

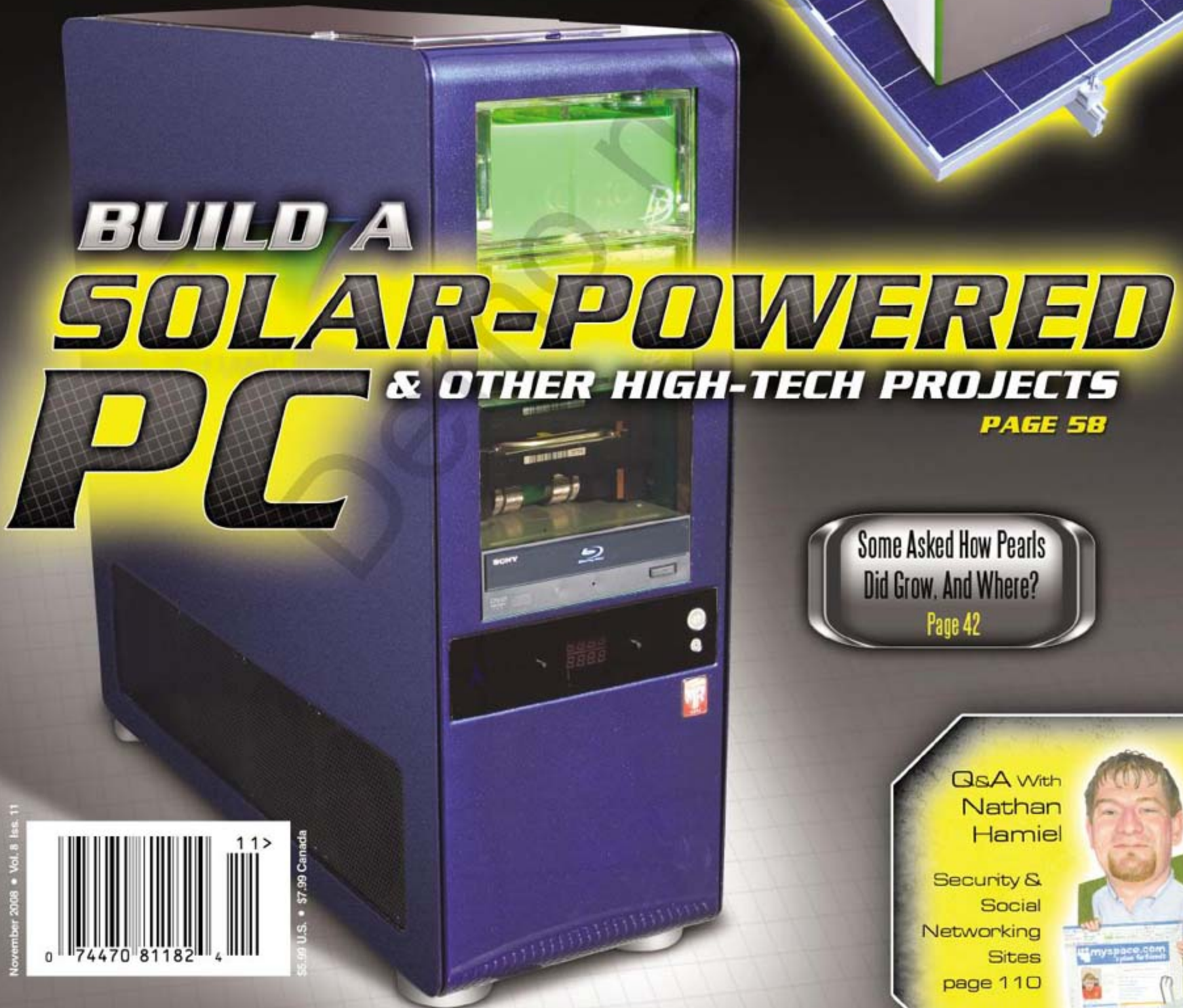
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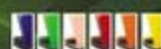
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EDITOR'S NOTE

This month in *CPU*, we're giving you a peek at a few of the many cool things we saw and did at Nvidia's big visual computing shindig in San Jose, Nvision 08. We spent the bulk of our time in the San Jose Convention Center at the GeForce LAN portion of the event, and as LAN parties go, it was pretty impressive.

We also sponsored the Ultimate Case Mod Challenge at the show, and several of us served as judges in that contest along with Dewayne Carel of Modders-Inc.com, and I have to tell you that the talent and workmanship on display at this event was *staggering*.

I've received a few emails since the event regarding a bit of controversy over our choices for finalists and the mod that won first place, and I would like to make a couple of points on the subject. First, there can be only one. We couldn't make every mod a first-place winner because . . . well, that's just not the way life works. We were impressed by aspects of every mod entered in the contest, and choosing even 10 semi-finalists was a pretty tough job. Choosing the top five was ridiculously hard, which should tell you that we fully appreciated the hard work and creativity that went into each and every system we judged.

Second, there was no second shooter. I've seen a couple of posters suggesting that because the bulk of the judges were from one organization (*CPU*), there was possibly some agenda at work that influenced our choices. I am loath to dignify this with a response, but I have to tell you that if you'd been privy to our deliberations, you'd know for sure that there was no conspiracy at work. Some points we agreed on, to be sure, but the idea that we were all pushing one particular rig, for any reason, is laughable. We spent considerable time making our individual cases for our favorite mods, offering counterpoints, and rehashing *ad nauseam*. No punches were thrown (at least, not within eyeshot of show attendees), but there was plenty of contention.

I even saw one poster protesting that we made an "ugly" mod the winner because it was the most impressive system in technical terms. Frankly I don't think the Blue Pearl was the most impressive mod from a technical standpoint, and I find it interesting that this is offered as a valid argument amid cries for more objectivity. Aesthetic beauty is the most subjective quality any item can have, after all, and some of the people making the most noise haven't seen the rigs in person.

Of course, you can't please everyone, and we also got some very positive, helpful feedback, and we are considering all of it. We had a great time at the show, and the vast majority of the modders and attendees who stopped by were fantastic. We thank all of you, and we look forward to seeing you again down the road a piece.



Chris Trumble, Publication Editor, *CPU*



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SanDisk Befriends DSLRs With New Memory Cards



DSLR digicammers, SanDisk wants to cover your storage needs with "lightening-fast speed." The company's new Extreme III 30MBps Edition SDHC cards come in 4GB, 8GB, and 16GB sizes (\$64.99, \$109.99, and \$179.99, respectively) and can record 39 shots in continuous mode at 4.5fps (each 6MB Fine files). The cards can also stand up to temps ranging from -13 degrees Fahrenheit to 185 degrees F. Nikon's mouth-watering new D90 (\$999.95) is the first DSLR to support the card, which SanDisk states offers "a 50% speed boost from previous 20MBps cards." By the way, the 12.3MP D90 shoots 720p HD video (24fps) in its D-Movie mode. ▲



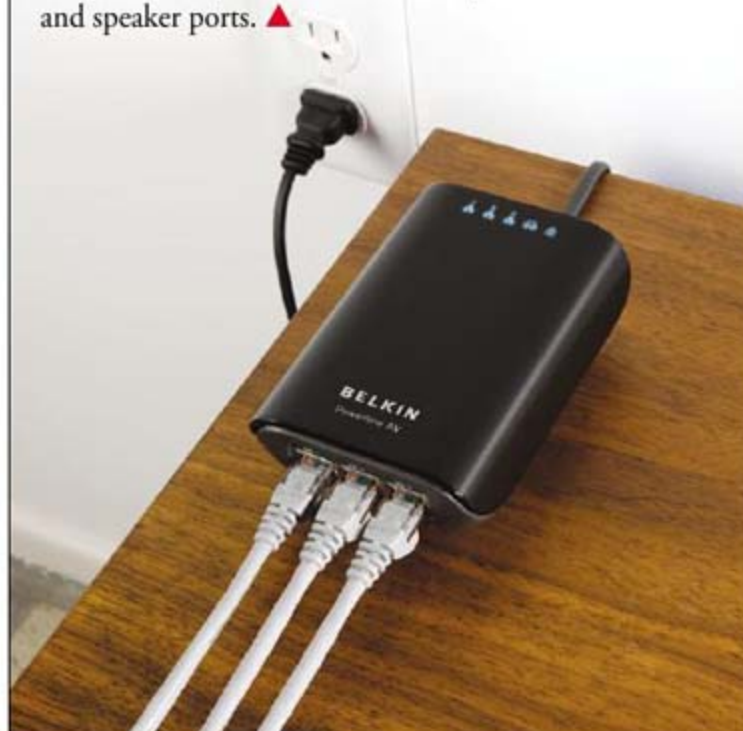
Now Playing On Xbox 360s ...

Now that the Xbox 360 Arcade (\$199) is cheaper than Nintendo's Wii, maybe we can afford accessories such as Turtle Beach's Ear Force X4 headphones (\$199.95), which wirelessly pipes 5.1 surround sound (Dolby Pro Logic II) from the console to each earcup via a transmitter. The X4 also auto-adjusts incoming Xbox Live chat volumes during gameplay. Outside the Xbox realm, Microsoft's SideWinder lineup now boasts the X6 Keyboard (\$77.95) and X5 Mouse (\$59.95). The X6 has left and right keypad connectors, as well as manually toggling between game modes and adjustable backlighting. The X5 (2,000dpi; 7,080fps), meanwhile, sports nine buttons (five customizable) and offers one-button access to Windows Vista Games Explorer. ▲



Are You Well-Connected?

Need connectivity gear? We've got it. Iogear's new Wireless USB to VGA Kit (\$229.95) packs a USB dongle and VGA adapter to wirelessly beam a WinXP or Vista PC's display to VGA-enabled devices at up to 720p from 30 feet. Iogear's USB Laptop KVM Switch (\$99.95), meanwhile, is "the first KVM switch that enables a laptop to replace the traditional keyboard, mouse, and monitor on a second computer." Elsewhere, Belkin's new N+ Wireless Router (\$119.99) integrates a USB port to attach an external drive for network sharing, while the new Powerline AV+ (\$179.99) has one port for a router and three others for a TV, DVR, gaming console, etc. with up to 200Mbps throughput—good enough for HD streams. Finally, Kensington's USB-IF certified Wireless USB Docking Station (\$229.99) tempts with its five USB ports and DVI-I and speaker ports. ▲



Logitech Thins Down; Gyration Takes To The Air



Fan of the Wiimote remote controller? Then check out Gyration's upcoming Air Mouse (\$99.99) and Air Music Remote (\$179.99; \$229.99 with keyboard). The 4-ounce, ambidextrous mouse works on the desktop or in the air up to 100 feet away using SWIPES software and GyroTools commands. The 2.4GHz RF Air Music Remote has the same in-air ability but controls your Media Center music library with no line-of-sight limitations. The remote also pairs with three home-theater devices and can access IPTV, YouTube, and Slingbox content. Logitech, meanwhile, has unveiled three new boards, including the Illuminated Keyboard (\$79.99), just 0.37 inches thick and sporting laser-etched backlit keys. Other new entries include the diNovo Keyboard for Notebooks (\$99.99) and Cordless Desktop S520 (\$59.99) keyboard-mouse combo. ▲

HARDWARE MOLE

DisplayLink Spreads The Visual Wealth

If you've been getting by with a paltry two-monitor setup, it's time to up the ante. Thanks to new quad-monitor technology that DisplayLink is providing for Intel's 4 Series Chipset Family, future users will be able to output an image across four displays simultaneously (two integrated displays, two USB 2.0 DisplayLink-enabled displays). Because the technology uses DisplayLink's USB network display software, additional graphics cards aren't necessary. "Working together, we've developed the industry's easiest-to-implement quad-monitor solution for future generation laptops and desktops, particularly because users don't have to hassle with adding another graphics card," stated DisplayLink's Dennis Crespo. ▲

All Eyes On The Eyeport

Your fragging aim not what it used to be? Then focus your peepers on the Eyeport Vision Training System (\$199.95). Using a patented system combining audio, color, and light, the Eyeport puts your eyes through daily 10-minute exercises designed to train them to aim, track, and focus better. The system from Dr. Jacob Liberman has cleared FDA approval, and the Pacific University of Optometry has done an independent three-week clinical study finding the Eyeport significantly improved depth perception, reading efficiency and comprehension, aiming, tracking, and focusing. If you're wondering if the Eyeport will make your glasses obsolete, no such luck. "It was developed to naturally strengthen the full range of vision skills involved in performing on all levels." ▲



Out With The Eee PC ...

... in with the N10. Apparently the cutesy Eee PC brand name was starting to annoy even Asus. According to online reports and leaked images, the company will dub its upcoming high-end netbook the N10. The 10.2-inch N10 will pack a dual-core Intel Atom 330, Windows Vista, 320GB hard drive, Altec Lansing speakers, card reader, fingerprint scanner, Wi-Fi and Bluetooth, three USB ports, and HDMI Out for around \$600. Dell, meanwhile, officially entered the netbook fray in early September with the long-rumored Mini 9 (\$349 to \$504) in Win-XP and Ubuntu Linux versions. Beyond an 8.9-inch screen (1,024 x 600), the Mini 9 has an Atom CPU, 1GB RAM, up to 16GB drive, Bluetooth and Wi-Fi, and 2GB free online storage via Box.net. ▲

InvenSense Scores A Win For Nintendo's Newest Wii Accessory

When Nintendo debuted the Wii remote controller in 2006, it used the best available accelerometer and infrared technology. As users pointed the Wii remote at their TV screens, they noticed it was only so accurate for shooting games. But now Nintendo plans to introduce the Wii MotionPlus accessory to go with the controller in 2009. This new accessory will make the Wii much more accurate at simulating sword slices or wrist flicks. InvenSense is supplying Nintendo with MEMS-based gyroscopes that measure movement more accurately. That will enable players to engage in new kinds of activities in the upcoming Wii Sports Resort game. They can, for instance, flick their wrists to operate the throttle on a jet ski or throw a virtual Frisbee. ▲



MetaRAM Dishes Out New Memory Capacity Tech For Intel Servers



MetaRAM debuted with much fanfare earlier this year as it announced it had created server memory that could quadruple the memory capacity in a server and cut costs as much as 90%. It does so by virtualizing memory so that a server can address bigger batches of DRAM memory modules, each with cheaper memory chips on board. This simple but clever trick increases the memory inside a

server, cutting hardware costs as well as saving electricity in data centers. At first, the company's chipsets for memory cards were used in AMD servers. But now MetaRAM has expanded to the Intel server market with the launch of a new DDR3 chipset. ▲



Intel Debuts New Family Of Solid State Drives At IDF

Intel's NAND Products Group unveiled its SSD (solid-state disk) drives for mobile and desktop platforms in a bid to replace laptop hard drives with flash memory. At its Intel Developer Conference, the company launched its 1.8-inch X18-M (mainstream) and 2.5-inch X25-M SSD drives based on its multi-level cell flash chips. The drives are available in 80GB and 160GB versions. The 80GB SSD is currently sampling and full production is expected shortly. The 160GB version will be available in production volumes in the first quarter of 2009. The company claims the performance will be 250MBps on sequential reads and 70MBps on sequential writes. Intel will face a bevy of competitors, including chips from Micron, EMC, Texas Memory, and Samsung. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

*Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

CPU	Released	Original price	Last month's price	Current price
AMD Phenom X3 Triple-Core 8750 2.4 GHz	3/27/2008	\$195**	\$179	\$179
AMD Phenom X3 Triple-Core 8650 2.3 GHz	3/27/2008	\$165**	\$145	\$145
AMD Phenom X3 Triple-Core 8450 2.1 GHz	3/27/2008	\$145**	\$102	\$125
AMD Athlon 64 FX-70	11/30/2006	\$599/pair	\$210	\$206
AMD Athlon 64 FX-72	11/30/2006	\$799/pair	\$319	\$319
AMD Athlon 64 FX-74	11/30/2006	\$999/pair	\$279	\$279
AMD Phenom 9500	11/19/2007	\$251**	\$163	\$191
AMD Phenom 9550	3/27/2008	\$195**	\$149	\$174
AMD Phenom 9600	11/19/2007	\$283**	\$142	\$157
AMD Phenom 9600 Black Edition	12/23/2007	\$251**	\$229	\$229
AMD Phenom 9750	3/27/2008	\$215**	\$205	\$199
AMD Phenom 9850 Black Edition	3/27/2008	\$235**	\$194	\$205
AMD Phenom 9950 Black Edition	7/3/2008	\$235**	\$235	\$235**
Intel Core 2 Duo E6750	7/16/2007	\$183**	\$184	\$151
Intel Core 2 Duo E6850	7/16/2007	\$266**	\$168	\$183
Intel Core 2 Duo E8190 45 nm	1/7/2008	\$163**	\$163**	\$163**
Intel Core 2 Duo E8200 45 nm	1/7/2008	\$163**	\$162	\$169
Intel Core 2 Duo E8400 45nm	1/7/2008	\$183**	\$169	\$169
Intel Core 2 Duo E8500 45 nm	1/7/2008	\$266**	\$206	\$206
Intel Core 2 Duo E8600 45 nm	8/10/2008	\$266**	\$266**	n/a
Intel Core 2 Quad Q6600	1/8/2007	\$851**	\$189	\$194
Intel Core 2 Quad Q6700	7/16/2007	\$530**	\$292	\$272
Intel Core 2 Quad Q9300 45 nm	1/7/2008	\$266**	\$259	\$267
Intel Core 2 Quad Q9400 45 nm	8/10/2008	\$266**	\$266**	n/a
Intel Core 2 Quad Q9450 45 nm	1/7/2008	\$316**	\$342	\$396
Intel Core 2 Quad Q9550 45 nm	1/7/2008	\$530**	\$324	\$539
Intel Core 2 Quad Q9650 45 nm	8/10/2008	\$530**	\$530**	n/a
Intel Core 2 Extreme QX6800	7/16/2007	\$999**	\$1,041	\$1,079
Intel Core 2 Extreme QX6850 3.0GHz 8MB cache 1333MHz FSB 65nm	7/16/2007	\$999**	\$1,009	\$1,009

Russian Web Site Owner Killed In "Incident"

This much is clear about Magomed Yevloyev, the now-deceased owner of a Russian Web site that routinely voiced opposition to governmental practices: He had been warned. After a Russian court ordered Yevloyev to shut down his site (www.ingushetiya.ru) due to "extremist" statements concerning alleged human rights abuses by officials in the Ingushetia region,

Yevloyev resurfaced the site soon after under a new name. In August, police arrested Yevloyev at an airport near Chechnya and escorted him away by car. According to Russian officials, Yevloyev was later shot following an "incident." Yevloyev's lawyer Kaloi Akhilgov stated the shooting "was no mistake" and Yevloyev was dumped on a roadside, later dying in a hospital. ▲



The Browser Wars Rage On

Add Google to the combatants now waging browser war. The day after Labor Day, the search giant unleashed the open-source Chrome in over 40 languages and complete with a five-part, 38-page comic book detailing Chrome's reason for existence. Built on Apple's WebKit rendering engine (think Safari and Android) and using a new JavaScript V8 virtual machine and "multiprocess design," Chrome runs tabs as isolated processes, meaning if one tab circles the drain, it won't take the rest with it. Chrome also sports Omnibox, a URL auto-suggester similar to Firefox's Awesome Bar, and private browsing courtesy of Incognito, similar to InPrivate in Microsoft's IE8 beta. ▲

Comcast Lobs 250GB Limit At Subscribers

Comcast subscribers wanted specifics on what the company deemed excessive broadband usage. The nation's second-largest ISP gave them just that in late August, declaring a monthly limit of 250GB on downloads/uploads effective Oct. 1. First-time offenders should expect a talking to from Comcast. Repeat offenders could face a year's banishment from access. Although Comcast says most subs come nowhere close to 250GB (62,500 songs or 125 standard-def movies) a month, free-use groups expectedly disagreed with the tactic, citing everything from future bandwidth-hungry technologies to labeling the move "the end of the Internet as we know it" as arguments. ▲

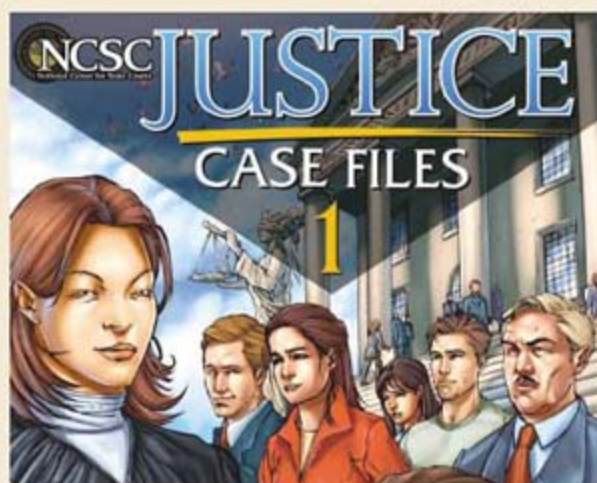
SIGHT SEEING

Do Charity Work With Good Searches

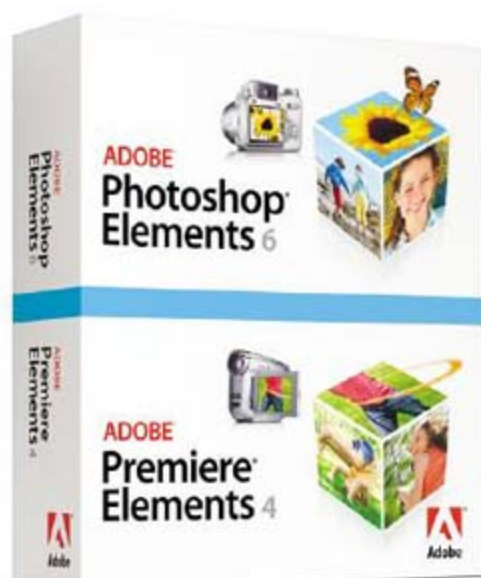
The folks at GoodSearch.com and GoodShop.com know gas prices and a slumping economy could limit what you normally give charities this holiday season. That's why they've partnered with 60,000 nonprofits and retailers to raise money via a Yahoo!-powered search engine you can add to IE, Firefox, and Safari. Your cost? Nada. At GoodShop.com, up to 37% of purchases from Target, Amazon.com, Best Buy, Nike, and others go to a charity of your choice. At GoodSearch.com, meanwhile, 1 cent of ad-generated profits goes to your charity. According to co-founder Ken Ramberg, over 100 new nonprofits and schools are registering daily. ▲

