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THE FUTURE OF THE LINUX DESKTOP

- ▶ Make a Desktop for Kids
- ▶ Write Your Own Plasma Widgets
- ▶ Running Remote Applications
- ▶ KDE 4... on Windows?



REVIEWED:
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OpenOffice.org vs.
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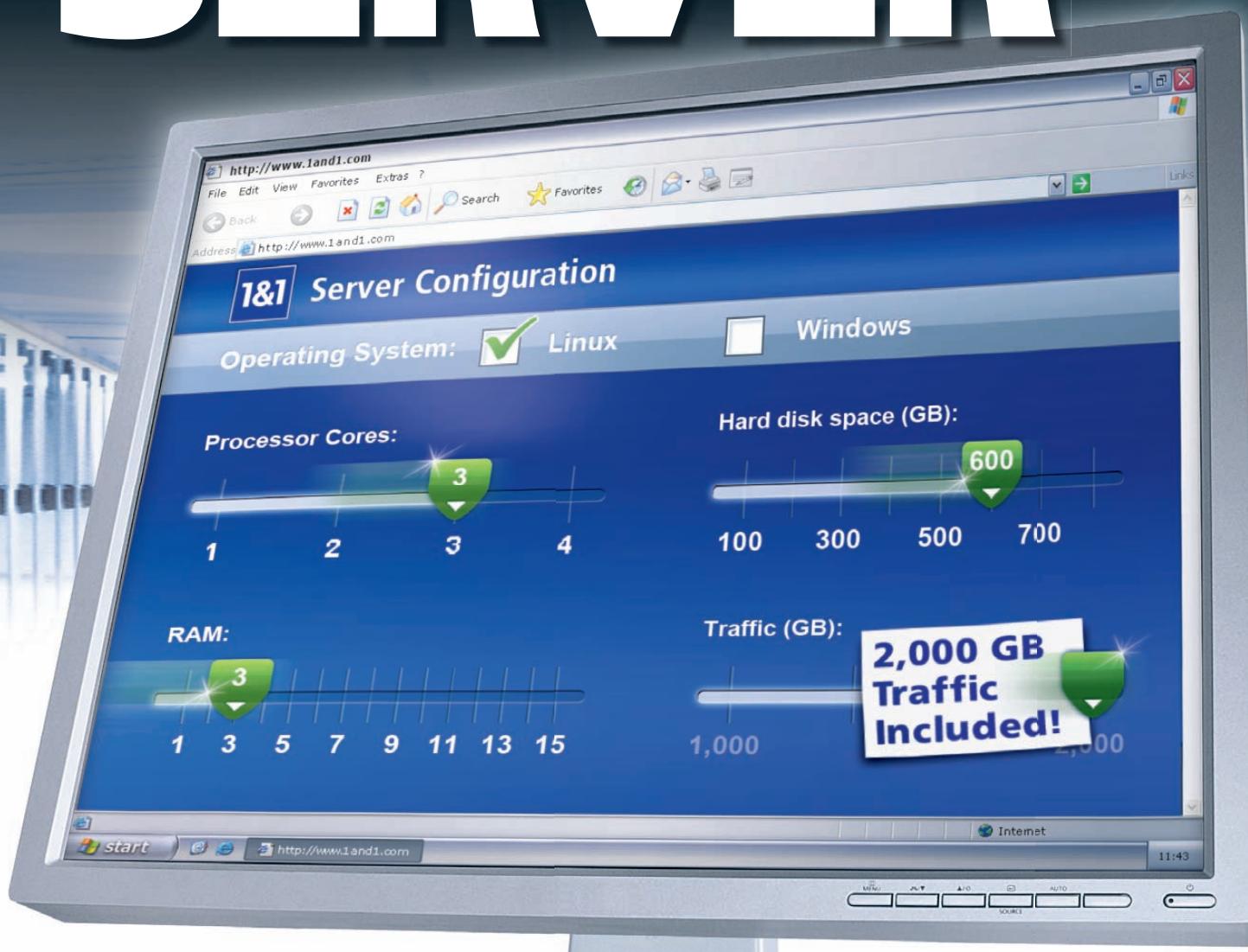
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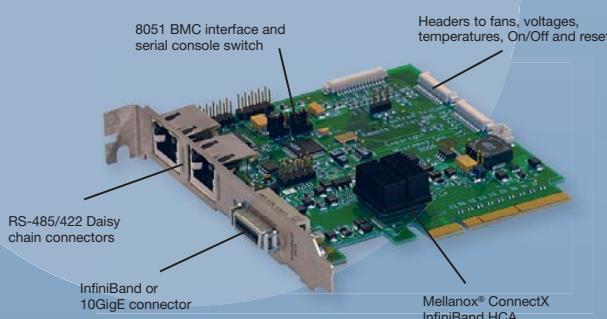
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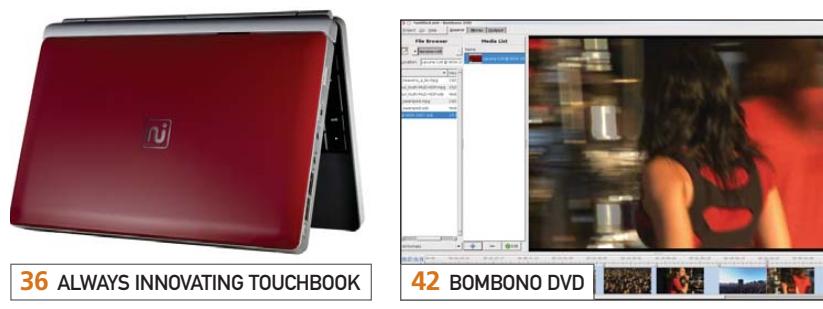
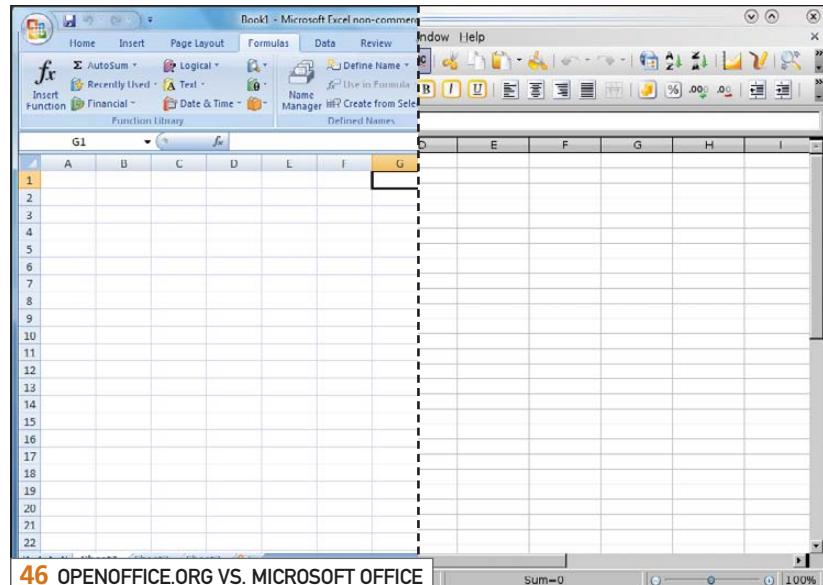
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Next Month: SYSTEM ADMINISTRATION

Most of the time, it's "I'm gonna beat you like red-headed sysadmin", but when things break, nobody gets more respect than a sysadmin. Next month, we've got the stuff you need to fortify your sysadmin toolkit even further.

Find out how AlienVault can help secure your systems and look good while doing it. Find out about SSH tunneling and how secure it really is. Find out how to hook up Nagios directly to SMS and show your teenagers what "texting" is all about.

For the home sysadmin, find out how to automate your backups and be ready for that next disk crash or the next time you accidentally delete something important.

All that and more, coming next month in *Linux Journal*.

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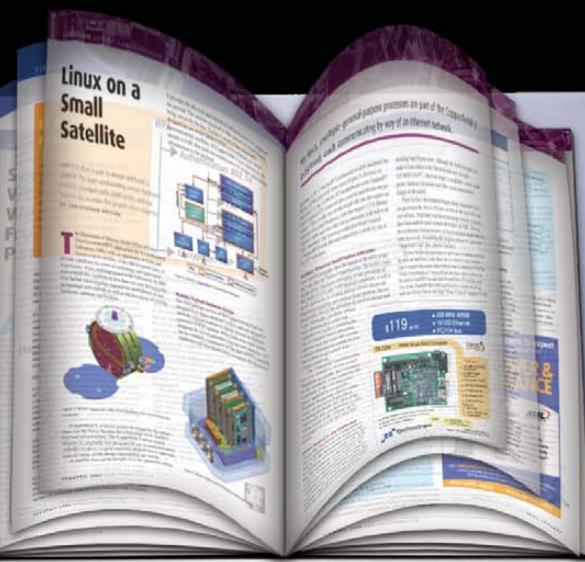
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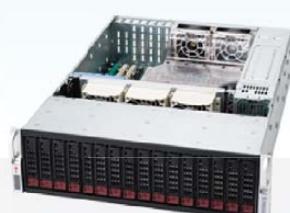
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2010, the Year Linux Skips the Desktop

The phrase "Year of the Desktop" is so cliché, it almost hurts me to write it. I say this year, we strive to move beyond the desktop! Before we get in line for our GNU brain implants, however, let's take this issue to celebrate what we're leaving behind. When you see how cool the Linux desktop is currently, you might have to postpone the soft-tissue kernel module another year or so, and 2010 can be the year Linux is ready for the desktop. Again.

Dave Taylor starts us out with automating Twitter responses. I may not have a brain implant, but my Twitter stream often makes it seem like I do. If you wish your Twitter stream would carry on conversations without you, be sure to read Dave's article this month. If you want to go one step further and control your automated Twitter stream from a coffee shop in the tropics, you'll want to connect back home securely. Mick Bauer shows us all about OpenVPN in his Paranoid Penguin column. VPNs are extremely convenient for remotely administering a network, and as a bonus, the shady guy at table 5 can't sniff your packets.

Speaking of shady guys, Kyle Rankin takes the opposite approach this month. Instead of connecting to a remote server with a VPN, Kyle shows us how to install our own local mail server. He assures me it is not because he cruises around the West Coast wardriving for open Wi-Fi to send spam in bulk, but he also promised me I could really make a lot of money if I set up a deal with a Nigerian prince. So although I don't suggest you use your fresh new e-mail server to spam people, Kyle does show us how a mobile postfix install can be really useful.

Because this is our desktop issue, we really can't count on Kyle for a good representation of what Linux looks like. Anyone who relies on Mutt and Irssi all day wouldn't understand the beauty behind KDE 4. Love it or hate it, KDE 4 has got the glitz. Whether it's the developer interview about the future of KDE

from Jos Poortvliet (which, so far, doesn't include brain implants) or the Plasmoid tweak-fest from Riccardo Iaconelli, we tell you all about KDE's present and future. Heck, even your Windows buddies can play along, as Stuart Jarvis shows us. KDE 4 also will run under Microsoft conditions!

Thankfully, the future of Linux is pretty much out of our hands by now. We're all getting older, and really it's the kids who will reap the benefits of the stable legacy we've given them. Dirk Elmendorf demonstrates some of the ways kids can really take advantage of the Linux desktop. So while in our circles we might still be arguing over which is better, Microsoft Office or OpenOffice.org (Bruce Byfield has a comparison for us this month), our kids probably will be wondering why we bothered typing at all. They'll be either thinking text to each other or, at the very least, using a touchscreen instead of those quaint "keyboards" we're so accustomed to. Daniel Bartholomew shows us what that might look like with his review of the Always Innovating Touchbook.

Don't worry if brain implants or KDE Plasmoids aren't your cup of tea. We still have our regular line up of product reviews, tech tips, programming and scripting. So whether you want to ride the Ruby Rails with Reuven Lerner or run remote applications tunneled over the network with Michael J. Hammel, this issue is bound to tickle your fancy in one way or another. We hope you enjoy this "Desktop" issue, and we look forward to next year's neural interface APIs, brain pinout diagrams and how to firewall your frontal cortex. For now, we'll just have to stick with ear buds and really loud music for direct cranial communication. ■

Shawn Powers is the Associate Editor for *Linux Journal*. He's also the Gadget Guy for [LinuxJournal.com](#), and he has an interesting collection of vintage Garfield coffee mugs. Don't let his silly hairdo fool you, he's a pretty ordinary guy and can be reached via e-mail at shawn@linuxjournal.com. Or, swing by the [#linuxjournal](#) IRC channel on Freenode.net.



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letters



Those Crazy Engineers

I really enjoyed Joey Bernard's "People, Research, Excellence" in the Upfront section of the November 2009 issue about using Linux tools for processing scientific/engineering data. Being an engineer, I can confirm that we do indeed use these kinds of data-processing tricks. We often string them together in pipelines.

We used to have a friendly competition to see who could string together the longest pipeline. Double pipelines were common, and soon triple pipelines became common too. We even had the occasional "quadruple piper" show up.

However, we finally bestowed the coveted "HooKa Award" to a five pipeline string. I do not remember the exact sequence, but it involved grep, sort, cut paste, awk and xgraph. It may have been done with fewer pipes in awk, but it met the committee's criteria of unique, useful and nonredundant functions for each pipe.

--
Henry Hojnacki

Google Hacks?

Thanks to Kyle Rankin for reviewing the Vuzix VR920 goggles in the December 2009 issue. This set of video goggles looks to be nice for video gaming, but depending on how someone can feed the two screens, it may be better suited for those who put on mascots. If Vuzix makes a version that takes

DVI input and works with the BeagleBoard, what's to stop someone from integrating two Webcams into a head of a mascot? This will work nicely with hobbyists as well as the special-effects industry. Jim Henson could be proud! Thanks for the great article.

--
Kelly Price

Calculating Distance

Coincidentally, Dave Taylor's columns on calculating latitude and longitude in the November and December 2009 issues were published at the same time I was writing some code (though not a shell script) to do the same thing for a client. The only problem I can see in Dave's solution is the conversion from kms to miles. One mile is equal to 0.621371 kms. Dave's answer to the distance between Long Beach, CA, and Boston, MA, is pretty close. Calculating the distance between Boston's Logan airport and Long Beach's Daugherty Field, I calculate 2594.8 miles. A flight-planning program I use puts the distance at 2594.5 miles. I would chalk Dave's difference up to the Yahoo Maps route, which will not be a straight line.

--
Ed Rubinsky

Microsoft Trolls?

I too think *Linux Journal* is getting letters from Microsoft Trolls [see the "Linux on the Desktop, Continued" letter in the December 2009 issue]. For example, the author of the "Dark Days?" letter in December 2009 issue claims he bought a small laptop running Linux. He didn't specify what laptop or what distribution. (There's a clue.) He claims it was incompatible with 3 mobile broadband. He claims he had no success loading Java. He claims he had no luck loading a (USB?) 56k modem for emergency use. What a crock of cranberries.

A little over a year ago, I bought an ASUS 901 Eee PC from Target. Out of the box, I had no trouble connecting one of three unsecured Wi-Fis in my multi-unit condo. I didn't try the other two. Later on, I was able to connect to the Wi-Fi at a local public library with no problem. Still later, I was able to connect to my son's encrypted Wi-Fi (that did take a few minutes of fiddling).

I have a hard-wired network. It was no problem to incorporate the 901 into it.

Just bring up a terminal screen on it (pressing Ctrl-Alt-t does that) and tweak a couple configuration files. Oh, did I mention I can print documents from the 901 to the printer attached to my primary PC?

The 901 came with Java on it. It's version 1.5. I installed 1.6.0_7 so I could run Moneydance on it. I had to tweak Moneydance's startup bash script so it would find where I installed it. Moneydance runs just fine. I installed MySQL on it so I could run my automobile fuel purchases and maintenance log software on it.

I had to install emeditor so I could invoke the software I installed from the GUI. It's running the Linux distro it came with. It does what I need it to do without changing the OS, so I didn't bother. It worked fine right out of the box for all the ordinary things—connecting to a Wi-Fi access point, doing e-mail, accessing the Web, writing, viewing pictures, watching YouTube videos and so on. True, I had to know something about using a computer before I could customize it, but so what? That's true for any of them.

One last thought. You know how to cripple a computer? Get rid of the command-line interface.

--
Dan Curtis

Although I'm not convinced the letters are from Microsofty folks, I admit it's often a bit odd to hear the problems people claim to have with their laptops. But then again, I got an Acer Aspire One 751h and had boatloads of problems. If the person is truly a new user, it's unlikely he or she knows what to specify when asking for help—"Uh, it's blue, does that help?" So it's very likely people are having legitimate concerns. The truth of the matter is that I'm unlikely to get flustered with scathing letters to the editor complaining about Linux's shortfalls. Our community is one that should strive to be open and helpful when people are looking for help and lend a sympathetic ear when people just want to vent. Why? Because if our goal is to help people understand the value of open source, we need to be that value.

So if they are trolls, I say bring 'em on. Some of the best Linux advocates were Windows users at one time!—Ed.

SheevaPlug Please

Hello, your magazine mentioned the SheevaPlug briefly (www.linuxjournal.com/article/10440), but I think that this interesting little device might be a good target for review. I've been thinking of getting one, as I'd love to have a Web server at home, but I don't want to have yet another machine sucking up power (not to mention, leaving it on all the time, avoiding distro hopping and so on, just to make sure that my server doesn't suffer from downtime). The SheevaPlug seems to be a full ARM-based (and tremendously low-power!) computer the size of an AC adapter, perfect for SSH and setting up whatever server a user would desire. I have found some reviews on-line, but none from sources that I trust as much as *Linux Journal*. Anyway, here's to hoping that one of your writers takes it for a spin sometime!

--
Tuxly_Tuxford_McTuxtington

I agree. In my house, the "server room" is our closet, and with a full-blown computer running in there, it gets hot! Not only are we interested in the SheevaPlug, but we also have an article lined up. Stay tuned for our take soon. (I'm actually waiting for the article to decide if / want to get one too!)—Ed.

Thanks Microsoft!

Like many geeks, people often ask me to fix their computers. Thanks to Vista and Windows 7, this has been happening a lot more often. I make a good bit of money, and I often convince them to install an "extra operating system" for free. I tell them, "if worse comes to worse, and Windows fails again, you always can use Ubuntu as a backup operating system so you still can get on-line or whatever. But, it is a very good OS and you should check it out."

So, I customize it for them (people can be very militant about docks or where a taskbar is). I also resolve possible wireless problems or blacklist modules that could cause hardware problems, and usually I like to put a little text document on their desktop as a quick walk-through.

So far, I have had only one person actually prefer Vista, in which case I removed Ubuntu for him. Everyone else has given me enormously positive feedback, and many have asked me to remove Windows altogether. A lot of the time, they even pay me a little extra. So, I would like to thank

Microsoft for all the extra business and money it has been throwing my way.

--
Zachay Bittner

Awesome. Might I add, installing things like Dropbox (dropbox.com) and Xmarks (xmarks.com) can make such transitions much less painful. If people have access to their documents and bookmarks, it makes using other computers pretty painless. Also, be sure to install lots of fun games in Linux. Even Solitaire gets old after a while, and they might reboot just to play Frozen Bubble!—Ed.

Work the Shell and C

Without looking it up for confirmation, it appears that your distance program [see Dave Taylor's "Calculating the Distance between Two Latitude/Longitude Points" in the December 2009 issue] is calculating doubles from input args parsed as floats (via atof). It's just a guess, but that would probably introduce those darn rounding errors.

--
Frank Brown

Dave Taylor replies: That's a good possibility. I'll dig into that one and see where I get. Thanks.

Desktop Linux? Not Yet

I have been a fan of Linux from its beginning and have followed the debate of whether it is ready for the general desktop as a main competitor to Windows. However, time and again I have been disappointed. My last confrontation was with Ubuntu, which I installed on my Dell Inspiron 530s. The wireless card has the Broadcom chipset (4328 rev 3), and it turns out this is not supported by any Linux distribution (out of the box). You can go through some contortions and install the drivers yourself, and I was able to do it for Ubuntu 9.04 but not for 9.10. Now, Dell is the first or second biggest computer maker, and Broadcom is also a major wireless chip supplier, so how come they are not supported by Linux (and this problem has been known for at least 2–3 years)? Even if Broadcom does not release its driver source code, why wouldn't the Linux distributors provide a simple script to install the right driver? This and similar problems prevent Linux from being a real competitor to Windows on the desktop.

--
Eli Sternheim

Sigh. Up until Windows 7, installing drivers

(that strange contortion) on Windows was much more common than the need on Linux. Even companies that don't provide source code aren't the problem—it's not providing any driver support for Linux. Take NVIDIA, for example. There is no source code for its drivers, but it supports the Linux community by providing close-sourced binary drivers for its hardware.

The other side of the coin is that hardware changes so often, a revision 3 vs. a revision 2 could be drastic. Shouldn't it be up to Dell to provide the drivers? If you want a driver for the Dell for Windows, you go to Dell's support site. Shouldn't Dell do the same for Linux? When it's all said and done, the Linux community is doing a fairly remarkable job supplying workarounds for strange hardware. Hopefully, support will continue to get better, even if vendors don't actively help!—Ed.

Dave Taylor's Problems with Distance

I think the distances computed by Dave's distance.c program are okay [see Dave's Work the Shell in the December 2009 issue]. I started to check the formulas carefully and then had an idea: Wolfram|Alpha (www.wolframalpha.com). Entering "denver, co to chicago, il", I got 916.7 miles—quite close to Dave's 917.984. Then, "long beach, ca to boston, ma" yielded 2,599 miles—pretty darn close to Dave's 2,597.53 miles. I would say his computations are okay.

So, why do the computations yield 2,599, when Yahoo Maps says it's 3,015, a good 400 miles longer? If you display the route chosen by Yahoo, it definitely does not look like a straight line. But the computed distance is along a great circle, not a straight line, and if you draw a great circle between the BOS and LGB airports using GPS Visualizer (www.gpsvisualizer.com/calculators), it is surprisingly close to the road route shown by Yahoo. (By the way, GPS Visualizer says the distance is 2,598.4 miles, so I think you can quit worrying about your distance computations.)

It may be that there is a fractal effect here: when the route is viewed from afar, it looks like a fairly smooth curve. However, if each short segment is examined, there probably is a lot of zigzag. (But 400 miles of zigzag?)

--
Roger House

[LETTERS]

Dave Taylor replies: Roger, I like your answer. We'll tally it up to a lot of sidetracks and inefficient roads.

A Penguin with Good Eyesight

I was in a reflective mood today and thought I should share some of my thoughts to encourage those of you cutting your teeth with Linux. Five years ago, I knew absolutely nothing about this glorious operating system, and I am within a month's time going to be starting up the first LUG in our community with 20 terminals available, so we can start collectively raising up new "Penguins" throughout our city. If you are discouraged with not knowing what in the world the terminal is, or if you think that "apt-get" is computer lingo for a "hiccup" or "yum" is an edible OS, you are not alone.

What I have found to be an invaluable resource is this magazine. At first, I thought I was reading some kind of hieroglyphic, but eventually, I caught on to one thing and then another. My wife thinks I am celebrating Christmas when my trip to the mailbox renders the next month's copy of *LJ*. I can't wait to read every page from front to back, even if I don't understand about 50% of it!

Bill Hybels, an American author, once said, "Visionary people face the same problems everyone else faces; but rather than get paralyzed by their problems, visionaries immediately commit

themselves to finding a solution." This is how I view Linux and the Linux community. My goal is to one day see my community hosting a Linux conference. It may not be of the same scale as many advertised within *LJ*, however, Linux has inspired me to go from a computer user paralyzed with problems to a "Penguin with good eyesight".

If you are a new user, hang in there. Be a good researcher. Learn to dual-boot. The pain of learning this OS pays off in no time. I spent 30 hours trying to work with my former OS and could not fix the problems I was having. I dedicated 30 hours to learning my new OS, and it was time spent wisely.

Much thanks to all who have contributed to this magazine and my growth as a Penguin. May we all improve our Vision!

--

Dean Anderson

Aw, shucks Dean, you're making us blush! Regarding a community Linux event, to be completely honest, they're usually at least as helpful as the big ones. My suggestion would be to start small. Perhaps invite a couple school techs to your LUG meetings and so on. I'm a big fan of Linux in education, so my suggestion may be biased, but if you can get kids using Linux in school, total world domination is the next logical step!—Ed.

PHOTO OF THE MONTH

Have a photo you'd like to share with *LJ* readers? Send your submission to publisher@linuxjournal.com. If we run yours in the magazine, we'll send you a free T-shirt.



Here are a couple shots of me doing some tower work on a pair of long-distance 802.11 Wi-Fi links. The equipment being installed is a pair of Ubiquiti Bullet2-HP radios, which are Linux-based. They are actually replacing a pair of Cisco radios that were found to be incredibly fragile. One of the wireless links provides service to a fireworks company (Premier Pyrotechnics) located about 11 miles from the city of Richland, Missouri. The other is to provide service to the company president, both of which are located in areas where any sort of broadband is completely unavailable other than satellite service. You can see, my Open Source backpack and Ubuntu backpacks came in handy for doing the "heavy lifting". Submitted by Nathan Neulinger.

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diff -u

WHAT'S NEW IN KERNEL DEVELOPMENT

The **git** and **quilt** tools were developed by **Linus Torvalds** and **Andrew Morton** for the same reason—to help organize patches. But part of Andrew's motivation in developing quilt was to avoid having to adapt his work habits to git. So, what do you get if you cross those two tools together? Apparently, you get **StGit** (stacked git), a Python script developed by **Catalin Marinas** and various others. It emulates quilt's ability to push and pop patches onto and off of a stack, but it does so on top of a full git repository. Thus, users can take advantage of the full range of git features, in addition to the pushing and popping features of quilt.

Large numbers of occurrences of the **big kernel lock** (BKL) are being expunged from the kernel. This isn't exactly news, but the pace of BKL patches seems to have stepped up lately. The basic pattern seems to be to push the BKL out of the core code and into specific drivers. This way, only a single piece of code relies on a given occurrence of the BKL. This lets the developers replace just that occurrence with something that does a different kind of locking that works for just that bit of code. The whole problem with eradicating the BKL is that the true locking requirements of anything that uses it are really very different from each other. So, if a lot of stuff depends on a single instance of the BKL, it's just impossible to recode that instance of the BKL to be less heavy-handed and still work for everyone. That's one reason why various folks used to say getting rid of the BKL would be nearly impossible. But lately, thanks to this whole process, folks like **Thomas Gleixner** and **Jan Blunk** and others are ripping the BKL out of the kernel in big fistfuls.

On systems with tons of CPUs, just listing the **boot messages** on the screen can cause big delays in the boot process and produce so much output, any information that actually might be useful for debugging is

simply buried under tons of other data. **Mike Travis** calculated that with 4,096 processors and a console baud rate of 56K, the boot messages would take almost an hour and a half just to display. He's posted some patches and worked with various folks like **Andi Kleen** and **Ingo Molnar** to help reduce the number of less-relevant messages that come through during startup.

Relicensing kernel code is tricky. You need to get permission from everyone who's submitted patches, because those people hold the copyright on their own contributions and have (modulo some legal fuzziness) released their code under the same license as the rest of the code, or under the licensing that they specify when they submit the patch. So, when **Mathieu Desnoyers** wanted to dual-license portions of the **tracepoint** code under the **GPL** and the **LGPL**, and other portions under the **GPL** and **BSD licenses**, he had to ask all the contributors for permission.

In the old days, that would be a nonstarter, because identifying all contributors would involve combing through mailing-list logs and Usenet logs, and even then, there wouldn't be any guarantee that everyone had been found. With the advent revision control for the kernel and the **Signed-Off-By** headers that are now standard with all patch submissions, it's now trivial to list everyone who's contributed to a piece of the kernel, as far back as the revision control records go.

Even so, actually getting everyone's permission is not always a done deal. In this case, Ingo Molnar rejected Mathieu's request, putting Mathieu in the position of either having to abandon the project, persuade Ingo to change his mind or extract Ingo's code and relicense the remainder, which would be very difficult. It's unclear how this particular case will turn out, but it's at least possible the relicensing will take place.

—ZACK BROWN

They Said It

Few things are harder to put up with than the annoyance of a good example.

—Mark Twain

It won't be covered in the book. The source code has to be useful for something after all.

