewer lines of code, if compared with starting a program in the C language. Most are easier to learn and use than, say, C++. This may well be a legacy of highly evolved computer technology. If you believe that "premature optimization is the root of all evil", perhaps using a "standard" programming language is one kind of premature optimization. A lot of careful thinking has gone into certain scripting languages, and very strong compilation software is available to host these languages. But, these advances in computer science also derive benefit from late-modern hardware technology. Machines today are so fast that it really is possible to use scripting languages as general-purpose programming languages for nearly any purpose on a wide variety of applications.

—Michael Baxter, Technical Editor,
Linux Journal

» Weigh in on the debate in our on-line forum: www.linuxjournal.com/forums/hot-topics/programming-languages-vs-scripting-languages.

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FAVORITE SCRIPTING LANGUAGE**Python** (28.9%)*Honorable Mentions***PHP** (21.7%)**bash** (19.8%)**Perl** (17%)

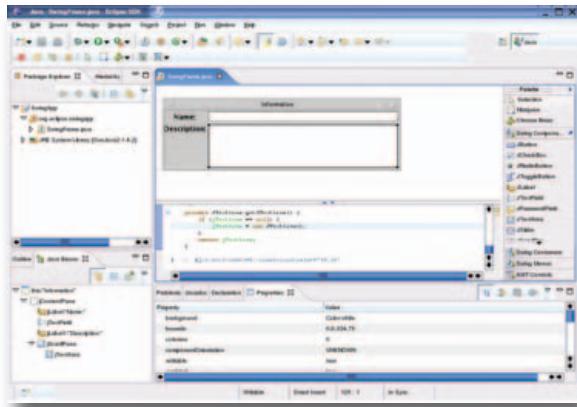
It's no surprise that Python grabbed top honors in the Favorite Scripting Language category, and that PHP, bash and Perl all deserve honorable mention for their strong showings.

FAVORITE SECURITY TOOL**SSH** (29.5%)*Honorable Mention***iptables** (19.4%)

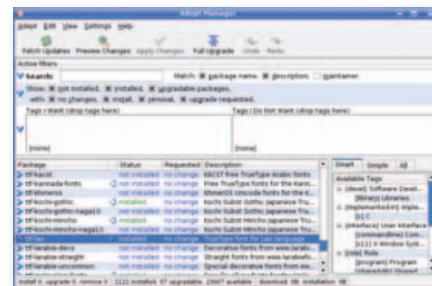
Just as it did in the last edition of this competition, the hyperversatile and hyperfavorite SSH wins this year in the Favorite Security Tool category with 29.5% of the votes. You also showed your love for the iptables tool for your packet-filtering tasks, which deserves an honorable mention for garnering 19.4% of the tally.

FAVORITE LINUX SOFTWARE DEVELOPMENT TOOL**Eclipse** (29%)

This year, Eclipse easily eclipsed all of its competitors to win Favorite Linux Software Development Tool. Although the rest of the votes were widely dispersed among many different tools—KDevelop, Emacs, GNU autoconf and NetBeans all registered significant vote counts.

**FAVORITE PACKAGE MANAGEMENT APPLICATION****Apt** (35.3%)*Honorable Mentions***RPM** (16.5%)**Yum** (14.9%)**Synaptic** (11.6%)

One of the main reasons so many of you love (K)Ubuntu so much is its sweet package management via Apt, this year's victor in the Favorite Package Management Application category. Apt won 35.3% of your votes. Many of you also cast your votes for the classic RPM (16.5%) and its useful friend Yum (14.9%). Meanwhile, a respectable number of you (11.6%) prefer the Synaptic front end on top of Apt to perform your package management tasks.

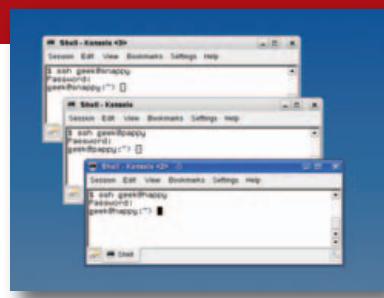
**FAVORITE LANGUAGE CONSTRUCTION TOOL****Flex** (18.1%)*Honorable Mentions***Bison** (14.7%)**javacc** (12.8%)

You know you're reading the right publication when a collective cheer rises up to celebrate the scanner-generator Flex winning a prize. Although Flex took top honors for Favorite Language Construction Tool with 18.1% of the votes, its yacc-compatible parser generator, Bison, tallied enough votes for an honorable mention (14.7%), as did the compiler-compiler for Java, javacc (12.8%). Although this category registered fewer votes than other categories, nearly 2,000 of you weighed in with your opinions.

FAVORITE SYSTEM ADMINISTRATION TOOL

OpenSSH (52.7%)

The depth of your love for OpenSSH is clear. Not only did you choose it for Favorite Security Tool (above), but you chose it as Favorite System Administration Tool as well. With 52.7% of your votes, it stands head and shoulders above its nearest competitors.



FAVORITE CONTENT MANAGEMENT SYSTEM

WordPress (23.8%)

Honorable Mentions

Drupal (21.4%)

Joomla! (18.9%)

Competition was tough for Favorite Content Management System, for you love your myriad options. Nevertheless, your favorite application in this category was the blog publisher WordPress (23.8%), which edged out the able Drupal (21.4%) and Joomla! (18.9%) to take the prize. It appears that the vast majority of you bloggers are gravitating toward WordPress, while the Webmasters are splitting into Drupal and Joomla! camps.



FAVORITE WEB SERVER

Apache (90.9%)

Rather than offer a Favorite Web Server category, we should just ask "Do you use the Apache Web server, yes or no?" and leave it at that. Apache wins with 90.9% of your votes.



FAVORITE LINUX-FRIENDLY WEB HOSTING COMPANY

GoDaddy.com (14.7%)

Honorable Mentions

1&1 (9.8%)

DreamHost (9.4%)

Rackspace (7.5%)

Given the variety of hosting companies available today, it's no surprise that none of them dominated the voting for Favorite Linux-Friendly Web Hosting Company. Although the winner, GoDaddy.com, garnered a respectable 14.7%, the real winner was "Other" with a whopping 42.4%. Nevertheless, hats off to GoDaddy.com for its rapid rise in popularity—it was absent from our last awards.

FAVORITE NETWORK OR SERVER APPLIANCE

Avocent Cyclades ACS Console Server (15.7%)

Honorable Mention

Guardian Digital Linux Lockbox (12.7%)

As with hosting, the voting for Favorite Network or Server Appliance category was diffuse due to the rabbit-like proliferation of useful products in the marketplace. The top vote-getter at 15.7% was the Avocent Cyclades ACS Console Server, and following up with honorable mention (at 12.7%) was the Guardian Digital Linux Lockbox.



**FAVORITE LINUX
HANDHELD DEVICE**

Nokia N800 (43.9%)
Honorable Mention
OpenMoko Neo (23.7%)

In case you hadn't noticed, many of us *Linux Journal* editors adore the Nokia N800. The N800 won the 2007 awards for Ultimate Linux Handheld, and its predecessor, the N770, would have won the 2006 Editors' Choice Award for Best Mobile Device, only we were afraid we never talked about anything else. Well, clearly our readers dig it too, because 43.9% of you chose it as your favorite handheld. Keep your eye on the newer OpenMoko Neo 1973, which burst on the scene and grabbed 23.7% of the vote.

**FAVORITE LINUX LAPTOP**

ASUS Eee PC (34.7%)
Honorable Mention
Lenovo T61p (20%)

Is there any surprise that the ASUS Eee PC got 34.7% of the vote to win the Favorite Linux Laptop category handily? Finally, a company created a laptop with Linux in mind and didn't consider Linux as a second-rate afterthought. It also is nice to see that our readers appreciate Lenovo's better-late-than-never but admirable effort to pre-install its T61p with SLED. This helped the device win honorable mention. Hopefully, awards like this will encourage Lenovo and others to pre-install all of their laptops with Linux from the start. If you accumulate the various models from our Linux-specialist friends like LinuxCertified, EmperorLinux and R Cubed, they fared well as a group too.