Now For Your Reading Pleasure: "Justice Case Files"

Poor Megan Robbins. One minute the darling Arbor University student is acing term papers. The next she's headed down the dark path of illegally downloading the new Cruel Mantra CD. 2,000 MP3 files later and Megan is a full-fledged download junkie facing prosecution for illegally downloading and trading music. From the minds at Layne Morgan Media—makers of "Think Before Your Drink," "Up In Smoke," and "No More Bull"—Megan's plight is depicted in "The Case of Internet Piracy," the first volume in the new "Justice Case Files" comic book series from the National Center for Small Courts. Will Megan get two years behind bars and a \$25,000 fine? Find out at ncsconline.org/D_Comm/Images/justice_case_files_01_preview.pdf. ▲



Adobe Upgrades Users To Photoshop.com

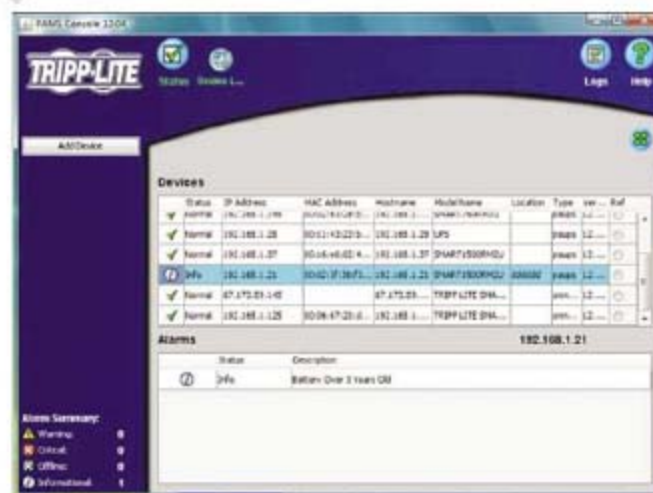


August was good to digital photogs. Microsoft introduced the senses-swirling Photosynth, Google added handy tagging/naming abilities to the Picasa 3.0 beta, and Adobe made Photoshop Elements and Premiere Elements even better. New in PS Elements is Scene Cleaner, which wipes unwanted elements from photos. Premiere Elements, meanwhile, has a new video-analysis mode that recommends clips; Videomerge for conducting green-screen experiments; and Instant Movie for creating entire flicks with audio, effects, and transitions based on themes. Buy alone (\$99 each) or in a bundle (\$149). Adobe also announced new Photoshop.com memberships. A free Basic plan scores you 5GB online storage and sharing. A Plus membership (\$49.95) offers 20GB, automatic online backups, updated templates and tutorials, and more. ▲



Tripp Lite Plugs In PowerAlert

Last month we told you about Edison, a free power-management utility from Verdiem Microsoft has endorsed for Windows XP and Vista systems. This month we bring you Tripp Lite's advanced enterprise-capable PowerAlert. Also free, PowerAlert is "a network-based power-management system that enables a network manager to monitor and control up to 250 Tripp Lite UPS systems or PDUs and the computers and equipment they support from a single interface." Tripp Lite offers PowerAlert in Network Management System, Local, and Shutdown Agent editions. Features include SNMP control, alarm notifications and history, auto device discovery, and mass device configuration. ▲



SOFTWARE SHORTS

Researchers Play Keep-A-Way

Carnegie Mellon researchers David Andersen, Adrian Perrig, Ethan Jackson, and Dan Wendlandt believe their Perspectives software, now available as a Firefox extension, can make you less vulnerable to “man-in-the-middle” attacks. Hackers use MITM assaults to prey on those who don’t know a PKI from a hole in the ground. Among other things, the Perspectives Firefox extension “can detect whether a self-signed certificate is valid and automatically overrides the annoying security error page if it is safe to do so” by ultimately letting a client automatically connect securely to a publicly available “network notary server.” Get Perspectives at www.cs.cmu.edu/~perspectives. ▲



Musings On The Gap In Innovation

Not to go book reviewer on you, but Judy Estrin’s new “Closing The Innovation Gap: Reigniting The Spark Of Creativity In A Global Economy,” sounds like a must-read. Estrin, former CTO at Cisco and co-founder of Precept Software and Packet Design, told *The New York Times* she’s not an alarmist but she’s concerned about “the state of our country and its innovation,” adding “we have a national innovation deficit.” Citing decreased funding and less risk-taking from VCs, Estrin suggests higher teacher salaries and a federal body that operates outside Congressional input as solutions to foster developing technologies. Elsewhere, Estrin gave her thoughts on Silicon Valley’s gender gap at Tom Foremski’s Silicon Valley Watcher (www.siliconvalleywatcher.com/mt/archives/2008/09/judy_estrin_on.php). ▲



Space: The Next Frontier For Malware

The late-July discovery of the low-level W32.Gammima.AG worm on a laptop aboard the International Space Station apparently wasn’t space’s first encounter with unsavory software. “It’s not a frequent occurrence, but this isn’t the first time,” NASA’s Kelly Humphries stated following the discovery. Space station Commander Sergey Volkov uncovered the worm after “running digital photo flash cards from stowage” through Norton AntiVirus. NASA later confirmed the discovery, which logs keystrokes to steal online game passwords. Space Invaders, indeed. ▲

BIOS Upgrades Available Online

Compiled by Steve Smith

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new lease on life. Here are a few recently released upgrades. Readers can check out www.cpumag.com/cpunov08/bios to see our entire upgrade list.

Manufacturer	Model	Version	Date	Description	URL
ASRock	P43R1600Twins-110dB	1.20	7/18/2008	Updates microcode for CPU; updates memory code for better compatibility	http://download.asrock.com/bios/775/P43R1600Twins-110dB(1.20).zip
Asus	M3N78-EMH HDMI	0506	7/7/2008	Adds item in BIOS setting to support PCIe2.0 Mode	http://support.asus.com/download/download.aspx?SLanguage=en-us
Asus	Striker II NSE	0406	7/7/2008	CPU multiplier now set to default value after CPR	http://support.asus.com/download/download.aspx?SLanguage=en-us
Biostar	Tpower I45 5.x	P45AA710	7/10/2008	Updates BIOS source code	http://www.biostar.com.tw/utility/biosdl.php?BID=1048

Job Of The Month



If you are a mature, well-trained, cross-platform programmer who still likes to play with dolls, then MGA Entertainment has your dream job. The company behind the Bratz line of girl toys, as well as many Marvel Comics-licensed properties, needs talented Web programmers to help relaunch its Bratz sites. You will need experience with PHP, AJAX, and MS-SQL/MySQL programming, especially those focused on social networking and online gaming, because we know how much those 'tween girls love to chat.

And if Web programming isn't your thing, MGA clearly is in expansion mode. They need a network administrator to handle the infrastructure and an Applications Programmer of business software. But we would hold out for the plum post of Research Manager, who gets to monitor focus groups, evaluate feedback on products, and advise on development. We're thinking this is like being Tom Hanks in "Big"—a top toy tester.

tinyurl.com/6ath77

Raw Numbers

A Day In Internet Life

Everyday Activities Of U.S. Internet Users
(Pew Internet & American Life)

49% Access search engines daily

60% Access email

39% Check news

28% Surf Web for fun

13% Visit social networking site
www.pewinternet.org/pdfs/PIP_Search_Aug08.pdf

Who Won The Online Olympics?

According to the early results surrounding the Olympics opening days, NBC, Yahoo!, and AOL grabbed the gold, silver, and bronze medals, respectively. By Aug. 11, however, Yahoo! had taken back the lead in daily Olympics audience.



Olympics-Related Site Traffic, Aug. 6 to 9 (in 000s)

Name	August 6	August 7	August 8	August 9
NBC Olympics	841	1,392	2,664	4,008
Yahoo! Olympics	1,505	1,430	1,477	3,324
AOL Olympics	511	718	395	1,010
Beijing2008.cn	39	114	429	780
NYTimes Olympics	432	369	341	466
ESPN Olympics	196	80	273	343
USA Today Olympics	34	55	280	184
Olympics.org	N/A	10	16	153
BBC Olympics	33	27	97	128
SI Olympics	N/A	15	45	112

Source: Nielsen Online
www.netratings.com/pr/pr_080811.pdf

Advertisers Still Tuned Out To Online Video

Tired of all those preroll commercials that seem to delay your favorite online video streams? You haven't seen anything yet, because advertising support for Web video is barely getting started. While 43% of us (129.5 million) will stream video online every month, according to eMarketer, advertiser spending on video ads amounts to a paltry 0.7% of their spending on TV spots. In fact, attracting significant ad dollars to online video is so tough, even the 800-pound gorilla in the market, YouTube, admits its revenues are negligible. According to Google's latest SEC filing, its wildly popular, market-owning video portal "[has yet to realize significant revenue benefits]." eMarketer predicts that video ad spending will more than quadruple over the next five years, however.

www.emarketer.com/Article.aspx?id=1006485



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The Saint

by Alex St. John

PCGA

Intel is showing a little leadership lately. They've started an organization called the PC Gaming Alliance to promote PC gaming. The founding members include folks like Dell, Acer/Gateway, Microsoft, AMD, Nvidia, and Activision. I admit that I was flattered and not a little surprised when they invited WildTangent to join, considering my strong and less-than-glowing opinions on Intel and Microsoft's contributions to the PC gaming environment. PCGA President and Intel employee Randy Stude assured me that my input would be appreciated, so I signed up my company to participate.

The PCGA's first initiative, which I think is hugely valuable and has been long in coming, is to accurately quantify the size and value of the PC game business. The problem in the past has been that the market analysts who cover the PC game market either try to treat it like the console business by simply counting boxes sold in retail, or they just count online revenue streams from subscriptions and advertising. The result has always been that the PC game market appears to compare very unfavorably to the console business despite the fact that there are more gamers in the world playing games on PCs than on all consoles combined. Also, because the PC is an "open" platform for game developers, PC game makers have been free to invent all manner of new ways to monetize their content, unfettered by the publishing and content constraints imposed by console makers.

Given that Nielsen has reported that 67% of PC owners play PC games, that the audience is spread across the spectrum of ages and demographics, and that the average console gamer also owns a PC and remarkably spends three hours more each week playing PC games than console games, one might intuitively expect that the actual value of PC gaming was much larger than it has been portrayed by folks who view gaming through the lens of the boxed retail business that console games have been limited to. The PCGA has undertaken a study to capture all of the myriad revenues associated with PC gaming, and the results were very much what I have always suspected. According to the results the organization released Aug. 19 at the recent Leipzig GCDC,

the PC game software market in North America alone is worth \$2.68 billion. This factors in boxed retail sales, online sales, advertising, and subscriptions and accounts for more money than any single next-generation console platform generates worldwide in software revenues. Nintendo, the current market leader thanks to the Wii, may top \$3 billion worldwide later this year. Overall, the PCGA found the worldwide PC game software market to total around \$57 billion, more than all other gaming platforms combined.

When you consider that World of Warcraft alone generates over \$1.2 billion per year in subscription revenues—more than all the revenue generated by all Xbox 360 titles combined—it should come as no surprise that in fact PC gaming utterly dominates the worldwide game market in audience, time spent, and revenues.

The PCGA is currently contemplating an initiative to define the minimum system specs for a "gaming" PC. Though well intentioned, I think this focus is somewhat misguided because it fails to recognize that nearly all consumer PCs are used for gaming by somebody in an average household of four. The goal should be to ensure that all consumer PCs sold in a given year can do a good enough job of playing all the PC games shipped in that same year. This would require OEMs to raise the bar for their entry-level consumer PCs and PC game developers to do a better job of making their games run well on entry-level PCs.

Intel desperately needs to step up its game in integrated graphics components or cede the market to AMD and Nvidia, and Microsoft needs to stop dreaming up new convoluted solutions to imaginary gaming problems and focus on the basics of keeping its bloated, warning dialog-laden OS out of developers' way. Once upon a time, there was a very good reason for making "Direct" part of the name of DirectX. The cost of replacing a PC's Intel integrated graphics component with a decent video chip is a difference of a few dollars that could easily be shaved off the enormous minimum RAM and/or CPU requirements needed to boot Vista's fat butt. ▲



Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multi-media browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

Send your feedback
to thesaint@cpumag.com

DREAM HARDWARE

These Gizmos
Don't Sing It,
They Bring It

It's a double bill in your mammoth screening room. First up is "Real Genius" in honor of your mildly radioactive coffee table, followed by "Runaway" as a nod to the metal arachnoids scaling your walls.

by Marty Sems

Periodic Coffee Table

It's something the whole class could go in on for their beloved chemistry teacher. Heck, our inner nerd is already making floorspace in the living room. RGB Research turns oak and whatnot into gold with this very punny periodic table (\$8,550; www.element-collection.com). It contains actual samples of all 92 naturally occurring elements, each carefully sealed in acrylic for safekeeping. And you won't have to worry about rogue nations sending agents to steal parts of your coffee table, as the dangerous transuranic elements aren't included. If you've long thought that your foyer could use a bit more antimony or tantalum, this is the table for you.

Meridian 810 Reference Video System

You have our permission to laugh at your friend with the 150-inch Panny plasma on preorder. Your new quad HD video system (www.meridian-audio.com; final appearance will vary) will blow it away with the ability to scale to ridiculously large screen sizes. This indivisible pairing of components starts with a 4,000-lumen, 10,000:1 native contrast ratio projector based on three JVC D-ILA (Direct-Drive Image Light Amplifier) processors. Feeding the beast is a Qdeo-based scaler that upconverts common source video resolutions to 4,096 x 2,400 quad HD. Four versions are available with various throw lengths, so rear projection is covered along with long-distance front projection. Don't think of the 810 as costing you a couple grand per megapixel; think of it as 9.8MP of visual impact on the wall of your personal gymnasium for a mere \$185,000.

SRI Wall Climbing Robot

Poor They Might Be Giants. The Johns may have found a new job climbing the walls on "The Else," but already they've been made redundant by this thing. SRI International (www.sri.com) has come up with a power-efficient robot that can climb vertical surfaces—we're talking stucco, wood, dry-wall, and even bumpy and dirty walls. Instead of suction cups or sticky molecules, the Wall Climbing Robot uses compliant electroadhesion to stick to walls. You can think of electroadhesion as a nonmetallic analogue to an electromagnet: Turn on some current, and objects attract each other; turn it off, and the objects don't. And the little critters are fast, too, being able to climb a body length every second. The technology involved is up for licensing. ▲

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E-mail Accounts	1,200 IMAP or POP3	500 POP3	500 POP3
Mailbox Size	2,000 MB	500 MB	75 MB
Website Builder	12 Pages	Additional \$ 8.99/month	✓
Access to Open Source Application Library	✓	✓	—
Personalized Business Cards	100	—	—
Starter Software Suite	✓	—	—
Search Engine Submission	✓	—	—
90-Day Money Back Guarantee	✓	—	—
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Price Per Month	\$4⁹⁹	\$6⁹⁹	\$15⁹⁵

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Get The Shot

Six Cameras For Today's Power User

Camera manufacturers continue to release new models with higher megapixel counts. However, as we all know, megapixels aren't everything. Body construction, dust reduction systems, live view options, controls, and many other features are

important to consider when selecting a D-SLR. Just as you demand power and performance from your PC, so too, you want colorful, crisp, and spectacular photos from your camera. Read on as we compare six hot D-SLRs to see how they stack up.

by Jennifer Johnson

Nikon D700

Nikon's D700 features the same 12.1MP full-frame FX sensor and the same processing engine as the higher-end D3 at a more affordable price. With this FX sensor, the camera can record pictures with an image area that's equivalent to a 35mm format film camera. What's more, the D700 also supports the DX format and will automatically switch to this mode when a DX Nikkor lens is attached to the camera's body.

Most cameras include a cover for the optical viewfinder to block light during long exposures. Instead of a cover, the D700 has an Eyepiece Shutter Lever that mimics a camera's shutter.

In the D700's menu system, you'll find a Multiple Exposure mode that lets you record two to 10 exposures in a single photograph. Although this won't be a setting you use all the time, it's still a cool feature, especially for the more artistic photographer.

On the back of the D700, you'll find the camera's large 3-inch LCD. This



D700
\$2,999.95 (body only)
Nikon
www.nikonusa.com



high-resolution 920,000-dot VGA display is especially nice when using Live View. The D700 has two Live View modes: Handheld mode and Tripod mode. In Handheld mode, you will compose the frame using ordinary TTL (through the lens) phase-detection AF (auto focus). For greater focus accuracy, use Tripod mode. In this mode, you frame the picture and focus on your subject before displaying the image on the screen. In Tripod mode, you can press the zoom button to check the focus more clearly before taking a picture.

I liked the D700's Virtual Horizon feature, which is available in Live Mode, because it helped me determine whether I was holding the camera straight or at an

angle, thereby eliminating some editing later. Another nice feature is the built-in HDMI output, which lets you show off your images on an HDTV.

Like many D-SLRs, the D700 incorporates image sensor cleaning that activates each time the camera powers on or off. Nikon's implementation of this cleaning feature involves four different resonant frequencies that remove dust from the optical low-pass filter in front of the image sensor.

Although the Nikon D700 has a hefty price tag in comparison to some of the other cameras in this roundup, it's also the only camera to offer a full-frame FX sensor along with the DX format. ▲

Olympus E-3

The E-1's long-awaited successor, the E-3, offers many improvements over the older model, as you would expect. These enhancements include a 10MP Live MOS sensor and TruPic III processor. The Live MOS sensor provides the E-3 with image quality that would compare to a FFT (full frame transfer) CCD

(charge-coupled device) sensor, while offering the low power requirements of a CMOS sensor. The camera also has a new 11-point AF system and a higher top shutter speed over the E-1 (1/8,000 second compared to the E-1's 1/4,000 second).

One of the first things I noticed about the Olympus E-3 was its articulating LCD.

Only one other camera in this roundup (the Panasonic Lumix DMC-L10K) has this feature. I really enjoyed using this monitor with the camera's Live View function because it let me frame images above my head and near the ground without being on the same level as the camera. While shooting in Live Mode, you can also

display a histogram to help you check for proper exposure and tone distribution before pressing the shutter button.

Olympus claims the E-3 has the world's fastest autofocus system when coupled with one of Olympus' compatible Zuiko Digital Supersonic Wave Drive lens. This quick-focusing capability comes courtesy of the camera's dedicated AF data processing engine, which can process data from 11 biaxial sensors simultaneously.

When shooting in low-light conditions, the E-3's body-based image stabilization can shift the image sensor up to an equivalent of five shutter speed steps to help compensate for movement and prevent blurry images. Because this image stabilization is built in to the camera's body, it doesn't require additional components in


E-3

\$1,699 (body only)

Olympus

www.olympus.com


the lens. In turn, compatible Four Thirds lenses can be smaller and lighter than lenses that incorporate these components.

Near the upper-left corner of the camera's LCD, you'll find a sensor that analyzes the camera's surroundings and adjusts the display's brightness accordingly. Recognizing that durability is also very important, Olympus made the E-3

body, the built-in flash, and the LCD splashproof and dustproof. For the maximum durability, you'll want to choose a Zuiko Digital lens that is also splashproof and dustproof.

The E-3's articulating monitor, body-based image stabilization, and fast autofocus system combine in a durable body to create a great camera for the money. ▲

Panasonic Lumix DMC-L10K

As mentioned, the Lumix DMC-L10K has an articulating LCD. In addition to being useful for framing images with the camera's Live View feature, the twisting display also lets you turn the display inward to protect it when the camera is not in use. For users who desire power in a compact form, the Lumix DMC-L10K's body is lighter and smaller than most of the cameras in this roundup, though it offers some of the same features found in midrange D-SLRs.

The Lumix DMC-L10K features a Live MOS sensor and Supersonic Wave Filter dust removal. This camera also has Contrast Detect AF, letting you focus on a subject while using Live View by simply half-pressing the shutter release as normal. With Contrast Detect AF in Live View mode, the camera closely mimics a compact camera, which is handy for some shooting conditions. To use Contrast Detect AF you must have a compatible lens, one of which is the camera's kit lens.