—Larry Wall

The first 90 percent of the task takes 90 percent of the time, and the last 10 percent takes the other 90 percent of the time.

—The Ninety:Ten Rule

Strange as it seems, no amount of learning can cure stupidity, and higher education positively fortifies it.

—Stephen Vizinczey, *An Innocent Millionaire* (1983)

Aoccdrnig to a rscheearch at an Elingsh uinervtisy, it deosn't mtaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht frist and lsat ltteer is at the rghit pclae. The rset can be a toatl mses and you can stil raed it wouthit porbelm. Tihs is bcuseae we do not raed ervey lteter by it slef but the wrod as a wlohe.

—Unknown

I am patient with stupidity but not with those who are proud of it.

—Edith Sitwell, quoted in *The Last Years of a Rebel* (1965)

Now Hear This

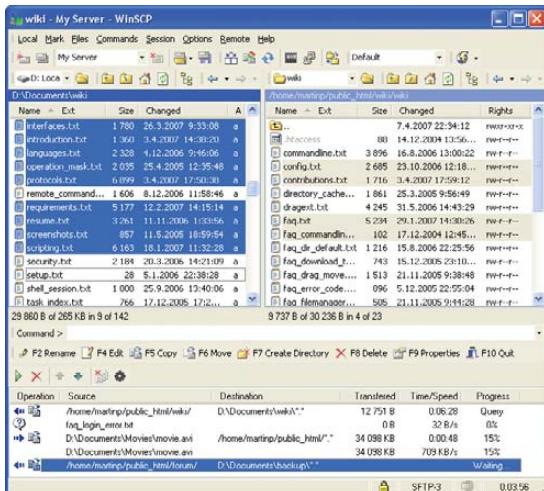
Even with modern Linux distributions, the inconsistency with onboard audio devices makes using headphones and microphones a hit-or-miss venture. When things work, they work great, but when things don't work, it's generally tough to get them going.

Thankfully, there is an audio standard that seems to work pretty consistently across operating systems: USB. Although the thought of purchasing additional hardware to get sound into or out of your Linux machine might seem a bit frustrating, USB audio devices tend to have better sound quality than the cheap onboard audio devices that come with most laptops and desktops.

Now, because I've given you this tip, you'll probably never need to use it. Still, it's good to know USB audio is very supported under Linux, and the devices are fairly standard. Plus, it's easy to add multiple audio devices with USB audio, which makes things like podcasting much easier!

—SHAWN POWERS

NON-LINUX FOSS



WinSCP Commander Interface (from winscp.net)

You can edit remote files using a local editor. It even gives you the ability to find files on the remote system. The GUI interfaces provide Windows integration: drag and drop, desktop and quick launch icons, "Send To" support and so on.

WinSCP optionally allows you to store configuration information in a configuration file rather than in the registry for making your WinSCP configuration portable. WinSCP also provides U3 support, which is a proprietary method for formatting USB drives and auto-launching applications from them.

WinSCP has been translated into numerous languages. The current stable release is 4.1.9, but version 4.2 may be available by the time you read this (at the time of this writing, the fourth beta version of 4.2 is available).

—MITCH FRAZIER

LinuxJournal.com

Sometimes you need to step away from the desktop. Bear with me on this for a sec. Seriously.

Of all the *Linux Journal* staff members, I may be the least able to separate myself from my electronic life. Now and then I do find it is nice to go back to old-school methods of organizing myself. I ditch the mobile device, the Google apps, the multiple workspaces and use an old-fashioned, awesome *Linux Journal* wall calendar.

See, we have this other Web site at www.linuxjournalstore.com where you can get all kinds of cool stuff. So you if you'd like a super-cool tricked-out office like I have, kick it old-school with me. Pick up a 2010 calendar and let your geek flag fly.

—KATHERINE DRUCKMAN



LJ Index February 2010

1. Windows XP percent market share: **70.48**
2. Windows Vista percent market share: **18.83**
3. Windows 7 percent market share (12 days after release): **2.15**
4. Mac OS X (all versions) percent market share: **5.27**
5. Linux (all versions) percent market share: **0.96**
6. iPhone percent market share (O/S market): **0.37**
7. Millions of Google hits for Windows: **7,330**
8. Millions of Google hits for Linux: **287**
9. Millions of Google hits for iPhone: **367**
10. Number of preferred "search" languages supported by Google: **45**
11. Number of user interface languages supported by Google: **129**
12. Number of official languages of sovereign countries: **116**
13. Number of sovereign countries: **203**
14. Number of Linux 1.0 kernels released: **1**
15. Number of Linux 1.2 kernels released: **14**
16. Number of Linux 2.0 kernels released: **41**
17. Number of Linux 2.2 kernels released: **27**
18. Number of Linux 2.4 kernels released: **71**
19. Number of Linux 2.6 kernels released (as of 2.6.31.5): **328**
20. Sum of above statistics: **2,057.06**

Sources:

- 1–6: marketshare.hitslink.com | 7–9: www.google.com
- | 10, 11: www.google.com/preferences |
- 12: en.wikipedia.org/wiki/List_of_official_languages |
- 13: en.wikipedia.org/wiki/Countries_of_the_world |
- 14–19: www.kernel.org/pub/linux/kernel/ |
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Comparing Files

You often may need to compare one version of a file to an earlier one or check one file against a reference file. Linux provides several tools for doing this, depending on how deep a comparison you need to make.

The most common task involves comparing two text files. The tool of choice for this task is diff. With diff, you can compare two files line by line. By default, diff notices any differences between the two text files, no matter how small. This could be as simple as a space character being changed into a tab character from one file to the next. The file will look the same to a user, but diff will find that difference. The real power of diff comes from the options available to ignore certain kinds of differences between files. In the above example, you could ignore that change from a space character to a tab character by using the -b or --ignore-space-change options, which tell diff to ignore any differences in the amount of whitespace from one file to the next.

What about blank lines? The -B or --ignore-blank-lines options tell diff to ignore any changes in the number of blank lines from one file to the next. In this way, diff effectively looks only at the actual characters when comparing the files, narrowing diff's focus to the actual content.

What if that's not good enough for your situation? You may need to compare files where one was entered with Caps Lock turned on for some reason, or maybe the terminal being used was misconfigured. You may not want diff to report simple differences in case as "real" differences. In this situation, use the -i or --ignore-case options.

What if you're working with files from a Windows box? Everyone who works on both Linux and Windows has run into the issue with line endings on text files. Linux expects only a single newline character, while Windows uses a carriage return and a newline character. diff can ignore this with the --strip-trailing-cr option.

diff's output can take a few different formats. The default contains the line that is different, along with a number of lines right before and after the line in

question. These extra lines are called context and can be set with the "-c", "-C" or "--context=" options and the number of lines to use for context. This default output can be used by the patch program to change one file into the other. In this way, you can create source code patches to upgrade code from one version to the next. diff also can output differences between files that can be used by ed as a script with the -e or --ed options. diff also will output an RCS-format diff with the option -n or --rcs. Another option is to print out the differences in two columns, side by side, with the -y or --side-by-side options.

The diff utility compares only two files. What if you need to compare three files? diff3 comes to the rescue. This utility compares three files and prints out the diff statements. Again, you can use the -e option to print out a script suitable for the ed editor.

What if you simply want to see two files and how they differ? Another utility might be just what you are looking for, comm. With no other options, comm takes two files and prints out three columns. The first column contains lines unique to the first file, the second column contains lines unique to the second file, and the third column contains lines common to both files. You can suppress each of these columns selectively with the options -1, -2 and -3. They suppress columns 1, 2 or 3, respectively.

Although this works great for text files, what if you need to compare two binary files? You need some way to compare each and every byte in each file. Use the cmp utility, which does byte-by-byte comparison of two files. The default output is a printout of which byte and line contains the difference. If you want to see what the byte values are, use the -b option. The -l option gives even more detail, printing out the byte count and the byte value from the two files.

With these utilities, you can start to get a better handle on how your files are changing. Here's hoping you keep control of your files!

—JOEY BERNARD

Linux in Education

One of the biggest arguments used against Linux in grade-school-level education is that we aren't teaching kids to use the applications they'll need in the "real world". As the Technology Director for a K-12 school district, I've heard that argument many times. After all these years, I still don't buy it. Truthfully, to give kids a well-rounded education, we should expose them to as many different types of technology as we can. Children should be comfortable using whatever tool is at their disposal to accomplish a given task. This isn't a new concept by any stretch of the imagination. For some reason, when it comes to computers, however, the "Microsoft Mantra" is all too prevalent.

Think about some other subject areas:

- Language: teachers begin teaching grammar to young kids. They start with the simple concepts, like differentiating between nouns and verbs, and move on to tougher things. By the time students are finished in high school, they've likely been given many different types of writing assignments. The concepts they've learned allow them to write well as they continue in life. Guess what though? I never once was taught to blog in school. It just didn't exist. Thankfully, because I was taught the concepts of writing and grammar, I'm able to pull off the crazy world of blogging as if I were specifically trained for it.
- Mathematics: just like with language, mathematics are taught with fundamentals. Specific problems are assigned (remember story problems?), but it's very clear that everything we learned in school was meant to be extrapolated upon.
- Reading: I didn't go to the most prestigious school in the country. Heck, I didn't even go to the best school in the area. I am very certain, however, that no school assigns every book ever written to their students. Even if they did, more books are published every day. Again, it's the *concept* of reading that we learn, not specific books.

■ Driver's Ed: my first car was a 1978 Volkswagen Diesel Rabbit. It was a four-speed manual transmission, and it had the touchiest clutch I've ever driven. In driver's ed, however, I drove a cute little Dodge with an automatic. Sure, when I finally got a car, I had to learn a few new things, but my driver's education and driver's license prepared me perfectly fine. The rules, procedures and, yes, concepts were all the same.

So why are computers different?

I think there are a few valid arguments for specific applications being taught in schools. For vocational programs, especially if they are computer-related, a firm grasp of the specific applications that will be used is slightly advantageous. Even with that, however, it's important to teach concepts, because programs change all the time.

Higher-level education (college and so on) is certainly the time to begin specializing in specific areas. Some of those areas require certain applications and/or operating systems. Accountants, for example, might be expected to know how to use QuickBooks. Graphic designers probably would be expected to know Adobe Photoshop inside and out.

At the grade-school level though, we need to teach children not only how to use technology, but also how to learn to use technology. If we can offer students the use of Windows, Linux and Macintosh, and teach them Web 2.0, handheld computing and application concepts, we prepare them to succeed. Isn't that what we ultimately want for kids? For them to succeed in whatever they do?

Linux is the *perfect* tool for education. It plays well with other operating systems, and it offers such a wide variety of applications that it's silly not to expose children to its usage. Oh, and there's also that little thing called cost. For many schools, that alone can seal the deal. Linux offers more, costs less and even can fit well with existing tools. Why in the world wouldn't schools want Linux?

—SHAWN POWERS

Wave Goodbye to E-mail?

Late last year, getting a Google Wave invite was reminiscent of getting a Cabbage Patch Kid in 1983. It was the newest gizmo everyone just had to have. As a geek, I was one of the kids begging the loudest. Thankfully, one of our readers from across the pond (Paul Howard, thanks!) sent me an invite, and I cleared my schedule for the product that was going to change the way I communicate. Only, it didn't.



I'll admit, some of the reasons are not Google's fault. First, off, it wasn't even in beta yet. I also didn't really have anything I wanted to communicate with anyone. Even with those two things in mind, I did expect it to be fun to experiment with. Quite frankly, it seemed more cumbersome than helpful.

In watching the demonstrations on the Google Web site, it seems apparent Google Wave was designed to solve some problems we've all faced in e-mail. Where I think Google may have gone wrong, however, is in trying to solve a problem with additional technology that really we've all learned to manage anyway. Sure, Google Wave allows conversations to take place in one section, so everyone can see what's going on, but we've all solved that years ago with "reply all" and "forward". Yes, Wave allows for embedded photos, videos and so on, but let's be honest, we've all been attaching files and/or links for years.



Google Wave Screenshot

So what do you think? Am I off-base with my assessment? Is Google Wave changing the way you communicate? If so, I'd love to hear about it. You'll have to send me an e-mail though, because even though I got my Google version of the Cabbage Patch Kid, mine is still in the box.

—SHAWN POWERS



REUVEN M. LERNER

Debugging Rails Applications

If and when you get stuck working on a Rails application, some of these techniques will help you identify and solve the problem more quickly than before.

The past few months, I've covered a number of automated testing systems available to Ruby programmers in general and Rails developers in particular. Automated testing, especially when you use it before and while you develop (as opposed to afterward) is a terrific way to improve the quality of your design, as well as the robustness of your code. Whether you practice TDD (test-driven development), BDD (behavior-driven development) or something similar to the two, your software is likely to have fewer bugs and be more maintainable than its untested counterparts.

So, does that mean software written in this way has no bugs? Let's not be silly—of course it does. But, if you have been serious about testing, you are likely to have fewer bugs, and they may well be harder to detect and more subtle.

If the bugs are smarter (or craftier), your debugging and testing tools need to be smarter too. Fortunately, as the Ruby language and the Rails framework for Web development have become increasingly popular, a number of talented developers have stepped up to the plate, offering a variety of sophisticated tools that can help you identify and squash bugs as they occur.

This month, I describe a few of the tools that I use when developing Web applications using Ruby on Rails. If and when you get stuck working on a Rails application you are developing, I hope some of these techniques will help you identify and solve the problem more quickly than before.

Look at the Logfiles

I'm a big fan of logfiles. When something goes wrong on my computer or in a program I've written, my first instinct is to check the logs. When I am teaching a class in Rails development, and people ask why their program doesn't work, my first response always is to ask them what the logfile says. It can be an invaluable starting point for debugging problems.

Fortunately for me, the Rails core team also likes logfiles quite a bit. Each environment—and there are three by default, for development, testing and production—has its own logfile, named

log/ENVIRONMENT.log, under the application's root directory.

Just what is put into the logfile depends on the settings you have made. By default, the development logs include a great deal more detail than the production logs, showing you (among other things) the actual SQL queries that are being sent to the database. Each log message has a level associated with it, much as you might have seen in other logging systems, such as Apache or log4j. A logged message is written to the logfile only if it is at least as important as the current environment's minimum logfile priority (in increasing order of priority: debug, info, warn, error and fatal). Thus, a fatal log message always will be written to the log, while a debug message will be written only if the current environment's log level is debug.

The logfile is useful in at least two ways. First, it allows you to see what is happening inside your program as it executes, particularly when something goes wrong. In the development environment, a fatal error will produce a stack trace in both the browser and in the logfile. But in the production environment, you probably don't want the world to see the internals of your code's flaws. For this reason, stack traces appear only in the production log, while the browser shows an error message. Tracing through a logfile is, as I stated earlier, my favorite way to figure out what is happening in a program.

In addition to the stack backtrace, the logs (and particularly the development logs) contain a wealth of other information, as you can see from this short example:

```
Processing ReviewController#view_one_review (for 74.212.146.115
at 2009-11-10 09:25:55) [GET]
Session ID: 9513bd79785b3d037804b45709a1f12c
Parameters: {"id"=>"2567"}
Rendering template within layouts/one-review.rhtml
Rendering review/view_one_review
Completed in 1400ms (View: 16, DB: 973) | 200 OK
[http://example.com/book_reviews/view_one_review/2567]
```

The first line shows the date and time when the

request was made, the controller and action that were invoked, and the URL (at the bottom of the log entry) that caused that controller and action to be invoked. It shows that the HTTP response code was (200, or "OK") and how long it took to execute, giving you a rough sense of how efficient a particular method might be. And, you even get a breakdown of how long the database and view each took, allowing you to focus your optimization strategy on the truly needy methods in your system.

You also get the full list of parameters that were submitted to the controller action. This has been particularly useful to me on numerous occasions when I get calls from clients. Being able to look at the parameters that were submitted to the controller action allows me to test those precise parameters and trace their usage through the system.

Finally, you can see which view templates were rendered. Especially on a site with a complicated set of views, it's often helpful to know just what is being invoked and displayed.

In the development environment, you also will see things like this:

```
Parameter Load (1.9ms)  SELECT * FROM "parameters"
  WHERE ("parameters"."param_name" = E'Blocked IPs'
    AND "parameters"."param_group" = E'Restrictions') LIMIT 1
PaymentMethod Load (2.0ms)  SELECT * FROM "payment_methods"
  WHERE (disabled = false) ORDER BY payment_method_name
State Load (6.5ms)  SELECT * FROM "states" ORDER BY abbreviation
```

In other words, you can see when objects are being initialized from the database and what queries are being used in order to do this.

So far, I've shown how you can use the default output in Rails logfiles to find useful information about what your application is doing. But I often find it useful to write information to the logfile as well, indicating where I am in the code or that a particular task has been accomplished. For example, on a book-store application that I worked on with a complicated pricing algorithm, I would log each calculation in that pricing algorithm to the logfile. This would allow us to "replay" the algorithms as users saw them and double-check our work in a variety of ways.

To log information to the Rails logs, simply use the logger object and send it a message corresponding to the log level you want to use. For example, if you want to know whether a product is in stock, you could say:

```
logger.warn "Checking to see if ISBN '#{isbn}' is in stock."
if Isbn.in_stock?(["isbn" = ? ", isbn"])
  logger.warn "\tYup, we have it!"
end
```

Such "chatty" logs might be slightly inefficient,

but they make it easier to read (and follow) what is going on inside your program, on the occasions when you need to read the logs to debug problems. Remember, you are creating these logfiles knowing you will need to read them someday, and by making them as enjoyable, flowing and enlightening as possible, you will make that experience far more pleasant.

I tend to use the warn level for most things I write to the logs and use debug when I want something to appear only in the development logs. If I have to display a complex data structure, I often will display it using YAML, with the `.to_yaml` method. This makes it easier to understand structures, particularly when you're interested only in one or two of its attributes.

I'm also a heavy user of `tail -f` on logfiles, which allows me to see the logfile as it grows. Combined with grep, this makes it possible to search for the occurrence of particular methods, values or anything else that might appear in the logfile. For example, you can look for every mention of a Person object with:

```
tail -f log/development.log | grep Person
```

If I want to peek at a value across many different invocations, I sometimes will put a special marker, such as the method name, in my logger call, by putting the following in a controller method:

```
logger.warn "[interesting_method] The value is '#{foo}'."
```

Notice that I put single quotes around the value; this allows me to identify whitespace and empty strings more easily. I then can see whenever this code is invoked:

```
tail -f log/development.log | grep interesting_method
```

Although I most commonly look at the development log (while writing code) and the production log (on a running server), I also have found occasion to look at the testing log, which shows the results of running tests. (If you are testing with Cucumber, realize that it has its own environment and logfile.)

Use the Console

I have been using logfiles to assist me in debugging and development for years, starting long before I began to use Rails. But logfiles allow you to see only what has happened in the past, passively. One of the best tools in a Rails developer's toolbox is the console, an interactive command-line interface that allows you to query, execute and test commands and variable values. If you are familiar with Ruby's `"irb"` for interactive work, the console will be familiar to you.

The console often is the first place that I write

any code. It puts you in a context similar to that of a controller, allowing you to talk to the database via ActiveRecord, creating (and modifying and destroying) objects and assigning them.

For example, I often play around with associations and named scopes within the console, testing that I easily can retrieve one object through another or retrieve a subset of objects using a method call. For example, if I have a Person object and a Vehicle object, I should be able to say Person.new.vehicles in the console and get the empty array. Or, I should be able to use a named scope to say Person.men, retrieving only the men from the database.

I also use the console a great deal to test objects for validity. The valid? method for ActiveRecord objects, coupled with the save! method that raises an exception when a save goes wrong, allows me to test objects to see whether ActiveRecord believes they're valid, and why. For example, if I say:

```
Person.new.save!
```

I should get a list (not formatted beautifully, I admit) of the validations that have failed—generally indicating which attributes need to be set in order to save the person successfully. True, you always could invoke the errors method on an object after a failed save, but I find this to be faster and more obvious, which is precisely why I'm in the console.

I often use the console to piece together the methods I am going to use or just to experiment with code that eventually will go into a class or module. If you modify a model definition while you're in the console, you need to reload models with:

```
reload!
```

so that the console will be synchronized with the current state of the source code.

By default, the console operates in the development environment, so that when you write:

```
./script/console
```

you are talking to the development database.

I should note that there are a number of Ruby gems designed to improve the irb experience. One of these is wirble, which colorizes and otherwise improves the irb interface. I have been using it for a while and find it hard to use irb without its various improvements.

A newer entry is looksee, which provides a new lp (lookup path) method that shows each of the methods an object responds to, categorized and sorted as a list of ancestors. Using lp has made it easier for me to know just which class or module definition I need to inspect to investigate

a particular method.

If you want to use the console for a production environment, which I often do when debugging problems on a production server, you will need to state the name of the environment explicitly:

```
./script/console production
```

I should add that recent versions of Rails include a similar command, dbconsole, which allows you to talk directly to the relational database for the environment to which you're connected. I often use dbconsole instead of typing mysql or psql (depending on the system I'm using). However, it's important to remember that when you work in the Rails console, the objects are subject to validations and other integrity checks that are not present in your raw connection to the relational database. So for safety's sake, it's usually a good idea to do things through Ruby, rather than the database. (Although if your database supports transactions, you can get some element of safety by doing all modifications within a BEGIN-COMMIT block.)

Debugger

The console, of course, is good for testing code, but you cannot run your entire Rails application inside the console. There are times, however, when you wish you could drop into the console just for a portion of your Rails application to poke around inside it. True, you could use logging statements to write the current state of affairs to the logfile, but there's nothing like interactively exploring an application from the inside to give you a better feeling about how it is working (or not).

The solution to this problem is the deceptively simple ruby-debug gem, which you can install (like all Ruby gems) by saying:

```
sudo gem install ruby-debug
```

You then need to include the gem. This typically is done in the development and/or test environment, but not in the production environment, for obvious reasons. Inside of config/environments/development.rb (or test.rb), you add:

```
require 'ruby-debug'
```

and you're set to go!

Under most circumstances, ruby-debug will do absolutely nothing. It won't affect your code, execution or anything else. But if you drop the method:

```
debugger
```

into your Rails application, the application will halt



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when it gets to that line and will give you a true debugger, looking something like GDB. You get a few lines of context around the current line, you can print current values (or any other expression) with the p command, and you can move forward in the program on a line-by-line basis with the n command. Your Web browser, which presumably triggers the debugger when it invokes a particular controller action, will hang while you are using the debugger, stepping through the code and inspecting the environment.

To explore things more fully, you can drop into irb at any time, getting another version of the Rails console. This is good when you want to do something more than just examine variable values—exploring the database, for example, or drilling down into the innards of the system.

Note that because of the nature of ruby-debug, it's really only practical for use with HTTP servers that you run in the foreground, such as WEBrick. But there's nothing stopping you from having two different application instances (one using Phusion and one using WEBrick) running in the same environment or working on the same database—just make sure to run them on different ports and be sure to keep track of multiple tabs that you might have open in your Web browser.

I've only begun to use ruby-debug seriously in the past few months, and I'm already wondering how I ever got along without it. If nothing else, exploring my application from the inside gives me many insights that I would never have had otherwise, and it gives me a chance to look at things actively, rather than just using logfiles.

Third-Party Options

Finally, you might want to try one or both of the commercial Rails services that have sprung up, and which provide monitoring and notifications for Rails applications. I should make it clear that both of these are hosted by for-profit corporations, and that although they are offering free versions of their products, their ultimate goal is presumably to make money.

New Relic RPM is a performance monitor that you install into your Rails application as a plugin. Every few minutes, the plugin reports your current application status back to New Relic's servers, where the data is then made available in an easy-to-understand format. New Relic's basic offering is free, and although it is much more limited than the commercial versions, I have found it to be highly useful in giving me a snapshot of the current system performance and bottlenecks. If and when your site brings in some money, it might be worthwhile to pay for one of New Relic's commercial products, which provide not only an indication of controller

and server performance from the last 30 minutes, but also from the last few weeks, as well as more detailed analyses of memory, database and CPU use, among other things.

Hoptoad, a service run by Thoughtbot, is similar to New Relic RPM, in that it has a free version as well as a commercial one. Hoptoad is similar to many notification systems, and it sends you e-mail when an exception occurs in your application. However, it keeps track of the entire stack trace and request context, and it also keeps a log of it on Hoptoad's Web site, keeping similar errors together. You also can indicate when you have resolved a problem, using it as a primitive sort of bug-tracking application. (Although I find it annoying that you receive e-mail only the first time a particular error manifests itself, until you mark it as resolved.) Hoptoad has made inroads into many Rails projects on which I have worked, and I have found it to be more reliable and easier to use on my projects than simpler exception-notification systems.

Conclusion

Debugging Web applications has never been easy, but the Ruby on Rails community has managed to create a set of useful and powerful tools that can make a big difference to average Web developers. Whether you are a new developer or an experienced one, having these tools in your toolbox can make you more effective at finding bugs and at getting your application, bug-free, out the door for your customers.■

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

A good introduction to the whole subject of debugging in Rails is in the Rails Guides series, specifically the article on debugging: guides.rubyonrails.org/debugging_rails_applications.html.

A slightly out-of-date tutorial on ruby-debug, but one that is straightforward and easy to understand, is by Patrick Lenz at articles.sitepoint.com/article/debug-rails-app-ruby-debug.

Amy Hoy, as often is the case, has many entertaining and useful things to say on the subject: slash7.com/articles/2006/12/21/secrets-of-the-rails-console-ninjas.

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DAVE TAYLOR

Parsing Your Twitter Stream

More work on the Twitter response bot.

Last month, we circled back to Twitter and started developing a shell script that lets you actually parse and respond to queries sent via Twitter. The idea was that if you were a store, for example, a tweet of "hours?" could be answered automatically with a response tweet of the store's hours—simple, but interesting nonetheless.

We ended last month with a script that does quite a bit in just a few lines:

```
#!/bin/sh

curl="/usr/bin/curl -s"
inurl="http://www.twitter.com/statuses/mentions.xml"
pw='PasswordGoesHere'
temp="/tmp/$(basename $0).$$"

trap "/bin/rm -f $temp" 0 1 9 15 # axe our temp file

$curl -u "davetaylor:$pw" $inurl | \
grep -E '(<screen_name>|<text>)' | \
sed 's/@DaveTaylor //;s/ <text>/;s/<\/text>//' | \
sed 's/ <screen_name>;s/<\/screen_name>;' | \
awk '{if (NR % 2 == 1) { printf ("msg=\"%s\"; ", $0) }
else { print "id=\"$0 \"} > $temp

while read buffer
do
    eval $buffer
    echo Twitter user @$id sent message $msg
done < $temp

exit 0
```

(Unfortunately, it has to have the Twitter account password hard-coded, which I've obviously redacted here. You can see where I have "davetaylor" appear and can tweak this to match your own Twitter account.)

This is a pretty tricky script, if I say so myself. Here you can see that we unwrap the XML sent by Twitter and use a complicated sequence of

This is a pretty tricky script, if I say so myself.

grep/sed/awk to turn it into two name=value pairs, instantiating msg and id.

When I run the script, I see:

```
Twitter user @TedWahler sent message That sounds like a
very interesting article. When and where can I read
&quot;When Not To Identify your Group Memberships&quot; Dave?
```

```
Twitter user @naomimimi sent message i will send you some
of my amazing restedness after sleeping for 20 hours
yesterday. *bzzzt* feel better? :)
```

```
Twitter user @GaryBloomer sent message RE: Song. Dave,
don't know if you have an answer yet, but: Supertramp:
If Everyone Was Listening
```

A tiny tweak can show who sends you tweets (these are actually @ replies, which is what makes this work): simply change the echo in the final loop to just echo \$id.

Want to find those shortened URLs and compile a list? That's a tiny bit more tricky, but you can use tr and grep to do the heavy lifting:

```
$ sh tweet-listen.sh | tr ' ' '\
> ' | grep 'http://'
```

```
http://twurl.nl/bco8tq
http://twurl.nl/bco8tq
http://bit.ly/12PvjV
```

Hey, someone must have retweeted or something for the same URL to show up twice!

What we want to do though is look for a specific pattern within the stream, so let's do that instead.