**WHO MAKES YOUR
FAVORITE LINUX
DESKTOP WORKSTATION?**

Dell (30%)
Honorable Mention
Hewlett-Packard (12%)

It wasn't surprising to see PC giant Dell win top choice in this category with 30% of the vote tally. Dell's product line has become more Linux-friendly over the years, which shows up clearly in your preferences. HP gets an Honorable Mention for its Linux offerings. There were lots of write-ins for various vendors in this category, but they were too diverse to merit a third place award. And, of course, many of you chose a home-brew solution as well.

**WHO MAKES
YOUR FAVORITE
LINUX SERVER?**

Dell (21%)
Honorable Mentions
IBM (14%)
Hewlett-Packard (12%)

The majority of voters in this category give their server business to the big vendors, such as Dell (winner of both the Favorite Desktop Workstation and Server categories), IBM, HP and Sun. Many readers also like to purchase from the smaller mom-and-pop shops—with too many write-ins to list here. And, as with the Favorite Desktop Workstation category, many readers prefer to build their own servers.

**FAVORITE GREEN LINUX
PRODUCT OR SOLUTION**

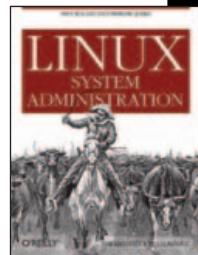
VMware (42.6%)
Honorable Mention
PowerTOP (16.3%)

Because virtualization is such a fabulous and popular way to improve the efficiency of your servers, VMware landed the top spot in the Favorite Green Linux Product or Solution category. The PowerTOP tool for finding energy wasters on your systems also is popular and won an honorable mention at 16.3%. Although many readers earnestly consider energy consumption and environmental impacts in their data-center strategy, we were surprised to see the high number of responses like "Hummer" and "I promote global warming". We wonder with concern, "How much good science is necessary to convince us of the seriousness of our environmental challenges?"

**FAVORITE LINUX BOOK
(REVISED OR RELEASED IN
OR AFTER JANUARY 2007)**

Linux System Administration
by Tom Adelstein and Bill Lubanovic (O'Reilly) (16%)
Honorable Mentions
Linux System Programming
by Robert Love (O'Reilly) (7.2%)
Official Ubuntu Book
by Benjamin Hill (Prentice Hall) (7%)
Practical Guide to Ubuntu Linux
by Mark G. Sobell (Prentice Hall) (6.6%)

There are so many great Linux books, how can one choose a favorite! Despite the amazing diversity, your clear winner for Favorite Linux Book is O'Reilly's *Linux System Administration* by Bill Lubanovic and *LJ* regular Tom Adelstein. Three other books clustered around the 6–7% mark, one from O'Reilly and two from Prentice Hall. Interestingly, several of you mentioned that you don't read "analog" printed books anymore, only digital materials.



FAVORITE LINUX JOURNAL COLUMN

Cooking with Linux by Marcel Gagné

(26.9%)

Honorable Mention

Work the Shell by Dave Taylor (15%)

Hack and / by Kyle Rankin (14.1%)

Looks like Marcel Gagné is going to have to be knocked off before anyone knocks him off the award stand for Favorite *Linux Journal* Column. Marcel's Cooking With Linux column, where Linux must be fun and one hand must remain free to fill the wineglass, has tickled and informed *Linux Journal* readers since its inception more than 100 issues ago. The ever-popular Dave Taylor also fared well (15%) for his Work the Shell column, and the upstart Hack and / from Kyle Rankin has become quite popular (14.1%) in its short life.



LINUX PRODUCT OF THE YEAR

ASUS Eee PC (37.3%)

Honorable Mention

One Laptop Per Child (17.9%)

We are pleased to present you with your very own *Linux Journal* Readers' Choice Product of the Year...drumroll please...the ASUS Eee PC! Once again, we congratulate ASUS for making a great Linux product from the ground up and not as an afterthought. The win is well deserved due to the pure excitement it has created in our community. And, it's created excitement here at *LJ* as well—see Jes Hall's review of the ASUS Eee PC at www.linuxjournal.com/article/9947, her "Hacking the Eee PC" at www.linuxjournal.com/article/10003 and Shawn Powers' video review at www.linuxjournal.com/node/1005898. See also "Eee PC Gets an Upgrade" on page 13 of this issue. We're also pleased to announce that the OLPC wins the Honorable Mention in this category; see Dave Phillips' "Sounding Out with the OLPC XO" on page 46 of this issue.



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Must-Have Firefox Extensions

A whirlwind tour through the powerful and diverse world of Firefox extensions.

DAN SAWYER

Plugins and extensions—they're what made Photoshop such a bonanza from the late 1980s onward, and they gave it the market push to triumph over competitors who preferred to keep their tools and development completely in-house. It was a great idea—make your own product more valuable by letting other people enhance it for their own benefit—and it worked famously. In the graphics world, everyone's got 'em now. But, in the browsing world...well, it takes an open-source project to apply that kind of functionality across categories.

Firefox did it, and it's one of the innovations that has helped Mozilla claw its way up from the bottom of the stack in the browser wars. Even though Internet Explorer still comes bundled with Windows, and Safari with Mac OS, and Konqueror with KDE, users across platforms opt for Firefox with greater and greater frequency. It's not just the tabbed browsing, or the built-in pop-up blockers, or the standards-compliance or the built-in search box—it's also the add-ons.

The Mozilla Project's plugin-based architecture turns a solid application into a customizer's paradise. The projects available on the Mozilla Add-ons site now stretch into the thousands, which gives the end user the opposite problem of the no-choice straitjacket of certain other browsers. The embarrassment of riches means too much choice, and figuring out how to narrow it down is no mean task.

The extensions come in a variety of flavors—from add-on applications to interface tweaks to toolbars. Here are a few that most users will find very handy. They extend functionality, enhance privacy and give users a leg up on taking their favorite content with them wherever they wish to go.

Irritation Reduction and Butt-Covering

Web pages are great things. The democratization of media that the Internet brings us means that everyone has a Web site, and it's a great thing. There's only one problem with everyone having a Web site: everyone has a Web site—even people who think it's cute to have their own personal radio station running any time you log on to one of their pages.

I may be a curmudgeon, but as much as I care about the teeming masses of humanity on-line, that affection does not extend to being willing to tolerate someone else's attempt to soundtrack my corner of the universe. It's been the case for several years now that if you wanted to surf around on MySpace or thumb through your Aunt Estelle's family photo albums on her personal site, you had two choices: endure the autoplay music, or turn your speakers off.

Not anymore—not if you surf with Firefox. Sun Chun-Yen's Stop Autoplay extension automagically toggles off *all* auto-playing media, and it allows you to blacklist Flash media providers if they get on your nerves. With Stop Autoplay installed, instead of embedded media assaulting you before the page finishes rendering, you are presented with a little red box with a Play button inside it. If you are inclined to listen to the embedded media, you have the option at your fingertips. If you're not, it won't bother you. It's a beautiful little plugin. It's simple, elegant and "just works". It also can help save you from vicious attacks by coworkers who don't like the autoplayed music either.

Protecting you from your boss (who actually expects you to be working when you're on the clock) is the noble quest undertaken by another add-on, Panic. Panic sets up a hotkey that, when pressed, will close all open tabs and open a tab containing the URL of a page you're actually supposed to be looking at. Note that it closes the tabs, it doesn't hide them. Once you press your user-definable hotkey, they're gone. Sure, trudging through the browser history to re-find that amazing article on "Linux Home Automation: the Ultimate Internet-Controlled Gun Cabinet" can be a drag, but when it saves you an unpleasant conversation with your boss, it's worth the price.