A few features found on Panasonic's compact cameras have also made their way into the Lumix DMC-L10K, such as Face Detection (up to 15 faces) and Intelligent ISO. Intelligent ISO, available when taking pictures in Live View, tells the camera to detect the movement of the subject near

Lumix DMC-L10K

\$1,299.95 (with Leica D Vario-Elmar 14-50mm/F3.8-5.6 ASPH lens)

Panasonic

www.panasonic.com


the center of the screen and then adjust the ISO and shutter speed according to the movement and brightness of the subject. Because high ISO settings can cause digital noise, you'll want to limit this setting for best results. Thankfully, Panasonic lets you choose the upper limit that's most appropriate for your shooting conditions. There's also a variety of automatic shooting modes, including Portrait, Scenery, Macro, Sports, and Night Portrait modes. Each of these modes has additional sub-modes, such as Normal Portrait, Outdoor Portrait, Indoor Portrait, and Creative Portrait.

When shooting with slow shutter speeds, the camera displays a countdown (through

the optical viewfinder or on the display in Live Mode) to let you know how much time is remaining during a long exposure.

The DMC-L10 is only available as a kit. Since the camera's body doesn't incorporate image stabilization, it's important to note that the 14-50mm/F3.8-5.6 kit lens is image-stabilized. This kit lens is slightly slower than some kit lenses offered by other manufacturers, although it's still a very good lens.

The DMC-L10K's flip-out LCD is a very useful feature, especially when combined with the camera's unique contrast detect AF, which is the same sensor that makes it possible for other compact digital cameras to focus using the sensor itself. ▲

Canon EOS 50D First Look Preview

Although a final production model of Canon's latest 50D wasn't available at the time this article was written, I was able to get my hands on a preproduction unit. The 50D uses many of the same controls and styling as its sister model, the 40D. When it announced the camera, Canon was sure to mention that the 40D would continue to be a part of the lineup. In other words, the 50D is not meant to replace, but instead complement, the 40D.

The new 50D has a 15.1MP CMOS sensor and Canon's new DIGIC (Digital Imaging Core) 4 image processor. Canon claims this improved sensor reduces noise and expands the sensitivity of the camera up to ISO 12800. Combined with the fast DIGIC 4 image processor, this camera offers a burst rate of 6.3 frames per second with bursts up to 90 Large/Fine JPEGs or 16 RAW images.

Another significant upgrade to this camera over the 40D is the inclusion of a large 3-inch Clear View LCD screen with 920,000-dot/VGA resolution. This screen offers four times the pixel count of the EOS 40D camera's screen. Some of the other new features found on the 50D have trickled down from Canon's professional cameras, such as the AF Microadjustment focusing control feature, originally introduced last year with the Canon EOS-1D Mark III.

For the less technical shooter, the 50D incorporates a new Creative Full Auto setting that is available from the mode dial. In this mode, you can adjust capture settings using straightforward language rather than

EOS 50D

\$1,399 (body only)
\$1,599 (with EF 28-135mm
f/3.5-5.6 IS USM lens)
Canon
www.canon.com



photographic terms. In other words, you can choose to "blur the background" while shooting in Automatic mode. This camera also has a Live View mode with three auto focus modes: Quick, Live, and Face Detection. When using Live Mode, you'll need to use the AF-ON button to focus on a subject. The 50D also has an HDMI output so you can display your pictures on an HDTV.

To increase the camera's resistance to dust, Canon upgraded the 50D's Self-Cleaning Sensor Unit with a fluorine coating on the low-pass filter. Ultrasonic vibrations attempt to shake dust particles off the filter each time the camera powers on or off, as well. ▲

Pentax K20D

The Pentax K20D offers two unique shooting modes that you are unlikely to find on other cameras: Sensitivity Priority and Shutter & Aperture Priority. The Sensitivity Priority mode lets you set the sensitivity to suit the brightness of the subject. In turn, the camera will select the appropriate shutter speed and aperture to obtain the correct exposure. Conversely, the Shutter & Aperture Priority mode lets you pick the shutter speed and aperture, while the camera chooses the sensitivity necessary to obtain proper exposure according to the brightness of the subject.

This camera includes an X-sync flash socket on the left-hand side of the K20D's body. This socket makes it possible for you to use external flashes and lights that wouldn't otherwise be compatible with Pentax's wireless flash system.

Another useful feature of the K20D is the ability to compare images side-by-side. When doing so, you can zoom in

K20D

\$1,199.95 (body only)
\$1,415.90 (with smcP DA 18-55mm
f/3.5-5.6 AL lens)
Pentax
www.pentaximaging.com



on a particular area of the image to get a closer look at how the images compare.

When adjusting white balance, the K20D's color-adjustable LCD is helpful because it lets you tweak the display to reach a neutral color representation. By knowing the screen is color-accurate, you'll be better equipped to fine-tune white balance.

This camera also has body-based image stabilization. Pentax's Shake Reduction feature enables sharp images at 2.5 to 4 stops slower than you could otherwise achieve. Image stabilization is a very useful feature when shooting in low-light



conditions, with telephoto lenses, or indoors with a flash because it provides more shooting versatility without having to haul around a tripod.

Finally, the K20D has a weather- and dust-resistant body. Although common sense tells us it's still wise to avoid rain and other weather conditions along with dust, it's somewhat comforting to know that the camera should withstand shooting in a variety of less than perfect conditions.

The K20 offers in-body image stabilization and a few unique features such as Shutter & Aperture Priority mode for a reasonable price. ▲

The Six Shooters

Image quality is obviously important, but so are features and specs when comparing cameras. Here's a closer look at how the six cameras included in this roundup compare side-by-side.

	Canon EOS 50D	Nikon D700	Olympus E-3	Panasonic Lumix DMC-L10K	Pentax K20D	Sony DSLR-A700
Dimensions (inches, HxWxD, approximate)	4.2 x 5.7 x 2.9	4.8 x 5.8 x 3	4.58 x 5.6 x 2.9	3.76 x 5.3 x 3.05	4 x 5.6 x 2.76	4.25 x 5.63 x 3.25
Weight (pounds, body only, no battery, approximate)	1.61	2.19	1.79	1.06	1.56	1.5
Effective megapixels	15.1	12.1	10.1	10.1	14.6	12.24
Image stabilization	Lens dependent	Lens dependent	Body-based sensor shift	Lens dependent, kit lens has MEGA O.I.S.	Body-based sensor shift	Body-based sensor shift
Sensor type	CMOS	CMOS	Live MOS	Live MOS	CMOS	CMOS
Sensor size (mm)	22.3 x 14.9	36 x 23.9	17.3 x 13	17.3 x 13	23.4 x 15.6	23.5 x 15.6
LCD size (inches)	3	3	2.5	2.5	2.7	3
Live View	Yes	Yes	Yes	Yes	Yes	None
LCD articulation	None	None	Yes	Yes	None	None
Top panel LCD	Yes	Yes	Yes	None	Yes	None
Video output	Yes	Yes	Yes	Yes	Yes	Yes
Lens mount	Canon EF mount	Nikon F bayonet mount	Four Thirds	Four Thirds	Pentax KAF2 mount	Sony alpha mount, Minolta A-type bayonet mount
Exposure compensation	+/- 3EV (1/3 steps)	+/- 5EV (1/3 steps)	+/- 5EV (1/3 steps)	+/- 2EV (1/3 steps)	+/- 3EV (1/2 steps)	+/- 3EV (1/3 steps)
Default ISO range	100 - 3200	200 - 6400	100 - 3200	100 - 1600	100 - 3200	100 - 3200
Shutter speed	bulb, 30 - 1/8,000 second	bulb, 30 - 1/8,000 second	bulb, 60 - 1/8,000 second	bulb, 60 - 1/4,000 second	bulb, 30 - 1/4,000 second	bulb, 30 - 1/8,000 second
Burst rate (fps)	6.3	5	5	3	3	5
Continuous buffer	90 JPEG, 16 RAW	100 JPEG, 20 NEF (RAW) Lossless compressed 14-bit	Unlimited JPEG, 16 RAW	Unlimited JPEG, 3 RAW	38 JPEG, 14 RAW, PEF, 16 RAW DNG	Unlimited JPEG, 18 RAW
Price (body only)	\$1,399	\$2,999.95	\$1,699	\$1,299.95 (lens included)	\$1,199.95	\$1,299.99
URL	www.canon.com	nikonusa.com	www.olympus.com	www.panasonic.com	www.pentax.com	www.sonystyle.com
CPU Rating	n/a	●●●●	●●●●	●●●●	●●●●	●●●

Sony DSLR-A700

When picking up the DSLR-A700, I first noticed its molded body that is designed to fit your right hand, complete with a ridge for your middle finger and another for the thumb. This helps you have a better grip on the camera, which is especially important if you're using a heavy lens.

The DSLR-A700 has a built-in HDMI terminal that lets you connect the camera to an HDTV. When connected to a Sony Bravia LCD HDTV, the new PhotoTV HD mode optimizes photos by fine-tuning sharpness, gradation, and color. Many D-SLRs have a fixed 3:2 aspect ratio, yet many HDTVs use 16:9, so images traditionally can't be displayed using the full width of the screen. To overcome this problem, the DSLR-A700 gives you a choice of shooting with either 3:2 or widescreen 16:9 aspect ratios.

When viewing photos on a TV, the included wireless remote is convenient for



DSLR-A700

\$1,299.99

About \$1,950 (with DT 18-250 mm lens)

Sony

www.sonystyle.com



toggling through images. Another cool feature is the camera's detailed battery status, which shows the amount of battery power remaining in terms of both a percentage as well as a traditional bar-based battery gauge.

The DSLR-A700 was the only camera in this roundup lacking Live View. It also lacks a top-panel status LCD, which gives you no choice but to use the rear LCD when you want to glance at your current settings. On the upside, when you rotate the camera to shoot in portrait mode, the camera's LCD changes to a vertical orientation to make it easier to see what settings you are using.

With the camera's Super SteadyShot in-camera image stabilization, you'll get image stabilization up to four stops slower on all alpha system lenses than would be possible without the technology.

In addition to Sony lenses, the DSLR-A700 is compatible with most Minolta Maxxum mount lenses. For versatility in storage, the DSLR-A700 supports Memory Stick Duo media cards as well as CF cards with the new UDMA (Ultra Direct Memory Access) standard.

Although the DSLR-A700 is a good camera, I was disappointed that it didn't offer Live View, especially for its price. ▲

Dare To Compare

To really get an accurate picture as to how one camera compares to another, I captured the same image with each of the cameras. In my test shots, I used the following settings: AV mode, 35mm, f10, ISO 200, automatic White Balance, and multisegment metering. I left any additional settings to the camera's defaults. Because the Canon 50D was a preproduction unit and image specifications may change, I can't include sample images here, but it's worth noting that image quality with the 50D was comparable to other cameras in my tests. In fact, I thought the image taken with the Canon camera was one of the best in terms of color and quality.

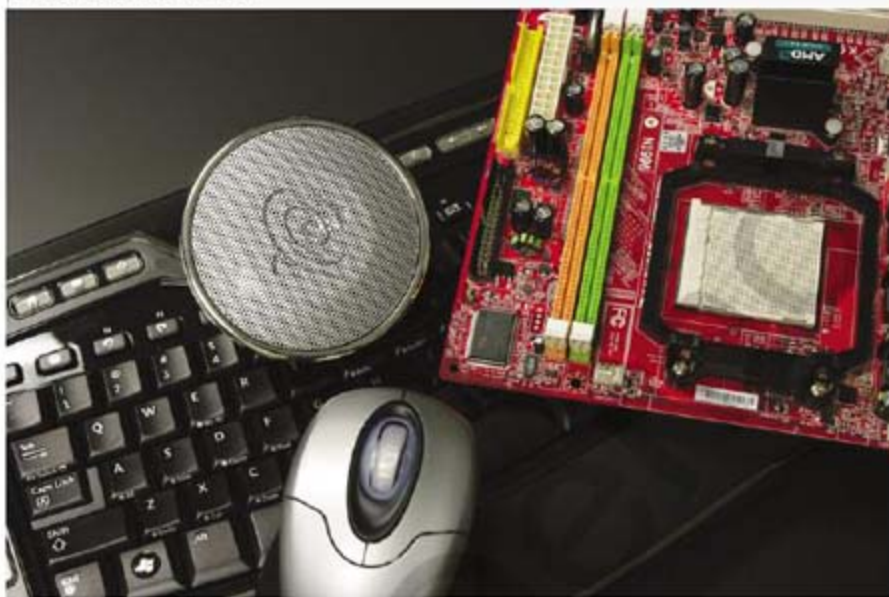
The images taken with the Sony DSLR-A700 and the Pentax K20D were as good as the Canon in terms of color and quality. Although the Nikon D700 showed good quality, the overall image was slightly more orange in color than some of the other images. The Olympus E-3 image is a bit warm, while the Panasonic Lumix DMC-L10K image is a bit cold. Either of these could easily be fixed in Photoshop or another image editing program. Although it's personal preference, I wasn't fond

of the more square-shaped image that the Olympus and Panasonic cameras produced. ▲

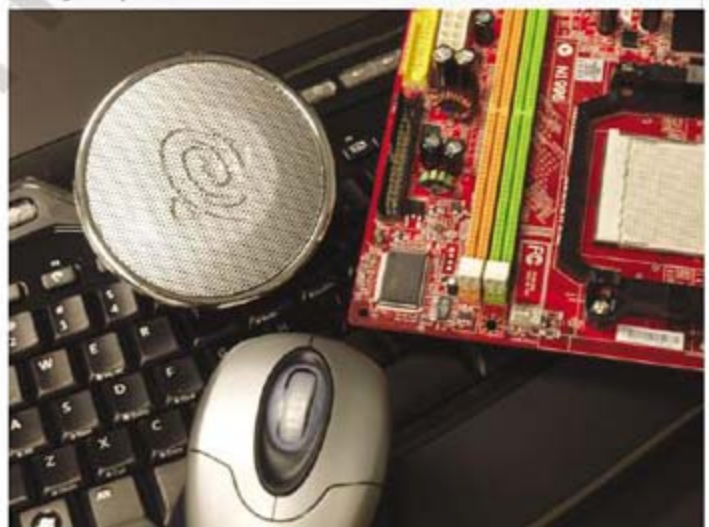
Nikon D700



Pentax K20D



Olympus E-3



Sony DSLR-A700



Panasonic Lumix DMC-L10K



All images were scaled down to 24.2%.



The best gaming systems run with **DOMINATOR**

"The XPS 730-series platform is the ideal place for Dell to showcase the best that PC performance hardware has to offer, we had very aggressive performance goals for this platform, including the ability to run 4GB of overclocked main memory with rock-solid stability. Corsair's DOMINATOR DDR3 modules were the only logical choice for the best-in-class performance memory required for the Dell XPS 730."

Patrick Desbois, Dell XPS Gaming Engineering



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Zalman GS1000

Zalman is best known for its extensive lineup of quiet CPU and GPU coolers. But over the last few years, Zalman has also expanded its family of products with power supplies, input devices, cases, and even some 3D monitors. I took a look at Zalman's latest full tower enclosure, the GS1000.

Although the GS1000 doesn't break much new ground in terms of features, Zalman has made some subtle design decisions that differentiate this case from many other "boutique" enclosures. To keep costs down, Zalman chose to use a combination of aluminum, steel, and plastic to construct the GS1000. Aesthetically, the different materials and textures worked together well, but I found the plastic edge trim and top panel were prone to fingerprints. That's a minor quibble though, as the fingerprints can be cleaned from the surface quite easily.

Zalman also configured the fan locations in this case in a rather unique way. Two 120mm

fans are mounted at the top and back, exhausting air from the case. There are three more fan positions available (one at the top and two at the bottom), but none of them are in the traditional intake position at the lower front of the case. Instead, the bottom half of the front bezel and bottom of the case have ventilation holes where air is drawn in from the negative pressure produced by the exhaust fans. Somewhat surprisingly, given Zalman's track record for producing quiet computing products, the stock fans included with the GS1000 were noisy. I wouldn't call them loud, but they did produce a noticeable hum that was easily audible.

At the top of the case, a small hinged panel hides a pair of USB ports, FireWire



GS1000
\$199
Zalman
www.zalmanusa.com



port, and headphone and microphone jacks. The back of the case has predrilled holes to accommodate tubing for a watercooling kit. There's a small handle attached to the removable PSU mount, so yanking a PSU out of its bottom-mounted position is about as simple as can be. The side panels of the case also feature handles and permanently attached spring-loaded thumbscrews that simplify getting inside the GS1000.

Once inside, the GS1000 has an open, expansive interior that was easy to work with. There are holes on the motherboard tray designed for neat cable routing, and the case also has a hot-swappable SATA backplane with dampened hard drive mounts that slide into and out of the case via the front panel.

It's not an all-aluminum beauty, and its stock fans were noisier than I would have liked, but for under 200 bucks, Zalman has a solid product in the GS1000. ▲

by Marco Chiappetta

Zerotherm Zen FZ120

In a relatively short time, Zerotherm has built a well-deserved reputation for producing high-quality CPU and GPU coolers. In a recent roundup, we found the Zerotherm Nirvana NV120 Premium to be one of the best air coolers we had ever tested (see "The Heat Is On" on page 23 of the June 2008 issue of *CPU*), so we were eager to see how its more affordable cousin, the Zen FZ120, performed.

The Zerotherm FZ120 is a familiar tower-type air cooler with aluminum heatsink fins and with copper heatpipes and base. Its heatsink has a honeycomb structure, which Zerotherm claims optimizes surface area and airflow through the cooler. The included 120mm PWM fan was relatively quiet, with a peak output of

31.4dBA. Mounting the FZ120 on an LGA775 CPU requires removing the motherboard from the case to install a backplate, but the mount is solid and sturdy. AMD owners don't have to go through the hassle, however: The FZ120 uses a clip that works with the stock AMD CPU cooler mount.

To test the FZ120, I installed it on an Asus motherboard with a Core 2 Extreme QX9650 processor. I ran the processor at stock and overclocked speeds. For the stock tests, I used the default settings of 3GHz processor clock speed and 1.25V core voltage. In the overclocked tests, however, I bumped the multiplier and core voltage to 11X and 1.4V, respectively yielding a stable 3.66GHz overclock.

At the stock settings, the Zen FZ120 kept the CPU running at 31 degrees Celsius (idle) and 47 C (load); the overclocked CPU hit only 38 C (idle) and 63 C (load).

For under \$40, the Zerotherm Zen FZ120 is an excellent choice for users looking to quietly cool an overclocked processor. The CPU temperatures it achieved were some of the best we've seen. ▲

by Marco Chiappetta



ZEN FZ120
\$39
Zerotherm
www.zerotherm.net



Specs: Dimensions: 23 x 8.7 x 20.5 inches (HxWxD); Weight: 26.4lbs; Motherboard compatibility: eATX, ATX, microATX; Drive bays: 4 5.25-inch external, 6 3.5-inch internal (3 hot swap); Seven rear expansion slots

Specs: Socket compatibility: 775, 939, 940, AM2; Dimensions: 4.96 x 2.40 x 6.14 inches (HxWxD); Cooling capacity: Over 150W; Fan speed: 1,100 to 1,800rpm; Acoustics: 19.5 to 31.4 dBA; Airflow: 59.48cfm

OCZ PC3-16000 Platinum Edition (4GB)

Over the past year or so, DDR3 has ramped in terms of clock speeds and latency has also come down nicely. We took a look at OCZ's new screaming fast 2GHz 4GB kit, the PC3-16000 Platinum Edition, and it strikes a nice balance of both clock speed and latency.

The OCZ PC3-16000 Platinum Edition kit offers a top-end clock speed of 2GHz and CL 9-9-9-30 timings. Its standard operating voltage is 1.9V, but OCZ also offers a 2GB kit with the same specs that runs at 1.8V. These unbuffered DIMMs also come with OCZ's EVP (Extended Voltage Protection) lifetime warranty, letting you jump the voltage on either kit by 0.05V without voiding the warranty.

In terms of performance, we found our 4GB kit ran exceptionally well at its rated speed in our Nvidia nForce 790i test bed. We caution you, however, that your motherboard and processor need to be up to the task if you want to hit this memory's top end 2GHz clock speed. We ran our kit at an asynchronous 1,800MHz FSB to our Core 2 Extreme QX9700 processor, with a 2GHz memory speed at 1.9V, and were actually able to hit better than stock 8-8-8-24 timings with a 1T command rate. This yielded a solid 8.9GBps in our Sandra XII Buffered Integer and Float memory benchmarks

and a snappy 299fps in our Half Life 2: Episode 2 low-res game testing. Compared to stock DDR3-1333 system memory settings at 7.8GBps in Sandra and 270fps in HL2: EP2, that's a nice jump.

The best surprise is that this 4GB kit retails for \$229 after a mail-in rebate. Compared to the average 4GB DDR3-1,333 kit retailing around \$200, the OCZ PC3-16000 Platinum Edition 4GB kit is a solid deal. ▲

by Dave Altavilla



PC3-16000 Platinum Edition (4GB)

\$249

OCZ

www.ocztechnology.com



Specs: Capacity: 4GB (2x 2,048MB); Frequency: 2,000MHz (PC3-16,000); Latencies: 9 (CAS), 9 (RAS Precharge), 9 (RAS to CAS), 30 (RAS Activate to Precharge); Voltage: 1.95V; lifetime warranty

Lenovo ThinkPad X200

When you think about the current trends in ultralight notebooks, images of the Asus Eee PC and the MacBook Air come to mind, and for good reason. These products created quite a splash in the market upon their debut. You could easily place your bets that others would follow suit in an effort to capitalize on this renewed "thin is in" trend.