Looking for Patterns

The easy way is to change the while read buffer loop to do the parsing:

```
while read buffer
do
    eval $buffer
    if [ "$msg" == "hours" ] ; then
        echo "Twitter user @$id asked what our hours are"
    elif [ "$msg" = "address" ] ; then
```

```

echo "Twitter user @$id asked for our address"

# else
#   echo Twitter user @$id sent message $msg
fi
done < $temp

```

Armed with that (and with some cooperative Twitter pals), I can now run the script and find out that:

```

Twitter user @MommyBrain asked for our address
Twitter user @lizhamilton asked what our hours are
Twitter user @valdezign asked what our hours are
Twitter user @bgindra asked what our hours are
Twitter user @MommyBrain asked what our hours are

```

Coolness, eh? Now, let's answer.

Responding to Tweet Queries

From an earlier column "Pushing Your Message Out to Twitter" in the November 2008 issue of *LJ* (www.linuxjournal.com/article/10222), we have a script already lying around that lets you specify

what message you'd like to send out on Twitter, so it's just a matter of assembling it properly:

```

while read buffer
do
eval $buffer
if [ "$msg" == "hours" ] ; then
  echo "Twitter user @$id asked what our hours are"
  $tweet "@$id our hours are Mon-Fri 9-5, Sat 10-4."
elif [ "$msg" = "address" ] ; then
  echo "Twitter user @$id asked for our address"
  $tweet "@$id we're at 123 University Avenue, Anywhere USA"
fi
done < $temp

```

In this instance, I'll repeat the earlier tweet script because it's both so succinct and so darn useful:

```

#!/bin/sh
# Twitter command line interface

user="DaveTaylor" ; pass='PasswordGoesHere'

```



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Just like so much in the world of programming, things aren't as easy as you'd like them to be.

```
curl="/usr/bin/curl"
$curl --silent --user "$user:$pass" --data-ascii \
"status=$(echo $@ | tr ' ' '+')"\ \
"http://twitter.com/statuses/update.json" > /dev/null

echo "(sent tweet $@)"
exit 0
```

The problem is a bit more complex than we've addressed so far, because when I asked people to send one-word queries, I also got things like "directions" and directions! rather than just the word by itself, unadorned by punctuation, quotation marks and so on.

This is something we'll need to deal with in the script, so



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we'll want to scrub the msg value to be just alphanumeric (or just alphabetic, if our set of canned response queries never includes a digit). This can be done with tr again, immediately after the eval \$buffer statement:

```
msg="$(echo $msg | tr -cd '[:alpha:]')"
```

That's not quite right. When we get "directions", it's actually with the quotes escaped by HTML so they're " rather than just the " symbol. The result? quotdirectionsquot. Not good.

Just like so much in the world of programming, things aren't as easy as you'd like them to be. Instead, we're going to have to strip out quotes manually as part of the scrubbing process. Now it looks like this:

```
msg="$(echo $msg | sed 's/&quot;/"/g' | tr -cd '[:alpha:]')"
```

It's a bit more complicated, but not terribly so.

The bigger issue is recognizing when we've already responded to a Twitter query to the bot. I'm sure no one's going to appreciate it if a query for "hours?" results in an answer every ten minutes for the next two weeks!

There are two ways to address that particular problem, one of which is to add timestamps to each tweet and figure out when we last auto-responded, but that sounds suspiciously like work. Instead, we simply can remember the most recent tweet to which we responded, including user ID, and use that as the starting point for subsequent auto-response parsing efforts.

I can't squeeze it in this month, but rest assured that next month we'll add this third piece and then talk about how to slip it into a cron job so that every N minutes our Twitter response bot answers any pending queries from the twitterverse.■

Dave Taylor has been hacking shell scripts for a really long time. He's the author of the popular *Wicked Cool Shell Scripts* and can be found on Twitter as @DaveTaylor and more generally at www.DaveTaylorOnline.com.

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Be sure to check it out at www.askdavetaylor.com/app.

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MICK BAUER

Linux VPNs with OpenVPN

Connect safely to the mother ship with a Linux VPN.

The other day, I was accompanying local IT security legend and excellent friend Bill Wurster on his last official “wireless LAN walkabout” prior to his retirement (it was his last day!), looking for unauthorized wireless access points in our company’s downtown offices. As we strolled and scanned, we chatted, and besides recalling old times, battles won and lost, and one very colorful former manager, naturally we talked about wireless security.

Bill, who has dedicated much of the past decade to wireless network security work in various capacities, reiterated something all of us in the security game have been saying for years: one of the very best things you can do to defend yourself when using someone else’s WLAN is to use a Virtual Private Network (VPN) connection to connect back to some other, more trustworthy, network.

You might think the main value of a VPN connection is to encrypt sensitive communications, and that’s certainly very important. But if you make your VPN connection your default route and use your trusted network’s DNS servers, Web proxies and other “infrastructure” systems to communicate back out to the Internet (for example, for Web surfing), you won’t have to worry about DNS spoofing, Web-session hijacking or other entire categories of localized attacks you might otherwise be subject to on an untrusted LAN.

For this reason, our employer *requires* us to use our corporate VLAN software any time we connect our corporate laptops to any WLAN “hotspot” or even to our personal/home WLANs. So, Bill asked me, why don’t you write about making VLAN connections with Linux laptops?

This isn’t the first good idea Bill’s given me (nor, I hope, is it the last). So this month, I begin a series on Linux VPNs, with special attention to OpenVPN. I’d like to dedicate this series to Bill Wurster, whose skill, creativity, enthusiasm and integrity have been such an inspiration not only to me but also to a couple generations of coworkers. Your warmth and wisdom will be sorely missed, Bill—here’s wishing you a long, happy and fun retirement!

VPN Basics

Rather to my surprise, the overview of VPN technologies in general, and Linux VPN choices in

specific, that I did in 2005 is still pretty current (see Resources for a link to this earlier article). If you find the overview I’m about to give to be too brief, I refer you to that piece. Here, though, is a brief introduction.

To create a “Virtual Private Network” is to extend some private network—for example, your home Local Area Network (LAN) or your employer’s Wide Area Network (WAN)—by connecting it to other networks or systems that aren’t physically connected to it, using some sort of “virtual” (non-dedicated, non-persistent) network connection over network bandwidth not controlled or managed by you. In other words, a VPN uses a public network (most commonly the Internet) to connect private networks together.

Because by definition a public network is one over which you have no real control, a VPN must allow for two things: unreliability and lack of security. The former quality is mainly handled by low-level error-correcting features of your VPN software. Security, however, is tricky.

You must select a VPN product or platform that uses good security technologies in the first place (the world is filled with insecure VPN technologies), and you must furthermore enable those security features and resist the temptation to weaken them in order to improve VPN performance (which is ultimately futile anyhow, as Internet bandwidth is generally slower and less reliable than other long-range network technologies, such as dedicated circuits).

There are three categories of security we care about in this context:

1. Authentication: is the computer or network device trying to connect to the trusted network an expected, authorized VPN endpoint? Conversely, am I, the VPN client, really connecting to my trusted network or has my connection request been redirected to some impostor site?
2. Data integrity: is my connection truly usable only by me and my trusted network, or is it possible for some outsider to inject extraneous traffic into it or to tamper with legitimate traffic?
3. Privacy: is it possible for an attacker to read data

contained in my VPN traffic?

You may not need all three types of security. For example, if you're using a VPN connection to transfer large quantities of public or otherwise nonsensitive information, and are only using a VPN in the first place to tunnel some not-normally-IP-routable protocol, you might consider a "null-encryption" VPN tunnel. But even in that case, you should ask yourself, what would happen if an attacker inserted or altered data in these transactions? What would happen if an attacker initiated a bogus connection altogether?

Luckily, some VPN protocols, such as IPsec, allow you to "mix and match" between features that address different security controls. You can, for example, use strong authentication and cryptographic error/integrity-checking of all data without actually encrypting the tunnel. In most situations, however, the smart thing to do is leverage good authentication, integrity and privacy (encryption) controls. The remainder of this series assumes you need all three of these.

There are two common usage scenarios for

VPNs: "site-to-site" and "remote-access". In a site-to-site VPN, two networks are connected by an encrypted "tunnel" whose endpoints are routers or servers acting as gateways for their respective networks. Typically, such a VPN tunnel is "nailed" (or "persistent")—once established, it's maintained as an always-available, transparent route between the two networks that end users aren't even aware of, in the same way as a WAN circuit, such as a T1 or Frame Relay connection.

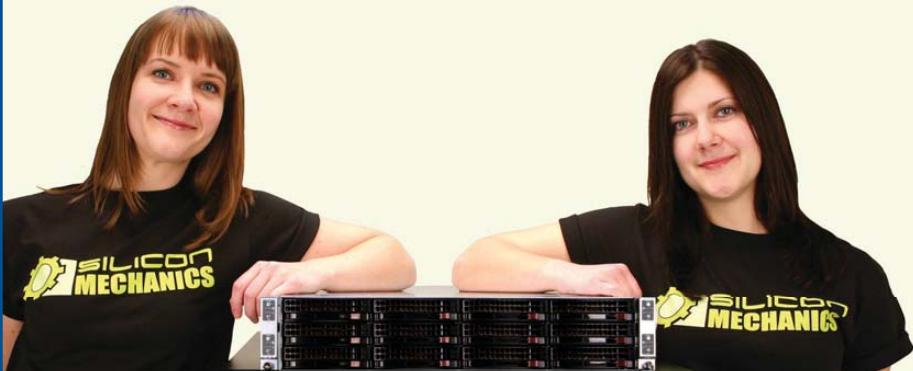
In contrast, each tunnel in a remote-access VPN solution connects a single user's system to the trusted network. Typically, remote-access VPN tunnels are dynamically established and broken as needed. For example, when I work from home, I establish a VPN tunnel from my company's laptop to the corporate VPN concentrator. Once my tunnel's up, I can reach the same network resources as when I'm in the office; with respect to computing, from that point onward I can work as normal. Then at the end of the day, when it's time to shut down my machine, I first close my VPN tunnel.

For site-to-site VPNs, the endpoints are typically routers. All modern router platforms support VPN



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Meet Victoria (on the right). She is the Silicon Mechanics marketing expert responsible for the events and promotions that keep our customers informed about new products and technologies. She's pictured here with her twin sister Veronica, an industrial designer, to help us make a point about what makes twin servers so popular. Victoria and Veronica are twins, but they don't look exactly alike and they don't do the same job. Twin servers are two servers in a single 1U chassis: they can be configured differently, and they handle their own individual workloads.



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protocols, such as IPsec. Establishing and breaking VPN tunnels, however, can be computationally expensive—that is, resource-consuming.

For this reason, if you need to terminate a lot of site-to-site tunnels on a single endpoint (for example, a router in your data center connecting to numerous sales offices), or if you need to support many remote-access VPN clients, you'll generally need a dedicated VPN concentrator. This can take the form of a router with a crypto-accelerator circuit board or a device designed entirely for this purpose (which is likely to have crypto-accelerator hardware in the form of onboard ASICs).

A number of tunneling protocols are used for Internet VPNs. IPsec is an open standard that adds security headers to the IPv4 standard (technically it's a back-port of IPv6's security features to IPv4), and it allows you either to authenticate and

integrity-check an IPv4 stream "in place" (without creating a tunnel per se) or to encapsulate entire packets within the payloads of a new IPv4 stream. These are called Authentication Header (AH) mode and Encapsulating Security Payload (ESP) mode, respectively.

Microsoft's Point-to-Point Tunneling Protocol (PPTP) is another popular VPN protocol. Unlike IPsec, which can be used only to protect IP traffic, PPTP can encapsulate non-IP protocols, such as Microsoft NETBIOS. PPTP has a long history of security vulnerabilities.

Two other protocols are worth mentioning here. SSL-VPN is less a protocol than a category of products. It involves encapsulating application traffic within standard HTTPS traffic, and different vendors achieve this in different (proprietary) ways. SSL-VPN, which usually is used in remote-access solutions,

2009: a Bad Year for SSL/TLS?

OpenVPN depends on OpenSSL, a free implementation of the SSL and TLS protocols, for its cryptographic functions. But SSL/TLS has had a bad year with respect to security vulnerabilities. First, back in February 2009, Moxie Marlinspike and others began demonstrating man-in-the-middle attacks that could be used to intercept SSL/TLS-encrypted Web sessions by "stripping" SSL/TLS encryption from HTTPS sessions.

These are largely localized attacks—in practice, the attacker usually needs to be on the same LAN as (or not very far upstream of) the victim—and they depend on end users not noticing that their HTTPS sessions have reverted to HTTP. The NULL-prefix man-in-the-middle attack that Marlinspike and Dan Kaminsky subsequently (separately) demonstrated that summer was more worrisome. It exploited problems in X.509 and in Firefox that made it possible for an attacker essentially to proxy an HTTPS session, breaking the encryption in the middle, in a way that allows the attacker to eavesdrop on (and meddle with) HTTPS traffic in a way that is much harder for end users to notice or detect.

But, that wasn't all for 2009 (which isn't even finished yet, as I write this). In November, security researchers uncovered problems with how the SSL/TLS protocol handles session state. These problems at least theoretically allow an attacker not only to eavesdrop on but also inject data into SSL/TLS-encrypted data streams. Although the effects of this attack appeared

similar to those of the NULL-prefix attack, the latter involved client/browser-side X.509 certificate-handling functions that were browser/platform-specific and didn't involve any server-side code.

In contrast, the November revelation involved actual flaws in the SSL/TLS protocol itself, whether implemented in Web browsers, Web servers or *anything else* using SSL/TLS. Accordingly, application or platform-specific patches couldn't help. The SSL/TLS specifications themselves, and *all implementations of it* (mainly in the form of libraries such as OpenSSL), had to be changed.

That's the bad news. OpenVPN depends on protocols that have been under intense fire lately. The good news is, because e-commerce, on-line banking and scores of other critical Internet applications do as well, at the time of this writing, the IETF has responded very rapidly to make the necessary revisions to the SSL/TLS protocol specifications, and major vendors and other SSL/TLS implementers appear to be poised to update their SSL/TLS libraries accordingly. Hopefully, by the time you read this, that particular issue will have been resolved.

Obviously, by even publishing this article, I'm betting on the continued viability of SSL/TLS and, therefore, of OpenVPN. But, I'd be out of character if I didn't speak frankly of these problems! You can find links to more information on these SSL/TLS issues in the Resources section.



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Although I don't recommend either due to PPTP's security design flaws, PPTP-linux and Poptop provide client and server applications, respectively, for Microsoft's PPTP protocol. Think it's just me? Both PPTP-linux's and Poptop's maintainers recommend that you not use PPTP unless you have no choice! (See Resources for links to the PPTP-linux and Poptop home pages.)

And, of course, there's OpenVPN, which provides both client and server support for SSL/TLS-based VPN tunnels, for both site-to-site and remote-access use.

Introduction to OpenVPN

All the non-PPTP Linux VPN tools I just mentioned are secure and stable. I focus on OpenVPN for the rest of this series, however, for two reasons. First, I've never covered OpenVPN here in any depth, but its growing popularity and reputation for security and stability are such that the time is ripe for me to cover it now.

Second, OpenVPN is much simpler than IPsec. IPsec, especially IPsec on Linux in either the client or server context, can be very complicated and confusing. In contrast, OpenVPN is easier to understand, get working and maintain.

Among the reasons OpenVPN is simpler is that it doesn't operate at the kernel level, other than using the kernel's tun and tap devices (which are compiled in the default kernels of most mainstream Linux distributions). OpenVPN itself, whether run as a VPN server or client, is strictly a userspace program.

In fact, OpenVPN is composed of exactly one userspace program, `openvpn`, that can be used either as a server daemon for VPN clients to connect to or as a client process that connects to some other OpenVPN server. Like stunnel, another tool that uses SSL/TLS to encapsulate application traffic, the `openssl` daemon uses OpenSSL, which nowadays is installed by default on most Linux systems, for its cryptographic functions.

OpenVPN, by the way, is not strictly a Linux tool. Versions also are available for Windows, Solaris, FreeBSD, NetBSD, OpenBSD and Mac OS X.

Getting OpenVPN

OpenVPN is already a standard part of many Linux distributions. Ubuntu, Debian, SUSE and Fedora, for example, each has its own "`openvpn`" package. To install OpenVPN on your distribution of choice, chances are all you'll need to do is run your distribution's package manager.

If your distribution lacks its own OpenVPN package, however, you can download the latest source code package from www.openvpn.net. This package includes instructions for compiling and installing OpenVPN from source code.

Conclusion

Now that you've got some idea of the uses of VPN, different protocols that can be used to build VPN tunnels, different Linux tools available in this space and some of the merits of OpenVPN, we're ready to roll up our sleeves and get OpenVPN running in both server and client configurations, in either "bridging" or "routing" mode.

But, that will have to wait until next month—I'm out of space for now. I hope I've whetted your appetite. Until next time, be safe! ■

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Resources

Mick Bauer's Paranoid Penguin, January 2005, "Linux VPN Technologies": www.linuxjournal.com/article/7881

Wikipedia's Entry for IPsec: en.wikipedia.org/wiki/IPsec

Home Page for Openswan, an IPsec Implementation for Linux Kernels: en.wikipedia.org/wiki/IPsec

Home Page for Strongswan, Another Linux IPsec Implementation: www.strongswan.org

Home Page for pptp-linux (not recommended): pptclient.sourceforge.net

Poptop, the PPTP Server for Linux (not recommended): poptop.sourceforge.net/dox

Tools and Papers Related to Moxie Marlinspike's SSL Attacks (and Others): www.thoughtcrime.org/software.html

"Major SSL Flaw Find Prompts Protocol Update", by Kelly Jackson Higgins, DarkReading: www.darkreading.com/security/vulnerabilities/showArticle.jhtml?articleID=221600523

Official OpenVPN Home Page: www.openvpn.net

Ubuntu Community OpenVPN Page: <https://help.ubuntu.com/community/OpenVPN>

Charlie Hosner's "SSL VPNs and OpenVPN: A lot of lies and a shred of truth": www.linux.com/archive/feature/48330



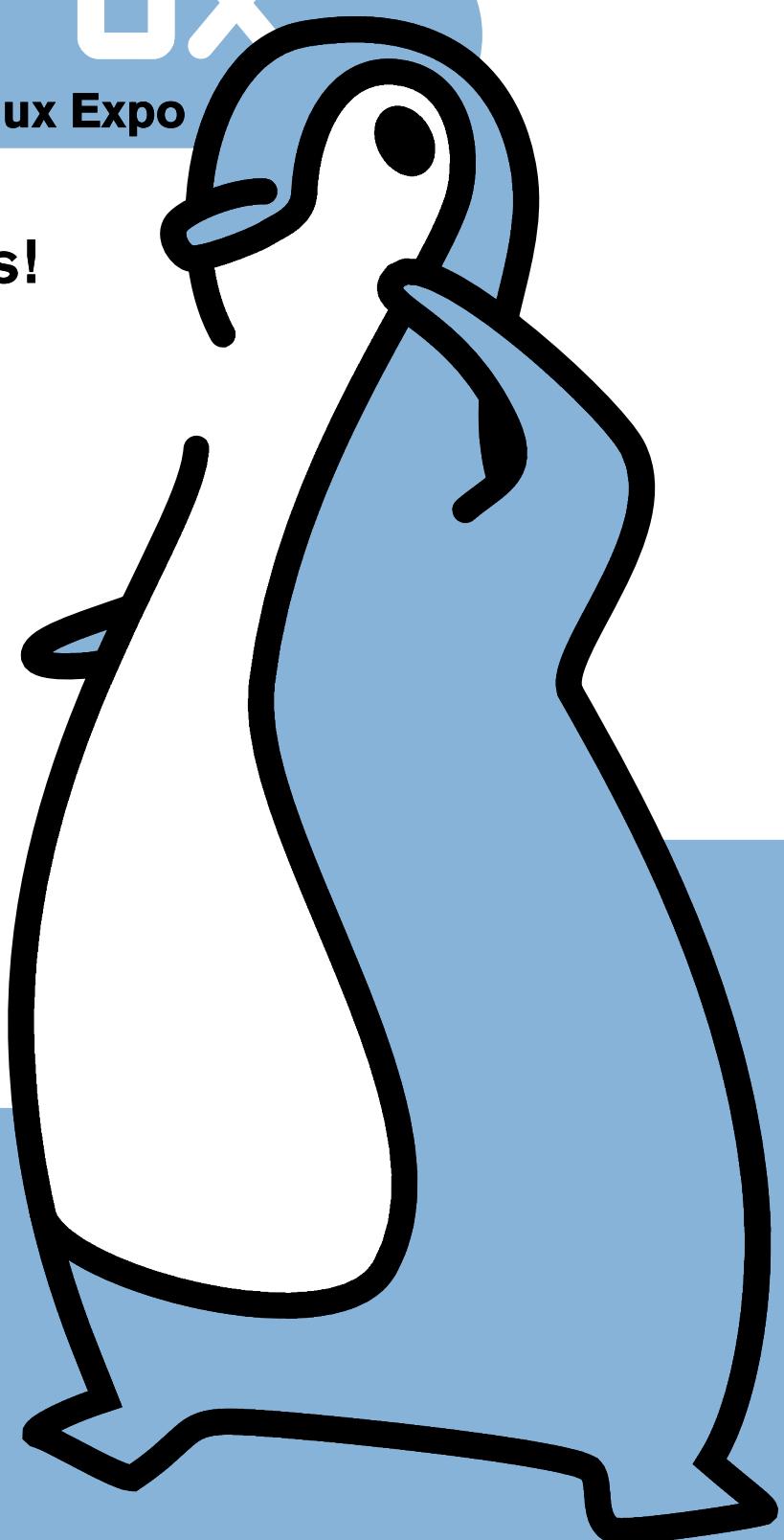
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KYLE RANKIN

Make a Local Mutt Mail Server

Mail server configuration doesn't have to require pages of text files, five manuals and a team of system administrators. If you just need to relay mail from your local mutt client, it'll take a few minutes and a few short lines in a Postfix config.

I talk about mutt a lot in this column, if you hadn't noticed. For me, in this day and age of large graphical mail programs and Web-based mail applications, you still can't beat the speed, power and customization of mutt. Let's also not forget the vi-style keybindings—I love those.

One thing you might notice the first time you use mutt, however, is that it is strictly a MUA (Mail User Agent) and not an MTA (Mail Transfer Agent). This means mutt is concerned only with acting as an e-mail client and doesn't actually contain any code to communicate with remote mail servers. That job is done by an MTA. Although many mail clients also include code so they can relay mail through an MTA, mutt opts to use the system's own local mail server. Traditionally, this hasn't been an issue on Linux, as most Linux servers have had some mail server installed and set up. These days, however, you might not have a fully configured mail server on your desktop install. That's okay though, because in this column, you'll see how simple it is to set up your own local mail server, thanks to Postfix.

Even if you don't use mutt, there are many advantages to having your own local mail server, if only to relay mail for you. For one, it can handle spooling all of your e-mail and will retry delivery automatically if it fails for some reason or another (such as if your wireless connection drops or you close your laptop) without having to leave your mail program open. For another, once you have your mail server set up how you want it, any other mail client on your computer can take advantage of it: simply point your client to localhost.

The Mail Server Holy War

A number of different mail servers are available for Linux these days, each with its own set of advantages and disadvantages. Many holy wars have been fought over Sendmail vs. Postfix vs. Exim vs. using Telnet to connect directly to port 25 on a mail server and type in raw SMTP

commands. I've tried them all over the years (yes, even Telnet), and for me, Postfix has the best balance between stable performance, security and most important, simple configuration files. So for this column, I discuss the specific steps for setting up Postfix as a mail relay.

The first step is to install the Postfix server itself. On most distributions, you'll find this package is split up into a main Postfix package plus a few extra packages that provide specific features, such as MySQL or LDAP integration. Because we are just setting up a basic mail relay here, all we really need is the main Postfix package. Now, if you install this package on a Debian-based system, you will be prompted by the post-install script that acts as a wizard to set up Postfix for you. If you want, you simply can walk through the wizard and pick "Internet Site" to send e-mail out directly to the rest of the Internet or choose "Internet with smarthost" to relay all of your mail through a second mail server (perhaps provided by your ISP) first. Either way, you will be asked a few simple questions, and at the end, you'll have a basic Postfix configuration ready to use.

On other systems (or if you choose "No configuration" on a Debian-based system), you might end up with an empty or very heavily commented Postfix configuration file at /etc/postfix/main.cf. What you'll find is that for a basic mail server, you really need only a few lines in your config. Postfix picks pretty sane and secure defaults, so if you want it to deliver mail on your behalf, you need only a few lines:

```
mynetworks = 127.0.0.0/8  
inet_interfaces = loopback-only
```

Yes, that's basically it. Now, simply restart Postfix with /etc/init.d/postfix restart, and your mail server will be up and running. With the sane defaults in Postfix, you just need to hard-code those two settings to ensure that Postfix accepts mail only

on localhost. The `inet_interfaces` line tells Postfix to listen only on the localhost address for e-mail so no clients can connect to your server from the outside. The `mynetworks` line adds to that security and tells Postfix to allow only mail from localhost to be relayed through the server.

The Pesky Port 25 Problem

It used to be that the above was all you needed for a functioning mail server on the Internet. With the rise of spam measures and countermeasures, however, these days, fewer and fewer ISPs are willing to allow port 25 traffic from clients through to the outside world. Even if they do, many mail servers on the Net won't accept traffic from hosts inside ISP networks. If you find yourself on such a network, you likely will need to add a relay host to your `main.cf`. The relay host is a mail server usually provided by your ISP through which your mail server can send e-mail. If you were setting up a client like Thunderbird, for instance, this would be the SMTP server you would configure for it.

To set up a generic relay host in Postfix, just add:

```
relayhost = mail.somedomain.net
```

to your `/etc/postfix/main.cf`. Replace `mail.somedomain.net` with the hostname of your ISP's relay host. Once you modify the file, simply type `postfix reload` as the root user to enable the new settings.

SMTP AUTH

Of course, some mail servers won't just let anyone on their network relay through them (and rightly so). In that case, usually they require that everyone authenticate with them first. This takes a few extra steps with Postfix, but like with everything else, it's still not very difficult. First, add the following lines to the `/etc/postfix/main.cf`:

```
smtp_sasl_auth_enable = yes
smtp_sasl_password_maps = hash:/etc/postfix/sasl_passwd
smtp_sasl_security_options = noanonymous
```

This tells postfix to enable SMTP authentication and tells it to look in `/etc/postfix/sasl_passwd` for logins and passwords to use for hosts. The next step is to create the `/etc/postfix/sasl_passwd` file. If I wanted to log in to `mail.somedomain.net` with the user name `kyle` and the password `muttrules`, I would put the following line in the file:

```
mail.somedomain.net kyle:muttrules
```

There is a downside to this in that the password for the account is now in clear text. That's less than

ideal, but you can at least make sure that only root can read the file. As the root user, type:

```
# chown root:root /etc/postfix/sasl_password
# chmod 600 /etc/postfix/sasl_passwd
```

Postfix actually doesn't read this file directly; instead, it reads a hash database created from this file. To create the file, run:

```
# postmap /etc/postfix/sasl_passwd
```

And, you will see that a new file, `/etc/postfix/sasl_passwd.db`, has been created. You'll need to run the `postmap` command any time you modify the `/etc/postfix/sasl_passwd` file. Now, reload Postfix one final time, and mutt should be able to relay mail through your local host. If you want to perform a quick test without mutt, you can type:

```
echo test | mail -s "test" user@remotehost
```

and it will send an e-mail message with a subject and body of "test" to the user you specify.

Postfix's logfile might vary a bit, depending on your system, but you should be able to find it in

Even if you don't use mutt, there are many advantages to having your own local mail server, if only to relay mail for you.

`/var/log/mail.log` or `/var/log/maillog`. That's the first place you should look if you find that some mail is not being delivered. The second place to look is the `mailq` command. That command will give you a quick status of all e-mail that is currently in the local spool along with its status. If all of your mail has been delivered successfully to other hosts, the output will look something like this:

```
$ mailq
Mail queue is empty
```

It's truly that simple. Of course, mail server administration definitely can become more complex than this when you want to do more than relay your own personal e-mail. But, it's good to know that simple configurations like the above are possible. If you are like me, saving time on the Postfix configuration just gives you extra time to tweak your mutt config. ■

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DIRK ELMENDORF

A Desktop for Our Little Penguin

How to make the perfect desktop for young kids.