On a related note, there is an extension that protects you from inconvenient questions from young children, nosy roommates and casual snoopers at neighborhood coffee shops. If you've ever heard the words "Mommy, what does 'stud' mean?" or "Daddy, what's burka porn?" from a five-year-old who has apparently appeared at your elbow from a neighboring dimension, you know what I mean. The Net sucks you in, and sometimes someone walks up behind you and starts reading over your shoulder—or worse, reading the names of the other tabs you're saving for later—and you don't notice them for a few hours...um, minutes.

Enter TabRenamizer, an extension that lets you protect your privacy by renaming the tabs in your open browser windows. It integrates seamlessly with Firefox, sitting as a menu option in the Tools window that lets you set it either to rename all future tabs or to rename all open tabs randomly. You also can rename an individual tab selectively by right-clicking on the tab title and selecting the now-present rename this tab option from the context menu. This gives you a renaming dialog so that you can give the tab any name you want.

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Taking My Media Everywhere

If there's anything out there that could push me to buy a video-capable portable media player, it's the Authors@Google series on YouTube (and similar lecture series available on Google Video from various think tanks and science conferences). Science, public policy, arts discussion—the Net has everything a growing brain needs. Unfortunately, a lot of it isn't in easily downloadable podcast form, but it's sequestered in various video formats behind the YouTube Flash curtain or hiding in other embedded players. Bringing it down to the hard drive, even just in audio form, used to be a pain and a half, often requiring some fancy stream ripping involving speaker wires and mencoder scripts. Not any longer. Now, there are a bunch of extensions and Greasemonkey scripts for Firefox that let you rip your beloved content from the cold, uncaring fingers of the Internet and then load it on your portable media player to take with you to family reunions. Two of them are worth special note.

The first is Fast Video Download, which, as its name suggests, will let you download pretty much any embedded video with the click of a mouse. When you call up a video on YouTube or Google Video or just about anywhere else, and it's one you want to take with you for viewing on the commuter train or for listening to at the gym, simply click on the handy-dandy video downloader icon that appears at the bottom right-hand corner of the Firefox screen, and away you go. It pulls the video from the Web server, in whatever format it's natively stored, and drops it on your hard drive, from where you can load it onto your portable media player at your leisure. Fast Video Download's philosophy is no-nonsense and unobtrusive, and it either works on a given site or it doesn't—your mileage may vary.

The second is an extension called Download Helper, and it has a different approach. It maintains a compatibility list and a directory of video sites from which it can download and file types it keeps an eye out for. Accessing its submenu through the Tools menu on Firefox allows you to customize it, to allow or block adult and/or pornographic content, and it also has special entries to help you find instructional and tutorial videos. It's a more comprehensive tool than Fast Video Download, but it's also less elegantly integrated into Firefox. Although Fast Video Download is the tool you want on hand when you stumble across something you're going to want to listen to again later, Download Helper is a tool better suited for dedicated video hunts (say, if you're doing research or you're going to be on a long plane ride and want your portable media player loaded up with things you haven't seen before).

Full-on MozApps

Not all Firefox extensions are little plugins or interface tweaks. Some of them are full-on, serious applications that just happen to run in a Firefox tab. There are quite a few of these, including a number of very good security auditing tools. However, today I'm focusing on must-haves for everyday users, so in this section, we're going to look at three tools that make the life of a normal Web 2.0 Netizen less hassle-prone.

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If you're hip deep in new media, you've probably got a blog. And a Flickr account. And a YouTube channel. And a Box.net file repository. And a Facebook account. And a...well, you get the idea. There are a lot of passwords to remember, and a lot of files to upload, and a lot of really crappy, limiting interfaces through which you have to do that uploading.

File Uploader changes all that. It's essentially a specialized FTP client that's compatible with a number of on-line file services and social-networking sites. After installing the extension and restarting Firefox, you are presented on the Tools menu with a File Uploader entry. Click on it, and a new tab loads with the application. Using the accounts management and services menus, you can sign up for new accounts with any of the supported services (including, but not limited to, the aforementioned YouTube, Box.net, Flickr and Facebook), or use accounts you already have and manage your files and photo albums remotely. Reordering, batch uploading, deleting and renaming are all supported, and, unlike the HTML interfaces offered by the services, you are not subject to the files-per-upload limits that the Web interfaces impose. If you are, like me, a working photographer (or merely an

avid hobbyist), and you're dependent on Flickr to showcase your work, this tool will save you a lot of time. If, on the other hand, you're a social-networking junkie, File Uploader will let you share more/better/faster with more people.

Although File Uploader is patterned after a classic dual-pane FTP client, it is not actually an FTP client. Instead, it emulates an FTP client over HTTP for particular services. For a true-blue FTP client that runs in a Firefox tab, you'll need FireFTP.

FireFTP is one of the oldest and most mature Firefox extensions around. It supports all the essential features you need in an FTP client—proxy support, multiple account support, integrity checks, encryption, hash and time synchronization. It operates on a classic three-pane view: local filesystem on the left, remote filesystem on the right and console data scrolling in a wide pane across the bottom. It also will keep local and remote directories synchronized, and it can do deep-tree comparison, so you can see what might be present on one filesystem that's absent from another. It's fast, it's light, and it works very, very well. Some standalone clients, like GFTP, have a few more bells and whistles, but they're the kind of features you use so rarely that you'll seldom need to call it up if you've got FireFTP handy. FireFTP is also cross-platform, unlike some of the other best open-source FTP clients, which are Linux or *nix only.

The other entry in the oldie-but-goodie pile is ChatZilla,

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http://www.linuxjournal.com/rss_feeds

Resources

Stop Autoplay: <https://addons.mozilla.org/en-US/firefox/addon/1765>

Panic: <https://addons.mozilla.org/en-US/firefox/addon/6367>

TabRenamizer: <https://addons.mozilla.org/en-US/firefox/addon/2987>

Fast Video Download: <https://addons.mozilla.org/en-US/firefox/addon/3590>

Download Helper: <https://addons.mozilla.org/en-US/firefox/addon/3006>

File Uploader www.fireuploader.com

FireFTP: <https://addons.mozilla.org/en-US/firefox/addon/684>

ChatZilla: chatzilla.hacksrus.com

NewsFox: <https://addons.mozilla.org/en-US/firefox/addon/629>

Free Access Plus: <https://addons.mozilla.org/en-US/firefox/addon/6139>

a venerable in-tab IRC client with all the trimmings. Although it doesn't have the \$@%!ng provocative veneer that bitchX does, it handsomely organizes chat channels, logs, has an extensive built-in list of available channels, supports DCC chats and file transfers, and has its own plugin and theming architecture. After install, just like FireFTP and File Uploader, you'll find it easily launched with a click from the Tools menu. In a sense, it's nothing really new—IRC is old tech—but it does implement all the standards very well, and for those who prefer to keep desktop clutter to a minimum but still enjoy fighting with random strangers on IRC, ChatZilla is a must-have.

The last of our full-on apps that just happen to run in a tab is NewsFox, an RSS newsreader for Firefox. It's a three-pane Atom/RSS feed reader laid out very similarly to an e-mail reader: feeds on the left, news items on the top right and story content on the bottom right. It handily auto-imports any Live Bookmarks you've got set up as soon as you launch it, so you don't have to worry about re-adding feeds to which you've already subscribed. Again, like FireFTP and ChatZilla, it's a solid, no-frills app that "just works" and does what it's supposed to do. And, also like ChatZilla and FireFTP, it doesn't cause a performance drag, which is a welcome change from the bad-old days when Firefox was new and full of memory leaks all the time.