The Lenovo ThinkPad X200 is just the sort of sprite to take on some of the incumbents in the ultralight arena. While it's definitely not quite as light (weighing in at 3.5 pounds with a 9-cell battery) or thin (a max height of 1.4 inches), it also packs a bit more oomph under its hood vs. the likes of a MacBook Air or

an ultra-cheap Eee PC. Built on Intel's new Centrino 2 (Montevina)

ThinkPad X200
\$1,798 (as tested)
Lenovo
www.lenovo.com



platform, the ThinkPad X200 supports Intel's latest Penryn-based, 45nm Core 2 Duo Processor, as well as 2GB of DDR3 memory.

The X200's graphics subsystem is based on Intel's integrated GMA X4500 HD graphics core, which supports full H.264, VC1, and MPEG-2 HD video decode in hardware. It also features a full-sized keyboard and a sharp 12.1-inch

WXGA LCD with a native resolution of 1,280 x 800.

Those of you who are ThinkPad veterans will appreciate Lenovo's TrackPoint mouse, but we were a bit disappointed to see that the system doesn't come with a touchpad. The X200 is also devoid of an optical drive, relying on external USB ports.

All told, the ThinkPad X200 offers a bit more performance and muscle vs. your average ultralight. And, of course, it's built ThinkPad-tough.

by Dave Altavilla



Benchmark Numbers:

3DMark 06 (CPU score)	2036
PCMark Vantage Pro	
Overall	3257
Memories	1974
Gaming	2942
Music	3543
Communications	3623
Productivity	3472
HDD	4651

Specs: CPU: 2.4GHz Intel Core 2 Duo P8600; Memory: 2GB DDR3-1,066; HDD: 160GB 7,200rpm; Graphics: Intel GMA X4500 HD; Windows Vista Business 32-bit

BFG GeForce 8800 GT OCX

Even at stock clock speeds, Nvidia's GeForce 8800 GT is known for providing gamers relatively powerful performance at a midrange price. BFG's 8800 GT OCX features the company's OCX ThermoIntelligence fansink to let BFG bump the card's core clock to 700MHz, shader clock to 1,728MHz, and memory clock to 1,000MHz—compared to the G92's respective stock 600MHz, 1,500MHz, and 900MHz speeds.

The fan on the OCX ThermoIntelligence cooler also includes green LED lighting. The size of the fan makes the GeForce 8800 GT OCX a two-slot card, but the extra cooling is worth the space. BFG claims that the OCX cooler lets this 8800 GT run up to 30 degrees Celsius cooler than a stock card. We used RivaTuner to compare its core temp to the stock-cooled MSI NX8800GT and found

that, under load, the BFG GeForce 8800 GT OCX ran between 20 to 22 C cooler than MSI's card.

The GeForce 8800 GT OCX's clocks also provided a slight, but not overwhelming, performance increase over the NX8800GT. We pushed the GeForce 8800 GT OCX's core clock to 756MHz and saw some greater gains over the MSI NX8800GT. For instance, we saw an 8.4% increase in the overall 3DMark Vantage score, and similar jumps in our gaming tests.

Greater thermal performance is the GeForce 8800 GT OCX's claim to fame, so it's ideal for those with systems running under hotter conditions, users



GeForce 8800 GT OCX
\$269.99
BFG
www.bfgtech.com



looking for extended longevity, or anyone who wants a little more performance. We also found this card for less than \$200 online, making it a solid bargain. ▲

by Nathan Lake

Benchmark Results	MSI NX8800GT	GeForce 8800 BFG GT OCX	BFG GeForce 8800 GT OCX (756MHz core clock)
3DMark Vantage			
Overall	P5926	P6236	P6422
GPU	5259	5562	5768
CPU	9557	9801	9790
Crysis 1.1			
1,600 x 1,200	16.3	17.2	17.5
2,560 x 1,600	3.2	3.9	4
Company of Heroes 2.1.0.2 (4XAA)			
1,600 x 1,200	42.3	46.9	48.2
2,560 x 1,600	17.2	19.6	20.4
World In Conflict 1.005 (4XAA, 16XAF)			
1,600 x 1,200	25	27	28
2,560 x 1,600	9	12	13
S.T.A.L.K.E.R 1.005			
1,600 x 1,200	61	70	74
2,560 x 1,600	28	36	38

Test System Specs: 2.67GHz Intel Core 2 Quad Q6700, Evga nForce 790i Ultra SLI motherboard, 2GB of 1,333GHz DDR3, 74GB WD Raptor, Corsair HX1000W PSU

Specs: BFG GeForce 8800 GT OCX; GPU clock: 700MHz; 512MB GDDR3 (1,000MHz); 112 stream processors; 56 texture-filtering units; 16 ROP

Epson Stylus NX400

Although some people may prefer a printer suited to a single purpose, such as speedy document production or high-quality photo prints, many of us need a printer that can produce a wide variety of material at a satisfactory quality. The Epson Stylus NX400 is an all-in-one that delivers admirable quality on documents, photos, scans, and copies.

The lone downside to the NX400 is that it's very loud. There was a booming click each time the printer fed paper into the tray, and during printing, we clearly heard the print heads buzzing along the page. We liked the NX400's slide-out, fold-in input and output trays that lock into place, which gave the printer a clean look and saved us desk space when we

stored the printer. Additionally, we found the menu system was intuitively designed and easy to navigate on the 2.5-inch LCD.

The Stylus NX400 features Epson's DuraBrite inks, which are resistant to smudges and smears. We ran tap water over both documents and photo prints and were unable smear any of the text or images on the pages. The detail in small fonts and photos was excellent. As you may expect, color depth and tonal highlights weren't as deep or bright as you'd see from a dedicated photo printer. Still, the NX400 produced 8x10 photos at a high-enough quality to frame. This all-in-one also cut the mustard when it came to scans and copies.

At highest quality, our 10-page test document took 2:18 (minutes:seconds) to print, and a 4x6 photo came out in 0:46. Documents looked acceptable at draft quality, but you'll probably want to use the Best Photo Quality setting for photos. If you're looking for an affordable all-in-one that delivers good prints, copies, and scans, Epson's Stylus NX400—albeit noisy—is certainly up to the task. ▲

by Nathan Lake



Stylus NX400
\$99.99
Epson
www.epson.com



Specs: Color resolution: 5,760 x 1,400; Scanner resolution: 48-bit color, 1,200 optical dpi; Memory card slots: SD, xD, MS Pro, CF

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Gaming Dominator



Powered by the Intel Core 2 Quad Processor



Power and Value



Powered by the AMD Phenom Processor



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Polaroid PoGo

When you think of Polaroid, instant prints reminiscent of years past come to mind. Today, Polaroid is bringing similar instant print gratification to digital camera and camera phone users with its PoGo mobile printer.

Marketed as a printer that will fit in your pocket, the PoGo prints wallet-sized, 2- x 3-inch prints that are water-, smudge-, and fade-resistant. Polaroid claims the printer takes 60 seconds or less to print an image. I'd agree: Once I transferred an image to the printer, PoGo took about 40 to 60 seconds to print. Transfer rates added more time, however. Depending on the transfer method used (Bluetooth or USB with a PictBridge-enabled camera), the transfer process sometimes took a minute or more before the photo would begin to print.

PoGo uses ZINK (Zero Ink) technology. Instead of ink cartridges, the printer uses Polaroid's special ZINK Photo Paper, which is embedded with yellow, magenta, and cyan dye crystals. The printer activates these crystals with 200 million heat pulses in a single pass to produce an image. The ZINK photo paper costs between 33 and 40 cents per print: 10 packs of paper cost \$3.99, while packages of 30 papers will set you back \$9.99.

Other than a slight humming noise when printing, the printer was completely quiet. Print quality was very



PoGo
\$149
Polaroid
www.polaroid.com



good for some shots and disappointing with others. Some nature shots showed excellent color and detail, while skin tones appeared overly red. The prints were indeed water-, smudge-, and fade-resistant. Even after a print sat under direct sunlight in my hot car for a couple of days, the print didn't fade.

Although you can buy a portable printer with a screen and card reader that can produce 4- x 6-inch photos for about the same price as the PoGo, these printers are larger, require ink cartridges, and don't necessarily produce better

prints. For ultra-portability and durable prints that won't smudge or fade, PoGo fills the gap. ▲

by Jennifer Johnson

Specs: 0.93 x 2.83 x 4.72 inches (HxWxD); Weight: about 8 ounces empty; Bluetooth; USB 2.0

BlueAnt Supertooth 3

Talking on a cell phone while driving can be distracting and dangerous. Still, we talk anyway, thinking it won't affect our ability to be a good driver. To try to force safer driving habits, some states have passed laws banning cell phone use (without a hands-free car kit or headset) while driving. Whether you live in such a state or you're just interested in the added safety and convenience of talking in your car hands-free, a Bluetooth car kit can be quite useful.

I recently tested the BlueAnt Supertooth 3 Bluetooth speakerphone. Built-in text-to-speech and voice control capabilities set this unit apart from other speakerphones. With text-to-speech, the Supertooth 3 speaks a caller's name or phone number aloud. Should you choose to accept the call, you can say "accept call," "accept," "answer," or "OK" to answer the phone.



Supertooth 3
\$129.95
BlueAnt Wireless
www.myblueant.com



When you pair a phone with the Supertooth 3, it will attempt to download your phone's address book. Once the address book is loaded on the Supertooth 3, the device will speak the name of the caller (e.g. "Call from Joe Smith") on incoming calls. Smartphones (including my personal

phone) don't always let you download the address book in one easy step. As a result, I had to transfer contacts one by one. This was a fault of the smartphone, not BlueAnt. "Regular" phones should work much better with this feature. Indeed, while testing the Supertooth 3 with the new Samsung Instinct, the address book transferred quickly and easily.

The text-to-speech voice sounded somewhat computerized but was still understandable. Although I had to speak loudly and deliberately, the voice-answering capabilities worked well. The noise-suppression and echo-cancellation features made it possible for my voice to be heard even with a loud car radio in the background. Overall, I liked the Supertooth 3. Everyone I spoke with could hear me fine, and it was nice to carry on a conversation without pressing the phone to my ear. ▲

by Jennifer Johnson

Specs: 2.4 x 4.8 x 0.8 inches (HxWxD); Weight: 4.05 ounces; Bluetooth 2.0; text-to-speech; 15 hours talk time; 800 hours standby; noise suppression; echo cancellation; automatic vibration sensor reconnection; voice control; voice-recognition dialing (if supported by phone)

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Wilson Electronics SignalBoost Mini-Mobile Amplifier

osing cell phone reception is no joking matter, especially for the mobile manic who requires a constant strong connection. The Wilson Electronics SignalBoost Mini-Mobile Amplifier can fill that need: Use it to increase your current signal (up to six times) and reduce your number of dropped calls while on the road.

Installation took very little time—approximately 10 minutes. I attached the external, magnetic antenna toward the posterior of the roof (it must be installed at least 12 inches away from other antennas on or in the vehicle) and ran the outside antenna cable under the door seal. This is the best way to conceal its length, but it wasn't entirely convenient.

Next, I placed the gray amplifier box directly behind the driver's seat and connected the Cell Phone Cradle Plus to

SignalBoost Mini-Mobile Amplifier

\$374.95

Wilson Electronics

www.wilsonelectronics.com



the SMA connector. The internal antenna, which wirelessly communicates with your cell phone, resides inside the Cradle Plus.

To test the Mini-Mobile, I drove to two semi-rural areas right outside of the city limits where reception is fair to poor. My LG PM-225 received only one bar of signal strength prior to linking up with the amplifier. Once I locked the phone into the Cradle Plus, the signal shot up to full bars in less than 10 seconds. What's more, I could make a clear call on the PM-225 in a location where the phone would normally search for service.

In order for your phone to receive a signal boost, it needs to rest in the adjustable cradle. Although the kit does include an earpiece, I would also recommend investing in a quality Bluetooth headset to filter out as much noise as possible. ▲

by Joanna Safford

Specs: 3.25 x 3.35 x 1 inches (HxWxD); operation frequency: 824 to 894MHz/1850 to 1990MHz; 1.5 watts max output; 31.7 dBm Max RF; 0.6 to 2A power requirement; multi-cellular support

Aten CS1782

If you want to share a monitor that uses a resolution greater than 1,650 x 1,050, traditional KVM switches may not support the use of that monitor's native resolution. The Aten CS1782 supports video resolutions up to 3,840 x 2,400, and with its Display Emulation Technology, the KVMP (KVM and peripherals) switch stored our monitor's resolution and refresh rate, so we could toggle between PCs using different resolutions without the monitor changing resolutions and rearranging our icons.

Aten also packed the CS1782 with a host of 7.1-channel audio and USB ports, so you can share speakers and multiple external USB devices between computers. The CS1782 is set inside a solid metal enclosure, and the weight of the switch helped keep the cables—which

are included with the switch—from moving the unit around.

We saw no video or audio quality degradation in our standard use and gaming exercises. When switching between our Windows test PCs, we occasionally had to wait for the mouse or keyboard to respond, but this wasn't too annoying. Surprisingly, there was no such delay when switching between Windows and Linux or Windows and

Mac systems. What did frustrate us was that we had to hold down the Input button for two to three seconds to switch inputs. On the plus side, the CS1782 can use hotkeys for every possible swapping variation, such as audio from one PC and video from another or bringing up only the video, audio, or USB hub for a PC.

Although we had a few minor issues with the CS1782, its compatibility with the highest resolutions and available ports are deal-makers. ▲

by Nathan Lake



CS1782

\$249.99

Aten

www.aten-usa.com



Specs: PC Inputs: DVI-I female (2x), USB Type B female (2x), 7.1-channel analog audio (2x); Console Connectors: DVI-I female, USB Type A female (for keyboard), USB Type A female (for mouse), 7.1-channel analog audio; Front inputs: USB Type A, mini stereo plug, microphone mini stereo plug

Rosewill Conqueror

Enter the Conqueror, Rosewill's newest gaming chassis. This midtower distinguishes itself with its prominent, seamless construction and cooling ability. But it lacks some of the user-friendly building features we'd like to see.

The black-clad Conqueror has an acrylic side panel and an eye-catching front bezel crafted with silver edges and black mesh. Conveniently, the front bezel can be reversed and opened in the opposite direction.

Despite being a smaller form factor, the Conqueror has plenty of room inside and can house up to an ATX motherboard. There are three external 5.25-inch drive bays, six 3.5-inch internal bays, and with the included adapter, a single external 3.5-inch bay. There are also seven expansion slots.

The Conqueror offers impressive cooling for its small size, with two 120mm LED fans in the front panel and one 120mm fan

in the rear. You can also add two additional fans on the side panel; there are mounts for an 80mm fan and your choice of either a 92 or 120mm fan. The included fans did a good job of keeping the system cooled and did it quietly.

The Conqueror had one irritating aspect, however. Although I was initially puzzled that the case lacked tool-less features, given its retail price, Rosewill directs its customers to NewEgg, where its much lower street price (\$69.99) makes this lack less of an issue. But some of the tooled features were undeniably difficult to work with. Take the internal drive cages, for example. Without the aid of a magnetized screwdriver, installing my hard drive was like playing a futile game of Operation. To secure the hard drive, I had to navigate the screwdriver through an outer hole, only to have the screw fall into the cage or my lap before reaching the screw hole on the drive.



Conqueror

\$142.80

Rosewill

www.rosewill.com



Specs: Bays: 3 5.25-inch external, 6 3.5-inch internal, 1 3.5-inch external. Fans: 3 (+1 optional) 120mm. Front ports: 2 USB, 1 FireWire, audio I/O

Once assembled, the Conqueror looks great and does a good job of housing and cooling components. This case is ideal for builders who need a cool place for their components, but due to a couple less-than-handly building features, don't plan to make frequent changes to their systems. ▲

by Kris Glaser

MSI P45 Platinum

MSI's P45 Platinum is a promising midrange motherboard for budget-conscious gamers and enthusiasts who don't want to sacrifice performance. Sporting Intel's mainstream P45 chipset, the Platinum is equipped to keep up with your most demanding computer pastimes.

The Platinum includes useful features such as MSI Live Update 3, which checks for BIOS updates and downloads drivers automatically so you don't have to, and Dual CoreCenter, which lets you manage your system's hardware settings from an intuitive user interface.

One of the Platinum's most notable features is its chipset heatsink, which is all-copper and fans out into five 2-inch spreaders to help dissipate heat. The CircuPipe looks weighty, but it's well-mounted and effective at cooling, not to mention aesthetically smart. This ATX mobo is also ATI CrossFire X-ready.

The Platinum is great for those desiring a cost-efficient motherboard with quality performance. If you plan to scoop this



P45 Platinum

\$189.99

MSI

www.msicomputer.com



Test system specs: 3GHz Intel Core 2 Duo E8600, 2GB DDR2; Gigabyte GeForce 9600 GT.

Specs: Socket 775; Chipset: Intel P45 Express; 1,600MHz FSB; Max memory: 16GB (DDR2-1200); Audio: Realtek ALC888/888T; Slots: 2 PCI-E x16, 2 PCI-E x1, 2 PCI; Ports: 12 USB 2.0, 6 SATA, 2 eSATA, 1 FireWire

board up on NewEgg and also need a CPU cooler, the P45 Platinum HC Edition includes Thermalright's V1 CPU cooler for an extra 30 bucks. ▲

by Kris Glaser

MSI P45 Platinum

3DMark Vantage

Overall	P3609
GPU	3122
CPU	6785

PCMark Vantage Pro

Overall	4227
Memories	3441
TV And Movies	3177
Gaming	4676
Music	4209
Communications	4134
Productivity	3915
HDD	2537
Dr. DivX 2.0.1*	3:57
WinRAR 3.71*	2:47

Cinebench 10*

Multithreaded (min:sec)	2:04
Multithreaded (score)	7085
POV-Ray 3.7 Beta**	1502.65pps

Crysis 1.1

800 x 600, Low Quality	50.2fps
------------------------	---------

* minutes:seconds

** pixels per second

*** Games tested at 1280x1024

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www.topower.com



Dual main transformers

- Balance load sharing
- Best for high watt design
- 12V generated from both transformers

Patent No.202005013110.5



Full Bridge Cable management

- Flexible to plug in any bridge
- 6 sets of 12V rails design
- Eliminate clutter and improve airflow inside the case



Fiber PCB with double layers

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- Up to 150°C utilization temperature



PowerGood LED indicator

- Self-test for normal operation



Mirror-effect coating

- Titanium-like mirror coating
- Nano technology for shielding EMI

Fry's

noweg.com

Asus EAH4870X2/HTDI/2G

World's Fastest Graphics Card Turns Red

ATI is back on top with its Radeon HD 4870 X2. And after two years in Nvidia's shadow, this card is anything but a fluke of engineering. In the September 2008 issue of *CPU*, Jen-Hsun Huang said Nvidia's goal with the GTX 200 was to design a single, incredibly fast GPU. (See page 110.) With the 4870 X2, however, ATI offers a compelling argument that two smaller GPUs are better than one really big one.

The Radeon HD 4870 X2 consists of two 956-million-transistor R770 GPUs stitched less than 1.5 inches apart on a single slab of PCB. These GPUs are manufactured on the same 55nm half-node step as the 3800 series. ATI equipped the 4870 X2 with 1,600 stream processors, 80 texture units, and 32 render backends. The core and memory clocks are set to 750MHz and 900MHz, respectively. All told, the card is capable of 2.4 teraflops of raw compute power.

ATI went with a 256-bit memory interface for each GPU, similar to the 3870 X2. But instead of the industry-standard GDDR3, Team Red decided to take a chance on GDDR5 memory, and this card has 2GB of it, for a total of 230GBps memory bandwidth.

The 4870 X2 also features vastly improved inter-GPU communication compared to the 3870 X2. The gen 2 PCI-E bridge interconnect delivers double the bandwidth (5GBps each way) compared to the 3870 X2's gen 1 interconnect. And ATI's unique sideport interconnect technology provides the GPUs with another 5GBps each way, but as we went to press, ATI hasn't enabled sideport in its drivers.

We tested the Asus EAH4870X2, which is a reference board adorned with a sticker depicting a long-haired, battle-bedecked fem. At first glance, the 4870 X2 looks nearly identical to the 3870 X2, down to the dual-slot, plastic, shrouded heatsink fan. The biggest departure for



EAH4870X2/HTDI/2G

\$549

Asus

www.asus.com



ATI is the use of black PCB and an opaque black heatsink shroud. The 4870 X2 gets its power from 6- and 8-pin PCI-E power connectors. ATI's PowerPlay Technology saves power during idle, but board power maxes out at 285 watts, a 45% increase over the 185-watt max power of the 3870 X2. The back plane features a pair of dual-link DVI ports and a HDTV video-out port. ATI also threw in support for the DisplayPort standard.

The 4870 X2 supports Direct X10.1, and at least two games on the horizon (Phenomic's *BattleForge* and Sega's *Storm Rise*) plan to showcase the Shader Model 4.1, improved antialiasing, and new HDR effects of DX10.1. Although these aren't A-list titles by any stretch, they do put a little weight behind ATI's DX10.1 argument.