The theme for this month's issue is the desktop, and when I sat down to write this article, I was going to focus on bringing the cloud to your desktop. A number of services exist, and I figured one of them would help me solve a problem that has gotten more troublesome of late—keeping all my workstations in sync. But, in the process of doing my research, a more pressing desktop problem came up. His name is Max.

Max is my son. He is only 15 months old, but he already has become a technology-seeking missile. No remote is safe. Any keyboard or mouse within reach is explored. This probably is a combination of mimicry, since I spend a lot of time with a mouse or remote in my hand, and his excitement over cause and effect. As the IT person in the house, I would prefer it that my users not bang on the keyboards until something bad happens. As a parent and Linux fan, I am happy for him to explore technology in whatever way he chooses—especially because I am in the golden time before I have to worry about what he is searching for on Google.

What started as a "crazy" idea came together pretty quickly. A quick scan of the inventory in my office turned up an old file server that was no longer being used. It is not very powerful, but Max did not need more than a "computer". I found a CD-ROM drive and installed it. The computer already had a network card (yes, it is so old, there was no onboard NIC) and integrated sound. I pulled out an old 17" monitor and some speakers. That

Figure 1. Crayola Keyboard and Colby T-Rex mouse



just left a mouse, keyboard and desk.

My wife already had gotten Max a keyboard. It was supposed to be for Christmas, but in the name of turning in my article in time, I opened it a few months early. It is a Crayola keyboard. The keys are big and brightly colored. It has no function keys (which means Max cannot get to the terminals). For a mouse, I picked up a Colby T-Rex mouse, which claims to be specially designed for the way little kids click. Originally, I was a little worried Max constantly would pick up the mouse to stare at the red light, but that did not seem to interest him.

The last piece of the puzzle was the desk. I measured Max and found that he needed a desk at about 22" tall if he was standing when he used the computer. I use a standing desk from GeekDesk. So, it seemed to make sense to have him stand as well—both because it is better for you and also because it means I won't be tripping over a tiny chair in my office. A quick trip to Wal-Mart turned up a computer stand. It was built out of particle wood and plastic tubes—not the best piece of furniture in the world, but I was able to find a combination of plastic tubes that gave it exactly the right height. As a bonus, I have tubes left over, so we can raise the desk as he grows.

Now that his workstation was assembled, it was time to get to the installing portion of the show. After some quick research on Google, I turned up three possibilities for his OS.

Sugar Learning Platform

The Sugar Learning Platform was the system originally developed for the One Laptop per Child Netbook. I was interested in this one because it is specifically designed for learning. The developers spent a lot of time rethinking how everything works so that it would reinforce that goal. Besides, like most people, I had seen only screenshots. It seemed like this was my best opportunity to use it for an actual purpose. Sugar is now based on Fedora as its base OS. You even can download a version to run off a USB thumbdrive. I downloaded and installed the Strawberry release onto a thumbdrive.

Edubuntu

Edubuntu is a branch of Ubuntu. This version is

focused on building an “educational” operating system, and it seems to have two different goals. The first is to group software in age-appropriate bundles. The second is to make it easy to administer computer labs running Ubuntu. I was more interested in the bundles than the administration. Originally, Edubuntu provided a full ISO for you to download and install. Currently, it offers another option. You simply can add on Edubuntu bundles to an existing Ubuntu install, which meant I could just use one of the Ubuntu CDs I already had lying around.

Qimo

Qimo (as in esQIMO) is a kid-specific distribution, also based on Ubuntu. It seemed to be more focused on the desktop portion than Edubuntu. For example, during the install process, you create a user account. That user is given full administration rights (aka access to sudo). Another user, qimo, also is created. qimo does not have a password and does not have sudo—meaning that when you boot up the machine, the user account the child is using can run applications but cannot make any modifications to the system. Qimo uses the Xfce desktop environment, so it should be less resource-hungry (which is important as I am putting it on old equipment). Qimo also has a very cute kid-style Eskimo theme.

Installation Day

I already had the Sugar thumbdrive, so I moved on to getting the other two installed. My goal was to have a run-off. I would install all three and play with them. Once I got comfortable, I would unleash Max on each and see which one was the winner.

I installed Jaunty (9.04) onto the computer. I also partitioned the drive into three different parts. That way, I could install each OS on its own partition. Once the install was complete, Ubuntu reminded me that Karmic (9.10) had been released. I decided to upgrade to Karmic, as the Edubuntu site said it supported it. After a long wait, everything was installed. Then, I added on the Edubuntu package:

```
sudo apt-get install ubuntu-edu-preschool
```

It installed without any problems. The only issue was it did not change anything about the look and feel of the system. Max does well, but I think it will be a little while before I have him navigate to different menus to find Tux Paint.

Undeterred, I went through the install process for Qimo. Again, things were very straightforward, but I made two mistakes in this portion. I did not install a bootloader. I figured I’d let the GRUB2 installed in Karmic handle the booting. (It turns out I should have installed it just to have easy GRUB menu files to crib from.) Second, I filled out the

information about an account on the system. I clicked Auto login, because I assumed it was silly to make Max log in. That turned out to be a mistake. Because the system was set to log in as me, it would not log in as the qimo user.

Now I had all three ready for testing. As they say in the UK, things went pear-shaped. I have only two USB ports on the workstation, and they are used up by the keyboard and mouse. That left me nowhere to plug in the Sugar thumbdrive. I booted up Karmic, and in the process of trying to add Qimo as a boot option, I went down the path of upgrading to GRUB2. In the process, I blew up my ability to boot anything.

That basically wasted an entire afternoon. This was all meant to be a project to introduce my son to the wonderful world of Linux—not an exercise in hair pulling. I took a step back and looked at the Sugar Web site to see if there was another way to run it. Then, everything clicked into place. Sure, these are different “products”, but they still are open-source software. Everything I was working on was a

Max does well, but I think it will be a little while before I have him navigate to different menus to find Tux Paint.

package at some point. So, rather than thinking of it as “here are three choices, pick one”, I decided to install Qimo as the base, and then put Edubuntu and Sugar on top. That meant I could play with all of it.

Installation, Take Two

I installed Qimo again. This time, I had it take over the entire drive. I also left the Auto login box unchecked. As I started poking around, I found that Qimo actually is based on Intrepid (8.10). I decided to use the onboard Ubuntu tools to upgrade it to Jaunty, so that it would be easier to bring in Edubuntu and Sugar, which was a very straightforward process. The only issue I ran into was with the custom GDM configuration file. I ended up hand-merging the original version from Qimo with the new one.

Once it was up and running, I added the Edubuntu package. Because it is available as a single package, it didn’t take very long. So, that just left Sugar.

There are some known issues with Sugar and Jaunty. The Sugar Wiki pointed me to a PPA (personal package archive). I added <https://launchpad.net/~alsroot/+archive/ppa> to my sources.list. Then, I authorized the archive by adding its signing key:

```
sudo apt-key adv --keyserver keyserver.ubuntu.com  
→--recv-keys F265806A9BFFF0F4
```



Figure 2. Max at His Workstation—Pre-Cable Cleanup

I had to remove a package that caused a conflict and then was able to install Sugar:

```
apt-get remove eToys-doc
apt-get install sugar-platform
```

To run Sugar, you run sugar-emulator. I played with it briefly. There were two problems. One, the version I installed seemed to need other things installed to get it to do anything. The second issue was even bigger than the first. The Sugar environment expects to be the desktop. That means it would like to take over the mouse and the display. It seems like it has potential, but it adds too much complexity for what I was trying to do for Max.

Next up, I added an MP3 player (Max loves to play music) and the Flash plugin. It turns out every kid Web site I could find requires Flash to see or do anything. I added links to his favorite Web sites to the desktop. I modified the display a little. I doubled the size of the mouse cursor and expanded the space between launchers on the main panel. Just to make things a little more solid, I zip-tied the mouse and keyboard so they can move, but not be removed. I contemplated setting up an auto off/on using Wake on LAN, but decided Max needs some more time before he can use his workstation unsupervised.

Once all that was done, I turned it over to Max. He played with Tux Paint for a little while. I turned on Proton Radio in the background for him, which he really likes. After a short time of moving the mouse, he anchored himself to the keyboard. Much like his father, he seems to prefer the keyboard as his input device of choice.

Conclusions

There is a lot of software out there for kids—serious typing tutors, counting and shapes helpers, and even a Mr Potato Head simulator (KTuberling). The craziest thing I saw was eToys, which is a Smalltalk environment for teaching kids programming. It is way beyond what I learned in Logo as a kid.

Max's first "computer" was my Chumby. He spent a lot of time looking at LOLcats on there. Plus, because the Chumby has a built-in slideshow for all of the content, Max constantly would get new stuff, even if he was just looking at the Chumby. That kind of interface really works well with Max's level of attention span. I was unable to find an application to duplicate that experience for Max. Spending some time searching, I have found some Flash-based games that come close. I will keep introducing new things to Max and see what sticks.

This actually brings me to my primary lesson from all of this. When I started, I was not sure if Max was ready for a computer. To be honest, there was not a clear consensus among my friends as to when that would be. Having played with Max and his computer for a week now, I can say this: Max is ready to explore anything as long as it is on his terms. That is the real value of this desktop. Now I have a place to show Max new things. I can let him try out new software or Web sites, and he can do it at his pace, because it is his computer. Before, as soon as playtime was done, I switched my computer back to work mode. Now Max wanders into my office does a little paint or controls the volume on some music. I look forward to the day when he asks for help debugging his eToys programs. I am not sure when that will be, but I am pretty sure it will come a little sooner with this project.■

Dirk Elmendorf is cofounder of Rackspace, some-time home-brewer, longtime Linux advocate and even longer-time programmer.

Resources

Colby T-Rex Mouse: kidzmouse.com/products/kidzmouse/colbytrex.html

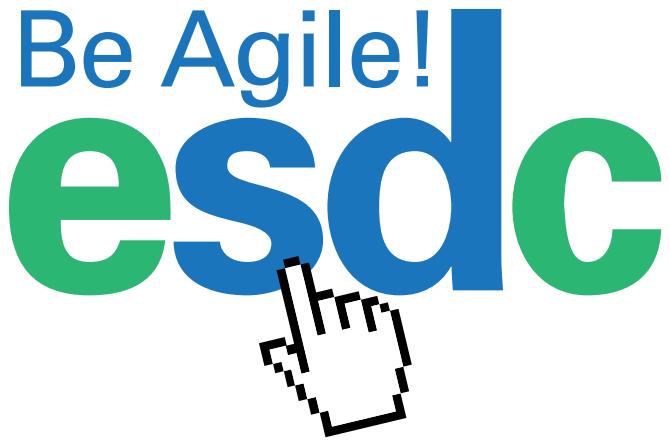
GeekDesk: www.geekdesk.com

Sugar Learning Platform: www.sugarlabs.org

Qimo: www.qimo4kids.com

Edubuntu: edubuntu.org

eToys: www.squeakland.org



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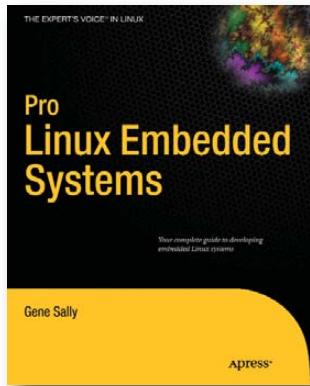
www.go-esdc.com



CodeWeavers' CrossOver Games

As if gamers didn't need another fix, CodeWeavers recently released Linux and Mac versions of CrossOver Games 8.1, an emulator that allows one to play Windows-based games without a Windows license. The new version 8.1, code-named Zombie Mallard, adds support for the fervently anticipated new game *Left4Dead 2* to the existing roster of games, which includes *World of Warcraft*, *EVE Online*, *Guild Wars*, *Prey* and the *Half-Life* series. CodeWeavers says that it is pleased to enable its customers to "do their bit to stave off the effects of the apocalyptic zombie plague sweeping this nation". CrossOver Games is available for download, either directly or via its authorized resellers.

www.codeweavers.com



Gene Sally's Pro Linux Embedded Systems (Apress)

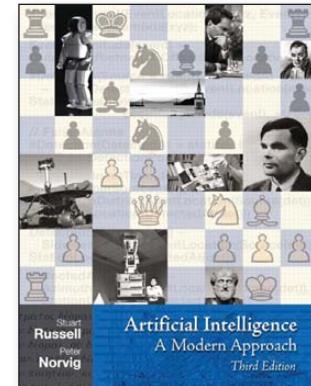
Gene Sally's new book *Pro Linux Embedded Systems* (Apress) goes beyond just porting embedded Linux to new hardware to cover tuning Linux and leveraging open-source code to build more robust, feature-rich embedded applications. The guide is a resource for employing technologies and techniques typically reserved for desktop systems. Readers will learn the anatomy of an embedded Linux project as well as how to create an embedded Linux development environment, configure and build an embedded Linux kernel, configure and build open-source projects for embedded systems and minimize resources and boot times. In addition, the book explores open-source resources available to improve development.

www.apress.com

Peter Norvig and Stuart Russell's Artificial Intelligence: A Modern Approach, Third Edition (Prentice Hall)

If you're looking for a comprehensive resource on artificial intelligence, pick up the new third edition of Peter Norvig and Stuart Russell's book *Artificial Intelligence: A Modern Approach*. Targeted at computer professionals, linguists and cognitive scientists interested in artificial intelligence, this work is an exhaustive treatment of the theory and implementations of AI. Key topics include intelligent agents, solving problems by searching, informed search methods, game playing, agents that reason logically, first-order logic, building a knowledge base, inference in first-order logic, logical reasoning systems, practical planning, planning and acting, uncertainty, probabilistic reasoning systems, decision making, learning from observations, learning with neural networks, agents that communicate, perception, robotics and more.

www.informit.com



RunRev Ltd.'s Revolution

RunRev Ltd. has boosted the feature set of its new Revolution 4.0 for application and Web development, available for the first time in a free version. RunRev says that Revolution offers "dramatic time and resource savings over traditional tools such as Flash, Silverlight, Java and C++". The new version 4.0 also offers direct deployment to the Web without recoding or writing a line of HTML. Revolution is a modern descendant of natural-language technologies, such as Apple's HyperCard, which enables software construction to nonprogrammers. Revolution 4.0 has three editions for different skill levels: the free revMedia, the enhanced revStudio and the revEnterprise for mission-critical applications.

www.runrev.com

Coyote Point's Equalizer GX Series

Coyote Point has bulked up the feature set of its EQ/OS Version 8.6, the latest iteration of the traffic management operating system that drives its Equalizer GX series product line. The series ranges from the entry-level E250GX load balancer to the enterprise-class E650GX all-in-one application delivery appliance. Core enhancements include 802.1Q VLAN support, which can double aggregate network throughput (up to 2.6 Gbps for the E650GX); overhaul of the failover subsystem; cluster-cloning capability; an expanded toolset for intelligent load balancing of VMware Infrastructure and a new energy-efficiency capability to power servers on and off automatically.

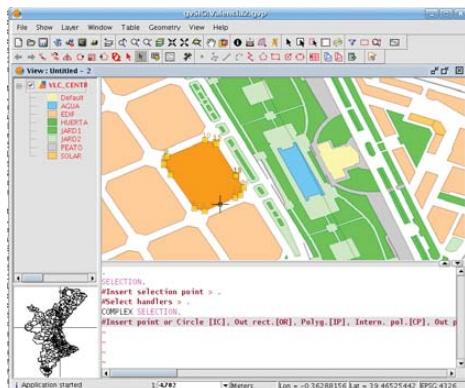


www.coyotepoint.com

Comtrol's RocketLinx ES7506 Switch

Comtrol Corporation says its new RocketLinx ES7506 industrial managed PoE plus switch "changes the game when it comes to where you place your devices". Designed for applications such as IP surveillance, security and transportation, where power sources are not conveniently located, the RocketLinx ES7506 offers four Power-over-Ethernet (PoE) ports delivering up to 30 watts and supporting the new IEEE802.3at standard. "When setting up an IP camera or wireless access point, for instance", says Comtrol, "you can choose the optimum location for the application, versus mounting the device closest to an available power source". Tasks such as configuring ports, rebooting a failed device or implementing green power scheduling can be controlled via SNMP, Web interface or the included RocketLinx NetVision management software. Additionally, the switch features two uplink ports that support redundant ring network topologies, which enable network failure recovery at less than five milliseconds.

www.comtrol.com



gvSIG Desktop GIS

Brethren map freaks should download the new version 1.9 of gvSIG, a free and open-source desktop Geographic Information System (GIS). gvSIG is designed for capturing, storing, handling, analyzing and deploying any kind of referenced geographic information, in both vector and raster formats, in order to solve complex management and planning problems. Version 1.9 sports a range of new features, including improved symbology and labeling, enhanced raster handling, geoprocessing with line layers, table joining, new data transformation tools and additional languages (US English, Brazilian Portuguese, Turkish, Russian, Greek, Swahili and Serbian). gvSIG is available for Linux, Mac OS and Windows platforms.

www.osgeo.org/gvsig

WSO2 Cloud Platform

WSO2 recently announced the launch of its WSO2 Cloud Platform, which it calls "the industry's most comprehensive platform for extending a service-oriented architecture (SOA) into cloud computing". The new WSO2 Cloud Platform features a family of WSO2 Cloud Virtual Machines. WSO2 SOA products are available as WSO2 Cloud Virtual Machines running on the Amazon Elastic Computing Cloud (EC2) or as VMware ESX virtual machines. Further, WSO2 Cloud Connectors enable IT developers to provide fast, secure cloud services. And finally, the multi-tenant WSO2 Governance-as-a-Service empowers IT professionals to manage governance in the cloud. All WSO2 Cloud Platform services are based on open software standards and support applicable interoperable protocols and relevant open data standards.

www.wso2.com



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Fresh from the Labs

Bombono DVD—Open-Source DVD Authoring Software

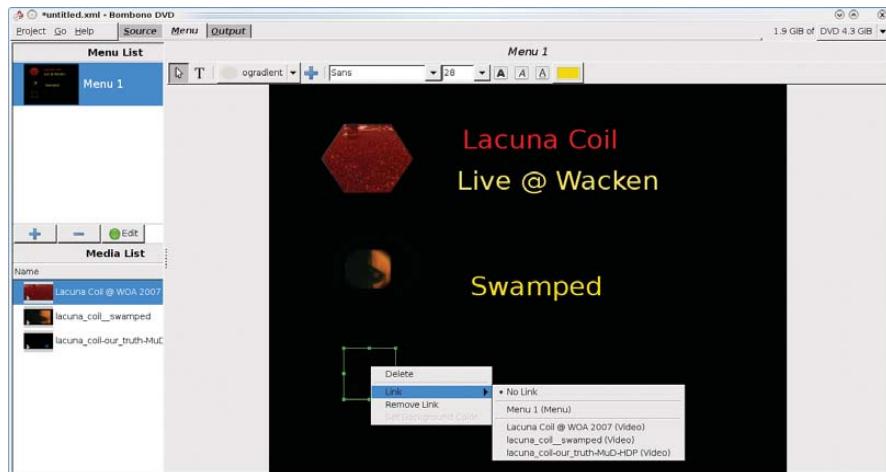
www.bombono.org/cgi-bin/wiki/Home

Starting off this month we have Bombono: a simplistic DVD authoring program that doesn't have the steep learning curve of many others in its field. According to the Web site: "Bombono DVD is a DVD authoring program for Linux. It is easy to use and has nice and clean GUI (Gtk)." Also from the Web site, the main features of Bombono DVD are:

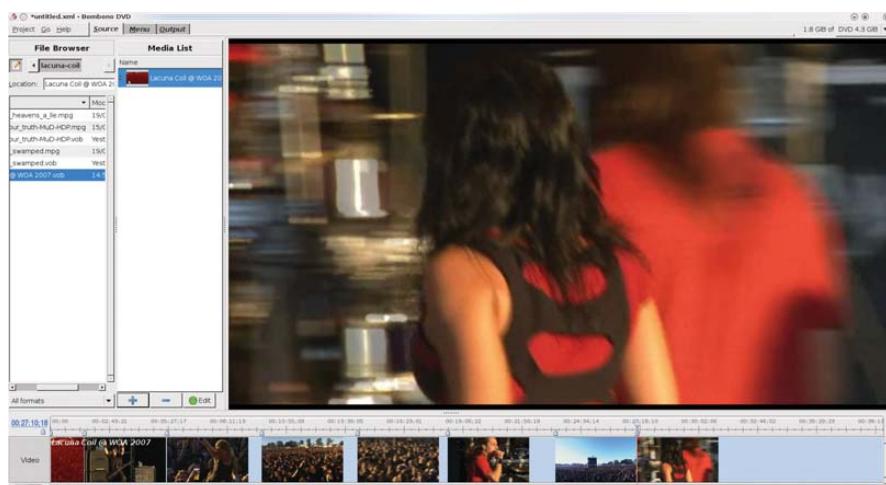
- Excellent MPEG viewer: timeline and monitor.
- Real WYSIWYG menu editor with live thumbnails.
- Comfortable drag-and-drop support.
- You can author to folder, make ISO images or burn directly to DVD.
- Reauthoring: you can import video from DVD discs.

Installation Binaries are available for Ubuntu, SUSE, ALT Linux and Arch Linux, along with the usual source tarball. For those compiling from source, there are some pretty stringent library requirements. The documentation lists the following:

- gtk+ >= 2.8 (www.gtk.org)
- gtkmm >= 2.4 (www.gtkmm.org)
- SCons >= 0.96.1 (www.scons.org)
- GraphicsMagick >= 1.1.7 (www.graphicsmagick.org)
- mjpegtools >= 1.8.0 (mjpeg.sourceforge.net)
- libdvdread (www.dtek.chalmers.se/groups/dvd)
- dvdauthor (dvdauthor.sourceforge.net)
- dvd+rw-tools (fy.chalmers.se/~apro/linux/DVD+RW)



Bombono DVD lets you author DVDs with ease, particularly with these easy-to-make menus that (actually) work.



I found that making chapter points in a video is actually really easy, and these chapters also can be linked to in your DVD menus.

- toolame (sourceforge.net/projects/toolame)
- libxml++ (libxmlplusplus.sourceforge.net)

In terms of packages I needed to install on my own Kubuntu system (obviously some were already in place), I needed: scons, libglibmm-2.4-dev, libxml++2.6-dev, libmjpegtools-dev, graphicsmagick, libgraphicsmagick1, libgraphicsmagick++1, libgraphicsmagick++1-dev and libgtkmm-2.4-dev.

Head to the Web site, grab the latest tarball, extract it and open a terminal in the new folder. Enter:

\$ **scons**

If your distribution uses sudo, enter:

\$ **sudo scons install**

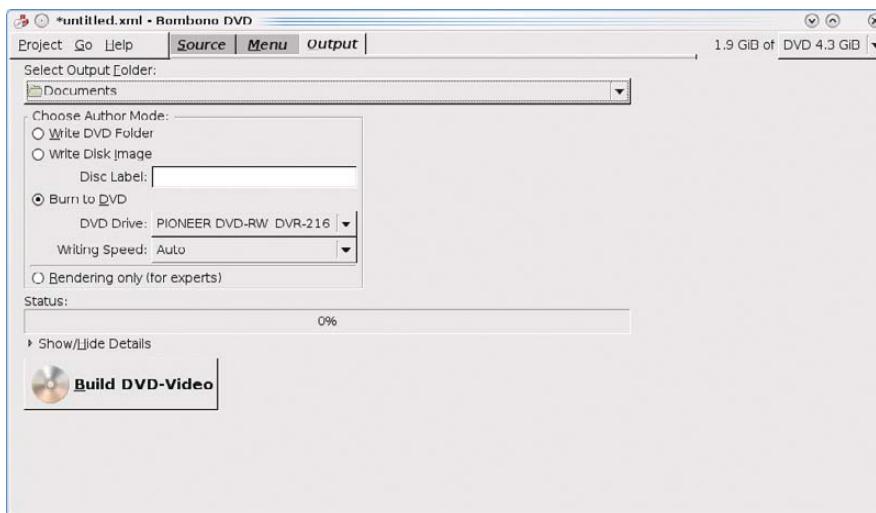
If not, enter:

\$ **su**
scons install

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Bombono already has reached the stage of maturity where it can make images and burn them to disc on the fly.

Once the compilation has finished, you will find it in your menu, or you can start Bombono with the command:

```
$ bombono-dvd
```

Usage A quick note before we jump in: you can use only MPEG-2 .vob files. It's a bummer, I know, so if you have files such as some DivXes you want to include, you're going to have to convert them first. Hopefully, future releases will support DivX, Xvid, MPEG-4 and so on, but for now, you'll have to make do with just .vob support.

Once you have some .vob files available, start the program, click on the Source tab, and look at the file browser on your left. Locate the files you're going to use, and either drag them across into the Media List pane or click the blue + sign. While we're in the source section, clicking the Edit button when a video is highlighted lets you split the file into chapters using the timeline below (more on that later).

For now, let's move on to the menu tab. Click the + sign in the Menu List pane to create a new menu. Then, you can add a menu object to link to a video along with some accompanying text. To add a menu object, choose the shape of the object you want to add and click the + sign next to it. Once the object has been made, you can move it around the screen or resize it. Now, let's make a link to the video you want to run from the menu object.

Right-click on the object and choose Link→(name of video). Note that if you've edited your videos to include chapters, these chapters can be linked to also, but I don't have the space to cover that here.

Now, let's add some text. You'll be in the standard mode for manipulating the menu objects as signified by the highlighted mouse pointer, but press the T button (as in T for text), and you'll be ready to go. Click next to an object and you'll see a blinking cursor, ready for you to start typing. If you don't like the font size or color, you can change them in the above menu.

With a menu out of the way, let's get back to editing—more specifically, making chapters. Return to the Source tab, and make your way back to the Media List pane. Select the file to which you want to add chapters, and click the green Edit button. Your file now will load up in the big timeline below.

It appears that when you're editing for chapters, if it's not evident where you are from the still image on-screen, you need to play the video in a separate player and take note of what time each point is, as the video does not seem to play in the window itself (although I could be wrong and missing something obvious). However, I found this wasn't really a Herculean task, so it shouldn't be much of a worry.

In the timeline section, the top slider is for browsing around inside the video, where the on-screen image will update

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depending on the position in time. If you look to the left, the strong blue digital readout will give you the exact time the slider is sitting on. To mark out a chapter, click the blue button underneath the time readout (I'll call it a Chapter Marker), and a Chapter Point will be made under the slider, marked with the same icon as the Chapter Marker. If you want to fine-tune this position at all, you also can slide around the Chapter Point, and if you've made one accidentally, you can right-click and choose Delete Chapter Point.

When you're happy with your soon-to-be DVD, head to the Output tab. Here, you can choose either to write a DVD Folder or make a disk image on hard drive, or you can just burn the project straight to DVD.

Of course, this project has some hurdles to overcome before it's truly ready for the mainstream. The most pressing issue is that you can use only .vob files for now. This is reasonable enough, but when given the often tricky task of converting files, most lazy people like myself are going to throw the whole job in the too-hard basket and go back to playing *Half-Life*. It'll be truly ready only when you can add almost any video file. This, of course, will require some probable structural changes to the design and coding—perhaps adding a video conversion stage prior to burning—but it still will be necessary.

Nevertheless, the authors have taken a good approach that I respect—keeping it tight and simple to begin with and working properly with the elements they do have, instead of creating an unstable mess with lots of features. This project is simplistic and highly satisfying, and it probably will become a distro mainstay once it reaches fruition. I'm looking forward to the finished product.

BuGLE—OpenGL Debugging Wrapper

www.opengl.org/sdk/tools/BuGLE

According to BuGLE's Web site: "BuGLE is a tool for OpenGL debugging, implemented as a wrapper library that sits between your program and OpenGL." Although it's still in development, the Web site states that it already can do the following:

- Dump a textual log of all GL calls made.
- Take a screenshot or capture a video.

- Call glGetError after each call to check for errors, and wrap glGetError so that this checking is transparent to your program.
- Capture and display statistics (such as framerate).
- Force a wireframe mode.
- Recover a backtrace from segmentation faults inside the driver, even if the driver is compiled without symbols.

"In addition, there is a debugger (glDbg-gui) that lets you set breakpoints and examine backtraces. It also lets you examine OpenGL state, shaders, textures, buffers and so on, and drop into gdb to see what is going wrong."