Freedom and Anonymity

As you can see from the above, Firefox extensions give people a lot of power over their browsing experience—indeed, a lot more than most anyone is used to having. But aside from the obvious minor advantages of time saved, extra utility and fun, it also can be a major force for good in the world. This is certainly the case with Free Access Plus, a filter-buster put out by an innovative developer going by the name of MohammedR. It's a notion that I can only hope someone in Hong Kong picks up on. Imagine Radio Free Europe in your browser and you get the idea. Free Access Plus circumvents state censorship of the Internet—particularly, it circumvents the Iranian government's content filters that block YouTube, del.icio.us, Flickr, Technocrati, Friendster, LiveJournal, MySpace and a number of others. It also purports to circumvent similar filters imposed by other governments. It's not a perfect solution, and it doesn't work all the time, but it is successful some of the time, and it's exactly the kind of thing open source is best at—opening the world to all people, even when their governments think they know better.■

Dan Sawyer is the founder of ArtisticWhispers Productions (www.artisticwhispers.com), a small audio/video studio in the San Francisco Bay Area. He has been an enthusiastic advocate for free and open-source software since the late 1990s, when he founded the Blenderwars filmmaking community (www.blenderwars.com). He currently is the host of "The Polyschizmatic Reprobates Hour", a cultural commentary podcast, and "Sculpting God", a science-fiction anthology podcast. Author contact information is available at www.jdsawyer.net.

TECH TIP Using a Garmin GPS and MapSource with Linux

Garmin is a popular brand of GPS devices. Unfortunately, Garmin makes its MapSource application only for Windows, not Linux. However, Wine runs MapSource, at least for Garmin GPS units that communicate via USB.

The following procedure is based on:

- Fedora 8
- The current Wine package (wine-0.9.56-1.fc8)
- A Garmin Vista CX, with the standard USB cable

Install Wine (as root):

```
# yum install wine
```

Make sure that you can access the GPS device. For my installation, the device is /dev/ttyUSB0. I found this by examining /var/log/messages when attaching the device. Check the permissions of the device file, and make sure you have access to it, possibly by adding yourself to the group that owns the device. In my case, I had to add myself to the group uucp. Remember to log out and log back in if you add yourself to a new group.

Now, define the device in Wine. This is done as follows

(do this using your normal login, not as root):

```
$ ln -s /dev/ttyUSB0 ~/.wine/dosdevices/com2
```

This will define the /dev/ttyUSB0 device as COM2 under Wine.

After that, you simply install the software on the Garmin CD. For example, for City Navigator NT (Europe), using your normal login, do the following:

```
$ cd /media/CNEURNTV  
$ wine ./Setup.exe
```

At the end, don't opt to start the program directly. Start it afterward via the command line:

```
$ wine ~/.wine/drive_c/Garmin/MapSource.exe
```

Using this procedure, I am able to unlock maps, make routes, upload and download from the GPS unit (via USB) and do software updates.

For more information, see my Web page:
www.peterverthez.net/gps/garmin-linux.html.

—PETER VERTHEZ

Remaster Knoppix without Remastering

Why go through complicated steps to remaster Knoppix, when there are a number of methods to get the most of the functionality without the fuss? KYLE RANKIN

If you have used Knoppix for any extended period of time, chances are you eventually thought about customizing it. You might have simply wanted to make cosmetic changes with a new background and a different theme, or you might have wanted to add programs, change what happens at startup, or make any number of more-intensive changes. Well, you aren't alone. There are more than a hundred different Knoppix-based live CDs in existence. Some have changed only a few tools, and others have performed a complete overhaul of the programs, the themes and even the file structure.

Traditional Remastering

If you had decided to change Knoppix, you quickly would become acquainted with some of the guides both on-line and in print about Knoppix remastering. At that point, some of you would have read the complicated set of steps and decided it just wasn't worth it. Knoppix fits all of its software within a compressed loopback filesystem on the disc. To remaster Knoppix, you must make a copy of the uncompresssed contents of that filesystem, use chroot to access the copy as though it were the root filesystem, make any changes you want to make, and then re-create the new cloop filesystem and ISO image with a few gigantic commands on the command line.

Not only is the process much quicker and less complex, it's also simpler to migrate your changes once the next version of Knoppix is released.

Of course, I oversimplified and excluded a few steps there. Besides some of the more technical steps, I also left out that minor bug you undoubtedly introduced but didn't notice until you booted. That means you get to go through the remastering process (especially the time-consuming steps of creating a new cloop filesystem) all over again. I also left out the step where you notice that even though you made minor changes, your ISO inexplicably is much larger than it was before and won't fit on a CD, so back to the remastering process you go to free up more space.

The fact is, traditional Knoppix remastering is a time-consuming, error-prone, complex process full of trial and error, but there is a better way. There are a few different methods you can use to tweak the default Knoppix disc without using the remastering process. I like to refer to these methods as "remastering Knoppix without remastering", because the default Knoppix cloop filesystem stays the same throughout the entire process.

I first became interested in low-impact Knoppix tweaks when I had to create a custom CD to include with my book, *Knoppix Hacks*. I didn't want to do much—just change the default background and add a few links to the desktop. Although I could have remastered the CD, I was concerned about introducing bugs, even with minor changes. Imagine if I had discovered a bug after the CD was printed and shipped around the country with the book! I figured if I could tweak Knoppix but leave the compressed image alone, I would reduce the risk considerably.

Ever since my first attempt to remaster Knoppix without remastering, I've used these methods so much that I actually prefer them and find them superior to remastering for most people's needs. Not only is the process much quicker and less complex, it's also simpler to migrate your changes once the next version of Knoppix is released.

Save Configuration

The first method you can use to change Knoppix involves a classic Knoppix tool called saveconfig. This tool creates and lets you choose a number of different files and settings from your user's configuration files, all of the files on the desktop, and network, graphics and other settings. saveconfig then creates a tarball called configs.tbz out of the files and stores it on a USB key, hard drive or other writeable media of your choice along with a custom knoppix.sh script.

To run saveconfig, click K→Knoppix→Configure→Save Knoppix Configuration or type saveconfig in a terminal. Then, you can choose which settings to save and to which hard drive to save them. The next time you boot your computer, type `myconfig=/dev/sda1/` to point Knoppix to a particular saved config, or type `myconfig=scan`, and Knoppix will scan all available drives for you. At the end of the boot process, Knoppix will run the knoppix.sh script on the drive, which will extract the tarball and restore your settings.

For minor, mostly cosmetic changes, the standard saveconfig script might serve all your needs. Simply make your changes, and then tell saveconfig to back up your personal

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configuration. This is useful, but you might want to back up only a few files, or you might want to add files that saveconfig doesn't save by default. To do that, you can tweak either the configs.tbz or knoppix.sh file. First, run saveconfig to create a configs.tbz and knoppix.sh file. Then, uncompress the configs.tbz file:

```
$ bunzip2 configs.tbz
```

Now, use tar to add new files to the tarball:

```
$ tar -rpPf configs.tar /path/to/file
```

You also can use tar to delete files:

```
tar --delete -pPf configs.tar /path/to/file
```

Once you are finished with your changes, you can recompress the tarball:

```
$ BZIP2=-9 bzip2 configs.tar
$ mv configs.tar.bz2 configs.tbz
```

Another way to tweak saveconfig (or even bypass it altogether) is to realize that when you tell Knoppix to use a particular saved configuration, all it really does is execute the

In addition to the saveconfig script, Knoppix provides an even more advanced script that creates a persistent disk.

knoppix.sh file, which is a standard shell script. That shell script contains the tar commands to extract the file. This means anything you put in the knoppix.sh file will be executed at the end of the boot process. What's more, if you create a new Knoppix disc and place the knoppix.sh in the KNOPIX/ directory on the disc, it will be executed *automatically* every time Knoppix boots. So, if there's an extra program you'd like Knoppix to have, just track down the .deb file for it and any of its dependencies, and add them to the disc. Then, in the knoppix.sh script you can put:

```
dpkg -i /cdrom/*.deb
```

Knoppix will install all of those programs at the end of the boot process. If you want to run any other commands or start any services, you also could put them in this script.