As the benchmarks illustrate, the Radeon HD 4870 X2 beat the GTX 280 in 3DMark Vantage's GPU tests but stumbled a bit to the GTX 280 in *World in Conflict* and *Company of Heroes* at 1,600 x 1,200. But when larger textures come into play at 2,560 x 1,600, the 4870 X2 leaves the GTX 280 in the dust. The 4870 X2 puts up some impressive numbers, including the fastest single-card *Crysis* score we've seen. AMD deserves to be passed the crown, but we certainly haven't heard the last word on the single-GPU vs. multi-GPU debate. ▲

by Andrew Leibman

Flagship Fight

		GeForce GTX 280	Radeon HD 4870 X2
3DMark Vantage Overall		P9684	P11409
3DMark GPU Score		9672	12178
GPU1 (fps)	1,280 x 1,024	28.68	34.56
GPU2 (fps)		27.98	36.83
3DMark CPU Score		9719	9592
CPU1 (Plans/s)		1313.19	1316.1
CPU2 (Steps/s)		13.68	13
Company of Heroes (4XAA)	1,600 x 1,200	80.6	74.5
S.T.A.L.K.E.R.		88.24	92.89
Crysis		25.37	28.84
World in Conflict (4XAA, 4XAF)		38	34
Company of Heroes (4XAA)	2,560 x 1,600	45.7fps	60
S.T.A.L.K.E.R.		53.88fps	73.62
Crysis		13.30fps	21.82
World in Conflict (4XAA, 4XAF)		29	33

Driver: nForce 177.41 & Catalyst 8.7

Test System Specs: Intel Core 2 Quad Q6700 (2.67GHz), EVGA nForce 790i Ultra SLI motherboard, 2GB of 1,333GHz DDR3, a 74GB Raptor, Corsair HX1000W PSU

Specs: GPU: Radeon HD 4870 X2; Core clock: 750MHz; Memory: 2GB GDDR5 (900MHz); 1,600 stream processors

by Anand Lal Shimpi

The Larrabee Question

Here's the problem: I'm not a fortune teller.

It's a problem because I have no idea whether Intel's first fully programmable GPU, code-named Larrabee, will be a success.

Here's what I do know:

Architecturally, Larrabee is quite interesting. It's built out of an array of x86 cores, derivatives of the original Pentium, but given a very wide vector unit useful at crunching through highly parallel code—and graphics rendering code, at that. The first Larrabee may have fewer than 32 cores but, depending on how the power side of the equation works out, we may see configurations with 64-plus cores.

If Intel can get these cores to run at speeds much greater than 1GHz, we're looking at a GPU with the raw power of AMD's RV770 or Nvidia's GT200 with 32 cores. The problem is that Larrabee won't ship until sometime in 2009, when both AMD and Nvidia will be shipping GPUs that are much more powerful. If Intel can manage a 64- or 80-core version of Larrabee by that time or get clock speeds high enough (or both), then we may have a competitive high-end part from Intel. If not, then Intel will have to focus elsewhere in the market.

There's nothing saying that Intel won't ship Larrabee as a midrange part, it could very well be a GPU that targets the \$100 to \$150 market. That being said, Intel needs success at the high end, so I'm still expecting Larrabee to at least attempt to compete in the \$300 to \$500 market at first. Its success here will largely be determined by Intel's ability to execute on the software side; it'll need great drivers, and although Intel has some very important individuals working on the drivers, that's not a guarantee of success.

Then we get to the question of whether Larrabee's x86 support actually means anything. Nvidia's answer is "No," simply because Larrabee's x86 support is quite limited; it doesn't support any of the MMX or SSE additions to the x86 ISA. Larrabee supports the same x86 as the original Pentium, plus a lot of new Larrabee-specific instructions—it won't run the same applications that your current Core 2s run without a recompile.

Eventually I think we'll see Larrabee's x86 and Intel's "CPU" x86 converge, but that'll take at least four years, so there's clearly a long-term strategy at work here. But I find myself asking the same question again: Is x86 a strength?

For games, the x86 angle doesn't really matter much. Larrabee's cores are better at handling mixed sequential/parallel code than AMD or Nvidia's, but that type of code isn't really used in graphics rasterization in games. Larrabee's gaming performance will really come down to how many cores Intel can cram on a single chip and how efficient its drivers and software renderer are. Intel does have the manufacturing advantage, but it's unclear how significant that will be upon Larrabee's launch. Larrabee will be a 45nm design and TSMC should be cranking out similarly small transistors by the end of 2009.

For nongaming applications, x86 itself doesn't have any major strengths today, especially since it's not the same x86 as what Intel CPUs run. Developers often complain about the complexities of developing for Nvidia's GPUs using CUDA; they say that the threading model is too difficult to implement and the GPU lacks significant serial performance. The latter is an argument that won't apply to Larrabee, which will allow Intel to succeed in some areas where AMD/Nvidia haven't with their GPUs. The former, however, is something that could very well apply to Larrabee, as well: Developing for these highly parallel processors isn't going to be easy.

The holy grail of writing your code and have it compile and run on an arbitrary number of cores just hasn't been found yet, nor am I sure it actually exists. At this point, you have to change the way you develop to get the most power out of Nvidia's GPUs using CUDA, and it's not clear to me whether the same frustration will apply to Larrabee when it launches next year.

That being said, Intel has the best compiler team in the business, and as I mentioned a moment ago, I'm not a fortune teller. I've been racking my brain on this and many more Larrabee questions over the past couple of months, and I'm not sure I'm any closer to an answer. But answers are coming. ▲



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' "48 Hours," and Fortune. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.

Talk back to Anand at anand@cpumag.com

The Shark Tank

by Alex "Sharky" Ross

Eee PC Hits The Desktop

The Asus Eee PC has been a real smash since its inception. The company has literally created a new realm/market and absolutely dominated it in the process. Its diminutive size, extremely light weight, relatively cheap price, and trendy design has given the Eee PC line quite a following with even the enthusiast community (no mean feat). With the small form factor notebook sector taken care of, Asus has turned its attention to the desktop. The small theme keeps on rolling now with the Asus Eee Box B202 small form-factor PC. At \$349 (and also based on Intel's low-power Atom processor), this little gem promises to spearhead an assault on the low-cost desktop market.

At first glance, the Eee Box B202 looks much akin to one of those wireless routers, only much fancier. It really is that small at just 8.5 x 7 x 1 inches (HxWxD)—even smaller than a Mac Mini. (The lack of an optical drive obviously helps keep dimensions down.) Keeping with the lightweight theme, the entire unit only weighs 2.2 pounds. The front end sports a trim cover door (somewhat flimsy, I might add) that opens access to the Power button, the hard drive activity light (a nice blue LED), an SD/MMC flash card reader, and twin USB 2.0 ports, as well as the headphone and mic jacks. The rear end sports the DVI output (there's a VGA adapter just in case), another couple of USB 2.0 ports, a Gigabit Ethernet port, and the stereo S/PDIF line output jack. There's also a small screw-in port for the wireless antenna.

The guts consist of an Intel Atom N270 processor with HyperThreading, clocked at 1.6GHz, running with a 533MHz front side bus with 1GB worth of dual-channel DDR2-400 memory. The platform chosen is the Intel 945GSE Express mobile chipset sporting onboard graphics in the GMA 950. The stellar ICH7 southbridge takes care of all the I/O, SATA, USB, and Gig-E LAN goodness. Storage is taken care of with a small form-factor 2.5-inch low-power 5,400rpm Seagate 80GB hard drive, usually found in laptops.

The bundle remains small and includes a users manual (mine's still sealed), a 65W power adapter, vertical stand, quick start guide, and a couple of DVDs, one for the system recovery and the other with tools for tweaking. The included USB keyboard and mouse are sadly not wireless (boo!) and rather cheap feeling/looking. I'd replace those with some wireless units pronto.

In terms of the BIOS, Asus has included options for a bit of overclocking. How nice. Bumping up the BIOS settings, the Atom N270 can be overclocked to 1.75GHz and the memory from 400MHz to 584MHz, and it will still run very stably. Modding and upgrading the Eee Box is obviously something that Asus left wide-open to the end user. I can totally see folks installing faster and higher-capacity hard drives and/or quicker and larger memory modules.

The Eee Box B202's performance is obviously not exactly mind-blowing, but the Eee Box seems right at home with all of your usual Web browsing, email, and other "useful" tasks. As far as HTPC buffs go, I don't think we're there yet. 1080p playback was just not up to snuff so Blu-ray is out, unless you run at 720p (which worked fine).

One thing you really notice when using the Eee Box B202 is that all of the "low-power" hardware also means it's a very quiet experience indeed. Using PCs for all these years, it's almost as though my ears have become accustomed to CPU fans, hard drives, and optical drives all clanking away together. I'd put it akin to the constant hubbub of living in Central London all your life and then moving to the countryside. Peace and quiet is certainly appreciated. For now the Eee Box B202 runs Windows XP, although there are plans for even lower-cost Linux-installed versions at a later date. ▲



Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently overclocks/tunes Porsche 996 Turbos with www.sharkwerks.com when he's not tweaking PCs.

Email me at sharky@cpumag.com

The apple doesn't fall far from the tree.



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Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

Mods & Ends

NZXT Avatar

Anyone who has made the switch from a run-of-the-mill mouse to a high-end gaming mouse has firsthand knowledge of the benefits a superior gaming mouse offers. Gaming mice tend to have more solid construction, better balance, and more responsive sensors. To date, this market has been dominated by the likes of Logitech and Razer. But NZXT also recently entered the fray with the new Avatar (\$59.99; www.nzxt.com).

Aside from its ambidextrous design, the NZXT Avatar offers a number of useful features and benefits. For one, the Avatar is outfitted with a 2,600dpi optical sensor for high sensitivity, responsiveness, and accuracy. The mouse also features an LED indicator, which gives you a visual indication of the mouse's DPI setting. Thanks to an integrated four-way switch you can tweak the Avatar's DPI on the fly. The Avatar also features a 5.8MPps (megapixels per second) image processor with a max frame rate of 6,469fps. In addition to the aforementioned features, the NZXT Avatar also sports seven programmable buttons and a

NZXT recently released the 2,600dpi Avatar gaming mouse with seven programmable buttons and an LED DPI indicator.



rubber gripping surface that helps avoid slipping during intense gaming sessions.

Scythe Kaze Master 5

The bay-bus fan controller market is filled with products that cater to many different types of enthusiasts. At one end of the spectrum are the over-the-top models loaded with blinking lights, LCDs, meters, switches, and knobs. But at the other end, you'll find more subtle offerings, such as the Scythe Kaze Master 5.25-inch bay fan controller (\$39.99; www.newegg.com).

Unlike many of the company's elaborate CPU coolers, the Scythe Kaze Master (available in black or silver) has a slick, understated appearance. It can control and monitor up to four fans and report temperature data recorded from four independent thermal sensors. The fan controller manipulates the output voltage for fan speed adjustment with a range of 3.7V to 12V, or it can stop the fans altogether. The unit can display temperature data in Celsius or Fahrenheit, along with fan speeds, on its basic digital display. And if you like the unit's sleek appearance, then you'll also appreciate the fact that the Kaze Master's



The Scythe Kaze Master can control and monitor up to four fans and detect temperatures from four thermal probes.



Upgrade your mouse's Teflon feet and make it slide like new with the SteelSeries Glide gaming stick-on mouse glides.

screen almost completely disappears when powered off, for a very clean look.

SteelSeries Glide

Is it time to spruce up that tired gaming mouse of yours? If so, check out the SteelSeries' line of Glide stick-on mouse glides. As their name suggests, the Glide G stick-on mouse glides (\$4.99; www.steelseries.com) easily attach to many popular gaming mice (suffixes such as G/MX, MS, and Ikari indicate pads for Logitech, Microsoft, and Ikari mice, respectively) and improve glide by minimizing friction between the mouse and mouse pad. If the feet on the underside of your mouse have seen better days, these babies could be just the ticket.

Fashionably Fresh Firmware

D-Link DIR-855 Wireless Broadband Router (v1.11)

A recent update for the D-Link DIR-855 remedies an SDK configuration data reset problem and an issue with FTP SPI and WEP 11b/g.

www.dlink.com

Pioneer DVR-116D DVD-R (v1.06)

The latest update for Pioneer's DVR-116D internal DVD burner increases write performance and reduces DVD burn times with certain media.

www.pioneer.com

Linksys WRP400 Wireless-G Broadband Router (v1.00.06)

A firmware update for the Linksys WRP400 adds a number of features and corrects a handful of bugs, including the following issues: Internet Access Restriction feature, incoming logging when Port Range Triggering is enabled, and DHCP lease time.

www.linksys.com

by Marco Chiappetta

The 10X Challenge

To Take On The Fastest, We Make The Fast Faster

PC enthusiasts have it rough. Building a fast system takes a lot of coin. Keeping it on the bleeding edge requires even more. There's just no getting away from the fact that being a PC enthusiast is expensive.

Of course, to offset the price of constant upgrades, many enthusiasts turn to modding in an effort to increase the performance of their systems, essentially for free. As regular readers of *CPU* know, this section is dedicated to the art of PC modding; over the years, we've modded everything from graphics cards to keyboards. We don't often perform multiple mods in a single issue to see how a concert of upgrades affect system performance.

With that in mind, we wondered: Would it be possible to mod multiple components in a system and make it perform like a rig costing many times more? By strategically choosing components and modding them all, could we make a system perform like one that costs twice as much? Fives times?

The Peak Of Performance

As of now, the pinnacle of desktop performance is Intel's Skulltrail platform. For



those that don't know, Skulltrail consists of a dual-socket Intel 5400 series-based motherboard, some FB-DIMMs, and a pair for Core 2 Extreme QX9775 processors (each with four cores running at 3.2GHz). As you probably expect, the components we picked for our Skulltrail system cost a pretty penny.

Intel's D5400XS motherboard is the foundation of the Skulltrail enthusiast platform. Its strength—the ability to use a pair of Core 2 Extreme QX9775 processors for a total of eight 3.2GHz execution cores. It has one weakness: the required use of slow FB-DIMMs.

Although not a necessity for every Skulltrail system, we wanted a high-end graphics configuration in our rig. We picked a pair of Nvidia's current flagship graphics cards, the GeForce GTX 280. (A couple of Radeon HD 4870 X2s would have been an option, as well.) As you can see, the core components alone for a system like this cost upwards of \$5,000.

Please note: We chose not to list the other components in the system (case, optical drives, etc.) because they had much less of an impact on our system's overall performance in our benchmarks and can vary greatly in price depending on your individual tastes and needs.

The Peak Of Price/Performance

To take on the high-end Skulltrail system, we settled on a group of core components that strike a balance between price and performance. None of the parts we chose are "best-in-class" components, but they all offer excellent value, and, more importantly for us, have significant headroom for overclocking. At under \$900, the challenger's core components were 5.5 times less expensive than the Skulltrail system.

We chose the 2.5GHz Core 2 Quad Q9300 for a few reasons. First, the CPU has proven to be highly overclockable. Second, the Q9300 is the most affordable Penryn-based quad-core processor currently in Intel's product lineup that has a relatively large 6MB L2 cache. Finally, because the Q9300 is only a 95W

Princely Performance At Pauper Prices

It's easy to build a screaming rig with unlimited funds, but most of us have to build on a budget. Below are the core components of our systems and what each part cost.

- Core 2 Extreme QX9775 (x2): \$3,100
- Intel Skulltrail D5400XS: \$659
- 8GB Kingston KVR800D2D4F5K2/4G FB-DIMM (x2): \$426
- GeForce GTX 280 (x2): \$800

Total Cost: \$4,985

- Core 2 Quad Q9300: \$259
- Asus P5Q Deluxe: \$199
- AMD Radeon HD 4850 (x2): \$300
- 4GB Corsair TWIN2X4096-8500C5D Dominator memory: \$139

Total cost: \$897

processor, we can overclock it using the stock cooler.

We wanted a P45-based motherboard because the chipset is known for its low power consumption and high overclockability. Choosing the Asus P5Q Deluxe was a bit more difficult because there are more affordable motherboards available that would have likely done the job as well as the P5Q. But we knew we wanted a decked out P45-based motherboard, and the P5Q Deluxe goes one step further by including a very complete, tweaker-friendly BIOS.

We thought picking the Corsair TWIN2X4096-8500C5D memory kit was somewhat of a no-brainer, due to its relatively large 4GB capacity, overclockability, and affordable price. And the graphics cards were an easy choice, too. Currently, the Radeon HD 4850 represents one of the best, if not the best, values in graphics cards. We decided to pair two Radeon HD 4850 cards together for the relatively strong performance and value, as two cards were available for just under \$300.

No Core Component Left Unmodded

Obviously, the components we chose would be no match for a Skulltrail-based



Pushing the pixels on the Skulltrail reference system were a pair of Nvidia GeForce GTX 280 cards running in an SLI configuration, which is one of the fastest graphics setups currently available.

Performance: Side-By-Side Comparisons, Before & After The Mods

To show the performance differences between an ultra high-end Intel Skulltrail-based machine and the much cheaper modded challenger machine we assembled for this project, we put together a simple chart with benchmark scores recorded for each configuration. The chart consists of scores produced by the stock Skulltrail system, vs. the stock challenge system, and vs. the modded challenge system. As a final data point, we have also listed the performance differentials for each test, reported in as a percentage gain or loss.

We ran the benchmarks on Windows Vista Ultimate SP1, which we installed on a Western Digital Raptor 150GB hard drive. We used the latest official video drivers available for the respective graphics configurations (as of this writing, Nvidia ForceWare v177.41 and ATI Catalyst v8.8).

So, how much faster (or slower) was our modded system in comparison to the uber powerhouse that is Skulltrail? Somewhat surprisingly, the benchmarks are split, although where the Skulltrail system wins, it wins big. In the benchmarks that are most affected by CPU cache size and compute performance, namely the synthetic tests that are part of the SiSoft Sandra XII SP2 suite and the multithreaded 3D rendering tests,

the Skulltrail system blew the doors off our relatively low-cost modded rig. In the more memory bandwidth and graphics intensive encoding and game tests, however, the scores are much closer. (Of course, being saddled with slower 800MHz memory didn't do Skulltrail any favors.) LAME MT, for example, only utilizes up to two threads, so our modded PC's higher-clocked quad-core processor was able to overtake the octal-core Skulltrail configuration, because six of Skulltrail's eight cores went unused in that test.

In the gaming tests, our modded system's ATI Radeon HD 4850 CrossFire configuration was able to outpace the GTX 280 tandem used in the Skulltrail rig in the high-resolution Half Life 2: Episode Two benchmark. The low-resolution Crysis benchmark also favored our modded system, because of its higher processor clock and increased memory bandwidth.

Ultimately, the sheer power of an octal-core Skulltrail rig, with 8GB of RAM and a pair of GeForce GTX 280s, was too much for our modded challenge system to handle according to the benchmarks alone. But keep in mind the modded system's price is only a fraction of the Skulltrail rig. The performance crown may belong to the Skulltrail system, but our modded challenge system is clearly the better value.

system on their own. Each of the components needed some tweaking and modification to wring the most performance from our challenger system. We've covered many of these mods in prior issues. For example, we polished both the processor's integrated heat spreader and the base of the stock heatsink to mirror finish. We replaced the basic TIM (thermal interface material) supplied on the stock heatsink with a higher quality TIM from OCZ, called Freeze. By doing so, we hoped for lower temperatures and better stability during overclocking.

To actually overclock the processor, we had no choice but to increase its voltage and FSB frequency, due to the fact that the Q9300 cannot have its multiplier increased like an Extreme Edition CPU. By increasing the processor's voltage to



The Intel P45 chipset at the heart of the Asus P5Q Deluxe motherboard is the current darling of the modding community due to its relatively low cost, strong performance, high overclockability, and low power consumption.

1.35V and slowly increasing the FSB frequency to 444MHz via the P5Q Deluxe's system BIOS, we were able to take the Q9300 up from its default clock speed of

	Intel Skulltrail Core 2 Extreme QX9775 (x2) @ 3.2GHz with GeForce GTX 280 SLI	Core 2 Quad Q9300 @ 2.5GHz with Radeon HD 4850 CrossFire	Core 2 Quad Q9300 @ 3.3GHz with OCed Radeon HD 4850 CrossFire	Performance Differential: Modded PC vs. Skulltrail
SiSoft Sandra XII SP2				
Processor Arithmetic				
Dhrystone ALU	104,512	42,652	57,064	-83.1%
Whetstone iSSE3	83,818	35,248	46,881	-78.8%
Processor Multimedia				
Integer x8 aEMMX/aSSE	843,519	323,864	433,372	-94.6%
Floating Point x8 iSSE2	546,735	155,608	208,516	-162.2%
Memory Bandwidth (MBps)				
Integer Buffered iSSE2	4,821	7,065	7,503	+35.7%
Floating Point Buffered iSSE2	5,116	7,108	7,546	+32.2%
Futuremark 3DMark06				
CPU Benchmark	6448	3781	4958	-30.1%
LAME MT MP3 Encoding (minutes: seconds)				
Single-threaded	0:42	0:56	0:40	+5.0%
Multithreaded	0:29	0:38	0:28	+3.6%
Cinebench R10				
Single-threaded	3,910	2,816	3,854	-1.5%
Multithreaded	23,298	9,764	12,476	-86.7%
KribiBench v1.1 (FPS)				
Sponge Explode Model	7.04	3.96	5.39	-30.6%
Ultra Model	20.27	14.91	19.96	-1.6%
Half Life 2: Episode Two				
CPU Test (800 x 600, low quality)	182.63	144.34	186.42	+2.0%
GPU Test (1,920 x 1,200, high quality, 4XAA/16XAF)	158.32	131.56	168.84	+6.2%
Crysis SP Demo (FPS)				
CPU Test (800 x 600, low quality)	111.18	102.04	129.41	+14.1%
GPU Test (1,920 x 1,200, high quality, No AA/AF)	67.94	43.96	48.32	-40.6%

2.5GHz to a fully stable 3.33GHz—an increase of approximately 33%.