Installation BuGLE is available only as source for the moment, so head to the Web site and grab the latest tarball. As for requirements, the Web site says you'll need the following:

- GCC 3.2 or later (4.0 is broken, but 4.1 works).
- FFmpeg is needed for video capture.
- GNU readline is recommended for history editing in glDbg.
- GTK+ is required for glDbg-gui.
- GtkGLExt and GLEW are highly recommended for glDbg-gui (without them, the texture display will not work).

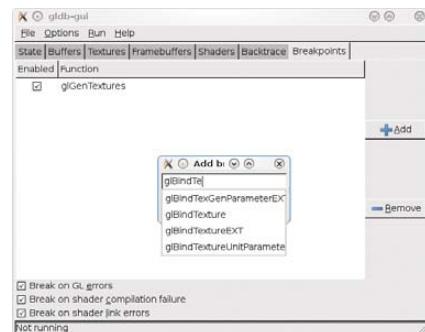
I found I also had to grab libgtkglext1-dev as well as libreadline5-dev to access some of the features that are pretty mandatory. I couldn't get my system to recognize libavcodec, which may have caused me some problems later on.

As for compilation, the documentation says you just have to run make to begin with, but I found I had to run the configure script first, or else make would return an error. If I'm right, then you'll need to run these commands:

```
$ ./configure  
$ make
```

If your distro uses sudo:

```
$ sudo make install
```



BuGLE is a powerful wrapping tool that can perform certain actions with a program when specified OpenGL functions are called.



A debugger also can be used while a program is running alongside.

If your distro doesn't use sudo:

```
$ su  
# make install
```

I'll quote the documentation directly for the next part: "Next, you need to install some files for the user that will run bugle. Create a directory \$HOME/.bugle, and copy doc/examples/filters and doc/examples/statistics into it."

Usage Okay, I have to level with you, I didn't get BuGLE to run the way I wanted it to (such as taking screenshots, video and so on). Maybe it was the configure script, maybe it was libavcodec not detecting, or perhaps I'm just dumb and missed something in the interface. I don't know. So why am I still highlighting this program? I see some great potential here, and what may be something very powerful in the future for anyone in the IT industry.

All I can really do is point you in BuGLE's direction and hope you have more luck than I did. I did get some functionality working, including some debugging, so I'll show you at least some basics that a puny mortal like myself managed to grasp.

To run BuGLE at the command line, use the following syntax:

```
$ LD_PRELOAD=libbugle.so your-program [plus any arguments]
```

To use the GUI version (much easier), use this syntax:

```
$ gldb-gui your-program [plus any arguments]
```

This last command starts BuGLE's GUI, but your program won't be running yet. Prior to running something, you can apply certain parameters, such as setting breakpoints on specified OpenGL functions. For information on this, check the Web site's documentation (although it seems to be geared more for other developers than users at this time of writing).

To actually run your program, it's as easy as clicking Run→Run. You can stop a program manually by clicking Run→Stop. The program can be continued with Run→Continue, or continued until the next OpenGL function call with Run→Step, and killed with Run→Kill. Also worth a look is the debugging console, under Run→Attach GDB, which has its own unique set of functions and commands.

And although I couldn't work out how to get these running myself, in the on-line documentation, I found the following instructions for using screenshot/video capture filter sets.

For straight screenshots:

```
filterset screenshot
{
    filename "screenshot.ppm"
    keyScreenshot "C-A-S-S"
}
```

For captured video:

```
filterset screenshot C-V inactive
{
    video "yes"
    filename "video.avi"
    codec "mpeg4"
    bitrate "1000000"
    allframes "no"
}
```

I may not have had much luck with BuGLE's bigger functions, but this is software in its early stages. When this project matures, the coding and its resulting possibilities will no doubt be very powerful—whether you're a graphics developer testing the latest driver or just a journo like me looking to take a screenshot from within a program. And when that's happened, someone probably will come along with a second GUI to use its functions in an alternative way, such as home users taking videos of whatever program they're running. Either way, the potential uses for this project are huge.■

John Knight is a 25-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.

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SOFTWARE

OpenOffice.org vs. Microsoft Office

Nobody disputes that Microsoft Office is king of the hill in office suites, but if you put marketing and market share aside, how does OpenOffice.org compare? BRUCE BYFIELD

How does OpenOffice.org (OOo) compare with Microsoft Office (MSO)? The question is harder to answer than you might expect. Few users have the experience or patience to do a thorough comparison. Too often, they miss features that have different names or are in different positions in the editing window. Or, perhaps they overlook the fact that some features, although missing in one, easily can be added through customization. Yet another problem when comparing something to MSO is which of the eight current versions of MSO do you use for the comparison?

To cut through these difficulties, as I compared OpenOffice.org 3.1.1 and Microsoft Office 2007, I assumed until a search proved otherwise that, if one office suite included a feature, the other also would have it. I also focused on the three core applications: the word

processors, spreadsheets and presentation programs. The results suggest a close feature match for average users, but in some cases, a clear choice for expert users.

Navigating the Interface

In Office 2007, Microsoft implemented its Fluent User Interface (better known as ribbons), replacing menus and taskbars with a combination of both. By contrast, OOo still retains menus and taskbars. Both use context-specific floating windows that open automatically when the cursor is at a particular type of formatting. When ribbons first appeared, they were both attacked and defended vigorously. Yet for all the effort, no independent study has proven conclusively that ribbons are easier or harder to use than the classic menus and taskbars. At first, you may have to search for repositioned features, but

neither has a clear advantage once you adjust to it. Most users are likely to be exasperated with the arrangement of features with the classic interface just as often as they are with ribbons.

Much the same is true of the on-line help. With MSO, users hoping for help have to drill down deep to find answers, and the arrangement of topics by questions is both limiting and hard to scan. With OOo, the problems with help are incompleteness and out of date and poorly written entries, but the result is equally unfriendly, even though the help system is more thorough.

As for the editing window, one office suite needs only to implement a feature for the other one to copy it. For instance, OOo borrows a zoom slider bar from MSO, while MSO borrowed floating windows from OOo. And, although you can point to areas where the interface of one is easier or more efficient, such as the template selector in MSO or OOo's Navigator that allows you to jump from feature to feature, these areas are counterbalanced by other features in which each suite is at a disadvantage. *Verdict: tie.*

The interfaces vary in strengths and weaknesses, but neither stands out as particularly well done. The main reason for preferring one interface over another is that you are used to it.

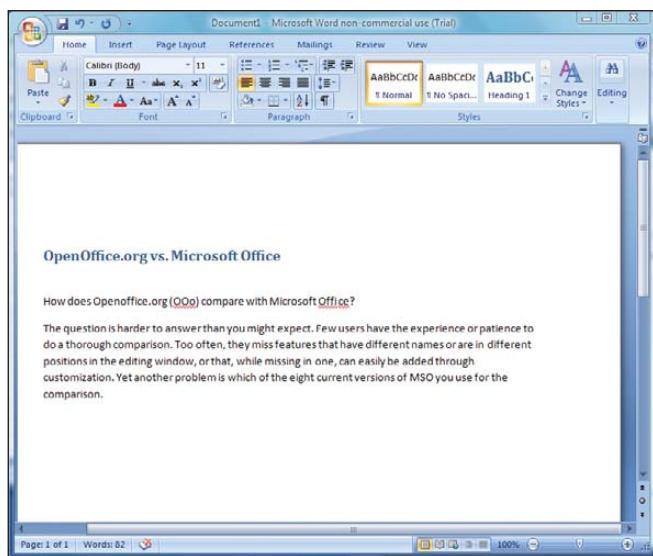


Figure 1. MS Word

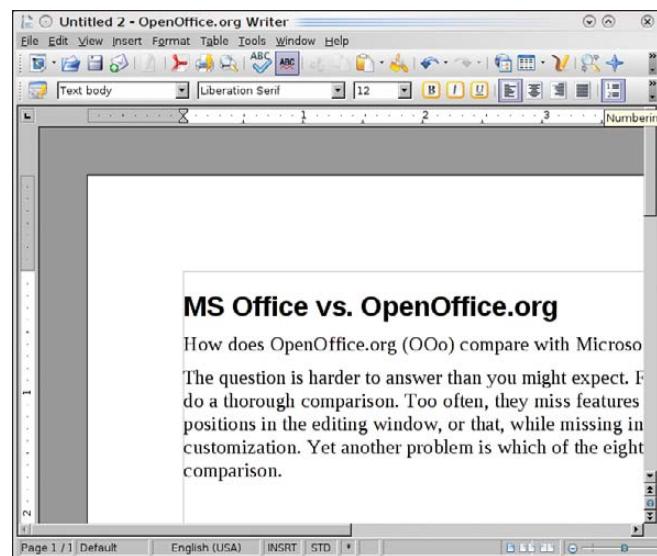


Figure 2. OpenOffice.org Writer

Word Processors: OOo Writer vs. MSO Word

For casual users, Microsoft Word is extremely convenient. For every feature, from templates and content pages to tables and bullets, Word offers libraries of standard layouts. These libraries are not particularly sophisticated by typographical standards. Some, like those for tables of contents, are frankly an aesthetic disaster, but for those who choose to ignore document design, they are good enough, especially in documents that will be used once and then discarded.

By contrast, the rumor is that OOo Writer's developers were required to use the word processor for their own documentation. Whether the rumor is true is uncertain, but it is true that Writer has more to offer for those who are concerned with document design. Writer comes with very few layout libraries, leaving you to download or create them, but in compensation, it allows you to a degree of control that makes it as much an intermediate layout program as a word processor. Kerning, hyphenation, the exact positioning of list bullets, headers, footers and footnotes or endnotes—all these layout features can be set with far greater precision in Writer than in Word.

To help you organize this precision, Writer is distinctly oriented toward styles. As you may know, styles is a feature that allows you to adjust formatting once, then apply the settings where needed, instead of applying all

the formatting manually each time you use it. Styles really save time when you are making major changes to layout and when saved into templates for re-use. Writer allows you to set styles for paragraphs, characters, pages, lists and object frames. Even more important, Writer is so oriented toward styles that even a simple act like adding a page number generally requires them. Some features, like outline numbering, are impossible without them. In comparison, Word is far more oriented toward manual formatting.

Although Word does include paragraph and character styles, you have to seek them out if you want to use them. When you do locate styles, you have to drill down into menus to change them, a process that is decidedly more awkward than Writer's arrangement of tabs in a window. Nor will you find the precision present in Writer's features. Rather than using styles, most Word users, I suspect, would prefer to stick with its layout libraries. In other words, Writer is more for advanced users, and Word for beginners. Word's orientation in particular, is implicit in the interface, which makes manual formatting tools easy to find and styles just one feature among dozens. The orientation is implicit also in the fact that advanced features like AutoText are so deeply buried, many users still believe that they were dropped when ribbons arrived. A corollary of the difference in orientation is that although Writer is adequate for

documents of hundreds of pages, few experienced users ever would consider Word for documents of more than about 20 pages.

Despite the change in the interface, Word is still crash-prone at greater lengths. Word does include a master document feature, just as Writer does, but as one commenter said, files that use Word's master document feature tend to be in one of two states—corrupted or about to be corrupted. *Verdict: Writer.*

You have to do more initial work with Writer to set up the templates you need, but once you do, the result is more professional, precise and individual than with Word.

Spreadsheets: OOo Calc vs. MSO Excel

Calc and Excel have been in an arms race for years. Excel extends the numbers of columns and rows it can support in one release, and in the next, Calc matches it. Recent releases also have seen developers improving Calc's speed when processing complex equations. Consequently, both Calc and Excel now support spreadsheets that are so extensive, any sane user would have switched from a spreadsheet to a database long before bumping against the limitations. In much the same way, Calc always has been careful to match Excel function for function to maximize compatibility. In fact, Calc actually has several dozen more functions than Excel, not because

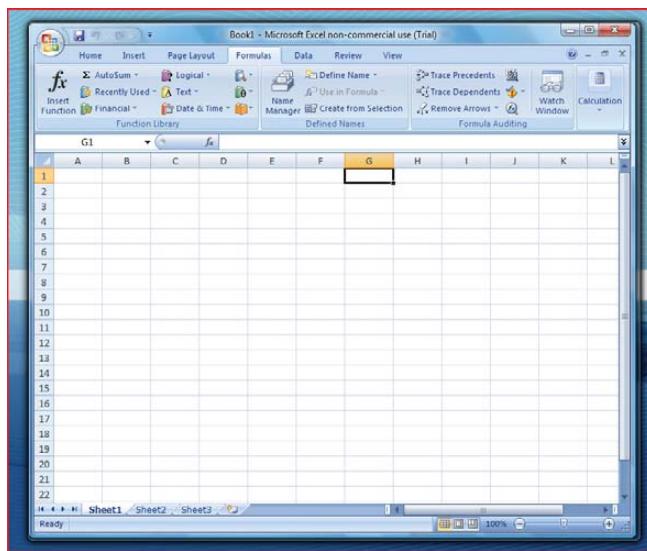


Figure 3. MS Excel

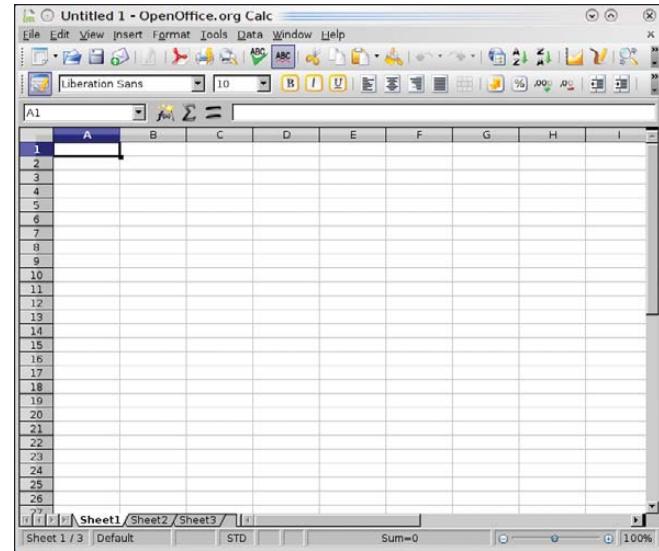


Figure 4. OpenOffice.org Calc

Calc can do more, but because it often maintains two versions of the same function—one for compatibility with Excel and one with extra features that Excel lacks. Given the sheer number of functions in both spreadsheets, I cannot be completely certain that one has functions the other lacks, but if either does, those functions are specialized ones that average users are unlikely to miss.

For sorting cell entries and manipulating formulae, Calc and Excel have a roughly equivalent feature set. The main difference is in some of the names—for instance, where Excel refers to “pivot tables” and “trace precedents”, Calc refers to “datapilots” and “detective”. With the basics so close, the differences between Calc and Excel remain minor at best.

For example, pivot tables in Excel are easier to construct than Calc’s datapilots and easier to manipulate later, although the use of cell and page styles in Calc makes formatting and printing easier. In the end, which application you prefer depends on what extras matter to you. Most users are unlikely to find any great difference in general functionality. *Verdict: tie.*

Slideshows: OOo Impress vs. MSO PowerPoint

OOo Impress produces slideshows that serve the needs of most users. It always has been especially strong in object animation, and because it shares much of its code with OOo’s Draw, it also is ideal for drawing charts and diagrams. One particularly useful feature is the ability to save object styles so that you easily can create copies and modify them all. Yet, despite such features, Impress always has struggled to catch up with MSO PowerPoint. Over its releases, it has narrowed the gap, adding built-in support for movie and sound clips and more recently tables. However, the gap remains in several key areas. For example, although PowerPoint allows the recording of continuous narrations, Impress is limited to adding sound clips to each screen. Similarly, Impress lacks the ability to use the pointer to draw on the screen during a presentation. If you want a Presenter View—a view that includes notes that display on your machine but not on the projector—you have to install the Sun Presenter Console extension in Impress. And, although PowerPoint includes a set of collaboration

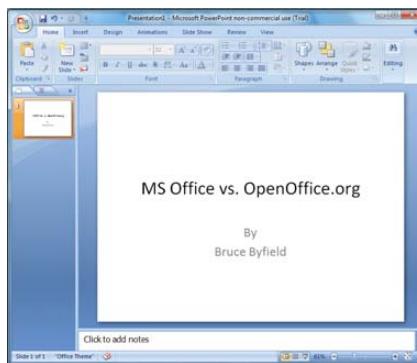


Figure 5. MS PowerPoint

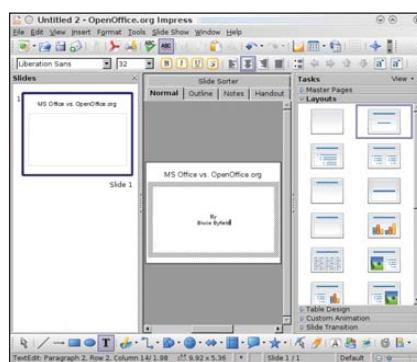


Figure 6. OpenOffice.org Impress

features similar to those found in Word, Impress’s first step to match them is scheduled to arrive in only OOo 3.2, when notes will be added.

Another weakness of Impress is that it is divided into three panes: a slide pane, the current slide pane and a task pane. This makes Impress almost impossible to use except in a full-screen window. However, although PowerPoint occasionally opens a task pane, in general, its ribbon interface means that it does not usually need one. *Verdict: PowerPoint.*

Other Features

Beyond the core applications, both MSO and OOo include other programs. Both include a small database, although OOo’s ability to connect easily to other database sources gives it a slight edge. In some editions, MSO includes Microsoft Outlook, a personal information manager; Visio, a charting program; Publisher, a basic desktop layout program, and a dozen more. The only other application in OOo is Draw, an SVG graphics editor, but as free software, OOo can be supplemented by dozens of other applications. Although these applications may

not always interact well with each other, neither do the components of MSO. And, at least an increasing number of free software applications support OOo’s Open Document Format, which means that a document written in Writer can be opened in AbiWord or KWord.

Yet another consideration is that, although MSO has an ecosystem of dozens of trainers and instructional Web pages built around it, instruction and resources for OOo are much scarcer. Conversely, OOo has developed a community of extension writers that is second only to Firefox’s, while MSO’s extensions are far fewer in number.

The Outcome

The fact that OpenOffice.org is free software predisposes me to prefer it. However, until I completed the analysis, I had no idea what the results would be. They ended (if you haven’t been keeping score) with OOo and MSO in a tie for general interface and spreadsheets, OOo in the lead in word processors, and MSO ahead in slide presentations. What these results suggest, I think, is that both office suites are mature products. Given a moment’s thought, that shouldn’t be surprising, since OOo’s development goes back more than 20 years. But we tend to think of OOo as a recent development, so the closeness of the comparison may come as a bit of a surprise.

This is the fourth time I have compared the two office suites. Each time, the differences between them have gotten smaller. Now, they are less than ever before. For those of us in the Free Software community, the latest results help to prove what we have known all along: opting for free software does not mean being satisfied with inferior tools. Of course, you might disagree with my conclusions, depending on your needs and expertise. But what they emphasize, more than anything else is that today free productivity apps can stand toe to toe with their proprietary equivalents, and win as often as they lose. ■

Bruce Byfield is a computer journalist who covers free and open-source software. He has been a contributing editor at *Maximum Linux* and *Linux.com*, and he currently is doing a column and a blog for *Linux Pro Magazine*. His articles appear regularly on such sites as Datamation, *Linux Journal* and *Linux Planet*. His article, “11 tips for moving to OpenOffice.org” was the cover story for the March 2004 issue of *Linux Journal*.

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A Review of the Always Innovating Touchbook

Take an ARM Processor (the OMAP3530) add a touchscreen and Linux and a quart of uniqueness, and what do you get? A Touchbook from Always Innovating, that's what.

DANIEL BARTHOLOMEW

The Netbook form factor is as boring as it is predictable: a 9–11" screen, an Atom processor, a small hard drive and about 1GB of RAM, all shoved into a small case with a cramped keyboard. Netbooks from Dell, HP, Acer, ASUS and others all fit this definition.

Fortunately, some companies are willing to try new ideas and form factors. One of these products is quite unlike anything else in the Netbook space and it's called the Touchbook from a company named Always Innovating (Figures 1 and 2). True to the company name, the \$399 Touchbook does have several innovating features that set it apart from other Netbooks.

For one thing, the Touchbook does not use an Atom processor. Instead, its hardware is based on the BeagleBoard Project and is built around the Texas Instruments OMAP3530 processor.

The Touchbook also has an interesting approach to expansion cards and onboard storage. The included Bluetooth and Wi-Fi adapters plug in to two of the Touchbook's four internal USB ports and the "hard drive" is a standard 8GB SDHC card like you might use in your digital camera.

The hardware design is the opposite of what you find in most Netbooks. Instead of trying to squeeze everything into the smallest, thinnest, lightest package, AI has created a case where everything has plenty of space and is easily removable—usually without tools and in the worst scenario, with just a screwdriver. This results in a case that is curiously blocky and as thick as a standard notebook.

Another interesting design decision was to make the Touchbook a tablet first and a Netbook second. Because of that, the screen section is thicker and heavier than the keyboard section. This leads to a problem I've never had with a



Figure 1. The entire contents of the box the Touchbook came in—no literature, no manuals, just the Touchbook, a stylus, three magnets and a power brick.

notebook-style computer before: if the screen is at more than a 90-degree angle the Touchbook will fall over backward.

The advantage of this design is that the keyboard can be completely removed from the Touchbook (Figure 3). The screen half has everything it needs, including a 6000 mAh battery. You even can save \$100 off the cost of a Touchbook by purchasing it without a keyboard. The only things in the keyboard half are the keyboard, a touchpad and a 12000 mAh battery. Always Innovating claims ten hours of battery life for both batteries together.

The screen half also can be turned around and mounted to the keyboard backward. This could be useful in several situations: if you want to have the Touchbook in tablet mode but want

to keep the keyboard with you, or if you want to prop the Touchbook up to watch a movie.

The screen measures 8.9" diagonally and has a resolution of 1024x600 pixels. True to its name, the screen is touch-sensitive. Unfortunately, it is a resistive touchscreen and not a more-accurate capacitive touchscreen.

Rounding out the hardware, the Touchbook comes with 256MB of RAM, 256MB of NAND Flash memory, three external USB ports, an accelerometer, stereo speakers and headphone/microphone jacks.

The hardware on the Touchbook is definitely not what I'm used to in the Netbook and notebook space. For one, it is more accessible and hackable. You slide one latch, and the entire back

cover of the screen half comes off. Inside, everything is easy to get to and various parts can be either unplugged (the Wi-Fi and Bluetooth modules) or unscrewed (the motherboard and battery). There are some size and weight trade-offs that go along with

this, but I can live with them. If you're looking for a thin and light Netbook, the Touchbook probably is not for you. But, if you like digging into the guts of your devices, the design of the Touchbook makes it easy to disassemble and hack.

The form factor lends itself to some

interesting applications. For example, you could hang the Touchbook from the back of a headrest in a car and use a Bluetooth keyboard for a bit of word processing while on a trip. It would have been nice if the detachable bottom part of the Touchbook turned into a Bluetooth keyboard when unplugged. Then, when you detached the screen, you still could use the keyboard.

Probably the most unusual peripheral that ships with the Touchbook is a set of three magnets. They're each about the size of a US dollar coin (bigger than a quarter, smaller than a 50-cent piece). These strong magnets came stuck together and were very hard to take apart (I had to use the edge of a table). There's even a note on the Always Innovating Web site saying they're working on their packaging so that the magnets are easier to take apart when you first get them. Keep these magnets far away from any children as they *will* get their fingers pinched if they try to play with them.

The purpose of the magnets is to allow you to stick the Touchbook to a metal surface, like your fridge. The back cover of the Touchbook has three metal rectangles, and you stick the foam-covered sides of the magnets to the outside of the back cover opposite the rectangles (it helps to take the cover off while doing this). The theory is that you then can stick the Touchbook to your fridge and watch a movie or play some music or surf the Web while cooking or washing dishes (watch out for soapy hands). It's sadly just a theory in my case. I don't know if my fridge is too slick or if the magnets aren't strong enough, but the Touchbook tends to slide down the side of my fridge and not stay put. I had better luck when I turned the magnets



Figure 2. The Touchbook



Figure 3. The Touchbook Screen Detached



Figure 4. The Touchbook with the Back Cover Off, Top View

over so that the foam-covered side was toward the fridge. It probably would work perfectly if both sides of the magnets were covered in foam.

My only strong complaint about the Touchbook hardware is the keyboard—more specifically, how the keys are arranged. I'm right-handed, and I've gotten very used to using my right thumb to press the spacebar. On the Touchbook, the spacebar is off-center to the left, and my right thumb sits directly over the Alt key. There's no comfortable way to stretch my right thumb over to press the spacebar, so I'm forced to use my left thumb, which is very awkward for me.

Keyboard issues aside, I am quite happy with the Touchbook's hardware. It's refreshingly different, surprisingly accessible and doesn't look half bad (if you don't mind the rounded boxy look).

On the software side, things are not quite as rosy at present. In its defense, Always Innovating clearly states on the Web site that the operating system and other software are of beta quality. Hopefully, that will improve by the time you read this.

One issue I ran into a lot is the screen is not very responsive, especially in tablet mode. It seems more responsive

The hardware on the Touchbook is definitely not what I'm used to in the Netbook and notebook space. For one, it is more accessible and hackable.

in keyboard-attached mode, so I suspect the software is responsible for the difference, and it is not a flaw with the touchscreen hardware itself.

The base Linux OS also has several issues. It's a customized distribution made just for the Touchbook. One issue I had was that when errors happened during the launching of an app (and they often did), the app would silently fail to start and leave me staring at the desktop wondering if the app would ever start. This happened mainly in tablet mode.

Software updates are also hit and miss at present. When I first received the Touchbook, the Check Update menu item reported that I had an update to install and that it would download it in the background and let me know when it was ready to install. It never notified me, and there was no progress widget or dialog box to let me know how

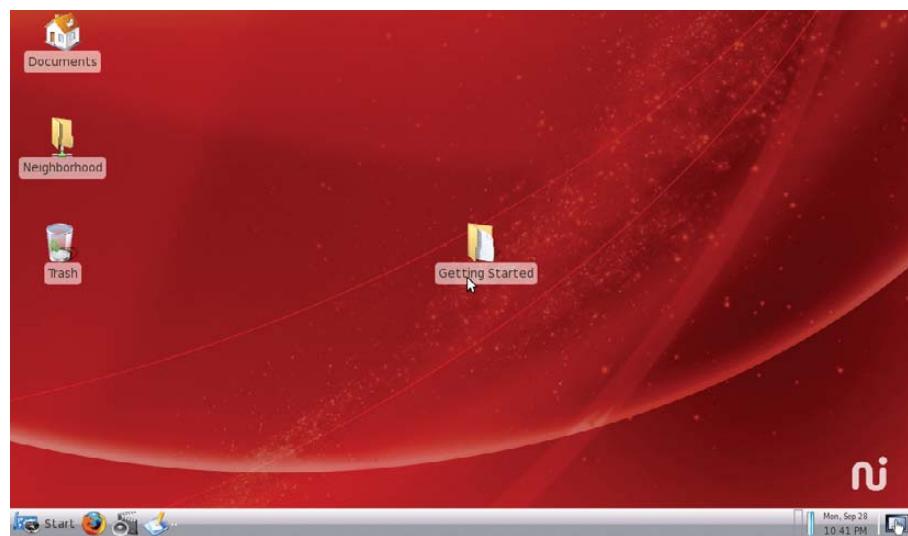


Figure 5. The Touchbook Default Desktop

things were going. About an hour after I started the update, I managed to get the Touchbook to lock up completely, and I had to do a forced reboot by pressing the power button for three seconds. After I rebooted and got back to the desktop and checked on the update, it said I was up to date. Not wanting to operate with a system that possibly was

5. Install the OS to the card using `gunzip -dc sd-card.gz | dd of=/dev/sdX`.

After going through this procedure, I didn't really notice much of a difference stability-wise, but at least I knew the procedure worked.

Software on the Touchbook includes AbiWord, Gnumeric, three different Web browsers (Firefox, Fennec and Midori), a painting program called MyPaint, The GIMP (confusingly named Image Workshop in the menu), the Xournal graphical note-taking application, Evince for reading PDFs, GNOME MPlayer for playing audio and video content, gThumb for viewing photos, the FBReader e-book application, the Pidgin IM client, a Hulu client, a selection of card and puzzle games, and *Crazy Tanks* (a 3-D tank combat game that uses the accelerometer for steering).