Example: Webcam

Here's an example of a tweaked knoppix.sh file that I made to turn Knoppix into an instant Webcam server. I first created a webcam directory on the CD-ROM and put a basic HTML file there that pointed to an image at /var/www/webcam.jpg.

Then, I created a knoppix.sh script and put it in the KNOPIX/ directory on the CD. Here is the script:

```
#!/bin/sh

echo Configuring Apache
cp /cdrom/webcam/index.html /var/www/index.html
/etc/init.d/apache start
echo Configuring Cron
echo '* * * * * root gqcam -d /var/www/webcam.jpg > /dev/null' >>
/etc/crontab
/etc/init.d/cron start
```

As you can see, there isn't much to this script. I copy the HTML file to the default Apache document root, start Apache, and then add a job to the global crontab and start cron. The cron command will run gqcam every minute, which will capture an image and store it in /var/www/webcam.jpg. Now, I can just burn the CD and boot it on any machine with a Webcam and Knoppix will take care of the rest.

Persistent Disk Image

In addition to the saveconfig script, Knoppix provides an even more advanced script that creates a persistent disk. The main problem with a live CD is that all of your changes are erased whenever you reboot. Traditionally, the persistence script created a loopback filesystem on a USB key or hard drive of a specified size and then copied your entire home directory to it. On the next boot, if you selected it with a cheat code, Knoppix would then mount the filesystem and point your entire home directory to it. That meant any changes you made to your home directory were kept through all of your reboots.

The main limitation to that script (as with legacy Knoppix discs) was that you could write only to certain directories. Beginning with Knoppix 3.8, Knoppix added UnionFS (now replaced with AuFS). This tool essentially allows you to merge filesystems on top of each other, even if one is read-only and the other is read-write. If you wrote to the filesystem, UnionFS/AuFS transparently took care of putting the writes on the correct filesystem. With Knoppix, this now meant the ramdisk that was traditionally used for /home and /etc could now be merged on top of the entire filesystem. You now could essentially write anywhere you wanted, install programs using the standard Debian package management, and basically treat the system like any other installed Linux distribution, limited only by your ramdisk size.

With the addition of AuFS, Knoppix changed its persistence script. Now when you click K→Knoppix→Configuration→Create a persistent Knoppix disk image, Knoppix creates a complete copy of the entire ramdisk. This is a copy of all of the changes you have made to the system since you have booted. Within the script, you can choose the maximum size of the filesystem, where to store the image, and even whether to use encryption. The next time you boot, if the USB or local hard drive is present, Knoppix automatically detects it and prompts you

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with a few options:

- Home: use only your persistent home directory.
- System: replace the entire /ramdisk mountpoint with the persistent disk image.
- Overwrite: off by default, but it will replace the /etc directory on your persistent image if you also enable the System option. You might want to do this if your system-wide graphics or network settings from a previous machine interfere with your current one.
- Init: start any persistent init scripts.

If you don't select any of these options, Knoppix will boot normally. It's also possible that you might have multiple knoppix.img files on different drives (or multiple files on the same drive in different directories). This actually is a good way to create custom Knoppix settings that are stored in different directories on a USB key. Say I have a security-focused persistent image in the security directory on my USB key (which Knoppix detects as /dev/sda1), I could then boot Knoppix with the home=/dev/sda1/security/knoppix.img cheat code.

Tweak Boot Settings

The saveconfig and knoppix.sh tweaks provide a lot of functionality, but their main downside is that they execute at the end of the boot process. Sometimes you want to change Knoppix settings sooner than that—whether it's the default screen you see at boot time or Knoppix's default cheat codes. These options and more are stored in the boot/isolinux/ directory on the disc and can be changed without much effort. Below I cover some of the more important files and what you can change with them.

Boot messages: the boot.msg, f2 and f3 files are text files that define what shows up at the boot prompt, when you press F2 and F3, respectively. If you want to add special help or even change the text completely, you can do so in these files.

isolinux.cfg: this is one of the most useful files in this directory, as it defines all the different kernels that can be loaded, along with their default boot options. For instance, here is the section of the file that defines the default Knoppix settings and cheat codes if you let the boot prompt time out or just press Enter:

```
LABEL knoppix
KERNEL linux
APPEND ramdisk_size=100000 init=/etc/init lang=us apm=power-off vga=791
initrd=
initrd.gz nomce loglevel=0 quiet BOOT_IMAGE=knoppix
```

For instance, you can see here that the default language is English, but if you wanted to change it to Spanish, you would change lang=us to lang=es. If you scroll down farther in the file, you can not only see other Knoppix types you can boot, but also listings for memtest and dos.

Tweak initrd

Along with the other boot files, under boot/isolinux/ is the default Knoppix initrd file called minirt.gz. This file is the initial root image that Knoppix mounts. Within the image are essential files for the boot process, including the init executable, but the file of most interest to Knoppix hackers is the linuxrc file, which acts as Knoppix's general startup script. First, make a copy of the minirt.gz file (in my example, I assume it was mounted under /cdrom), uncompress it and then mount the filesystem:

```
# cp /cdrom/boot/isolinux/minirt.gz .
# gunzip minirt.gz
# mkdir temp
# mount -t ext2 -o loop minirt ./temp
```

Now, if you look in the top-level directory of that mounted filesystem, you will see the linuxrc file. A lot of the script defines default settings, such as which filesystems are built in to Knoppix and the process Knoppix uses to mount them, but you also can see where Knoppix defines system-wide defaults and also allows you to override them. For instance, the following lines define the default Knoppix directory and cloop file and the ability to overwrite them via a cheat code:

```
KNOPPIX_DIR="KNOPPIX"
KNOPPIX_NAME="KNOPPIX"
case "$CMDLINE" in
  *knoppix_dir=*) KNOPPIX_DIR="$knoppix_dir"; ;;
  esac
case "$CMDLINE" in
  *knoppix_name=*) KNOPPIX_NAME="$knoppix_name"; ;;
  esac
```

If you want to add some extra functions to the boot process, read through the script to identify where would be best. For instance, at some points of the script, the KNOPPIX cloop filesystem isn't loaded yet, nor are many common modules. If you aren't sure where to add your changes, just add them to the end of the script before the comment #Give control to the init process. At that point, Knoppix should have major modules and filesystems loaded and mounted.

Once you are finished with your tweaks, unmount the minirt filesystem and recompress it. Then, you can overwrite the default version with your custom edition:

```
umount temp
gzip -9 minirt
```

These are only a few examples of how to remaster Knoppix without remastering. One of the great things about these methods is that they are typically easy to try, so if you make a mistake, you can fix it quickly. Plus, most of these methods lend themselves well to migration from one Knoppix disc to the next for when the next version of Knoppix is released. Finally, because most of your custom tweaks can be self-contained, if you want to share them with friends, you simply can share your knoppix.sh and configs.tbz files, for instance, instead of an entire ISO image.■

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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Thin Clients Booting over a Wireless Bridge

How quickly can thin clients boot over a wireless bridge, and how far apart can they really be? RONAN SKEHILL, ALAN DUNNE AND JOHN NELSON

In the 1970s and 1980s, the ubiquitous model of corporate and academic computing was that of many users logging in remotely to a single server to use a sliver of its precious processing time. With the cost of semiconductors holding fast to Moore's Law in the subsequent decades, however, the next advances in computing saw desktop computing become the standard as it became more affordable.