Of course, increasing the system's FSB also had affected the memory frequency. The P45 chipset-based Asus P5Q Deluxe motherboard offers a number of different memory divisors in its BIOS. And with a 444MHz FSB, we had the ability to choose memory speeds ranging from 1,066MHz to over 1,200MHz. But, to maintain stability we settled on a memory frequency of 1,113MHz, which is a slight increase over the Corsair TWIN2X4096-8500C5D's rated frequency of 1,066MHz.

Then we turned our attention to the Radeon HD 4850 cards. The Radeon HD 4850 is known to run very hot, so we polished the base of each of the Radeon's coolers and replaced the stock TIM. From the



No graphics card currently on the market can match the sheer value of the Radeon HD 4850. A pair of these cards running in a CrossFire configuration offers more than enough horsepower for any game, and they can be had for under \$300.

factory, the Radeon HD 4850 sports a GPU clock speed of 625MHz and a memory frequency of 993MHz. But by modding the cooling setup and tweaking the GPU core and memory frequencies via the overdrive tab available within ATI's

Catalyst driver suite (which is just as suitable for overclocking as third-party utilities when you're not dealing with volt mods or aftermarket cooling), we were able to take those clock speeds up to 695MHz (core) and 1,090MHz (memory).

The End Result

We weren't quite able to match the performance of the Skulltrail system, despite our efforts. But, our modded system performed exceptionally well for the price. For those who wouldn't mind spending a few more dollars, aftermarket cooling hardware for the graphics card and CPU and perhaps some higher-clocked memory could have pushed performance further. ▲

by Marco Chiappetta

Mad Reader *MOD*

A Poppin' Shade Of Blue

When James "G_Rider" Haladus says "everything's custom," he means it. A CNC (computer numerical controlled) machinist by day, Haladus put his skill to good use when crafting his top-to-bottom redesign of Tagan's Black Pearl ATX case. The result was an impressive creation that left no detail overlooked or unpolished. Although it's bereft of some of the unique features we saw at CPU's Ultimate Case Mod Competition, held at Nvision 2008, the Blue Pearl nonetheless reflects not only Haladus' perseverance but also his keen, meticulous attention to detail.

Blue Pearl was born out of Haladus' need for a heartier watercooling system. "I was looking for a case that I could mod to my watercooling needs," he says. "I was trying to put in the biggest radiators as possible."

"I figured I needed to have two loops and wanted it to be as big as it could be. I started with two 240 [radiators], and then moved to 360s. I thought, 'Why not two 480s?'"

"At that point, I thought this would be the setting-off point for the rig. It came down to a millimeter to get everything to fit."

Haladus really did pull off quite a feat when modding the Blue Pearl. By stuffing both radiators, pumps, and tanks within the chassis, the Blue Pearl's dual watercooling system is fully self-contained. The system's CPU and motherboard bridges are connected to the first loop, and the GPUs and hard drives share the second loop.

The Blue Pearl is no slouch in terms of hardware, either. Haladus used an Intel E8400, which he overclocked to 4.4GHz. He added 4GB of Corsair DDR3-1,333 memory and two BFG GeForce GTX 280s in SLI. The Blue Pearl uses two 74GB Western Digital Raptors for performance, and a 500GB Seagate drive supplies the mass storage.

Haladus estimates he spent seven to eight months on the build, and everything from the custom automotive-grade paint job inside and out (even the memory fan block was repainted to match) to the case windows is done to perfection. Each wire and cable is individually sleeved, and Haladus says that he used no more than five zip ties throughout the case.

"Everything's cherry," Haladus says. "It's the cleanest case mod in my life, and I'm proud to say I made it." ▲



Haladus made sure every square inch of his rig—inside and out—was modded to match, including the memory fans for Blue Pearl's Corsair Dominator RAM.



A row of four 120mm fans line the bottom of Blue Pearl on each side, but it's what's behind that fans that is really impressive: Haladus stuffed two 480 radiators in the case.



The slick, flawless paint job caught our eye and drew us in. Haladus says automotive-grade paint coats just about every paintable surface on the system.



A pristine back panel shows off Blue Pearl's two-tone color scheme. The custom-cut top-panel windows provide a top-down look at the Blue Pearl's meticulously cabled interior.



Blue Pearl is more than good looks. Haladus dropped in two watercooled GeForce GTX 280s for his graphics subsystem.



A pair of Danger Den tanks rest in the Blue Pearl's drive bays. Haladus says that heating concerns his old rig presented were one of the primary reasons he embarked on this mod.

Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreaderm@cpumag.com. We're looking for rigs that are recognizable as PCs; your Wookiee mod won't find a home here. If we include your system in our "Mad Reader Mod" section, we'll help you load up your modder's toolbox with \$1,500 and a one-year subscription to *CPU*.

Nvision 2008

Inaugural Visual Computing Expo Proves It's All About The Graphics

Bigger is better. This philosophy certainly played out in the closing days of summer as Nvidia took over the San Jose (Calif.) Convention Center and several surrounding buildings for Nvision 2008.

As amateur and professional gamers, graphics professionals, vendors galore, developers, and even a few scientists swarmed downtown San Jose from Aug. 25 to 27, it was readily apparent that Nvidia wanted to put everything under the visual computing umbrella on display. Indeed, there was truly something for everyone.

Nvidia CEO Jen-Hsun Huang welcomed everyone to the party in his keynote address, which served as an overview of what Huang called Nvidia's "ecosystem"—a broad, diverse collection of industries in which graphics processing plays a major role. As he covered topics such as stereoscopic gaming, GPGPU applications, and multitouch computing interface, Huang welcomed big names in their respective industries. Marv White, CTO of Sportvision (www.sportvision.com), Joshua Edwards of Microsoft Live Labs (livelabs.com), and Jeff Han of

Perceptive Pixel (www.perceptivepixel.com) shared the stage to discuss Sportvision, Photosynth, and multitouch technologies, respectively. Many others shared the stage with Huang, as well, including "Battlestar Galactica" fan favorite Tricia Helfer, who explained some of the benefits (and challenges) of bringing cutting-edge CGI to the TV and film industry.

Although there was plenty on display at Nvision, Team CPU spent most of its time in the eye of the storm, the San Jose Convention Center, which housed both

CPU's Ultimate Case Mod Challenge

Baseball has the World Series. Football has the Super Bowl. At Nvision 2008, *Computer Power User* sponsored the Ultimate Case Mod Challenge, and the level of talent that turned out was some of the best of the best. In fact, any of the top five rigs could've taken top honors at prior mod competitions.

Several modders started with a stock case and proceeded to gut the internals, fully customizing a computer case to fit their unique needs (whether it be for unparalleled performance, astonishing aesthetics, or both). Others created cases from scratch, and some of the finished systems were unlike any we'd ever seen.

Based on the level of craftsmanship we witnessed, picking our winner was the case mod competition equivalent of a photo finish. In the end, we let the spirit of the competition—

modding a case to produce a masterpiece—determine the winner. The following five systems were a cut above the rest:

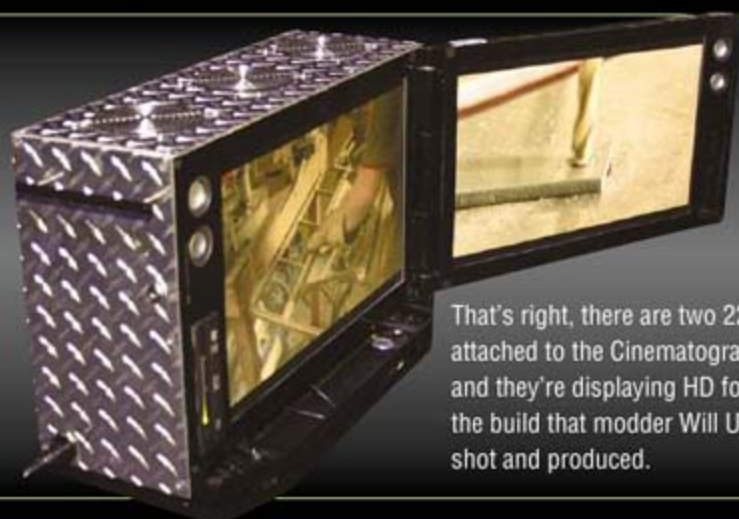
Top 5 mod: Cinematograph HD. Recent film school graduate Will Urbina wanted an ultimate HD system. Realizing nothing on the market would suit his needs, Urbina took matters into his own hands. While many of us would be content with a single 22-inch widescreen LCD, Urbina doubled down and built a duo of Hanns G displays into the Cinematograph HD.

The exterior of the case has a durable, industrial (yet polished) look, and the hinged side "panel" opens to reveal the two 22-inch LCDs that are amazingly tucked into the case. Urbina also attached hinges to the bottom panel, which lets you tip the entire case back, revealing a stowaway compartment

that houses the system's keyboard and mouse. The Cinematograph HD is the closest thing we've seen to an all-in-one HD creation station.

Top 5 mod: Overkill. "Handcrafted" is almost an unflattering understatement when it comes to describing Jeremiah Avery's behemoth of a rig. Eschewing a watercooling setup, which seems to be par the course for today's modded systems, Avery relied on ferociously powerful, yet ferociously loud, fans to blast Overkill's wickedly powerful internals with a steady stream of gale-force winds.

To build a home for his hardware, which consisted of an Intel Q9450 and a hat trick of GeForce GTX 280s in 3-Way SLI, Avery relied on hand tools, steady hands, and a keen eye. A friend draped the Overkill in a custom paint job to give the system a polished exterior to match its meticulously crafted interior.



That's right, there are two 22-inch LCDs attached to the Cinematograph HD, and they're displaying HD footage of the build that modder Will Urbina also shot and produced.



Three GeForce GTX 280s and an absurd amount of air-cooling make up Overkill's impressive payload.





Nvidia didn't take the subtle approach when decorating the front of the San Jose Convention Center. Almost 10,000 people attended Nvidia's first visual computing extravaganza.

Third place: Battlestar Galactica. If Tricia Helfer had stopped by the GeForce LAN, we have no doubt that she would have done a triple-take at Brian Carter's imposing system. Aside from a side-panel window that revealed the Battlestar Galactica's internals, there was little we could find beyond the system's size that would distinguish it as a PC.

We first saw the Battlestar Galactica in February at PDXLAN, but Carter said it was still a work in progress. We're glad he waited until Nvision 2008 for the official unveiling. The case is modded to resemble the eponymous TV series' spacefaring battleship, the Galactica, complete with rear-facing engine pods and a Viper landing bay with working landing lights. Carter went the extra mile to complete the look by additionally modding his LCD and keyboard to match. It doesn't take a "Battlestar" fan to appreciate the spectacular quality of this mod.

Second place: Rogue. If this were a custom PC build competition instead of a case mod challenge, giving the Rogue the gold would've been a no-brainer. Builder Craig Brugger incorporated a number of slick concepts we wouldn't mind incorporating into our own next build (provided we had the skill to pull it off). Rogue's case certainly demonstrated Brugger's modding prowess, with features such as a built-in 10.1-inch LCD, cut side panels with exceptional acrylic artistry, and a removable top panel containing six fans that were wired to an electrical contact. This let Brugger remove the top panel quickly without having to disconnect Molex power connectors that are common to case fans.

Despite the Rogue's carefully customized exterior, it was the system's guts that impressed us the most. Rogue's centerpiece was a system within a system: A pico ATX

motherboard, which Brugger mounted along the Rogue's front panel, operated independently from the main system, primarily as a fileserver with a 1TB mass storage drive. But Brugger didn't stop there. He internally networked the two systems and linked their desktops (yet each desktop could operate independently). While the Rogue itself was turned off, saving power, the internal pico ATX system remained humming along as a file server. Did we mention it had a system within a system?

First place: Blue Pearl. We like to think we can spot a case mod that requires a painstaking effort to polish and refine every last detail, and we found that in James Haladus' Blue Pearl. Haladus started with a Tagan Black Pearl case but ended with a creation that was totally his. We got up close and personal with the Blue Pearl for this month's Mad Reader Mod, so check it out on page 42. ▲

Everything about this rig is "Battlestar Galactica," right down to the display and keyboard.



Craig Brugger's Rogue had plenty of surprises in store, including a system within a system, thanks to a pico ITX motherboard carefully mounted behind the Rogue's front panel.





For this crew, gaming at Nvision was most definitely serious business.

the GeForce LAN and ESWC (Electronic Sports World Cup; www.eswc.com). Based on the sheer floor space devoted to these events, it was clear that Nvidia was intent on providing a high-quality atmosphere for the people responsible for fueling Nvidia's empire: gamers.

LAN Party, Nvidia-Style

Gaming took center stage, with distinct areas partitioned for professional ESWC tournaments, casual pick-up and organized tournaments, a Guinness World Record attempt, and workshops/vendor exhibitions.

PlayStation 3 consoles, CyberPower and Maingear desktops, and Alienware laptops lined the periphery of the GeForce LAN floor, giving passersby the opportunity to test their skills in Crysis Wars, Call of Duty 4, and Guitar Hero: Aerosmith.

The GeForce LAN afforded those who wanted to game the opportunity to play virtually unabated from 8 a.m. Monday until the closing ceremonies kicked off Wednesday at 3 p.m. And Nvidia rolled out the green carpet (literally) for the 800-plus who attended the BYOC LAN. An enormous mosaic of Václav Pajkrt's

"Growth of Cubic Bacteria," which took first-place honors the NVArt competition, covered the façade of the SJCC, and green-dyed water spouted forth from the fountain in front of the building; even to the unaware, Nvidia was here to paint the town green.

Once the GeForce LAN gamers arrived at their reserved table spaces and plugged into the power and LAN connections (Nvidia hauled in over 10 miles of Ethernet cable to ensure everyone had a connection), they were able to enjoy pickup games of some of the most popular multiplayer titles. Call of Duty 4, Team Fortress 2, and Command & Conquer 3 were especially popular, and Nvidia also reserved an alcove of computers for official tournaments of CoD 4, TF 2, World in Conflict, Unreal Tournament 3, and Guitar Hero: Aerosmith. (PS3 consoles were used for GH: Aerosmith.) And yes, plenty of hardware prizes were doled out.

Class Is In Session

Of course, there was plenty to do for attendees who wanted to take a break from the nonstop fragfest. The SJCC's Exhibit Hall hosted dozens of Nvidia partners showcasing their latest wares, but there were also a handful of presentations that focused on topics that power users live and breathe. Particular topics of interest were "Build an Inexpensive Gaming PC," "Overclocking & Exotic Cooling," and "Mod Your CPU Case." And for gamers hoping to pick up a few pointers to use in the GeForce LAN's official TF 2 tournament, pro gamers from Team Pandemic offered their expert advice to get a rocket launcher up on the competition in Valve's multiplayer FPS.

At the Evga booth, k|ngp|n and Shamino showed attendees the definition of extreme overclocking, dumping gallons of liquid nitrogen over a CPU and GPUs strapped into an Evga FTW motherboard to achieve a massive overclock. Attendees were also invited to guess k|ngp|n and Shamino's resulting 3DMark Vantage Performance score (the duo exceeded 29,000 3DMarks) for a shot at a tricked-out gaming system.



Evga brought in hardcore overclockers Shamino and k|ngp|n and let them run wild with liquid nitrogen and an Evga FTW motherboard.

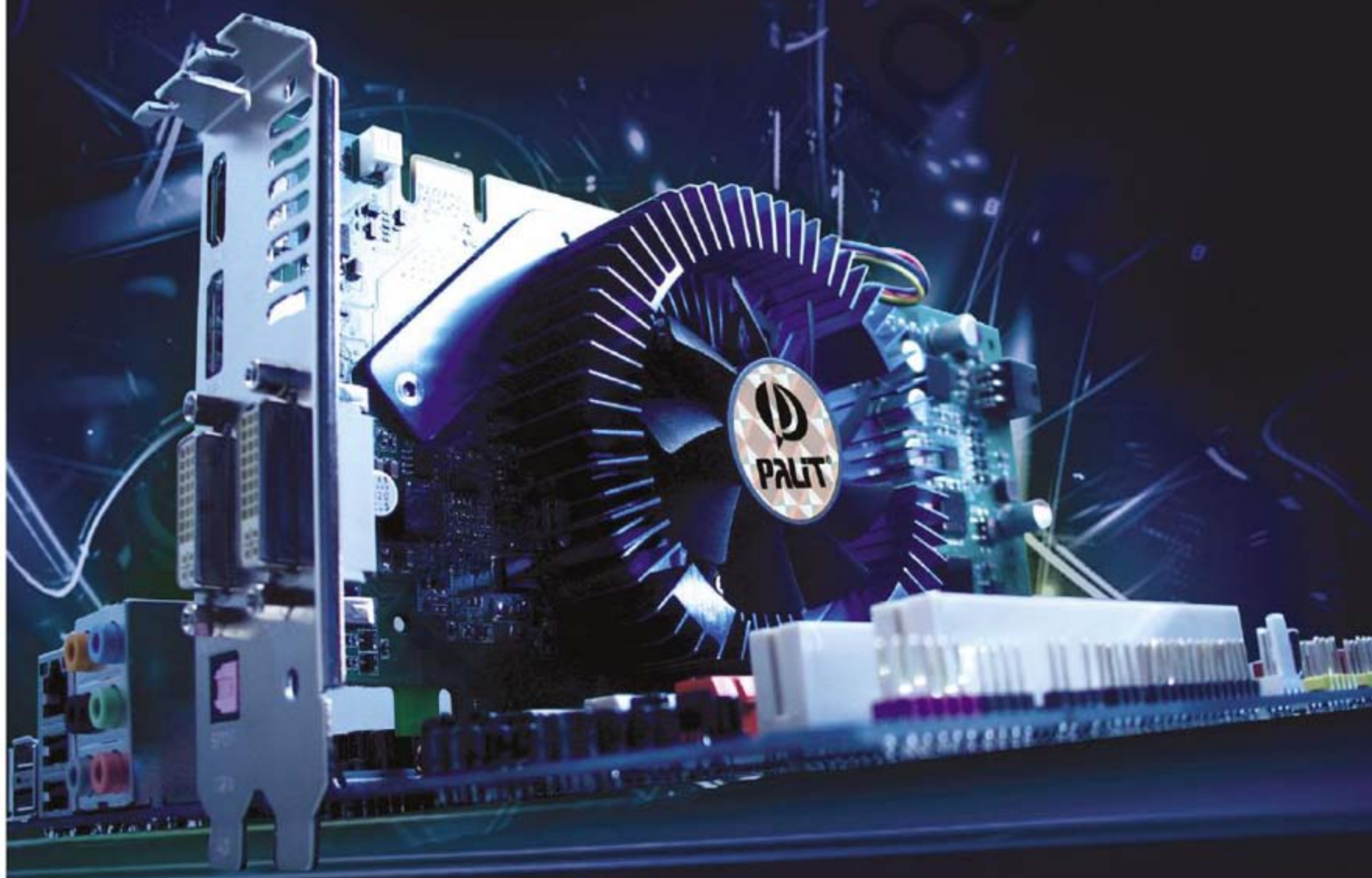


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Mythbusters Adam Savage and Jamie Hyneman show off the finished product of their giant "GPU"—the "Mona Lisa," paintball-style.



& Then Some

As the three-day BYOC LAN buzzed, the SJCC also included events we like to call "gaming with a purpose." For starters, 203 brave souls set a Guinness World Record by gaming against each other (Nvidia didn't set restrictions on playing a particular videogame) nonstop for 36 hours. Participants were allowed one 10-minute break for every hour spent gaming during the attempt and could roll several breaks over into one or more larger breathers, but many of those gunning for the record looked as though they were good to go with considerably less time off.

All gamers who signed up received a "Guinness World Record" attempt T-shirt and Club SLI status, and Nvidia heaped rewards on those who successfully completed the attempt. At the end of the successful attempt, piles of empty Bawls cans lined the tables, as well as a few exhausted warriors who decided the distance to travel to an actual bed was too far to walk for sleep. Nvidia also recognized the new record holders on stage at Nvision's closing ceremony.

While the Guinness World Record attempt rolled on through most of the three-day LAN, casual gamers shared the floor with gaming clans from 53 countries

competing in the ESWC. These pro gamers battled it out in Counter-Strike, Quake III, Warcraft III, Trackmania Nations, and Defense of the Ancients. Tournament games spread across three days, as well, with quarterfinal matches beginning on Monday and finals on Tuesday and Wednesday.

For those interested in checking out the next evolution of 3D gaming, Nvidia also put together a bank of computers equipped with stereoscopic gaming hardware. Stereoscopic gaming, a technology that requires compatible displays and special glasses (think of the red-and-blue-lensed 3D glasses of yesteryear, with a few upgrades), adds even more depth to in-game 3D graphics. Anyone who attended Nvision 2008 could stop by for a firsthand glimpse (literally) of the emerging technology, which should be released later this year.