I tried playing *Crazy Tanks*, and it seemed to play fine. I could drive around by tilting the display and shoot at other tanks by tapping on the screen. However, there is no obvious way to quit the game apart from dying or holding in the power button until the Touchbook turns itself off.

I also tried to watch an episode of *The A-Team* using the Hulu client. I was able to search for the show and select an episode, but it never played. I tried several other shows but none of them played either.

The other applications were along



Figure 6. The Display properties dialog is very sparse.



Figure 7. Tablet Mode

the lines of what I expected based on my experiences with them in the past.

The desktop runs Xfce4, which, although not exciting, seems to run well (Figure 5). Some applications tended to crash a lot. AbiWord, for example, tended to freeze up whenever I tried to print. I attribute this in general to the unfinished and unstable nature of the beta OS and in particular to the CUPS software.

The display properties window (Figure 6) lets you specify whether the display will rotate automatically, and you can further specify if you want automatic rotation only when the Touchbook is in tablet mode. The screen does rotate automatically, but the Only in tablet mode check box does not change the behavior. The screen always rotates when you physically rotate the Touchbook if the Auto rotation check box is checked, tablet mode or no.

Speaking of tablet mode (Figure 7), I almost never had anything launch successfully when using it. In the rare instances when something did launch successfully in tablet mode, the Touchbook automatically resized everything to full screen, which makes sense.

The instability goes deeper than that with large pieces like AbiWord. Even simple things, like pressing the prtsc (aka Print Screen) button to take a screenshot didn't work most of the time. In fact, it usually worked exactly once per reboot.

The processor in the Touchbook seems quite capable for ordinary word-processing and Web-browsing tasks, but

the filesystem is really slow. This stems, I suspect, from its use of an SD card for primary storage.

I ran two content tests, one for video and one for audio. For video, I tested performance with multiple sizes of the *Big Buck Bunny* movie from the Peach Open Movie Project. The Touchbook did fine with the 480P (854x480) sized MP4 movie but couldn't handle the extra processing required for the 480P h.264 file, a smaller 640x360 h.264 file or any of the larger files.

For audio, I used the same batch of test files I use when testing audio players. These include audio files in AIFF, MP3, WAV, M4A, Ogg and FLAC format. The Touchbook played all of them fine. I've also recently added some high-definition FLAC files to my test suite. These files include ones at the following bit/kHz combinations: 24/88, 24/176.4 and 24/192, with anywhere from two to six channels of audio. This is an unfair test, especially because ALSA down-sampled the dual-channel files to 48kHz and because the speakers on the Touchbook aren't anywhere close to being audiophile quality. However, I was impressed that the Touchbook actually was able to play the files. The only time it obviously messed up was with my surround-sound test file, which has someone saying "left", "right", "center", "back" and so on. Not only was the audio present only for the "left" and "right" portions of the test, but they also were switched so that they were coming from the wrong sides—not a big deal but interesting. And, for those who want to standardize their music libraries on a single format, the Touchbook should be able to play them, even if the format is high-definition FLAC.

Finally, the Touchbook has an annoying habit of going to sleep after letting it sit for a minute or so. Sometimes I don't even have to let it sit, it will



Figure 8. Using Xournal to Write a Note

just go to sleep while I'm typing—at least, I think it's sleeping. The screen turns off, and I can press the power button once and then count to ten, and the screen will come back on. This happens even when the Touchbook is plugged in. It's annoying.

Conclusion

In the final analysis, I like the hardware much more than I like the software, and I like the Touchbook's potential more than I like its current state. If you just want a Netbook that works, stay away for now. If, however, you like tinkering and don't mind a bumpy road, there's a lot to like. ■

Daniel Bartholomew lives with his wife and children in North Carolina. His on-line home is at daniel-bartholomew.com.

Resources

Always Innovating: alwaysinnovating.com

BeagleBoard: www.beagleboard.org

Re-install Instructions: www.alwaysinnovating.com/wiki/index.php/Reinstall_OS

Big Buck Bunny: www.bigbuckbunny.org

KDE 4 ON WINDOWS

Let KDE Konquer your Windows desktop.

Have you ever found yourself working on Windows—for whatever reason—and reached for one of your favorite applications from the free software world only to remember that it is not available on Windows?

It is not a problem for some of the best-known free software applications, such as Firefox, Thunderbird, OpenOffice.org, GIMP or Pidgin. However, for some popular Linux applications, such as those from the KDE desktop software project, cross-platform support only recently became a possibility. KDE relies on the

Qt toolkit from Nokia, which has long been available under the GPL for operating systems such as Linux that use the X Window System, but it was available under proprietary licenses for Windows only until the most recent series, Qt4. With the release of a GPL Qt for Windows, KDE developers started work on porting the libraries and applications to Windows, and the KDE on Windows Project was born. The project tracks the main KDE releases on Linux and normally has Windows versions of the applications available shortly after.

STUART JARVIS

INSTALLATION

It is easy to try out KDE applications on Windows. Simply go to the project Web site (windows.kde.org), download and run the installer (Figure 1). You'll be presented with a few choices to make, such as the installation mode (a simple "End User" mode with a flat list of applications or the "Package Manager" mode that is categorized like many of the Linux package managers). You also are given the option of whether to install packages made with the Microsoft compiler or those made with a free software alternative—as many users are likely neither to care about nor understand this option, it may have been better to hide it in an advanced tab.

Next, you are presented with a choice of download mirrors, followed by the choice of which version of KDE software to install. It's hard to imagine why you wouldn't simply want the latest stable release, but the installer

gives you a few options and, oddly, seems to preselect the oldest by default.

In the next step, you are presented with a list of applications and software groups available to install, or you can select everything (Figure 2). The installer then takes care of downloading and installing the software, and you don't need to make any further interventions. I did find that the speed of the various mirrors varied greatly; some were up to ten times faster than others. If you're short of time and things seem to be going slowly, it may be worth canceling the download and trying another mirror. The installer is intelligent enough to re-use what you already have downloaded, so you don't really lose anything in this way. When the installation is complete, your new KDE applications are available in a KDE Release subsection of the Windows application menu.

The main KDE 4 distribution for Linux is split into large modules—for

this issue: "as one can see, we are already working on splitting up packages into smaller parts, so that each application can be installed separately." Many modules already have been split, so you can install the photo management application digiKam, individual games and key parts of the KDE software development kit separately from their companion applications. The productivity suite KOffice will be split up in a similar way in the near future, and Patrick hopes that the Education module will follow shortly afterward.

Overall, the installation process will feel familiar and easy if you've used Linux in the past. However, if you have used only Windows, the process of using a single installer to install whatever applications you want may seem a little strange. After all, most applications for Windows are installed by downloading a single self-contained executable file that installs the application and everything it needs to run in one go. The KDE on Windows installation process reflects the fact that KDE applications share a lot of code in common libraries.

Patrick explains that individual self-contained installers simply would not make sense at this stage: "the base libraries for a KDE application are around 200MB, so each single application installer would be probably this size." A version of Marble, however, is available from its Web site as a self-contained installer—the map widget is pure Qt, so it is possible to maintain both a Qt and KDE user interface wrapping that widget. The pure Qt version is small enough to be packaged in this way.

As Torsten Rahn, Marble's original author and core developer puts it, having a standalone installer for the full KDE version of Marble "would increase the time a user needs to download and install Marble; installing the Qt version takes less than a minute." It might be possible in the future to package a common runtime environment and provide applications as separate executables, similar to the approach taken by Java applications, but Patrick notes that this would take time, as "it would be a lot different from the current Linux-like layout." In any case, the current approach has some advantages, because it makes you aware of other available applications and allows you to try them out simply by marking an extra check box.

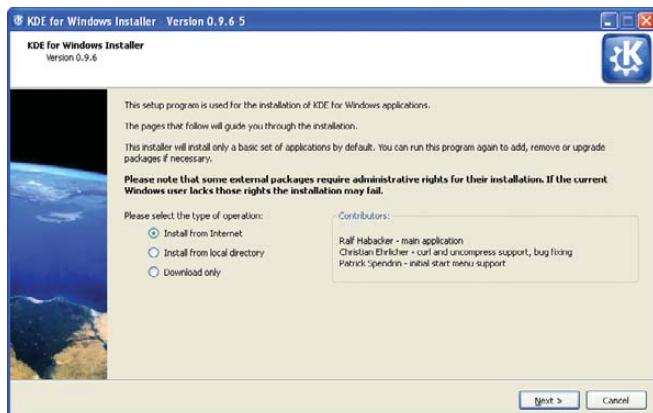


Figure 1. KDE on Windows Installer Welcome Screen

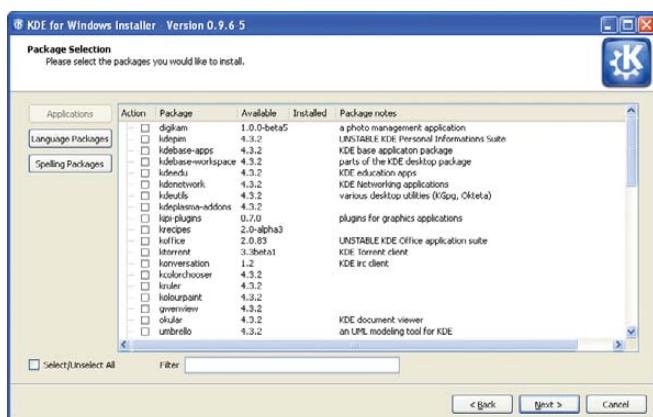


Figure 2. The installer provides a simple list of applications available for installation.

FEATURE KDE 4 on Windows

FIRST IMPRESSIONS

The KDE 4 Windows install comes with a slimmed-down version of the System Settings configuration module (Figure 3), which will be familiar to you if you've used KDE 4 on Linux. Here, you can adjust KDE 4 notifications and default applications in addition to language and regional settings. However, these apply only to the KDE applications, so you can encounter slightly odd situations. For example, if you open an image from Windows Explorer, it will be shown by the Windows Picture and Fax Viewer, but if you open the same file from KDE 4's Dolphin file manager, it will be opened with the KDE image viewer, Gwenview. Of course, you can

use the Windows control panel to make Windows prefer KDE applications for opening images and documents and change the file associations for Dolphin so that it will use other Windows programs that you have installed, but you will need to make adjustments in both places to get consistent behavior.

System Settings also allows you to choose a selection of themes for your KDE applications, including some that tie in well with the Classic and Luna themes in Windows XP. At present, KDE 4 doesn't include special themes for Windows Vista or Windows 7. However, Windows users are accustomed to using mismatching software from many different vendors, and the KDE applications fit in as well as anything else.

Most of the applications I tried seemed just fine, at least to start with. Konqueror, for example, correctly displayed the selection of major Web sites I visited (Figure 4). However, after using the applications for a while, I began to notice a less-than-perfect integration with the Windows environment. Okular, the KDE document

viewer, used the default Windows dialog for open and save, with common Windows folders, such as Desktop and My Documents, available on the left-hand panel. However, other applications, such as KWord, used the KDE file dialog which, in common with the Dolphin file manager, has links on the left-hand panel to Home and Root. These labels probably will not mean a lot to a Windows user unfamiliar with a traditional Linux filesystem layout, and it would be nice to see Dolphin and KDE dialogs modified to show standard Windows folders, such as Desktop and My Documents instead.

STATE OF THE APPLICATIONS

digiKam, the photo management application, is one of the real highlights of the KDE world on Linux (Figure 5). On Windows, it started fine, found all my images and allowed me to view a full-screen slideshow. I was able to use its powerful editing tool to crop a photo and adjust the color levels of an image, but when saving the modifications, I received an error that the save location was invalid. digiKam was attempting to prepend a forward slash (as found in a Linux filesystem) to the save location, so that it read "/C:/Documents and Settings...". A small error, but one that makes practical use of the application difficult.

KOffice2, still experimental on Linux, seemed to run quite well on Windows. I was able to create a document, save it in OpenDocument format and then

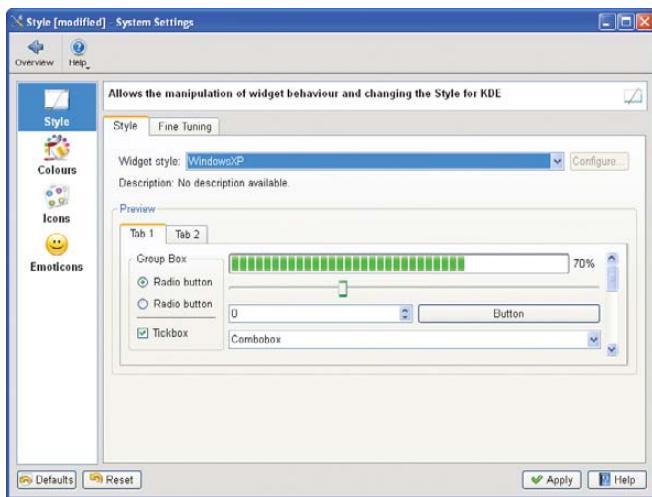


Figure 3. The KDE System Settings module lets you adapt the look and feel of KDE applications to match your system.

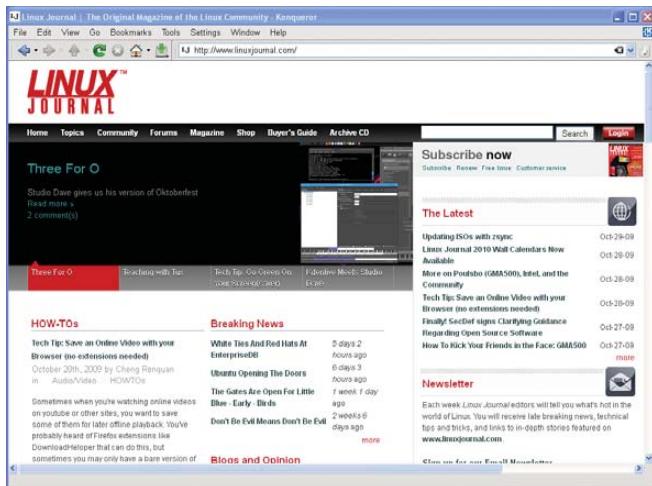


Figure 4. KDE's Konqueror Web browser handled all the major sites I tried.

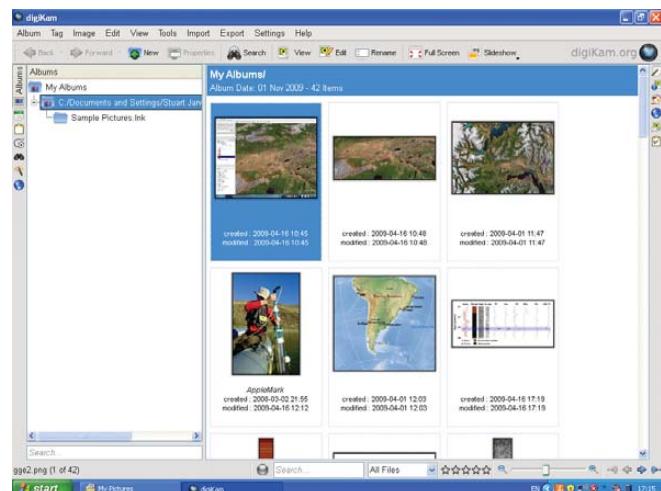


Figure 5. digiKam, the KDE photo manager, worked quite well, finding and organizing my photos.

open it in Okular. Windows users who primarily use Microsoft Office and don't want to use another office suite might consider Okular as a lightweight OpenDocument viewer.

One of my favorite KDE applications on Linux is Kopete, the universal messaging application (Figure 6). I was able to log in to my Windows Live Messenger account and chat to my contacts, but the XMPP protocol (used by Google Talk) wasn't available. Integration with KDE's secure password storage system, KWallet, also seemed imperfect, as I had to go through two rounds of unlocking the wallet before Kopete appeared to have access to the account passwords.



Figure 6. Kopete works well with the Windows Live Messenger service but currently lacks XMPP support on Windows.

Dolphin, the file manager, seemed to work well (Figure 7), and its breadcrumb navigation structure made rapid switches between folders easy. It felt faster than Windows Explorer at loading thumbnails of images, and the preview pane provides excellent file overviews without having to open a dedicated application. If I spent a lot of time on

Windows, I would be tempted to try Dolphin as an Explorer replacement. As mentioned previously, Konqueror also handled everything I threw at it.

One notable application missing from the KDE installer is Amarok, the popular music player. The Amarok Web site explains that the Windows port is highly experimental and has been omitted from the KDE 4.3 release of the KDE on Windows installer, although it was available on Windows with KDE 4.2. In fact, no music or video player was available from the KDE installer for version 4.3, which is a shame, as the Phonon technology

developed by KDE and integrated into Qt should make it easier than ever before to make such applications truly cross-platform.

KDE 4 comes with a great selection of simple games built in, including the likes of *Hangman*, *Battleships* and a few

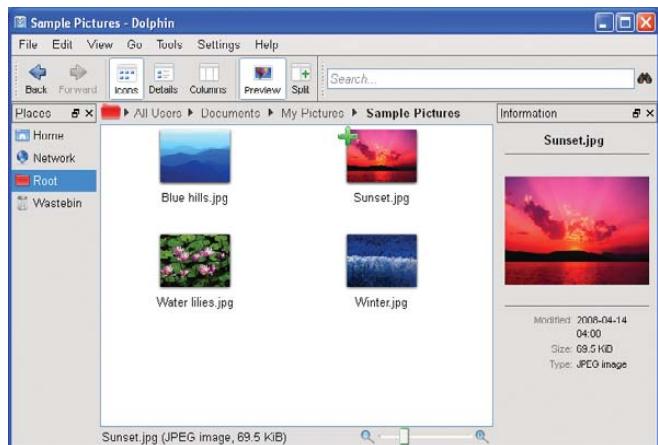


Figure 7. The Dolphin file manager is an attractive and easy-to-use replacement for Explorer.



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more exotic options, such as *Mahjongg* (Figures 8 and 9). Windows includes its own applications for playing many of these games, but the KDE alternatives were highly impressive with beautiful artwork. I encountered few problems that would give any indication that they hadn't been designed for Windows in the first place—only some problems saving partially completed games due to differences between the Linux and Windows filesystem structures.



Figure 8. *KMahjongg* is beautifully presented and very usable on Windows.



Figure 9. *KHangMan* comes with a selection of nice themes and worked flawlessly.

GOING ALL THE WAY: PLASMA ON YOUR DESKTOP

The desktop shell in KDE 4 on Linux is provided by Plasma, a flexible, integrated replacement for the separate desktop, widget and taskbar applications of KDE 3. It is possible to run Plasma as the desktop shell on Windows, but some major features are missing—such as a taskbar—and you need to make some changes to the Windows Registry to try it out. In fact, trying Plasma on Windows really is not a good idea on any machine that you care about, because once you have made the switch, you cannot easily revert it from within your KDE Plasma desktop session. The safest way to try Plasma on Windows is to use a new (and disposable) user account in Windows running in a virtual machine. If you do try it (see the Replacing the Windows Desktop Shell with KDE's Plasma sidebar for instructions), you'll be presented with a pretty KDE desktop (Figure 10) to which you can add a few of your favorite widgets, such as a clock or the KDE menu, run a few KDE applications and, well, that's about it. Windows programs are entirely inaccessible. Although there is a certain wow factor to having an almost complete KDE 4 desktop on your Windows machine, using it is not really practical in any serious way at present.

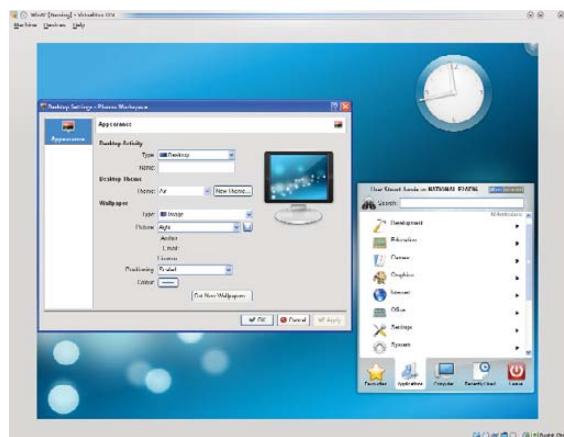


Figure 10. The KDE Plasma desktop shell running on Windows—attractive, but not yet very functional.

CAN KDE SUCCEED ON WINDOWS?

Some of the KDE applications are competing for your attention against better-known alternatives that you easily can install from a single executable file. KDE's Konqueror Web browser, although a fine application, finds itself in a very crowded market for Windows browsers with Internet Explorer already installed and the likes of Firefox, Opera, Safari and Google Chrome all available as alternatives. The potential for some other applications to become popular on Windows is, however, much higher. Kopete faces only Pidgin and the proprietary Trillian messenger as serious competition in the market for multiprotocol messaging clients. Okular is a lightweight but well featured alternative to Adobe Reader. Marble is almost in a class of its own—the nearest competitor perhaps being Google Earth. Kontact, the Personal Information Management suite, also has potential as a compelling

REPLACING THE WINDOWS DESKTOP SHELL WITH KDE'S PLASMA

First, this is a really bad idea and may make your Windows system unusable. If you must follow these instructions, use at least a spare user account and preferably a disposable install in a virtual machine. You have been warned.

If that has not put you off and you still want to see how Plasma looks on Windows, you need to download and run Autoruns for Windows from Microsoft (technet.microsoft.com/en-us/sysinternals/bb963902.aspx).

Next, simply unzip the downloaded archive and run autoruns.exe (not autorunsc.exe).

In the main program window that appears, you then have to select the Logon tab and find the entry that references explorer.exe. Double-click on that to open the registry editor and change the key to replace explorer.exe with the full path to plasma-desktop.exe (if you accepted the default KDE install options, this is probably C:\Program Files\KDE\bin\plasma-desktop.exe).

Log out and back in again. You should be presented with a pretty but largely nonfunctional Plasma desktop.

You'll probably have to press the computer reset button to escape.

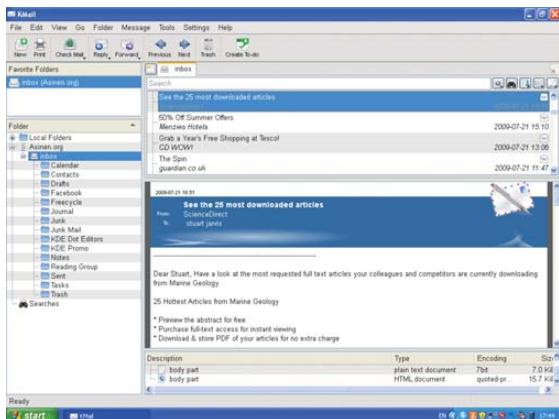


Figure 11. KMail, part of the KDE Kontakt Personal Information Management suite, was able to connect to my mail server and download my e-mail.

cross-platform alternative to existing solutions (Figure 11). Mozilla Thunderbird is a clear competitor, but it lacks comprehensive calendar functionality. Benjamin Dietrich, working in IT support at a German university, who currently has to support many different mail applications across the various computing platforms, believes Kontact could "provide one

solution, once it is as mature as it is on Linux". However, a way to distribute Kontact as a self-contained installer easily would add to its appeal: "a single binary installer would be perfect."

The spread of KDE applications to Windows also has had benefits for the wider KDE Project. Amarok's integration with the Last.fm music service was largely put together by a developer who used Windows rather than Linux. It is unlikely that he would have become involved if it had not been possible at the time to run

Amarok on Windows. Getting exposure to users on Windows also gives KDE the potential to attract users to trying KDE 4 on Linux and should make the transition for such users easier if they already know some of the applications.

CONCLUSION

The KDE on Windows Project still is quite

young, and there are plenty of rough edges in many of the applications and some notable gaps in the application line-up. However, the installation process works well and is straightforward for anyone who has used a package manager on Linux. Although the installation process is different from that of most Windows applications, the installer is sufficiently well designed that it should not cause problems for most Windows users. The recent and continuing work to split up applications so that users can install exactly what they want also lowers the barriers to trying out KDE applications in Windows. Some of the applications have great potential to fill gaps in the Windows application world, particularly as free software alternatives to proprietary applications. As the project Web site freely admits, many of the applications may not yet be ready for day-to-day use, but they are well worth checking out and will only get better. ■

Stuart Jarvis is a scientist and longtime KDE user. He divides his time between digging up some of the world's finest mud and regretting ill-judged experiments with pre-release software.

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RUNNING REMOTE APPLICATIONS

Displaying remote applications on a local system or even controlling a remote desktop requires little configuration and almost no changes to your everyday application use.

One of the advantages to using a GNU/Linux system is the separation of the display system from the underlying operating system. The Linux desktop has at its core the X Window System, a software architecture that provides layering of display components. Each component provides its own set of display features. These features include the ability to change out window managers, directly drive hardware, provide alternative desktop environments and even remotely display some or all of a desktop.

Most Linux users will be familiar with window manager and video display hardware tools, because the desktop paradigm has long assumed the user is sitting in front of the system running the desktop applications. Remote display, although not new to the X Window System, is discussed less often, because end users were thought to have only one system in use.

But, end-user needs have grown more sophisticated, and applications like media and Web servers, for example, provide ample reasons to manage multiple PCs remotely, even within a single household.

In this article, I discuss the variety of methods available to Linux users for running Linux applications on a remote system for display locally. I cover basic configuration issues, discuss limitations and advantages, consider security implications and contrast the reasons for using each method. All of the tools discussed in this article should be available from any popular Linux distribution, although package names may vary. Examples and discussion focus on GNOME-based solutions running on Fedora, although similar functionality and applications exist for KDE users. This article does not specifically address display of Mac or Windows applications on Linux systems; however, the section on VNC is closely applicable.

MICHAEL J. HAMMEL

The GNU/Linux Display Architecture

From a very high level, the GNU/Linux display system can be viewed as three distinct components (Figure 1). At the lowest level comes the Linux kernel and the X.org display server and its associated libraries (referred to commonly and collectively as X11). The display server and kernel work together to provide management of the display hardware, and the libraries provide higher-level software a convenient means of using them.

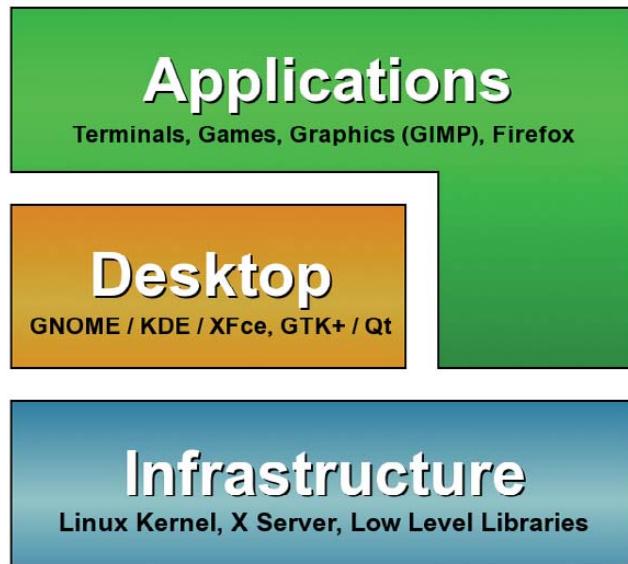


Figure 1. The Linux Display System Stack

The desktop environment sits in the middle of this stack. This includes GNOME, KDE and Xfce, the three most popular desktop environments. In support of these environments are application libraries, such as GTK+ and Qt, as well as a variety of other general-purpose libraries used by desktop applications.

Applications sit above the desktop environment. These are the actual tools users run to view movies, listen to music, communicate with friends and coworkers and purchase products from the Internet.

Remote display of applications is handled by features found within the Infrastructure and Desktop layers. Applications that run in the desktop and X11 environments can be told to display remotely but leave the details of how that is done to the underlying layers of the stack.

There are three methods by which users can run an application on a remote system and have it display locally—that is, on the screen in front of which they are seated. The first method involves the use of the X Display Manager Control Protocol (XDMCP). This protocol is part of the X11 specification and is implemented on Linux systems using the GNOME Desktop Manager (GDM) or when using KDE, by the KDE Display Manager (KDM), both of which are replacements for the X Display Manager (XDM). This method is focused on running individual applications, although there are applications that can provide a complete remote desktop.

The second method relies on OpenSSH support of X11 protocols. It also is focused on running individual applications and is typically easier to configure and use.