Although the technology behind thin clients is not revolutionary, their popularity has been on the increase recently. For many institutions that rely on older, donated hardware, thin-client networks are the only feasible way to provide users with access to relatively new software. Their use also has flourished in the corporate context. Thin-client networks provide cost-savings, ease network administration and pose fewer security implications when the time comes to dispose of them. Several computer manufacturers have leaped to stake their claim on this expanding market: Dell and HP Compaq, among others, now offer thin-client solutions to business clients.

And, of course, thin clients have a large following of hobbyists and enthusiasts, who have used their size and flexibility to great effect in countless home-brew projects. Software projects, such as the Etherboot Project and the Linux Terminal Server Project, have large and active communities and provide excellent support to those looking to experiment with diskless workstations.

Connecting the thin clients to a server always has been done using Ethernet; however, things are changing. Wireless technologies, such as Wi-Fi (IEEE 802.11), have evolved tremendously and now can start to provide an alternative means of connecting clients to servers. Furthermore, wireless equipment enjoys world-wide acceptance, and compatible products are readily available and very cheap.

In this article, we give a short description of the setup of a thin-client network, as well as some of the tools we found to be useful in its operation and administration. We also describe a test scenario we set up, involving a thin-client network that spanned a wireless bridge.

What Is a Thin Client?

A thin client is a computer with no local hard drive, which loads its operating system at boot time from a boot server. It is designed to process data independently, but relies solely on its server for administration, applications and non-volatile storage.

Following the client's BIOS sequence, most machines with network-boot capability will initiate a Preboot EXecution

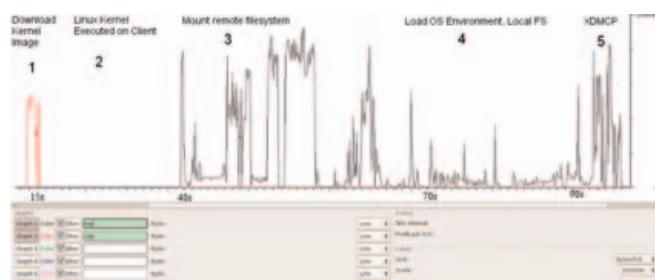


Figure 1. LTSP Traffic Profile and Boot Sequence

Environment (PXE), which will pass system control to the local network adapter. Figure 1 illustrates the traffic profile of the boot process and the various different stages, which are numbered 1 to 5. The network card broadcasts a DHCPDISCOVER packet with special flags set, indicating that the sender is trying to locate a valid boot server. A local PXE server will reply with a list of valid boot servers. The client then chooses a server, requests the name of the Linux kernel file from the server and initiates its transfer using Trivial File Transfer Protocol (TFTP; stage 1). The client then loads and executes the Linux kernel as normal (stage 2). A custom init program is then run, which searches for a network card and uses DHCP to identify itself on the network. Using Sun Microsystems' Network File System (NFS), the thin client then mounts a directory tree located on the PXE server as its own root filesystem (stage 3). Once the client has a non-volatile root filesystem, it continues to load the rest of its operating system environment (stage 4)—for example, it can mount a local filesystem and create a ramdisk to store local copies of temporary files. The fifth stage in the boot process is the initiation of the X Window System. This transfers the keystrokes from the thin client to the server to be processed. The server in return sends the graphical output to be displayed by the user interface system (usually KDE or GNOME) on the thin client.

The X Display Manager Control Protocol (XDMCP) provides a layer of abstraction between the hardware in a system and the output shown to the user. This allows the user to be physically removed from the hardware by, in this case, a Local Area Network. When the X Window System is run on the thin client, it contacts the PXE server. This means the user logs in to the thin client to get a session on the server.

In conventional fat client environments, if a client opens a large file from a network server, it must be transferred to the

client over the network. If the client saves the file, the file must be again transmitted over the network. In the case of wireless networks, where bandwidth is limited, fat-client networks are highly inefficient. On the other hand, with a thin-client network, if the user modifies the large file, only mouse movement, keystrokes and screen updates are transmitted to and from the thin client. This is a highly efficient means, and other examples, such as ICA or NX, can consume as little as 5kbps bandwidth. This level of traffic is suitable for transmitting over wireless links.

How to Set Up a Thin-Client Network with a Wireless Bridge

One of the requirements for a thin client is that it has a PXE-bootable system. Normally, PXE is part of your network card BIOS, but if your card doesn't support it, you can get an ISO image of Etherboot with PXE support from ROMomatic (see Resources). Looking at the server with, for example, ten clients, it should have plenty of hard disk space (100GB), plenty of RAM (at least 1GB) and a modern CPU (such as an AMD64 3200).

The following is a five-step how-to guide on setting up an Edubuntu thin-client network over a fixed network.

1. Prepare the server. In our network, we used the standard standalone configuration. From the command line:

```
sudo apt-get install ltsp-server-standalone
```

You may need to edit /etc/ltsp/dhcpd.conf if you change the default IP range for the clients. By default, it's configured for a server at 192.168.0.1 serving PXE clients.

Our network wasn't behind a firewall, but if yours is, you need to open TFTP, NFS and DHCP. To do this, edit /etc/hosts.allow, and limit access for portmap, rpc.mountd, rpc.statd and in.tftpd to the local network:

```
portmap: 192.168.0.0/24
rpc.mountd: 192.168.0.0/24
rpc.statd: 192.168.0.0/24
in.tftpd: 192.168.0.0/24
```

Restart all the services by executing the following commands:

```
sudo invoke-rc.d nfs-kernel-server restart
sudo invoke-rc.d nfs-common restart
sudo invoke-rc.d portmap restart
```

2. Build the client's runtime environment. While connected to the Internet, issue the command:

```
sudo ltsp-build-client
```

If you're not connected to the Internet and have Edubuntu on CD, use:

```
sudo ltsp-build-client --mirror file:///cdrom
```

Remember to copy sources.list from the server into the chroot.

3. Configure your SSH keys. To configure your SSH server and keys, do the following:

```
sudo apt-get install openssh-server
sudo ltsp-update-sshkeys
```

4. Start DHCP. You should now be ready to start your DHCP server:

```
sudo invoke-rc.d dhcp3-server start
```

If all is going well, you should be ready to start your thin client.

5. Boot the thin client. Make sure the client is connected to the same network as your server.

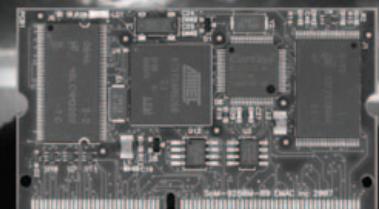
Power on the client, and if all goes well, you should see a nice XDMCP graphical login dialog.

Once the thin-client network was up and running correctly, we added a wireless bridge into our network. In our network, a number of thin clients are located on a single hub, which is separated from the boot server by an IEEE 802.11 wireless

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bridge. It's not an unrealistic scenario; a situation such as this may arise in a corporate setting or university. For example, if a group of thin clients is located in a different or temporary building that does not have access to the main network, a simple and elegant solution would be to have a wireless link between the clients and the server. Here is a mini-guide on getting the bridge running so that the clients can boot over the bridge:

- Connect the server to the LAN port of the access point. Using this LAN connection, access the Web configuration interface of the access point, and configure it to broadcast an SSID on a unique channel. Ensure that it is in Infrastructure mode (not ad hoc mode). Save these settings and disconnect the server from the access point, leaving it powered on.
- Now, connect the server to the wireless node. Using its Web interface, connect to the wireless network advertised by the access point. Again, make sure the node connects to the access point in Infrastructure mode.
- Finally, connect the thin client to the access point. If there are several thin clients connected to a single hub, connect the access point to this hub.