Out With A "Splat"

Even as the last tournament wrapped up, the last professional seminar ended, and the last can of Bawls was quaffed, one trick remained up Nvidia's green sleeve. After a short recap of the conference's highlights, Jamie Hyneman and Adam Savage of "MythBusters" fame took the stage to

demonstrate the difference between a CPU and GPU in true "MythBusters" style.

Relying on the engineering mindstorms that make them famous, Hyneman and Savage used mechanized paintball guns to demonstrate how CPUs and GPUs work. To show how a CPU processes data, the duo used a single paintball gun strapped to a small, remote-controlled arm and programmed to blast a smiley face image on a canvas, one paintball at a time. To demonstrate how a GPU uses parallel processing, Hyneman and Savage lifted the curtain on a series of hundreds of barrels, each loaded with a single paintball and connected via hoses to an enormous tank of compressed air. Using Leonardo da Vinci's "Mona Lisa" as inspiration, the pair fired all the paintballs at once, illustrating how a GPU worked its magic in a simple, yet wholly awesome and entertaining, fashion.

It's difficult to encapsulate the visual computing bonanza that rocked San Jose, so use www.nvision2008.com as a starting point if you want to fully indulge yourself. Nvision will be back in 2009, and if the sophomore follow-up is anything like the inaugural event, it'll be another graphically good time. ▲

by Vince Cogley



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Derek K. asked: I’ve been keeping tabs on all of the various low-power, low-profile, low-cost machines coming to market these days, like the Eee PC, MSI Wind, Dell’s Mini Inspirons, and more interestingly for my purposes, some of the low-cost desktop variants such as the upcoming Dell Studio Hybrid and Asus Eee Box desktops. I love the ultra-small form factor of these new machines and the cool, quiet, ultra-low power designs they’re based on with Intel’s Atom CPU. From what I’ve seen online so far, these machines come with larger standard spinning hard drives, larger amounts of system memory, and integrated graphics. The way they’re set up, it appears that they should be able to not only double as a business-class desktop but also as a home-theater PC with DVI and S-Video outputs. What are the chances these types of machines will have the horsepower and features I want to get the job done? I want to output HD resolutions for my digital video content and also attach some external storage where possible, most likely across a network. Am I just dreaming here?

A: We’ve been coveting those tiny form-factor low-power boxes just like you, Derek, and have had many of the same questions crop up along the way. While it’s true that machines such as the Asus Eee Box definitely are small, sleek, and stylish enough to blend in well as an HTPC, we’d caution that you look deeper into their tech specs before taking the plunge on any of these recently introduced Atom-based machines. Most all of them have integrated graphics based on Intel chipset technology. With the exception of Intel’s latest G45 series chipset, with its integrated X4500HD graphics engine, none of the previous generation chipsets have onboard hardware processing for H.264 or VC-1 HD decoding. To date, all of the Atom-based machines we’ve seen thus far are based on Intel’s previous generation chipsets with integrated graphics, such as the 945G/GMA950 in the Eee Box, which just won’t cut it. As a result, all of the processing workload for HD video decoding will be handled by the Atom CPU.

We specifically took a look at the Asus Eee Box at Hot Hardware.com (www.hothardware.com/Articles/Asus-Eee-Box-B202-Desktop-System) and determined that it could handle 720p HD video processing pretty well, but it fell far short in our 1080p tests, with lots of dropped frames, stuttering, and hang-ups. It turns out, in this configuration, that the system’s 1.6GHz Atom CPU just wasn’t up to the task all by itself. However, the Dell

Studio Hybrid system you mentioned here certainly does have the makings for a solid HTPC.

The new Dell Studio Hybrid, though it too is based on a previous-generation integrated Intel G965/X3100 chipset (we're waiting with bated breath for some hint of a model based on the G45), also has a more powerful Core 2 Duo mobile dual-core CPU under its hood for much more processing power. You can actually configure the system up to a 2.6GHz Core 2 Duo T9500 CPU currently, though you won't need that sort of power for HD video decoding alone. A quick trip through Dell's online configuration system offered a Studio Hybrid with 2GB of system memory, a 160GB 5400RPM SATA hard drive, a slot-load Blu-ray disc combo DVD+/RW & BD-ROM drive, and Windows Vista Home Basic, for \$799. Though it runs a little over twice the price of the Eee Box, it's definitely more capable for your home-theater purposes and also comes with an HDMI output, as well as DVI.

Lee H. asked: After much research and posts to different forums, I have gotten conflicting responses on my question and thought I'd turn to you. Can you run a second monitor and keep your cards running in SLI mode? The answer is apparently no, due to a driver issue. Now this is where it gets tricky: If you have three PCI-E x16 slots like the nForce 780i, can you add a third card for multimonitor support and leave the first two in SLI mode? The response I got from the support system of Nvidia was also no. According to them, to add a third Nvidia graphics card would have the same driver issues, and you would still have to disable SLI in order to run a second monitor. Now, from this statement, I ask a third question: Can the third card be of a different chipset than the other two? I did get one response that it can be done but only in Windows XP. Now I'm really confused.

I've continued to ask in different forums, but it seems to be a closed issue. If I am willing to spend the extra money for the card, why wouldn't either chipset maker provide support in the form of information and possibly a modified driver? Please use your extensive testing assets to give it a try. I don't really see this publication as leaning to one side or the other. I can't be the only user that has this need, so the question really boils down to: What does it take to have a second, third, or even fourth monitor and keep the graphics power that you have when your system is already SLI capable?



AMD's ATI Radeon HD series graphics cards support multiple monitors when running in a CrossFire configuration. Nvidia's GeForce cards didn't originally support multimonitor setups when running in SLI mode, but that feature is coming with a new driver release.

A: This is an issue that has been discussed ad nauseam over the years. When operating as standalone cards, Nvidia's GPUs support multimonitor configurations without issue. However, team a pair of cards up in SLI mode, and only a single monitor output is supported. For a couple of years, the same held true for ATI's graphics cards, but ever since the release of the Radeon HD 3870 X2 and the Catalyst drivers that supported the card, ATI has in fact enabled multimonitor support when using CrossFire.

The information you have received to date is unfortunately correct. As of this

writing, Nvidia has yet to support multimonitors with SLI, and Windows Vista does not support heterogeneous graphics adapter configurations. That is to say, Vista's new driver model does not currently work with graphics cards from different vendors. According to the Microsoft Web site, "In a system configured with heterogeneous graphics adapters (that is, adapters that use different drivers), Windows Vista will disable one of the two adapters and present an error message. . . . Device Manager will show the disabled device with an Error Code 43. Event Log Viewer will also have a message logged that contains the same text as in the error message displayed."

The good news is that, by the time you read this, Nvidia should have released its Forceware 180-series drivers that enable multimonitor support with SLI. We have spoken with Nvidia regarding this issue on a few occasions in the past and were informed that by the mid-September timeframe multimonitors with SLI should be a reality. For now, you can always disable SLI to re-enable your additional screens or look to a device like the Matrox TripleHead2Go Digital Edition, but the former will limit you to three screens and also limit the maximum resolution. ▲

by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com

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Intel's Platform Power Management Strives For Energy Efficiency

Try going an entire day without hearing someone utter phrases such as "improved energy efficiency" and "going green." Then spend another day trying to find a convenience store offering gasoline for less than \$3 per gallon.

Our guess? You'll have two equally frustrating days. "Going green" is part of the everyday lexicon in America today.

Although most people initially think about gas mileage and compact fluorescent light bulbs when discussing energy efficiency, the computing and consumer electronics industries also can benefit greatly from strong energy efficiency measures.

Intel has worked to improve energy efficiency in computing for the past several years, and the company recently announced Platform Power Management technology. Platform PM involves building

energy efficiency technologies into a variety of hardware and software components and then having those components work together through the platform to provide high-end energy efficiency.

Continued Research

For most of the first two decades of personal computers, concerns over energy efficiency were far less important than delivering high performance. However, as consumers have wanted better battery life and smaller form factors, developing energy efficient products that continue offering strong performance levels has become a focus of high-tech companies.

"The energy efficiency effort at Intel is now well into its sixth year," says Raj Hazra, director of Intel's systems technology laboratory. "The fundamental principle

is: We can do better with more cooperation between the software and the hardware."

As part of Intel's Platform PM research, Hazra says the researchers had to work through three questions.

- First, could the overall system be "smart" enough to move in and out of energy efficient modes when warranted, based on the type of work the user is performing?
- Second, could individual components in the overall system go from sleep mode to active mode on their own, again, based on the user's needs?
- Third, could the individual components offer varying levels of sleep mode, meeting the needs of the current task?

"What has to happen on the platform is to make the hardware efficient in

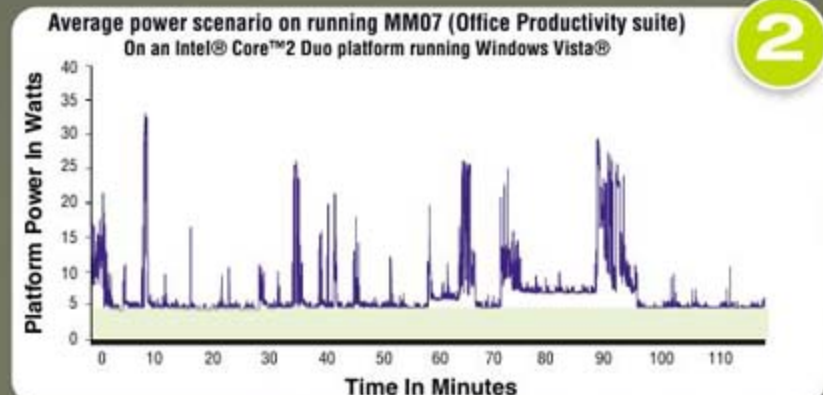
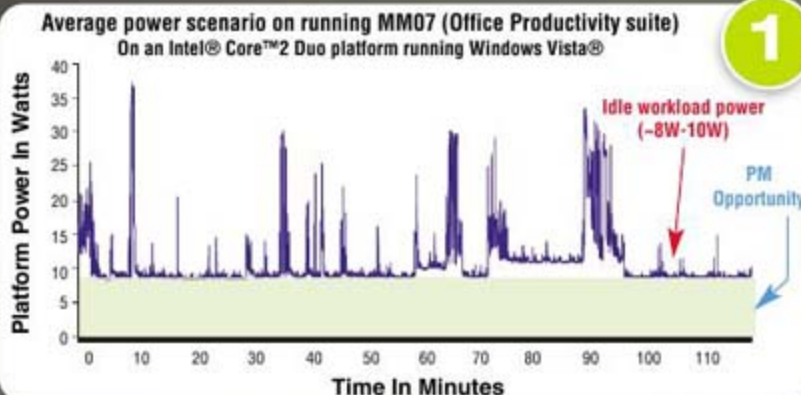
Laptop Power Management

One area where Intel sees significant potential for improved power management is with laptops. As shown in Image 1, the laptop uses several watts of power, even when in idle mode (which Intel estimates occurs up to 90% of the time for a typical laptop user). With improved power management in idle mode, the system could greatly extend battery life.

Of course, the tradeoff is latency. When the system is idle but still using a lot of power, its latency is low: When you're ready to work again, the laptop responds quickly because its power usage remains high. Some pieces of hardware and software can require low latency from the laptop to operate properly; some components might crash when encountering latency problems.

It's important to find a balance between minimizing latency when responding from an idle condition and maximizing power efficiency. Intel Platform PM (Power Management) would help manage latency issues while improving power efficiency in a few areas. For example, devices in the system will provide feedback to the Platform PM on their power and latency needs (Image 3), based on workload requirements. The Platform PM can then ensure latency will not cause crashes while maximizing power efficiency. In Image 2, you can see the potential power savings in a laptop using Platform PM by reducing the amount of power used at idle. Intel is working with hardware manufacturers, hoping they'll increase the latency their products can tolerate.

As you can see from Image 4, systems are complicated, especially when it comes to energy efficiency. With each component working



using exactly the required amount of power to complete its tasks, no more, no less," Hazra says.

Efficient Hardware

Early power conservation research focused on the operating system, where the OS would move the entire system into and out of sleep mode. Research now has migrated to hardware components. For example, processors can shut down portions of the core that aren't needed for a particular task. New USB and I/O devices also have more energy efficient capabilities.

Convincing companies throughout the industry to support Platform PM and build components that make use of strong energy efficiency has been easier than expected in the past few years, says Paul Diefenbaugh, Intel's principal engineer for the Platform PM project.

"Overall, there has been a push toward energy efficiency in the market, and we've been able to ride that wave, so it seems like it's getting easier," Diefenbaugh says. "There are certain low-cost segments where it's still a

trade-off, but we're riding a wave and want to take advantage of it."

For example, the USB 3.0 specification brings vastly improved energy efficiency over USB 2.0. (USB 3.0 products should appear in 2009 or 2010.)

"We learned a lot trying to fix the existing USB spec," Diefenbaugh says. "We want good behavior in all devices."

"If something is not cooperating, it can throw a big monkey wrench into the platform," Hazra adds.

Adding Value

Intel's researchers say the power savings achieved through better energy efficiency will yield more powerful devices . . . at least when it comes to improved performance.

"Energy consumption and performance are two sides of the same coin," Diefenbaugh says. "The more energy you save, the better performance you can get. Higher performance is definitely a part of this."

The most obvious benefit in more efficient energy usage by all components within a system would be to laptop users, who would see increased battery life. Intel

says laptop batteries could see double the lifespan between charges with Platform PM technology.

But Hazra says Platform PM involves much more than improving battery life. For example, devices that are more energy efficient can use smaller form factors. Such devices will generate less heat, which also would benefit energy-gobbling data centers.

"It's up to the OEMs and the customers as to how they reap the benefits," Diefenbaugh says. "They can have double the battery life, they can have smaller laptops."

Developing software and hardware components that are smart about energy efficiency requires some work on the part of high-tech companies, but they'll reap the benefits, Hazra says.

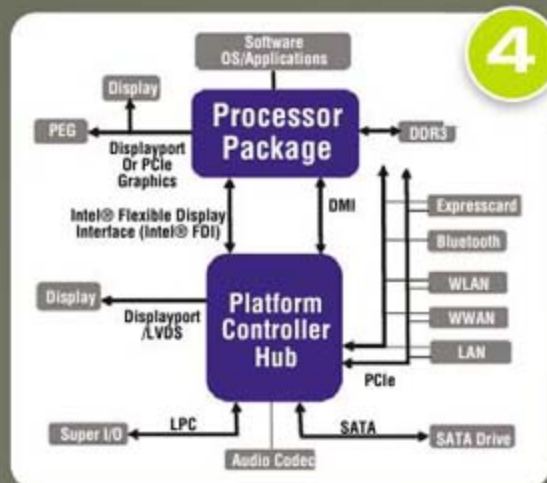
"There's a value in energy-efficient performance," Hazra says. "It benefits every component and makes the platform more desirable. . . . The evolution of these technologies and this ecosystem has actually been beneficial to vendors and users." ▲

by Kyle Schurman

independently, those individual power management efforts aren't as efficient as they could be by working together. Because IA (Intel Architecture) platforms are open systems, a variety of vendors contribute hardware and software to the computer. Consequently, it's difficult to guarantee energy efficiency. It only takes one vendor's product to be inefficient in how it uses energy to hinder a system's ability to manage energy usage.

Intel's idea of Platform PM requires all of the components in the system to cooperate in terms of energy usage. Hardware, software, and the Platform PM's core logic all work together to achieve maximum energy efficiency.

"We're moving to the mode where we know when the system is not doing anything . . . in certain modes of operation," Intel's Paul Diefenbaugh says. "The software and hardware knows what mode it's in. We need to have that communication between the devices and the core logic."



For example, when a user is viewing an email, the Platform PM system will monitor all applications and hardware. Rather than using the highest refresh rate on the screen, the system could take a screenshot of the email, placing it in a memory buffer, waiting to refresh and redraw the screen image until the user pushes a key or uses the mouse, which would save energy. The Platform PM also would realize that other system components, such as a USB memory stick, the hard drive, and a particular core on a multicore microprocessor, aren't needed as the user reads email, so it could place those components in idle mode, saving additional power.

With Platform PM, the entire system could move out of idle mode within 50 milliseconds, giving the user access to the entire system quickly enough that the user wouldn't notice the change from idle to alert status, further limiting latency concerns. ▲

Breaking Down Kaminsky's DNS Bug

The more one talks to Dan Kaminsky, the more it seems as though he wishes he hadn't discovered the flaw in DNS that could have left Internet users unsure about the validity of the Web sites they were trying to visit, something that could essentially destroy the Internet.

Don't misunderstand, however.

Kaminsky, a security expert and director of penetration testing with IOActive who's heavily involved in the Black Hat Conference, was more than willing to put in the hours and hours of work required to battle the bug. And he was

glad *he* was the first one to stumble on the flaw, rather than having a criminal discover the flaw and exploit it before vendors could release patches.

More than likely, however, Kaminsky would've been happier if the bug simply hadn't existed or had been negated long ago by more stringent security measures.

"When I saw all of this many months ago, I said, 'If I don't do something, everything is going to break,'" Kaminsky says.

For now, DNS (Domain Name System) isn't completely broken, thanks to a software patch. But more problems could be on the way, without significant

changes to the security used for DNS and the Internet.

The Issue

Kaminsky was working with DNS, performing some routine research in late February, when he stumbled onto the flaw. He was stunned.

"I thought, 'This can't work, or the Internet would be totally hosed,'" he says. "But it worked."

Essentially, the flaw allows a malicious hacker to redirect requests for a particular Web site to the bad guy's Web site. The flaw Kaminsky found is different

DNS Bug Timeline

Considering the size and scope of the DNS flaw Kaminsky discovered, the industry moved very quickly throughout 2008 to combat the flaw.

Feb. 20. A few days after discovering the flaw, Kaminsky contacts Paul Vixie for the first time to discuss the problem and potential courses of action.

"Paul's an institution in DNS," Kaminsky says. "Between Paul and I, we called in all of our contacts at major companies and other researchers."

March 31. Sixteen vendors and researchers meet at Microsoft's headquarters in Redmond, Wash., to discuss Kaminsky's discovery and to determine a course of action.

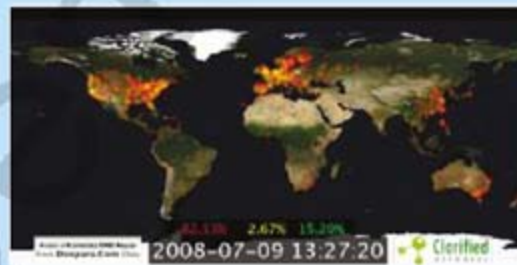
"We decided that the bug was so problematic that we had to come out with a simultaneous release," he says. "We committed to shipping on the same day, and we did it on July 8."

July 8. Kaminsky publicly announces the existence of the flaw in DNS but refuses to give details until most systems were patched, in an effort to prevent criminals from exploiting it. The vendors also release the patch on July 8.

July 9. Within 24 hours, about 15.2% of the affected servers had successfully installed the patch (green areas in upper right image) and another 2.67% had installed the patch but still needed to fix a few problems (yellow

areas). About 82.13% had not yet installed the patch (red areas).

July 21. Halvar Flake makes an accurate guess on the DNS flaw in his blog. The blog page later was taken down.



July 23. Successful patches climbed to about 42.43% (green areas in middle image at left).

July 24. Kaminsky gives some hints about the DNS flaw in a pre-Black Hat Webinar, emphasizing that system engineers need to use the patch immediately.

Aug. 3. Successful patches climbed to about 64.87% (green areas in lower image at left), which Kaminsky says was a high number. Only 21.22% (red areas) had not yet installed the patch.

"We did a lot of outreach to customers over the month" after the release, Kaminsky says. "It was a bit rocky, but the patch rates were amazing."

Aug. 6. Kaminsky speaks at the Black Hat Conference in Las Vegas, fully outlining the DNS flaw and the steps taken to that point to combat the flaw. ▲



Sources: DoxPara.com, Clarified Networks

from phishing, where a hacker will create a site that mimics a real Web site and then trick a user into clicking a link that goes to the fake site. With the DNS flaw, the hacker doesn't need to trick anyone into clicking a link; he hijacks the domain name. (For more detailed information on DNS and the flaw, see the accompanying graphic.)

"Now imagine that an attacker can take out the middleman and avoid sending the spam that's forged to look like it came from an online bank," says Paul Vixie, who co-founded ISC (Internet Systems Consortium), which creates software designed to support the Internet's infrastructure. Cisco, Sun Microsystems, Microsoft, Red Hat, and the ISC make most of the DNS server software that is in use by ISPs today. "Instead, they can just use their existing botnets to infect the DNS servers of Internet Service Providers, small and home office users, small and medium businesses, or even corporations.

"Then, when users within those communities visit their banks, or eBay, or PayPal, or Amazon, they will sometimes end up visiting a fake evil Web server instead of the real one. While I'm not in the business of online crime, I can only imagine that if criminals had access to the technology that reduced their costs and their risks, they will take advantage of it, especially if it only requires a very simple attack that takes about 11 seconds to complete."

The Plan

Despite some controversy and criticism, the plan for combating the DNS flaw came together after several months of work, successfully negating the initial threat. The solution didn't completely end the threat, but it did significantly reduce the chance that an unscrupulous hacker could take advantage of the flaw, which is part of basic DNS code.

Preparing the plan took dozens of hours during the first month; Kaminsky says he spent enough time on the problem to qualify as a full-time job.