The last method is based on Virtual Network Computing (VNC) mechanisms that are operating-system-independent and more suited to complete desktop sharing.

Using XDMCP via GDM

In X11 parlance, the server is the thing that manages your display hardware, and the client is the application that needs the server to display windows. This often confuses people, because it's backward from one's normal understanding of the terms client and server, as now the server is the computer in front of you and the client is the remote computer.

Most applications on the Linux desktop provide the -display command-line option. This option is equivalent to setting the DISPLAY environment variable, and it tells X11 clients (applications) which X server to display on. The default setting is to display on the local server, referenced as :0.0. A remote server can be specified by prefixing this value with the hostname (or IP address), such as galileo:0.0. The reference to galileo:0.0 works only if the host galileo is running at least one instance of an X server.

The use of the -display option is tied to the configuration of XDMCP on the X server. XDMCP is the old-school method of displaying remote applications on a local display. Most old-time UNIX and X11 users are familiar with its use, although configuration issues have evolved with the Linux desktop.

On GNOME systems, XDMCP is controlled by GDM. GNOME users are familiar with GDM from the graphical login screen. That screen is actually only one part of GDM and not related to our discussion. GDM also controls XDMCP usage for an X session, otherwise known as a graphical login. The graphical login starts a new X server with various options. By default, GDM does not permit XDMCP connections to the X server from remote client applications. To enable it, edit the file /etc/gdm/custom.conf to look like this:

```
# GDM configuration storage
[xdmcp]
Enable=true
[chooser]
[security]
DisallowTCP=false
[debug]
```

The [xdmcp] section has a single option, Enable, which when set to true, allows XDMCP connections. However, GDM also needs to be told to allow TCP connections in order for the remote applications actually to use XDMCP when communicating with the X server. The [security] section option DisallowTCP must be set to false in order to disable the feature that denies TCP connections.

Note that XDMCP is the higher-level protocol (the way a client application and an X server will communicate), while TCP is a lower-level protocol, which for our purposes can be defined as the networking port that the communication flows through.

Once configured, restart GDM. You can do so by changing the run state to 3 and then back to 5 with the following commands, with a short pause between them recommended. Be aware that if you execute the first command in a terminal/shell window, the window will disappear, because this command

kills the X server. You'll be dropped into a virtual console/terminal, at which point, you probably will have to log in to execute the second command:

```
sudo init 3  
sudo init 5
```

Now the local X server is configured to allow remote applications to connect to it. One additional step is required to specify which hosts have access to the local X server. There are two ways to do this. One is to edit the /etc/hosts.allow and/or /etc/hosts.deny files. A simpler method is to run the xhosts command after logging in to the local system:

```
xhost +<hostname-or-ip>  
xhost -<hostname-or-ip>  
xhost +
```

The first command allows a specific host to display locally, and the second denies a host. The third method allows any host to display locally. This option should be used only on a trusted network, such as your network at home that is behind your firewall. The xhost settings are applicable only to the current login session.

Now, open a terminal window, log in to the remote system (preferably with SSH, but Telnet if you must), and start another terminal with the display option set to the local X server:

```
xterm -display galileo:0.0
```

The xterm started here is running on the remote system

XDMCP Pros and Cons

PROS:

- Uses native X11 functionality.
- Easy to configure via GDM.
- Convenient for use behind a firewall.
- Separate X server session.

CONS:

- Does not support video or audio.
- Insecure protocol (clear-text passwords under XDMCP; considered a security issue in business environments).
- Native protocol means it's not compatible with non-Linux native desktops.

but displaying on the local X server (on the computer in front of you). You can start other applications the same way with each appearing as an ordinary window on the local desktop. In this way, the remote applications mix seamlessly with the local desktop. If for some reason your shell prompt doesn't include the name of the host in the prompt, you probably should set it so that you know on which system each xterm is running.

GDM comes with GNOME, so as long as you have GNOME installed, you can use this method of remote application display. With KDE, you normally would use KDM, but its configuration is not covered here.

Remote Desktops Using Xnest/Xephyr

The -display option allows a single application to display remotely, but what about an entire desktop? It is possible to start a graphical login remotely over XDMCP using the Xnest or Xephyr X servers. These servers act like application windows on your local display but connect to the remote display manager (GDM) to offer up a graphical login. GNOME doesn't include these servers, and on most Linux distributions, they are likely not installed by default. However, if you do a quick search of your distribution's software repositories, you should find packages similar to these Fedora-specific packages: xorg-x11-server-Xephyr and xorg-x11-server-Xnest.

After installation, the servers can be run manually to connect to a remote system:

```
Xnest :10 -query <host-with-gdm-configured> -geometry 1024x768  
Xephyr -query <host-with-gdm-configured> -screen 1024x768 :1
```

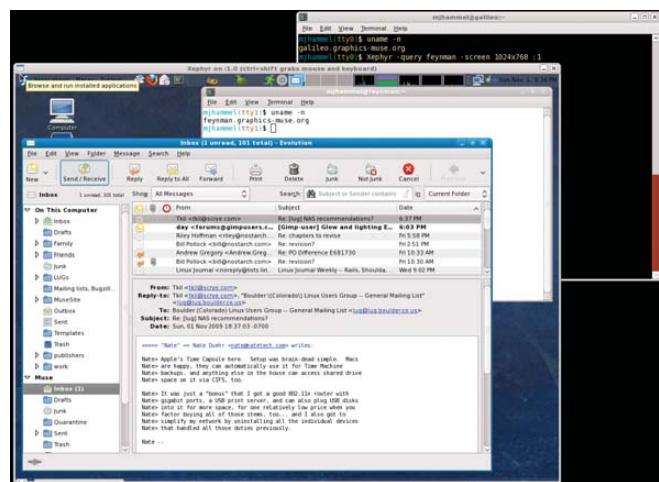


Figure 2. Xephyr-Based Remote Desktop Running Evolution

Experiments with both shows that Xephyr (Figure 2), the more modern and more actively developed of the two, was more stable. Unfortunately, logging out of a session prevented further connections. That may be because GDM was configured to allow only a single session from a remote system and may be fixed with additional research into GDM configuration. In these tests, however, the only solution was to restart GDM on the remote host.

XDMCP via GDM acts as a conduit for remote applications to display on a local machine. This means it does not control

remote desktops. In fact, there doesn't need to be anyone logged in to the remote system at all, although GDM does need to be running. Because it doesn't take control of an existing X session remotely, it is possible to have a different display size on the local display. For example, if the remote system provides only a display resolution of 800x600, it still would be possible to display at 1024x768 on the local display using a Xephyr and a GDM/XDMCP-managed connection. It also means you can use different desktop environments (GNOME, KDE, Xfce or others) for the remote and locally displayed sessions.

Remote Display via SSH

By far, the easiest of the three methods for remote application display is to use SSH. SSH is the secure shell, a tool for connecting to remote systems using encrypted communications. Linux systems use the open-source OpenSSH implementation of SSH. This package offers X11Forwarding, a configurable option in the server and client (the SSH server and client) that end users utilize with the -X command-line option.

SSH uses a client/server architecture. The server side is the remote system, and the client is the local system (the configuration that we normally think of as client/server and the opposite of X). The remote server must be configured to allow X11 forwarding. This is done by enabling the X11Forwarding option in /etc/ssh/sshd_config:

```
...  
AcceptEnv LANG LC_CTYPE LC_NUMERIC LC_TIME LC_COLLATE  
AcceptEnv LC_MONETARY LC_MESSAGES  
AcceptEnv LC_PAPER LC_NAME LC_ADDRESS LC_TELEPHONE  
AcceptEnv LC_MEASUREMENT LC_IDENTIFICATION LC_ALL LANGUAGE
```

```
#AllowAgentForwarding yes  
#AllowTcpForwarding yes  
#GatewayPorts no  
X11Forwarding yes  
...
```

X11 forwarding also can be enabled on a per-user basis in this file by placing the X11Forwarding option after a user specification:

```
...  
Match User bilbobaggins  
    X11Forwarding no  
...
```

These changes will not take affect until the SSH server is restarted. If your distribution provides it, the service command is the easiest way to do this:

```
sudo service sshd restart
```

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X11Forwarding Pros and Cons

PROS:

- Very secure—as secure as SSH.
- Simple to configure.
- Simple to use.
- Works with port forwarding.
- Does not require remote GDM or X server to be running.
- Safest way to display remote app on other side of firewall to the local display.
- Multiple applications with a single connection.
- Can work with video.

CONS:

- Potentially very slow compared to VNC and GDM.
- Audio doesn't work.
- X11 protocol is a bandwidth hog.

The client-side configuration, found in `/etc/ssh/ssh_config`, requires enabling the `ForwardX11Trusted` option. This is enabled by default on Fedora systems, although other distributions may require the option to be enabled manually:

```
...  
ForwardX11Trusted yes  
...
```

Note that the location of the SSH client and server configuration files may vary with different Linux distributions. Consult the OpenSSH package for your distribution to find the configuration files.

Once the server and client sides are configured for SSH, a user can use X11Forwarding by adding the `-X` option to an SSH login. The `-X` option passes the required `DISPLAY` information to remote applications, which automatically open on the local display. Note that using SSH X11Forwarding means the remote application should not use the `-display` option nor should the `DISPLAY` environment variable be set. SSH will take care of all of that automatically.

SSH X11Forwarding does not require the remote machine to be running GDM or an X server. This means remote systems can be run in headless mode, which means they have no display at all. Instead, users log in remotely using `ssh -X`, run graphical applications on the remote system and have them display locally. This places far less load on the remote system than using the GDM-based remote application display.

Although in most instances, you will need to have an X server installed on the remote system, because most X applications, which are on the remote system, will need the associated X libraries, and most package managers will end up installing the entire X server to provide them:

```
ssh -X <remote host>  
# login to remote host succeeds...  
xterm -geometry 80x50
```

Virtual Network Computing (VNC)

XDMCP is the old-school method, and SSH is the safe method. But, the method best integrated into the desktop is Virtual Network Computing (VNC). VNC is a system based on the Remote Frame Buffer protocol from Olivetti Research Labs, which is available for anyone to implement. This protocol isn't based on X11, but lives at a lower level in the Infrastructure layer. This means VNC software can work with any desktop system, including Linux, Windows and Mac OS/X. With VNC, you can display remote Linux desktops next to remote Mac desktops on your local display.

VNC is essentially a protocol definition—it describes how something should work. There are numerous implementations available for Linux systems. Clients are referred to as viewer applications. One open-source implementation is TigerVNC, a fork of the popular TightVNC implementation. TigerVNC offers both server and client viewers and was created to help increase development activity on the project.

GNOME users will find Vino as the default VNC server and Vinagre as the most full-featured client viewer, and they are tightly integrated with the desktop, meaning GNOME provides menu options to configure and enable both the client (Vinagre) and server (Vino).

VNC Configuration

Unlike XDMCP/GDM and SSH, VNC is not used to launch remote applications for display on the local system. Instead, it is used to view and/or grab control of the remote desktop. Thus, the remote desktop must already be running. Additionally, VNC would not be useful if the remote system were running in headless mode, although Xvnc can remove this restriction also. Xvnc provides a remote "virtual" X server to which VNC clients can connect. Because the remote desktop is virtual, Xvnc also can be used to enable an alternate remote desktop and/or multiple remote desktops, perhaps of different sizes.

The VNC server must be enabled on the remote system for the client viewer to connect to it. The server is configured from GNOME using the `System→Preferences→Remote Desktop` menu option. The configuration dialog requires enabling desktop sharing, configuring security constraints and setting methods of notification (Figure 3).

Sharing refers to how the desktop will be accessed. Sharing

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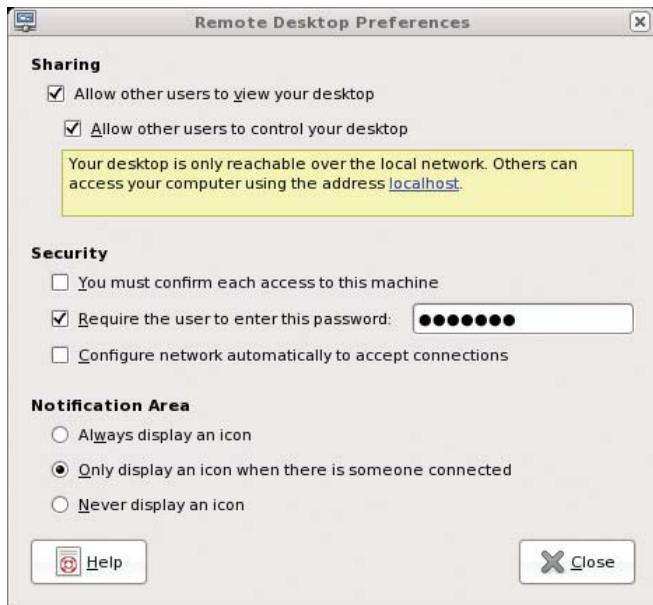


Figure 3. Vino Configuration under GNOME

is enabled by allowing remote users to view the desktop and, if desired, allowing them to take control of the desktop. In the latter case, the user of the desktop where the server is enabled will no longer be able to use the desktop while the remote user controls it. For administration of systems on your local network at home, the server should be configured to allow other users to control the desktop.

Under Security, the only option required for home use is specifying a password. This password is not encrypted for Vino or TigerVNC, so this protection is not very helpful outside of a local network protected by a firewall. If the option to confirm each connection is set, every time you use a VNC client viewer to connect to that machine, you also must walk over to that machine to allow the connection. For home use, this option

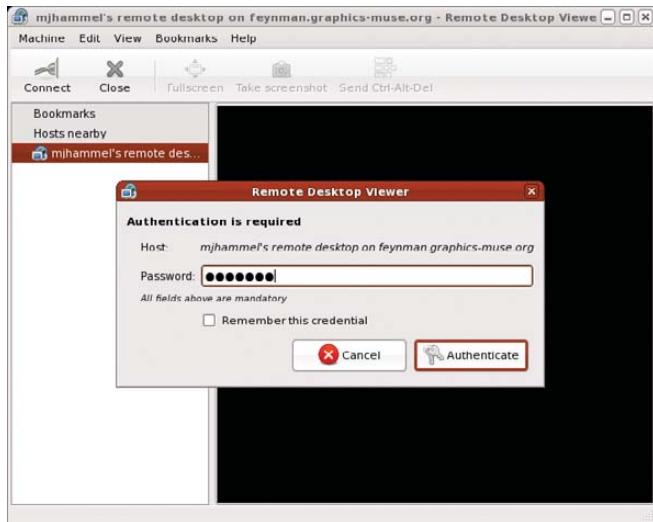


Figure 4. Vinagre Login to Remote Server

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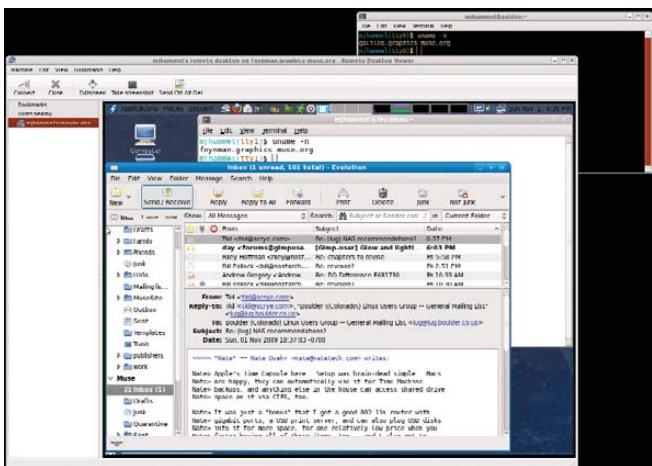


Figure 5. Vinagre Remote Desktop Display

should not be set.

Notifications are a personal preference. Because the idea of VNC, at least for our purposes here, is that the server is on a machine you don't want to be in front of, the notifications are of little use. However, it is helpful to have an icon displayed when a connection is active, in case you forget when one machine is controlling the one you're trying to use.

On the client side, the GNOME Vinagre VNC client viewer is started from Applications→Internet→Remote Desktop Viewer. The Vinagre client looks like any other desktop application (Figure 4), with a menu bar and an obvious Quit option (File→Quit). This is in contrast to, for example, Xephyr for displaying a remote desktop. Vinagre also allows opening connections to multiple remote servers with each remote desktop connection accessed by a tabbed folder (Figure 5). This makes using VNC very convenient and easy to understand, as it uses the usual desktop application widget paradigms.

VNC: Multihead Using Two Computers

One of the clever ways to use VNC is to connect the local keyboard and mouse to the remote desktop. This simulates a multihead configuration where two monitors act as a single screen. Using x2vnc, the local computer acts like the first monitor, and the remote desktop acts like the second monitor. Moving the mouse off the right edge of the local monitor moves it into the left edge of the remote desktop. This is a clever way of using a laptop to control a MythTV client connected to your TV without having to deal with IR remote controls or IR keyboard/mouse combinations. For example:

```
x2vnc <remote host> -east (or -west, -north, -south)
```

Above, the `-east` option configures the remote desktop to act as if were to the right of the local desktop, and `-west` reverses this setup. Various other options are available to refine the use of this configuration.

VNC extensions provide various forms of compression and security. These extensions must be supported on both ends of the communication. If the server supports these but the client does not, VNC still will function between the two but without those extensions.

VNC Pros and Cons

PROS:

- Extremely easy to configure under GNOME, especially for a local network (behind firewall).
 - Can be secured with passwords.
 - Displays the entire desktop—in fact, it actually controls the remote desktop.
 - Can link single keyboard/mouse to multiple computers.

CONS:

- Displays the entire desktop, not just individual applications, all within a single window.
 - Does not support audio or video playback.
 - Use of multiple ports may require use of setting up VPN first to use over the Internet.
 - Not secure by default.
 - Remote desktop must be running—login session must be active.

Performance

From a bandwidth perspective, the use of SSH is likely to provide the best performance of these three options, as long as only a single remote application is displayed locally. GDM-based connections are likely to be roughly similar in performance, depending on the compression available in the SSH connection and what, if any, compression may be configured in GDM.

VNC has the potential to be the fastest of all three if extensions are introduced that compress the frame buffer data sufficiently. Because VNC is based on a tile architecture, where rectangles of frame buffer memory are resent if they have been updated, any compression that improves the transfer of tiles will have serious performance implications. However, at the time of this writing, there were no such extensions currently in use.

Security

XDMCP uses UDP port 177, and the X server uses TCP port ranges from 6000 + display number. XDMCP also is prone to DoS attacks. GDM has some configuration options to address this, but XDMCP use still should be considered insecure. Therefore, GDM and XDMCP should be limited to use behind

firewalls and should not be used across the Internet.

SSH connections are, by design, secure if properly used. Because of built-in encryption, there is no reason SSH X11Forwarding could not be used across the Internet. Note that the use of X11 protocols over SSH can be bandwidth-intensive, and therefore, only a small number of applications from the remote system should be displayed locally using SSH.

VNC can be used across the Internet as long as the remote server's firewall forwards port 5900 to that server. VNC does not include security extensions by default and, therefore, is insecure in nature. Various server implementations provide security extensions, but Vino does not. VNC use across the Internet using Vino as the server should be done only over VPN or SSH connections.

Choosing a Method

None of these options support playing media files, such as movies or music. I mentioned that media servers could be managed remotely, and I stand by that. The management of those systems—starting and stopping servers, configuring them and so forth—is easily done using any of these methods. But, making use of those media provided by those servers is best left to streaming media players that connect from the local system to the remote servers.

For home users who need to manage remote systems on their local network that sit behind a well configured firewall, VNC offers the most complete and easy-to-use option. Home office

users who need to connect to remote systems may find SSH a better option (as this author does). GDM/XDMCP is the least-favored solution, because SSH is faster and arguably easier to use for single applications, and VNC offers easier-to-use solutions for accessing remote desktops. Still, GDM/XDMCP is the only option if your needs include starting a new session on a remote system, as neither SSH nor VNC supports that type of use.■

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Resources

GDM: projects.gnome.org/gdm

TigerVNC: tigervnc.org

Vino: www.gnome.org/~markmc/remote-desktop-2.html

Vinagre: projects.gnome.org/vinagre

x2vnc: fredrik.hubbe.net/x2vnc.html

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The Future of the KDE Free Desktop

Aaron Seigo and Sebastian Kügler, two leading developers in the KDE community, share their ideas on the future of the Free Desktop. | JOS POORTVLIET

We recently sat down with KDE core developers **Aaron Seigo** and **Sebastian Kügler** for an interview. Sebastian lives in the Netherlands, works on Plasma and is a board member of the KDE e.V., the legal organization behind the KDE community. Aaron is the lead developer for Plasma and has been involved in the KDE community for more than ten years. He currently lives in Vancouver, Canada. We spoke about the future of the Free Desktop—do the developers look forward, and what do they see if they do?

JP: Is looking forward 3–5 years something you often do when working in free software?

AS: Well, it depends on the scope of things. You can compare this with the board game Go; it has very simple rules. And most of the time, you just look at a small part of the board. But at other times, you have to look at the whole thing: figure out where you're going. Working in free software, we often look no further than the next release. But, we also need to step back once in a while and look five or ten years ahead. We don't have the luxury of pure research, but we can't stick to the immediate future either. Thinking long term helps drive what we do in the short term! Things like the social desktop and the semantic desktop have been in development for many years and still have years to go before you will see them come to fruition. So, maybe not every day, but once in a while I do.

SK: Of course, a lot actually. Years ago, when I became a Plasma developer, I had

two goals in mind: improving power management and improving network management. Power management has been solved since our 4.2 release with Powerdevil and the battery widget. We're getting there with the Networkmanager widget; I expect it to be pretty good with 4.4. I feel we're currently close to the perfect traditional desktop, and it's time to go a step further. Focus on a good, integrated user interface for new devices like media centers, Netbooks and phones—devices where the interface is an extension of the device itself. And, look at new use cases—like integration of the Web in the desktop.

Freeing the Web from the Browser

JP: So what are the most exciting things you expect to happen within the next five years?

AS: I see three hot items. First, erasing the lines between local content and the network, or freeing the Web from browser, if you will. And, of course,

mixing the two, like relating the files you have on your PC with your Facebook contacts, for example.

SK: Indeed, this is what we are working on with Project Silk. The starting point for the browser has been as a way of viewing HTTP pages, a remote document viewer. It became interactive with the arrival of Web applications. Currently, a Web server sends the same Web application to every device. These applications are designed for five-year-old computers: a device with a mouse, keyboard and 800x600 resolution. But in 2010, typical screen sizes vary between high definition and smartphone. We have input devices like touchscreens, on-screen keyboards and more. Those work very differently from the traditional computer. For example, an interface making use of hover won't work without a mouse. Using a single font means it will often be either too small or too big, and scrollbars are impossible to touch on a phone screen. The problem is that the Web server does not know anything about the device you're using. And currently, we're stuck with that because data and service are tied with the user interface, so everybody gets the same, often inadequate Web application. Project Silk decouples front and back ends, and runs the user interface on the client. The client knows its own screen size and resolution, knows what input is available, if it has a motion sensor and so on, so it can interact with the user in a far more friendly way.

An added advantage of using Silky is

that working off-line is easier. Of course, we'd love to be on-line 24/7, but that won't happen any time soon. Having good caching and synchronization makes it possible to work faster and better, even without a network.

Social Computing

AS: The second hot item would be social computing. How can we take what we have learned from Web 1.0 and 2.0, like e-mail, BBS, forums and social-networking sites, and make it an integral part of the computing experience. It is about people and letting them connect—and having your computer be aware of you and your connections. Who am I, where am I, what am I doing? These days, we take our PCs with us—think Netbooks, but also smartphones. When you bring them, they should interact with your environment and the people around you.

SK: The social desktop is strongly related to freeing the Web from the browser. We get data from the Web and use it in our social desktop widgets. This also makes it possible to make mashups, remix and combine data from different sources.

Important to making social computing possible is to have applications understand certain concepts like "this is a friend" and "this is a colleague". This is where the Semantic Desktop, or Nepomuk initiative, comes in. Thanks to Nepomuk, applications can understand each other while talking about complex concepts like relations or tasks. Then, you can start to integrate social data in the desktop—like immediately getting community help from within your application, or contacting developers, or finding people with similar hardware. This makes contributing to and working with the community very easy. With Web 2.0, the Web went from read-only to read-write. The desktop basically still has to take that step. We do that by making our technology more accessible with easier development technologies, such as scripting and having good documentation and development tools. And, we're using mechanisms to let people share content with each other—for example, with our GetHotNewStuff framework. You easily can upload and download content like wallpapers, new game levels or plugins and extensions right from within the application interface. You can rate and comment on it—be a community. In other words, you're turning everyone into contributors by lowering the barrier.

Mobility

AS: Third would be the idea of increased mobility—having multiple devices. FOSS started on the desktop—literally being written on desktops—on top of or below a desk. Now, we don't work only on desktops and laptops, but we run our software on phones and Netbooks. This is a huge shift but also presents new opportunities and opens doors. The best thing is that we're not separating these devices like our competitors are doing. We don't develop a vertical stack on each device like Apple and Microsoft do, with different user interfaces and widgets, effects, layout and everything. We do what the Linux kernel did—one kernel for wristwatches up to big-iron hardware. We're developing a horizontal stack, from mobile devices all the way up to workstations—a device continuum. In part, this is possible because technology got more sophisticated; mobile devices are now more powerful than the average desktop was five years ago. The low end is fully capable of running our desktop stack.

Coming Together

SK: The best thing about these three trends is that they are coming at the same time. They are different but complement each other perfectly. You can have multiple devices with the same software stack, working together over the network and aware of your social context—blending on-line and off-line. Technology-wise, they are separate streams, but they create the compelling user experience for the next ten years.

AS: For example, Nepomuk initially was conceived as the Semantic Web technology. We're currently doing this on the local computer, but we are ready for the Web, storing all the data properly to be shared. This then works with the Open Desktop Initiative, focusing on open and free Web services where you are in control of your own data.

SK: Look at Canonical's Ubuntu One service or the Maemo OpenDesktop work. The services are coming already. The division between computer and the Web will become smaller and smaller—you can connect your on-line life with your local life in an obvious and simple way. Users won't even notice, won't care. Cool stuff.

AS: Many of the most exciting things going on right now have been on our minds for many years. Exploring new ideas is like being in a dark room, looking for a light switch. You stumble around in the dark, bump into things, and when you finally find the light switch, you already have a pretty good idea of the room. Then you see it in full light and really realize its potential. There is no shortcut to that. Ask any researcher—it takes blood, sweat and tears. It is 1% inspiration and 99% perspiration, to use a cliché.

Traditional Desktop

JP: And how about the current desktop, is that still being worked on?

AS: Of course, there is a lot more going on. We are not stepping away from what we initially wanted to do; we're not a ship looking for wind. We are still on track, but growing into new challenges—challenges that inspire people and let us take the next step. We're now at tens of millions of users, but this will be something people will want to use, and it has the potential to bring us to the mainstream.

SK: Well, a question that might come up is "Do we want focus or diversity?" But in free software, you can have both. Some teams work on specific innovations like these, but our community is very diverse in nature, and we do lots of other stuff as well. For example, for the coming releases, the traditional enterprise use cases, like groupware and office, have a lot of resources behind them. Many developers work on digiKam and Gwenview for better photo management, and Kdenlive, a great video editing solution. Our educational community is growing like never before, especially lately in Brazil. The KDE games community is working on a whole new framework for 2-D and 3-D games, easily distributable by GetHotNewStuff. So yes, the basics are covered—in the last 180 days, we fixed more than 18,000 bugs! So we're working at the crazy rate of 100 bugs a day!

AS: And, so much is going on all the time. We have a beautiful community here. KDE is currently really a hot spot for innovation. All these developers at meetings and on-line are talking about such cool stuff, the challenge is to tell

FEATURE The Future of the KDE Free Desktop

the world what we're doing. I personally see that as a part of my job, besides writing code—listening to what people are doing and sharing the story!

SK: Our community has been growing a lot lately, and we've actively worked on enabling that. We have a very open community, with little hierarchy and a lot of room for trying new things. This is why we're so innovative, and why it's so much fun. We also spend a lot of energy on retaining people. Over the last few years, we really improved upon the process of turning casual contributors into core contributors. We have a lot of developer sprints, and these work incredibly well. It is a good way of combining the flexibility and diversity of an on-line community with the advantages of being with a bunch of smart people in one room and knowing each other personally. These meetings are good for making great technological strides, but also for community building. We're currently at a rate of one meeting somewhere in the world every 2–3 weeks, besides our two yearly conferences, Camp KDE in the Americas and Akademy in Europe.