We found ad hoc mode unsuitable for two reasons. First, most wireless devices limit ad hoc connection speeds to 11Mbps, which would put the network under severe strain to boot even one client. Second, while in ad hoc mode, the wireless nodes we were using would assume the Media Access Control (MAC) address of the computer that last accessed its Web interface (using Ethernet) as its own Wireless LAN MAC. This made the nodes suitable for connecting a single computer to a wireless network, but not for bridging traffic destined to more than one machine. This detail was found only after much sleuthing and led to a range of sporadic and often unreproducible errors in our system.

The wireless devices will form an Open Systems Interconnection (OSI) layer 2 bridge between the server and the thin clients. In other words, all packets received by the

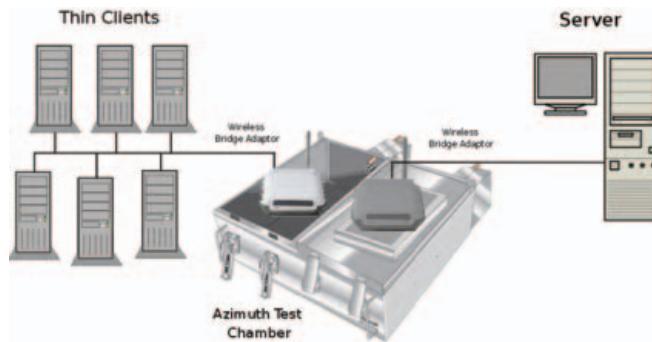


Figure 2. Six thin clients are connected to a hub, and in turn, this is connected to wireless bridge device. On the other side of the bridge is the server. Both wireless devices are placed in the Azimuth chamber.

wireless devices on their Ethernet interfaces will be forwarded over the wireless network and retransmitted on the Ethernet

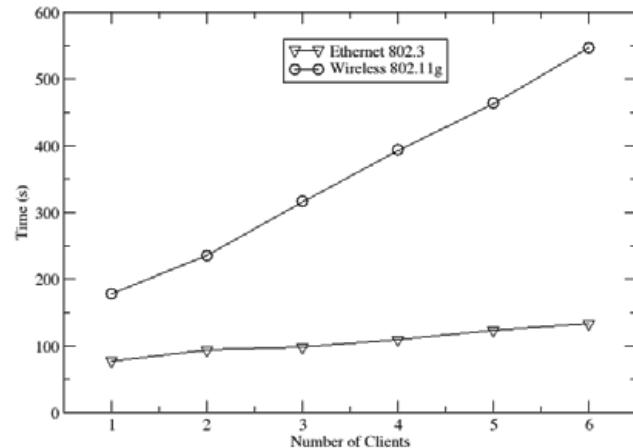


Figure 3. A Boot Time Comparison of Fixed and Wireless Networks with an Increasing Number of Thin Clients

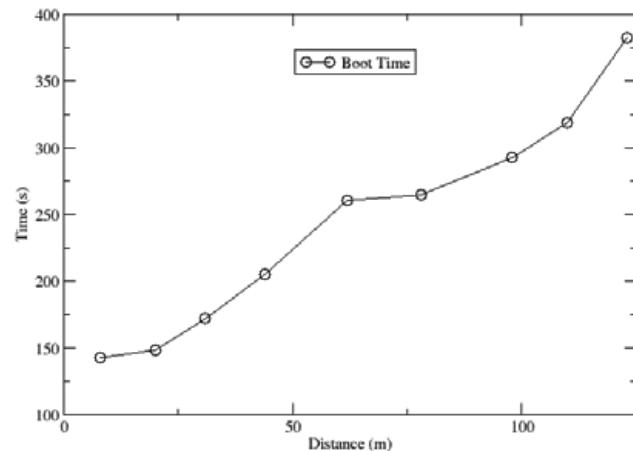


Figure 4. The Effect of the Bridge Length on Thin-Client Boot Time

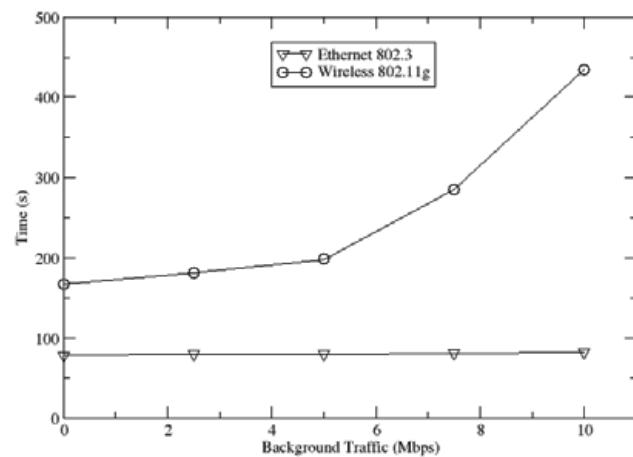


Figure 5. Boot Time in the Presence of Background Traffic

adapter of the other wireless device. The bridge is transparent to both the clients and the server; neither has any knowledge that the bridge is in place.

For administration of the thin clients and network, we used the Webmin program. Webmin comprises a Web front end and a number of CGI scripts, which directly update system configuration files. As it is Web-based, administration can be performed from any part of the network by simply using a Web browser to log in to the server. The graphical interface greatly simplifies tasks, such as adding and removing thin clients from the network or changing the location of the image file to be transferred at boot time. The alternative is to edit several configuration files by hand and restart all daemon programs manually.

Evaluating the Performance of a Thin-Client Network

The boot process of a thin client is network-intensive, but once the operating system has been transferred, there is little traffic between the client and the server. As the time required to boot a thin client is a good indicator of the overall usability of the network, this is the metric we used in all our tests.

Our testbed consisted of a 3GHz Pentium 4 with 1GB of RAM as the PXE server. We chose Edubuntu 5.10 for our server, as this (and all newer versions of Edubuntu) come with LTSP included. We used six identical thin clients: 500MHz Pentium III machines with 512MB of RAM—plenty of processing power for our purposes.

When performing our tests, it was important that the results obtained were free from any external influence. A large part of this was making sure that the wireless bridge was not affected by any other wireless networks, cordless phones operating at 2.4GHz, microwaves or any other sources of Radio Frequency (RF) interference. To this end, we used the Azimuth 301w Test Chamber to house the wireless devices (see Resources). This ensures that any variations in boot times are caused by random variables within the system itself.

The Azimuth is a test platform for system-level testing of 802.11 wireless networks. It holds two wireless devices (in our case, the devices making up our bridge) in separate chambers and provides an artificial medium between them, creating complete isolation from the external RF environment. The Azimuth can attenuate the medium between the wireless devices and can convert the attenuation in decibels to

an approximate distance between them. This gives us the repeatability, which is a rare thing in wireless LAN evaluation. A graphic representation of our testbed is shown in Figure 2.

We tested the thin-client network extensively in three different scenarios: first, when multiple clients are booting simultaneously over the network; second, booting a single thin client over the network at varying distances, which are simulated by altering the attenuation introduced by the chamber; and third, booting a single client when there is heavy background network traffic between the server and the other clients on the network.

Conclusion

As shown in Figure 3, a wired network is much more suitable for a thin-client network. The main limiting factor in using an 802.11g network is its lack of available bandwidth. Offering a maximum data rate of 54Mbps (and actual transfer speeds at less than half that), even an aging 100Mbps Ethernet easily outstrips 802.11g. When using an 802.11g bridge in a network such as this one, it is best to bear in mind its limitations. If your network contains multiple clients, try to stagger their boot procedures if possible.

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Second, as shown in Figure 4, keep the bridge length to a minimum. With 802.11g technology, after a length of 25 meters, the boot time for a single client increases sharply, soon hitting the three-minute mark. Finally, our test shows, as illustrated in Figure 5, heavy background traffic (generated either by other clients booting or by external sources) also has a major influence on the clients' boot processes in a wireless environment. As the background traffic reaches 25% of our maximum throughput, the boot times begin to soar. Having pointed out the limitations with 802.11g, 802.11n is on the horizon, and it can offer data rates of 540Mbps, which means these limitations could soon cease to be an issue.

In the meantime, we can recommend a couple ways to

The boot process of a thin client is network-intensive, but once the operating system has been transferred, there is little traffic between the client and the server.

speed up the boot process. First, strip out the unneeded services from the thin clients. Second, fix the delay of NFS mounting in klibc, and also try to start LDM as early as possible in the boot process, which means running it as the first service in rc2.d. If you do not need system logs, you can remove syslogd completely from the thin-client startup. Finally, it's worth remembering that after a client has fully booted, it requires very little bandwidth, and current wireless technology is more than capable of supporting a network of thin clients.

Acknowledgement

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Ronan Skehill works for the Wireless Access Research Centre at the University of Limerick, Ireland, as a Senior Researcher. The Centre focuses on everything wireless-related and has been growing steadily since its inception in 1999.

Alan Dunne conducted his final-year project with the Centre under the supervision of John Nelson. He graduated in 2007 with a degree in Computer Engineering and now works with Ericsson Ireland as a Network Integration Engineer.

John Nelson is a senior lecturer in the Department of Electronic and Computer Engineering at the University of Limerick. His interests include mobile and wireless communications, software engineering and ambient assisted living.

Resources

Linux Terminal Server Project (LTSP): ltsp.sourceforge.net

Ubuntu ThinClient How-To: <https://help.ubuntu.com/community/ThinClientHowto>

Azimuth WLAN Chamber: www.azimuth.net

ROM-o-matic: rom-o-matic.net

Etherboot: www.etherboot.org

Wireshark: www.wireshark.org

Webmin: www.webmin.com

Edubuntu: www.edubuntu.org

TECH TIP Tips for Using the cd (Change Directory) Command

Invoking the cd utility by itself (that is, without any arguments) will change the current directory to the directory specified by the \$HOME environment variable:

```
nick@nimble ~ $ cd /tmp/
nick@nimble /tmp $ cd
nick@nimble ~ $
```

Invoking the cd utility with a single hyphen (-) argument will return you to the previous directory you were in.

If you accidentally issue a cd without any arguments, typing cd - is a convenient way of returning to the directory you came from—in essence functioning as an undo operation:

```
nick@nimble ~/a/long/path/to/some/files $ cd
```

```
nick@nimble ~ $ cd -
/home/nick/a/long/path/to/some/files $
nick@nimble ~/a/long/path/to/some/files $
```

Or, if you want to alternate between two directories, cd - makes this simple:

```
nick@nimble ~/path/to/some/files $ cd ~/another/path/to/some/files/
nick@nimble ~/another/path/to/some/files $ cd -
/home/nick/path/to/some/files
nick@nimble ~/path/to/some/files $ cd -
/home/nick/another/path/to/some/files
nick@nimble ~/another/path/to/some/files $
```

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The Bigger Switch

An open-source angle on Nick Carr's latest book. **DOC SEARLS**

I've always liked Nicholas Carr, even when I didn't agree with him. He's a clear thinker, a solid writer, a fearless partisan for sanity and a member of nobody's cabal. His landmark 2003 article, "IT Doesn't Matter", was voted the best of that year by the staff of *Harvard Business Review*. In 2004, Nick expanded that article into the book *Does IT Matter?*. He followed in 2005 with "The End of Corporate Computing", in *MIT Sloan Management Review*. As usual, few reviewers agreed with him. Including me.

His main point: IT functions were turning into "commodity inputs" developed outside of IT organizations and becoming profoundly generic. He added that IT was declining in strategic importance within organizations, and instead was doomed to perform purely functional roles. From the Preface to *Does IT Matter?*:

IT's transformation from a set of proprietary and heterogeneous systems into a shared and standardized infrastructure is a natural, necessary, and healthy process. It is only by becoming an infrastructure—a common resource—that IT can deliver its greatest economic and social benefits.

I didn't see how much this thesis had in common with my own observations about open-source development until I read Nick's latest book, *The Big Switch: Rewiring the World, from Edison to Google*. In it, Nick stays on the supply side of technology, detailing the sources of IT's—and everybody's—commodity inputs from pure utility service providers: Google/YouTube, Amazon, Skype and PlentyofFish. He sees good and bad in the trends. For example, although he agrees with some observations in Lewis Hyde's classic *The Gift: Imagination and the Erotic Life of Property* and Yochai Benkler's more recent *The Wealth of Networks*, he also dismisses their optimism:

...there's a naïveté, or at least a short-sightedness, to these arguments as well. The utopian rhetoric ignores the fact that the market economy is rapidly subsuming the gift economy. The "gifts of time and ideas" are becoming inputs to the creation of

commodities...businesses are using the masses of Internet gift givers as a global pool of cut-rate labor.

Yet, there is more to a gift economy than the charity implied by the g-word. As Eric S. Raymond put it in "Homesteading the Noosphere":

Abundance makes command relationships difficult to sustain and exchange relationships an almost pointless game. In gift cultures, social status is determined not by what you control but by what you give away....

This abundance creates a situation in which the only available measure of competitive success is reputation among one's peers.

Eric's essay appeared on the Web in 1998. At that time, the LAMP stack was still four letters long. Now that stack is a pile that exceeds a half-million code bases. Most of that code was produced originally for very practical reasons: to solve a problem, to add a capability, to get some work done—or, in hacker parlance, to "scratch an itch". Those code bases are what organizations, including companies large and small, use to build countless new "solutions" and businesses. What they benefit from is less the value of gifting and peer esteem than the value of re-usability, which matters not only to hackers but also to anybody who wants to save money and time.

Peer-built commodity code has given us re-usability out the wazoo. In fact, we have so much of it that the builder of anything technical has to cope with a surfeit of free loose parts, as if sitting in a vast bin of Lego pieces, all seemingly from different sets—a little Star Fighter here, a little Train Station there, a lot of who-knows-what—all of it useful, or it wouldn't have been made in the first place.

It is usefulness that lies behind the creation, expansion and ubiquitizing of what Nick calls the World Wide Computer. If it weren't for the LAMP heap, we would not have the scale of freeness and abundance required to scale up a Flickr, an Amazon Web Service or a Google Cloud Computer.



Consistent with Nick's prophesies, I've been hearing lately about troubles in IT-land. It seems that the gears where IT meets HR are stripped by the independence of what Peter Drucker prophetically called Knowledge Workers. It seems these workers are getting, and sharing, most of their knowledge through commoditized external services outside of IT's control. I know one company where the internal IT system is so locked-down and firewalled against usefulness that employees in one division are getting most of their work done on their own computers, with their own cell phones, using utility "social networking" services from Twitter and Facebook.

There is a natural tendency, of course, to imagine utopian scenarios for the future of the Net. Being a natural optimist, I have gone overboard in that direction more than once—and have been called on it by Nick himself, repeatedly. What still gives me hope, however, even after I discount my own optimism, is the almost brutally meritocratic and practical nature of open-source goods production, and the abundance of smart sources from which they come.

I don't see utopian ideals behind what Alvin Toffler called the Information Age (in *The Third Wave*, which came out in 1980). Rather, I see practical ones, modeled on the construction industry, complete with "architects", "designers" and "builders". The difference is in the materials. In the physical world, we are bound by the laws of physics and the periodic table. In the networked world, we are bound by what the human mind can produce. We have no equivalents of rock and wood, because our raw materials are far less limited and far more abundant than both. This creates new problems and opportunities in equal profusion.

But, for better and worse, the source is us. ■

Doc Searls is Senior Editor of *Linux Journal*. He is also a Visiting Scholar at the University of California at Santa Barbara and a Fellow with the Berkman Center for Internet and Society at Harvard University.

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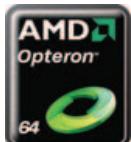
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