Targeting Common Users

JP: So there are major changes and improvements coming to the Free Desktop. But will the average user care about any of those?

AS: Ha. Users surely won't say, "I want to immerse myself in a socially contextual computing experience." What people *will* say, however, is, "Hey, I walk into the train station and instead of going to the schedule board, I look at my phone and use the widget that is being broadcast in the building." If people see it, they will want it and use it. They don't think, "I want the same KDE software I have on my desktop also on my phone", but they will notice that it works and looks the same, provides the same logical work flow. Our technology simply provides advantages to users—they might have a different language from developers, but they will enjoy it. We have to focus on that. We don't have the luxury of doing pure research; it has to benefit people and be within their reach.

SK: I think if you make these features very easily accessible, users will use

them. The best features are noticed only when you take them away. For example, there is window snapping in KWin, a feature we've had since forever. It makes windows a little resistant to overlapping each other, easing the placement of windows—really something users don't notice. But, turn it off, and their windows feel funny. It's hard to place them right. We have hundreds, thousands of such small things, we almost never advertise them. You can't show them in a screencast and barely can explain them in person. But they make a difference; they make your experience just feel better. This is how I would like to integrate these features—in a way nobody notices.

AS: Look at a hot topic right now, search on the desktop. The direction most implementations take is all wrong, really. Our competition thinks of Google, who is searching the Web, going through these billions of documents. You're looking for something, so you fire up the browser, go to this page with a search bar, type something and find it. The needle in a haystack. So this has been brought to the desktop. And do people use it? Not as much as you might think. They still organize files in folders, and use recent documents. You don't do a random search if you have at least a clue of where the file probably is.

SK: The technology has to be built in to applications; there shouldn't be a special "search" dialog. You want to start with what people are doing—who am I, where am I and what do I care about. We discussed this in 2004 when we wanted to get search technology moving in KDE. We wanted implied searches. Say you download photos from your camera, which has geo-tagging. When you fire up Marble (the KDE Desktop Globe), it shows the photos in the spot they were taken. That is intuitive. Compare it with what LinkedIn does—shows you other people you might know and want to connect to in the sidebar. It is unobtrusive, but you notice it when it is useful and use it. You might not have searched for those people by yourself, but LinkedIn helped you find them anyway. Users will not even know they are using it, except that they have this icky feeling their computers are psychic.

Disadvantages

JP: But all this comes with disadvantages, right? Like bad performance, privacy and security dangers. What are you doing to combat those issues?

SK: Much of this can even improve in those areas. Caching and using desktop applications makes working with Web content faster. And, you easily can keep data off-line if you want—this is much better when it comes to privacy. Decoupling data and the user interface also makes sure that only controlled code runs locally, so there are less runtime security issues, which are so typical with on-line applications. Add-ons you can download within KDE software can be signed cryptographically to ensure integrity. Most of what Nepomuk does when relating data, it does on your own PC, which makes it much easier to keep your private data private. For many use cases, using on-line services is simply not an option—think about businesses. They can't entrust their data to Google or other on-line services, because of either internal policy or law. Our technology makes it very easy to keep the user in control without giving up on features.

AS: This is the typical innovators' dilemma. You try a new, promising thing that has never been done, and you instantly discover that despite good intentions, it doesn't work very well in practice. It is buggy, slow, hard to use. Why? Because it is new! Nepomuk, for example, is now at its third storage back end. The first one was functional, but insanely slow and resource-intensive. No kidding, it was a research project. The question the first incarnation answered was "Can we do this?", not "Does it work well?" Currently, we use Virtuoso, which represents a huge improvement. And now Nepomuk is becoming production-ready; individual application developers are starting to create production-ready code, integrating the features. We knew years ago that contextual computing was possible, but would it work in real life? I believe in the ingenuity of people and of our community. Nothing about this is fundamentally impossible. Even now, being so new, it works surprisingly well on today's laptops and even Netbooks. We still have to migrate it down to mobile devices—of course,

that's a challenge. Luckily, work is going on in that area, and as a backup, we always have the cloud. If a local computer doesn't have the power to handle it, we can move a part of the resource usage to the big iron on the Web.

Commercial Interests

JP: And is there commercial interest in all this, are companies getting involved? And, does that work?

SK: There are three areas where KDE is getting commercially very interesting. One would be PIM. This has been the case for years, and it's being used quite a bit in enterprise environments. The KDE groupware suite has been developed with enterprise deployments in mind, and in fact, much of that work has been contributed by companies making money on adapting KDE for corporate use cases. Second, there is KOffice. It's being deployed on the Nokia high-end smartphones right now, and this can go in many more areas. Third, Plasma is seeing commercial interest lately, by device

manufacturers, for example.

AS: Well, the more people are involved, the bigger the chance something good comes out of it. This is what makes FOSS work so well. The community is very good at experimenting. In a more traditional environment, where return on investments is key, you have to guess before you invest. It can be very hard to come up with a good idea in such an environment. But we don't guess, we just try. What works, sticks. Bringing in commercial interests is good; it brings in more people, more creativity and different perspectives too. And, they are willing to work on things volunteers might not like—like Bluetooth support. A Nepomuk researcher in France isn't interested in that, but Maemo developers are. The challenge is to integrate it all—research, experimentation and commercial results—in one community. We're doing very well at it, I would say. We have lots of people coming in lately, new commercial ventures, large, entrepreneurial. If we can keep our culture intact, this will lead to great things!■

Jos Poortvliet is a leading member of the KDE marketing team and has been promoting KDE at conferences and in writing for the past six years. He is an organizational psychologist by profession, lives in the Netherlands and works as a business consultant at a major financial institution.

Resources

KDE: kde.org

openDesktop.org: opendesktop.org

Social Desktop: socialdesktop.org

Nepomuk, the Social Semantic Desktop: nepomuk.kde.org

Plasma: plasma.kde.org

KDE TechBase, Project Silk: techbase.kde.org/Projects/Silk

Camp KDE 2010: camp.kde.org

Akademie 2010: akademie.kde.org

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Riccardo Iaconelli

Plasma is one of the most exciting technologies KDE 4 has brought to life. It often is considered to be merely the desktop shell of KDE 4, but in reality, it is so much more.

We are just starting to see the full potential of Plasma, but it's already being used by some of the best KDE applications. Amarok, for example, uses it in so-called context view, and the Plasma packaging system is widely used in conjunction with GetHotNewStuff technology. Plasma's main goal is to provide a powerful framework you can use to build your own UIs. All of this is possible because the Plasma libraries are not tied to a specific use case. Instead of housing all the desktop-related code in the plasma-desktop binary, the majority of it is contained in desktop-specific plugins. That is why the desktop shell itself is just a few hundred lines of code, but it uses thousands of lines of code located in the Plasma libraries.

Why C++ and Not JavaScript?

Although JavaScript bindings are the official language for widget authoring, for security reasons, its subset of functions is limited to the Plasma API, and it gives the programmer no access to pure Qt or KDE components. JavaScript plasmoids are great if you want your widget to be installable as an add-on easily and securely, in which case the bindings are complete enough to give you access to most of the functions you will ever need. JavaScript bindings also offer an extremely easy approach to the API. There are less problems related to packaging, and JavaScript is (usually) a less difficult language to use.

However, I'm going to introduce you to a C++ plasmoid, because the JavaScript API is quite new, and most widgets to date have been written in C++. For this reason, you're likely to find more code examples or help for C++ plasmoids.

Nonetheless, we expect more and more JavaScript components to be produced over time, especially after the release of KDE 4.4. And, as the API remains very similar, it shouldn't be difficult to migrate your knowledge of C++ to JavaScript.

Ruby, Python (including Edje support) and C# bindings are also production-ready and offer access to the full C++ API, but if you use them for your component, only users having the kdebindings package installed will be able to use it. JavaScript bindings are the only ones shipped with the Plasma libraries and are currently the only ones officially suggested.

Understanding Plasma's Design

We created Plasma with development flexibility in mind. The basic idea is that to write simple things, you shouldn't need more than what is necessary for actual functionality.

This approach should be very scalable and not limiting—meaning you should be able to extend, tweak and experiment with user interaction without destroying any work previously done or re-inventing the wheel. To achieve this, Plasma has separated the mechanisms of getting the data from the visualization itself. This approach is commonly known as the Model View approach.

In this tutorial, I create a plasmoid for providing a visualization

of an RSS source. The C++ class that represents the base class for the visualization will be called Plasma::Applet. I also briefly overview the other classes later in the article, and I assume that you know some basic Qt programming techniques. If that is not the case, however, check out some of the many tutorials you can find on-line. I make references mainly to basic things like QString or the Signal/Slot mechanism in this article.

Writing Your First Lines of Code

I'll get to the instructions to build the plasmoid later; first, I want to give a brief overview of the most significant parts of the code. You can download the full source code from ftp.linuxjournal.com/pub/lj/listings/issue190/10638.tgz. I don't cover the CMake configuration file in this article, but you can find it in the tarball complete with comments.

All KDE plugins and extensions, as well as application launchers, are described in the files with the .desktop extension. First, you need a .desktop file for this tutorial. This file contains the data used by KDE to show the applet to the user, and it contains the plasmoid's name, description and credits. A minimal desktop file for this example plasmoid looks like this:

```
# plasma-applet-exampleplasmoid.desktop  
  
[Desktop Entry]  
Name=RSS
```

```
Comment=An RSS Plasmoid  
Icon=application-x-plasma  
Type=Service  
X-KDE-ServiceTypes=Plasma/Applet  
X-KDE-Library=plasma_applet_plasmoid  
X-KDE-PluginInfo-Name=plasmoid
```

The first lines are fairly obvious. They provide a human-readable name and description and an icon. The following lines tell the system what kind of plugin it is. The important line here is the X-KDE-PluginInfo-Name. This line tells the KDE internals what the plugin's name is (this is used as an argument to plasmoidviewer to preview your plasmoid). Note that this name cannot contain any special characters. Make sure the name of this file matches the pattern plasma-applet-*.desktop.

Next, let's look at the source code for a very simple plasmoid, with the minimum amount of code needed to make it valid, such that it actually will compile and load.

First, the header:

```
// plasmoid.h  
#ifndef PLASMOID_HEADER  
#define PLASMOID_HEADER  
  
#include <Plasma/Applet>
```



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```
class Plasmoid: public Plasma::Applet
{
    Q_OBJECT
public:
    Plasmoid(QObject *parent, const QVariantList &args);
    ~Plasmoid();
};

// This is the command that links your applet to the .desktop file
K_EXPORT_PLASMA_APPLET(plasmoid, Plasmoid)

#endif
```

As you can see, this is a pretty simple class derived from `Plasma::Applet`. A few interesting things to note:

- The first two lines (and the last one) are the common trick for ensuring that the header file doesn't get loaded multiple times—meaning you will have no compiler errors due to that.
- The `Q_OBJECT` macro is inserted because you need to make use of slots later on (the signal/slot paradigm is a Qt feature, and any introduction to Qt should explain it if you're not familiar with it).
- The `K_EXPORT_PLASMA_APPLET` macro is what actually exports the plasmoid (and, therefore, makes it displayable). You can find more information on this macro on TechBase (see Resources).

Now, here's the actual implementation:

```
#include "plasmoid.h"

Plasmoid::Plasmoid(QObject *parent, const QVariantList &args)
    : Plasma::Applet(parent, args)
```



Figure 1. First Run of the Applet

```
{
}

Plasmoid::~Plasmoid()
{
}

#include "plasmoid.moc"
```

For now, this plasmoid doesn't do anything beyond displaying its own background. If you were to compile it and preview your work with `plasmoidviewer`, you would see what looks like Figure 1.

It's a bit boring perhaps, but on the other hand, it compiles and runs. Now, let's inject some cool features.

To get some new data, you should be familiar with another Plasma component, the `DataEngine`. This class is the base class that the applet uses to interact with the rest of the world. It mainly is used to fetch data from different sources. `DataEngine` is a read-only object. Its read/write counterpart is the `Service` class, which is used in cases where user input can modify the environment outside the plasmoid itself (think of Web services, for example). Just like Applets, additional `DataEngines` and `Services` can be written and installed by the user. It's simple to connect to a data engine from within an applet; you just need to add the following line:

```
Plasma::Applet::dataEngine("rss")->
    connectSource("http://dot.kde.org/rss.xml", this);
```

In this case, `rss` is the name of the data engine you want to invoke. The first argument of `connectSource()` is the source name (in this case, the URL of the feed you want), and the second argument is the object that should be updated when the data engine receives new data. Another data engine example would be the Time data engine, and you would connect it with the following code:

```
timeEngine->connectSource("Local", this);
```

Local, in this case, means the local time zone. This, however, will update only once. To make it update automatically (and update your plasmoid) every second, you would have to write something like this:

```
timeEngine->connectSource("Local", this, 1000);
```

The third parameter, if present, specifies how often (in milliseconds) you should request an update from the source. Note that the source also can decide to update itself independently.

You also can connect several data engines to one single object; just make sure to check the `sourceName` in the `dataUpdated` function (see below) when the update occurs.

You can get a list of the available engines and their structure with a plasma tool called `PlasmaEngineExplorer`. Run the following command inside your terminal:

```
plasmaengineexplorer
```

This will show you a rather large list of engines from which to choose for building your plasmoid. Find one that inspires

you and start hacking on it. To know what structure the data engine gives you, you either can use the engine explorer, look at another applet's source code, or even explore the data engine source code itself.

To give your plasmoid the data, the DataEngine tries to call a slot with the following signature:

```
void dataUpdated(const QString &sourceName,
                 const Plasma::DataEngine::Data &data)
```

Add this function (method) to your Plasmoid class with the following code (don't forget the declaration in the header file):

```
void Plasmoid::dataUpdated(const QString &sourceName,
                           const Plasma::DataEngine::Data &data)
{
    QMap<QString, QVariant>
        item      = data["items"].toList().first().toMap();
    QString title   = item["title"].toString();
    QString feedtitle = item["feed_title"].toString();
}
```

DataEngine is type-agnostic; it stores all of its data in QVariants. It's your responsibility to know what data to expect and to convert it accordingly. In this case, the data is a QList of QVariants (each item) that in reality is a map. You take the first element and convert it to a QMap. Then, you extract the title and the feed title and store them in QStrings. That is all you need to get the data from any RSS feed.

So now, you've got the data, but how do you display it? With Plasma, it's a piece of cake!

The Plasma team has created several useful widgets that can be utilized in an applet. What you need in this case is a label. First, create a simple linear layout for the plasmoid in the constructor, like this:

```
QGraphicsLinearLayout *layout = new QGraphicsLinearLayout(this);
```



Figure 2. Plasmoid Widget in Its Full Glory

```
setLayout(layout);
```

A QGraphicsLayout will resize and align all the widgets it contains automatically. Linear and Grid layouts also are available. Now, include a Plasma::Label as a member in the header, initialize it and add it to the layout, like so:

```
m_rssTitle = new Plasma::Label(this);
layout->addItem(m_rssTitle);
```

Finally, add the following lines to dataUpdated():

```
QString text = "Most recent news from <b>" + feedtitle + "</b>:";
text += "<br /><br />" + title;
m_rssTitle->setText(text);
```

Note that you don't need to destroy/free any objects, because every object that has a parent (assigned on creation by passing an argument to the constructor) is deleted automatically by Qt's garbage-collection system.

If you compile your applet now, and everything has gone well, you should see something like Figure 2 when launching the plasmoidviewer.

When the DataEngine fetches new data, your plasmoid will be updated automatically.

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Build Environment

For your build to succeed, you must have the Qt4 and KDE development libraries, cmake and the usual compilation tools, such as make, g++ and so on, installed onto your system. Note that this tutorial assumes a KDE version greater than or equal to 4.3.

To build your plasmoid, change directory to your plasmoid, and issue the following commands:

```
mkdir build  
cmake -DCMAKE_INSTALL_PREFIX=`kde4-config --prefix` ..  
make  
sudo make install
```

Note the backticks (`) in the cmake command, which mean "substitute here the result of the evaluation of the quoted command".

The first time you test the plasmoid, you'll have to refresh the KDE configuration cache by issuing the command:

```
kbuildsycoca4 --noincremental
```

You'll also need to run this command any time you make modifications to the plasmoid desktop file.

To test the plasmoid, run the following command:

```
plasmoidviewer plasmoid
```

Plasmoidviewer is a little test application that makes it easy to load and play with a single plasmoid without having to restart your desktop every time.

Writing Other Types of Plasmoids

In this tutorial, I've explained how to write a simple plasmoid from scratch, but I've barely scratched the surface. As I mentioned previously, Plasma is all about plugins, and writing other types of plasmoids is just as easy. You can, for example, write your own "containment". Containments are a subset of applets, which are built to contain other applets. The panel, the desktop, or the "folder view" are all examples of containments. Being applets, they also can be used like regular applets wherever that makes sense.

You can write wallpapers, which are plugins that draw a containment's background. With these, you can draw a simple image or a more complex rendering, such as a Mandelbrot fractal or even an animated (and intractable) Earth globe!

You also can create a plasma theme, which changes the look and feel of all the applets through the usage of SVGs.

Apart from visualization, you can write a DataEngine and/or an associated Service to be able to gather information from the rest of the world. You can make a Runner, which is a plugin that responds to user queries—from "3+2" to "run command x" to "google for x" to "shut down the PC". These are then accessible from Krunner, from menus, or even from your own applet!

All of this also is accessible through scripted languages, be it JavaScript, Ruby, Python or many others. And obviously, you can invent your own binding to Plasma by re-implementing a ScriptEngine, which has been done, for example, to be able to load simple Apple Dashboard or Edje widgets.

As you can see, there are almost infinite possibilities for expressing your creativity, and all this goodness is exposed through an intuitive and powerful API.

A Quick Look into the Future

This article was written in October 2009, when the stable version of KDE was 4.3, and Qt was at version 4.5. By the time you read this, however, both Qt 4.6 and KDE 4.4 should be available, so let's briefly outline what possibilities these new versions will offer:

- First, Qt introduces a new animation framework, sometimes referred to as Qt Kinetic, which makes animations in our plasmoids trivial. You will be able to decide what should be animated, how that element should look at the start of the animation (for example, be at position 0,0) and how it should look at the end of it (for example, be at position 100,20, rotated 20 degrees and scaled by a factor 2), and everything will be taken care of for you. For more information, take a look at the Qt documentation (see Resources).

- Anchor layouts, a minor improvement in Qt that might nonetheless save you from major headaches, are designed to make it possible to achieve many visual presentations with less effort.

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■ Remote plasmoids is one of the most interesting things that KDE 4.4 will bring. This technology has been developed as a Google Summer of Code Project, and it allows you to transport applets, data engines and services over the network transparently. Without any more code than what you would write for a local component, you will be able (because of compression and caching algorithms) to distribute services and content between any HTTP-capable machine efficiently. Ideas include writing a lightweight server application that distributes plasmoids and/or content directly from a Web server, without requiring any graphical interface on it or perhaps built directly into your Web 2.0 application. The API to interact with this technology is, in fact, extremely simple and has a very small runtime requirement.

Conclusion

There's so much more to say about Plasma and its technologies, but I'm out of space. The Resources for this article include many useful references to help make your desktop (or whatever your Plasma is running on) a better place. ■

Riccardo Iaconelli has been a KDE developer since 2005. He is one of the core Plasma developers, and he is part of the team that gave birth to the project. Riccardo also is a member of the Oxygen team, the project that strives to bring beauty to KDE 4, working both on the code and the artwork. He currently is attending his last year of high school in Milano, Italy.

Resources

Complete Qt documentation, with tutorials and examples is at doc.qt.nokia.com.

The full KDE API documentation is accessible at api.kde.org.

TechBase, a wiki for KDE developers can be found at techbase.kde.org.

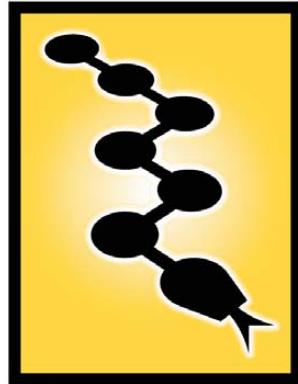
Another great introductory tutorial is techbase.kde.org/index.php?title=Development/Tutorials/Plasma/GettingStarted. All other Plasma tutorials (including tutorials for non-C++ languages) are at techbase.kde.org/index.php?title=Development/Tutorials/Plasma.

The KDE examples module, a new KDE module released with KDE 4.4, contains example code, including (but not limited to) Plasma plugins. Your distribution should have packages available, but if not, you can browse the SVN repository via websvn.kde.org/trunk/KDE/kdeexamples, or you can download a tarball from ftp.kde.org/pub/kde/stable/latest/src.

The full source code for the applet described in this article is available at ftp.linuxjournal.com/pub/lj/listings/issue190/10638.tgz.

You can contact the Plasma developers and applet writers via the mailing list plasma-devel@kde.org, or by joining the #plasma channel on the Freenode IRC network. Don't hesitate to contact us if you need some help!

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Advertising is a bubble. If that's a true statement, Google is a bubble too. And if that's true, many of the goods we take for granted on the Web are at risk. Let's run down some evidence.

Google has more than a million servers. The company is notoriously silent on the exact number, but I was told by a Google official that it was headed toward a million in the next couple years—and that was seven years ago. For a peek at the future, Jeff Dean of Google gave a presentation at an ACM workshop in October 2009, outlining "Spanner", a "storage and computation system that spans all our data centers". His "design goals" slide described a "future scale" with " $\sim 10^6$ to 10^7 machines, $\sim 10^{13}$ directories, $\sim 10^{18}$ bytes of storage, spread at 100s to 1000s of locations around the world...."

Google's data centers are already public utilities on the scale of coal-fired power plants. Google is silent about the number and size of these as well. In March 2008, Rich Miller of Data Center Knowledge wrote, "The conventional wisdom is that Google has dozens of data centers. We're aware of at least 12 significant Google data center installations in the United States, with another three under construction."

Those data centers serve enormous sums of traffic. According to the ATLAS Internet Observatory 2009 Annual Report, Google has reached #3 among the top ten "Tier 1" Internet backbone providers last year. Just two years earlier, Google wasn't on the list. As a Tier 1 player, Google "peers" with others on the list. That means they pay nothing to each other for data transit. Tier 1 status is more a matter of traffic rather than physical fiber backbone. Google has plenty of backbone, but where it rules is with traffic.

The greatest source of inbound traffic for most Web sites has long

been search engines, where Google has a near monopoly. Consider the case of StackOverflow.com. Last year it reported, "83% of our total traffic is from search engines, or rather, one particular search engine". Google was first with 3,417,919. Yahoo was second with 9,779.

To some big-old business categories, Google's threat is apocalyptic. Take geographic data. For many years, NAVTEQ and Tele-Atlas have enjoyed something of a duopoly in the geo-business, providing data to GPS companies, car companies, avionics manufacturers and so on. When you looked at Google Maps, you saw NAVTEQ's or Tele-Atlas' logo. That ended last October, when Google dumped Tele-Atlas, just like it had dumped NAVTEQ earlier, as a source of US map data. As it does in so many other business categories, Google is now giving its US geo data away for free—or less. Bill Gurley reports, "Google will pay you to use its mobile OS. I like to call this the 'less than free' business model. This is a remarkable card to play. Because of its dominance in search, Google has ad rates that blow away the competition." Sound familiar? It's roughly the same thing Microsoft did to the browser business. It eliminated that business by offering Internet Explorer for free. Back then, however, the browser business was new and small. Google goes for bigger game, such as the phone business.

Android might be the most apocalyptic move ever laid on a standing industry. First, Google creates an open phone design on a Linux platform, lines up a pile of handset makers behind it and then works deals with carriers as well. I've done a lot of consulting work in the telco world over the last few years, and here's the most graphic way I've heard Google's approach to the industry explained: "Google feeds a

dock rope down the gullet of the monster, waits for the rope to come out the back end, and then yanks it straight."

Of course, the phone business needs some straightening. We're long overdue for white-box phones and data paths that look and feel like the real Internet, rather than billed phone connections. I've got no problem with Google hastening history there.

I'm just worried about the way Google makes money. Nearly all of it comes from advertising. That's what pays for all the infrastructure Google is giving to the rest of us. As our dependency on Google verges on the absolute, this should be a concern.

Think of advertising as oil and Google as one big emirate. What happens when the oil runs out?

Maybe it already is. Citing a "Natural Born Clickers" study by ComScore and Starcom, *Ad Age* last year reported that "the number of people online who click display ads has dropped 50% in less than two years, and only 8% of Internet users account for 85% of all clicks...What's more, the 8% of Internet users that compose a majority of clicks is also down by half from the last study, which found 16% are responsible for 80% of clicks. The 2008 study found half of all clicks come from lower-income young adults."

The free rides won't go on forever. There are better ways than advertising for demand and supply to find each other (including search, which is free), and more will be found. Google will be in the middle of that discovery process, no doubt. But it's an open question whether Google will make the same kind of money in a post-advertising marketplace. I'm betting they won't.■

Doc Searls is Senior Editor of *Linux Journal*. He is also a fellow with the Berkman Center for Internet and Society at Harvard University and the Center for Information Technology and Society at UC Santa Barbara.

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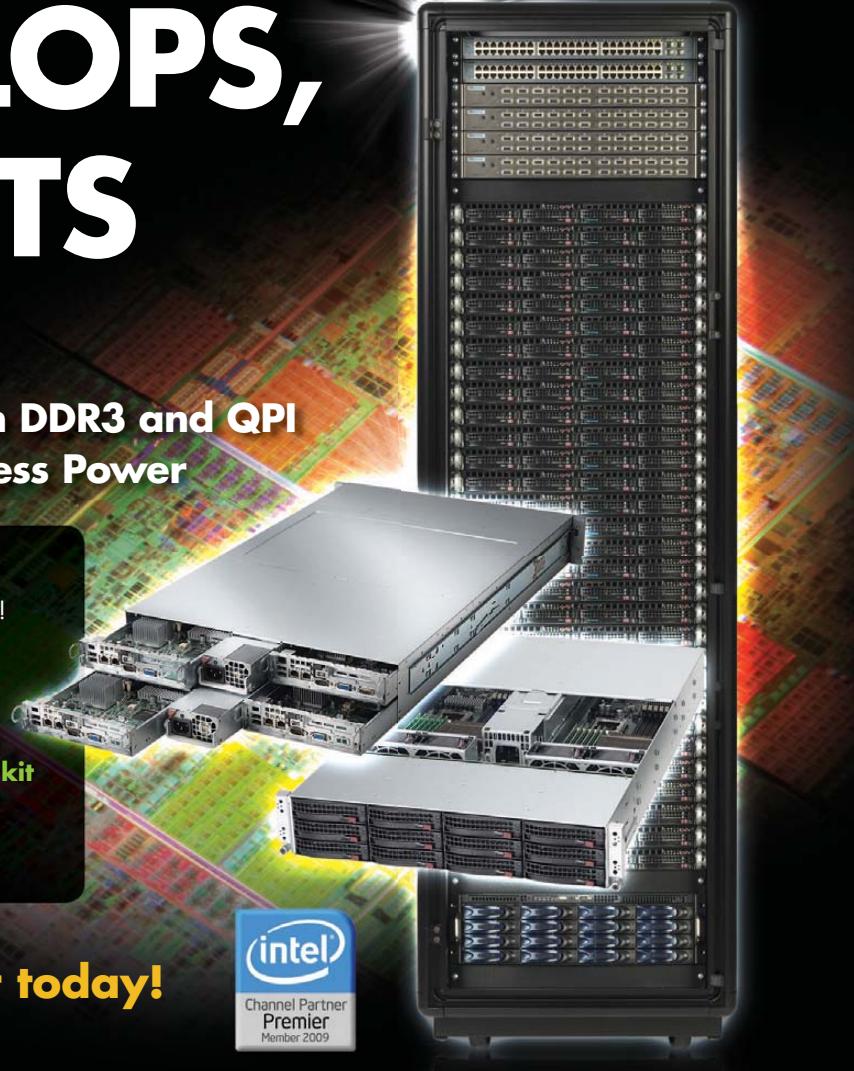
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