"I didn't want it to be an entire month of work, but . . ." Kaminsky

says, trailing off. "The girlfriend is pretty happy this is almost done."

Ultimately, he and Vixie decided to put together a conference that Microsoft offered to host in late March. Sixteen engineers attended the conference, many learning of the flaw for the first time.

"There were people on jets who didn't even know what the bug was," Kaminsky says. "I just told them that this is the entire Web and all e-mails between companies. . . . I didn't need to go into further detail. They just knew they had to be there."

After outlining the flaw, Kaminsky says the group focused on answering three questions. First, what exactly did the flaw mean for DNS? Second, what should be done to combat the problem? Third, when should the solution occur?

They agreed to issue a simultaneous patch on July 8 that would not completely eliminate the issue but would severely decrease the odds of a bad guy guessing the Transaction ID number for a DNS lookup, thereby gaining the ability to hijack Web sites. The patch randomizes the source port and introduces 2,048 (2 to the 11th power) new unknown possibilities to the hacker. When coupled with the 65,536 potential Transaction ID numbers (2 to the 16th power), the patch results in about 134 million guesses per DNS lookup (2 to the 27th power). Additional changes may occur later, too. For example, by using a 32-bit Transaction ID number, the number of possibilities would increase to about 4.29 billion.

Stage Three

Kaminsky says hacking has migrated to its third stage, which highlights the dangerous possibilities of the DNS flaw.

- **Stage 1.** Hackers targeted servers, going after items such as telnet and FTP.
- **Stage 2.** Hackers targeted browsers and software running in them, such as Java and ActiveX.
- **Stage 3.** Hackers are targeting everything else, including all network applications. And, because many different aspects of the Internet rely on DNS (such as email), such attacks can extend beyond spoofing Web sites. By

poisoning email, a hacker could even defeat a Trust Authority Certificate and SSL.

"All networked applications are fair game," Kaminsky says. "The reality is, we now have a whole new range of software to worry about."

Although the recently released patch greatly hinders the ability of a hacker to exploit the DNS flaw, Kaminsky says the patch isn't perfect and more work and research will be required. (That doesn't mean vendors shouldn't install the patch, Kaminsky says, because it provides vital, monumental protection over the DNS flaw without a patch.) The DNS flaw could only be the beginning of serious threats to the structure of the Internet, he says, and engineers and designers need to be more focused on security.

"It's a wake-up call," Kaminsky says. "It's a wake-up call that we are using code that is unsafe. And we are building systems that have unreliable dependencies. . . . All [DNS servers] have the same design elements, and all were vulnerable to the same bug. That's incredible. We should be doing better."

Obviously, if you can't trust DNS, you can't trust the Web, meaning this problem is extremely troubling to security experts. Vixie says DNSSEC (DNS Security Extensions) is the technology that can fix DNS, but various bottlenecks are preventing implementation.

"The real fix is something called DNSSEC, which has been ready to deploy for years, but which is being held up by the U.S. Dept. of Commerce," Vixie says. "Without DNSSEC, it's only a matter of time before another keyhole is discovered or before someone finds a more effective way to guess our random numbers.

"So, while panic has ended, 'great concern' is still with us."

The great concern definitely exists, because someone who's not as honest as Kaminsky and Vixie might find the next Internet flaw. ▲

by Kyle Schurman

DNS And The Flaw

```
C:\>ping www.cpumag.com

Pinging www.cpumag.com [12.39.144.18] with 32 bytes of data:

Reply from 12.39.144.18: bytes=32 time=180ms TTL=113
Reply from 12.39.144.18: bytes=32 time=186ms TTL=113
Reply from 12.39.144.18: bytes=32 time=185ms TTL=113
Reply from 12.39.144.18: bytes=32 time=186ms TTL=113

Ping statistics for 12.39.144.18:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 180ms, Maximum = 186ms, Average = 184ms

C:\>
```

First, let's define DNS.

DNS (Domain Name System) is the Internet system that matches the alphanumeric Web site names we easily remember and understand (such as www.cpumag.com) with the numerical IP addresses that the software and servers of the Internet use to find Web sites. (FQDN, or fully qualified domain name, is the official title for the alphanumeric Web site names.) As you can see from the DOS prompt image above, when pinging an alphanumeric Web site name, you'll receive a numeric IP address in return, which requires a DNS lookup.

Think of DNS as the digital phone book of the Internet, and it stores all of the possible IP addresses for Web sites. When using a phone book, you remember the name of the person or business you want to call, but you need the phone number to actually contact the person or

business. The phone book matches the name to the number.

DNS works in a similar manner to the phone book. Various sections of DNS exist in numerous locations on the Internet, and DNS helps your Web browser find the correct location for the IP address information you want.

Once the browser finds the correct location for the desired DNS information, it then stores the IP address in a nearby cache—usually a local nameserver used by your ISP—for a specified amount of time. By using a nearby cache, your browser can save time when retrieving the information again later. (Because of the use of a cache, this DNS flaw is called a form of cache poisoning.)

Because the numeric IP addresses change constantly on the Internet, DNS is important for moving information efficiently. As Kaminsky says, every aspect of the Internet relies heavily on DNS working correctly.

Many nameservers hold DNS information at various locations on the Internet. You might make a DNS request from one server, and, if it doesn't have the information, it will send you to

other servers, as shown in this example of how a legitimate DNS lookup works with no interference from hackers.

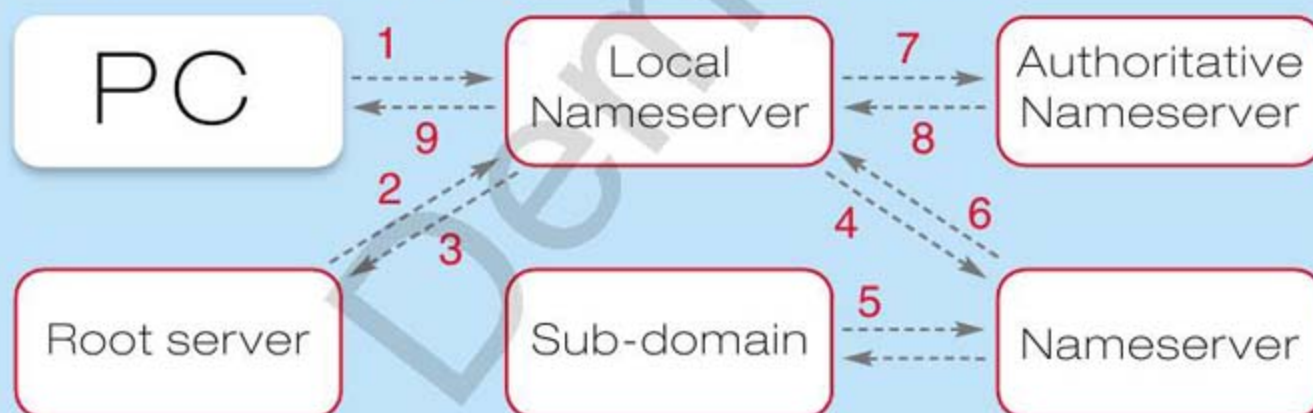
The results of the DNS lookup include a 16-bit Transaction ID, which essentially yields a random number between zero and 65,535, that only the real nameservers would know. The bad guys could only guess at the Transaction ID. Without that number, an IP address is ignored by the local nameserver. Kaminsky calls it a "race" as the legitimate nameservers attempt to return the actual result before the hackers can guess the Transaction ID and return a fake result.

When a nameserver returns a successful DNS request to be stored in the cache of the local nameserver, the nameserver also determines the length of time the cache can store an IP address, whether it's a minute or 24 hours (called time to live, or TTL). When the TTL is set, hackers cannot attempt another Transaction ID guess on that exact name until the TTL expires.

Although some people might consider TTL a security feature for DNS, Kaminsky says that simply isn't true, because the Transaction ID number can be cracked with a correct guess. ▲

Legitimate DNS Lookup

The PC, also called a client, uses a Web site name (FQDN) to ask for the IP address, in a DNS lookup.



1-The local nameserver, often maintained by the local ISP, contains a list of 13 root servers. If the query is already stored in cache here, or once the local nameserver receives the answer at any point in this process, it skips ahead to step 9.

2-The local nameserver selects a root server at random.

3-If the root server has the IP address it sends it back to the nameserver. If it doesn't have the answer, it tells the local nameserver another nameserver it can try to use to find it.

4-The request goes to the nameserver that the root server suggested, for example, a domain nameserver.

5-In some instances, a domain nameserver might send the request on to a sub-domain nameserver, then the answer travels back to the domain nameserver and on to the local nameserver.

6-It can either send back the answer or a suggestion about which nameserver to go to next.

7-The local nameserver tries another nameserver, as suggested by the last nameserver, continuing to look for the answer.

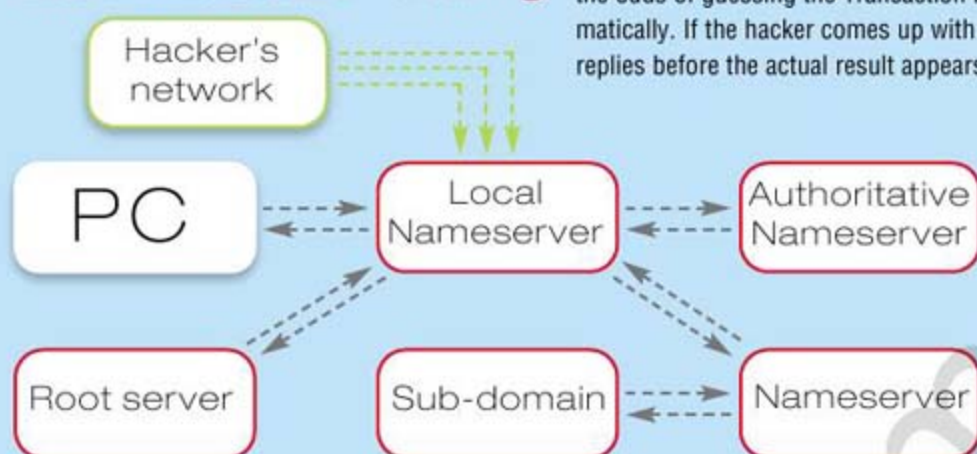
8-Eventually, one of the nameservers will return the desired IP address. The data in the final answer is labeled "authoritative," meaning it's been verified.

9-With the verified IP address and correct Transaction ID in hand, the local nameserver passes the answer back to the PC, saving a copy of the answer in its cache. The entire process occurs in a split second.

Sources: DoxPara.com, Unixwiz.net

In the basic form of exploiting the DNS flaw, the hacker's network floods the local nameserver with guesses at the Transaction ID during a typical DNS lookup. If the hacker's network can guess correctly before the real IP address (with the real Transaction ID) is returned to the local nameserver, it can hijack the Web site in question by poisoning the

Basic DNS Cache Poisoning



In the example Kaminsky discovered, the hacker wouldn't bother with trying to hijack one IP address; instead the hacker would try to convince the local nameserver that it's an authoritative nameserver.

The hacker's network attempts to mimic an authoritative nameserver, telling the local nameserver to look for its DNS data in the bad guy's network, rather than in an actual DNS nameserver. As with the previous example, the hacker's network floods the local nameserver with guesses on the Transaction ID, hoping to come up with the correct number before the real data and real Transaction ID number makes it to the local nameserver, this time claiming an "authoritative" answer.

cache stored on the local nameserver. Any subsequent requests for that Web site that go through the poisoned cache will be redirected to the fake IP address, at least during the life of the TTL. The hacker can return many fake results faster than the nameserver can return the actual result, but they're ignored without the correct Transaction ID. By using random Transaction ID numbers, the bad guy improves the odds of guessing the Transaction ID dramatically. If the hacker comes up with 100 replies before the actual result appears, the

If the hacker manages to poison the local nameserver's cache with data about the fake authoritative server, he now owns the ability to forge an entire domain of Web addresses, controlling an entire nameserver. By setting a high TTL, the poisoned data will remain in cache a long time. Once the attacker gains control of a domain, it then has access to several items, including:

- All requests to the domain.
- Email that runs through the domain, which can be intercepted and read before being sent on to the next server as if nothing happened.
- Any attachments related to the domain.
- Any executable files with the domain.

odds of making a correct guess would be better (100 in 65,356), but still poor.

Because new races on a unique name cannot occur before the TTL expires, the hacker uses variations of the Web site name he wants to hijack, such as `www1.sample.com`, `www2.sample.com`, and so on, thereby forcing a large number of races.

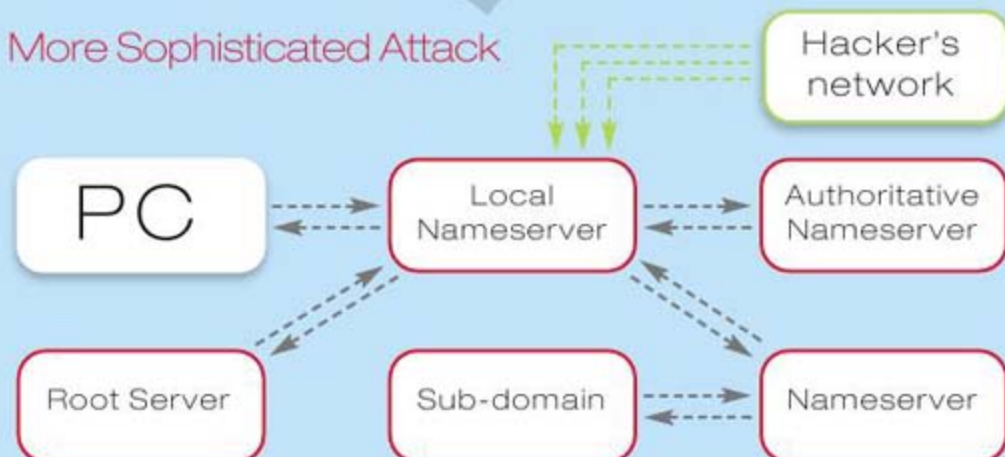
With only 65,536 possibilities for the Transaction ID, the hacker, through brute force guessing, probably will eventually come up with a correct Transaction ID number at some point, despite the poor odds. The patch increases the number of possibilities to more than 134 million, which significantly reduces the hacker's odds. Even with 100 fake guesses, the odds would become about 1 in 1.34 million versus about 1 in 654.

Still, this attack only hijacks one Web site name. The DNS flaw could yield a far more sophisticated and dangerous attack, which hijacks entire domains. ▲

A spam filter theoretically would catch the fake IP addresses, but because spam filters rely on DNS, the DNS flaw affects spam filters, too.

As Kaminsky mentioned in his discussion at Black Hat: "It doesn't matter how you lock down [sample.com] if .com is broken." ▲

More Sophisticated Attack



With the ability to control a domain and intercept email, the bad guy could force a request for a "forgotten" password. Because most Web sites use email either to give the user his password or to provide a link to a Web page where the user can change his password, the hacker could intercept the password.

In another type of attack, the bad guy could take over the domain that controls popup ads, instead creating fake alert messages that could cause the user to click through to a dangerous Web site or download malicious code. ▲





HI-TECH HIJINKS

Instant Awesome, Just Add Ingenuity

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One PC, 14 Displays

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Harness The Power Of A RAID NAS

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Build Your Own Solar-Powered Rig

Think about the common PC for a minute. We'll even give you two minutes, because it's probably been a while since you've owned a "common" PC (if you ever did). What came to mind? If your imaginary common PC is anything like ours, it probably comprises a midtower chassis, a ho-hum 17-inch LCD, a middling processor with about 2GB of equally middling RAM, an optical drive or two, integrated graphics (or maybe a low-end discrete board if Mr. Common PC inadvertently picked a system with such an option), media card reader, and the obligatory keyboard and mouse.

And you know that these PCs will be relegated to the most pedestrian of computing tasks—email, Web surfing, iTunes, and word processing. If Mr. Common PC is really living life on the edge, he might even put his par-for-the-course system through an intense Photoshop Elements session or try his hand at—gasp!—installing third-party hardware. Of course, for Mr. Common PC, his "rig" is little more than an expensive tool, purchased to ensure that he's keeping up with the times.

You're not of the same stripe as Mr. Common PC, and it shows. In addition to having the most powerful hardware and capable software on the block, a lot of you have added personal touches to your system, stuff that Mr. Common PC doesn't know exists. High-end components are virtually mandatory; yours are overclocked. If you don't have more than one hard drive stashed in your chassis, there's a fair chance you have a NAS box set up to serve files to all of your networked PCs. Dual monitors? With all of the projects you have on your plate, why not? If you don't have multiple graphics cards, you want them. And we haven't even begun to scratch the surface of vanity mods, which are proof that computing can be just as much about form as it is about function.

Because out-of-the-ordinary has become more rule than exception to you, we've cooked up a quartet of PC projects that we think are right up your alley. Of course, all but one of our projects require fairly significant financial investments. (You'll see.) If you have deep

pockets, then by all means feel free to use any or all of these articles as a template for a similar project of your own. Otherwise, put your feet up and enjoy a collection of quirky (yet useful) builds on our dime.

We'll start things off with a visual extravaganza, the ultimate Vista Desktop. This endeavor will surely please master multitaskers, as well as amateur supervillains who need a menagerie of monitors to keep the grounds under constant surveillance (and what else do you plan on lining the walls of your subterranean lair with, anyway?). Check out our LCD mosaic in "Monitor Multiplicity" on page 60.

Storage gurus and media streaming fiends may want to skip the visual goodness of our ginormous wall o' displays and head straight for "A Serving Of HD," which starts on page 64. As hard drives balloon to incredible capacities, the idea of keeping your entire media collection in a central networked repository becomes a tantalizing proposition. But you don't want to simply throw a bunch of HDDs in a networked enclosure and call it a day, so we set out to build a custom NAS box with a little CPU flavor.

You probably have a USB flash drive (or four) that you put to good use, but you really ought to put it to better use. For times when others might need to call on your awesome arsenal of utilities and other software, you owe it to yourself to have a USB-powered toolbox at the ready. "The Portable PC EMT" covers our ideal setup, starting on page 67.

Although all of the preceding projects have the CPU seal of approval, we've saved our big fireworks show for the end. Using a low-wattage CPU is a sure-fire way to save a few pennies on your monthly electric bill, but we've assembled a machine that scoffs at wall sockets. You'll definitely want to help yourself to a serving of solar; "Get Off The Grid" on page 70 is ready to deliver.

This month, creativity takes center stage. Even if you don't replicate our builds, we hope that these creations will spark you to produce something truly uncommon. ▲

by Vince Cogley

MONITOR MULTIPLICITY

One PC, 14 Displays

Multitasking hardware is all the rage these days. And although a system with a quad-core processor and 4GB of RAM will have no problem simultaneously running a few applications, even dual-monitor setups may not provide enough screen real estate for all the applications you want to view. There are a few different options, including

quad-output graphics cards as well as multiple output DVI splitters and expansion adapters, to add support for additional monitors to your system.

In this article, we'll walk through our experience with setting up 14 monitors, eight acting as independent displays, on a single PC. We encountered some minor roadblocks, from hardware conflicts to basic monitor organization, during the process. But if you've got the cash for the hardware, you can create a

similar or scaled down multimonitor setup in your home.

Hardware & Software Considerations

According to Microsoft, Vista's Windows Display Settings applet (titled Display Properties in Windows XP) in Vista can control up to 10 independent monitors. However, Windows XP and Vista are not limited to 10 monitors. You can use third-party software, such as Realtime Soft's UltraMon (\$39.95; realtimesoft.com), to utilize more than 10 independent outputs from a single PC. For instance, if you had two quad-output graphics cards and three USB-to-DVI



Figure 1. With more than three monitors, organization becomes an issue. By spreading out our monitors in a long row, we found that the display farthest away became impracticable to use.



From Window XP and Vista's Display applet, you can set the resolution and virtual location of up to 10 monitors.



Two of VisionTek's X1650XT Quad graphics cards provided us with eight independent DVI outputs.

adapters, you'd need third-party software to control the 11th monitor. To handle our multiple monitor needs, we installed two VisionTek X1650XT Quad (\$399.99; www.visiontek.com) graphics cards for a total of eight independent video outputs.

Multiport external video adapters are another way you can connect more than 10 monitors to your system. For additional independent displays, you could use an external graphics expansion product, such as Matrox's DualHead2Go (\$229; www.matrox.com) or TripleHead2Go (\$329), that lets you span a single desktop across all monitors connected to the external adapter. If you want to clone some of your displays—ideal when you want to see a key desktop at multiple locations—you can use a video splitter to divide the video signal among several monitors. Aten was kind enough to send us three of its VSI-164 splitters. Each splitter offers four DVI ports that can replicate a desktop at up to a 1,920 x 1,200 video resolution. Additionally, the VSI-164 (\$400; www.aten-usa.com) splitters can work in a chain, so three VSI-164 splitters could clone one desktop on 10 monitors. USB-to-DVI adapters are also available to let you extend or clone your desktop using a

small external adapter. For example, Tritton's SEE2 Xtreme (\$119.99; www.tritton.com) lets you extend, mirror, or set the monitor as the primary display.

Vista Roadblocks

WinXP lets you use different brands and models of graphics cards to generate video for multiple monitors. However, the WDDM (Windows Vista Display Driver Model) requires that all the graphics processors on your PC use the same driver. If your video cards use different drivers, Vista will disable one of the graphics processors and eliminate its use in your multimonitor setup.

Initial Setup

We began by installing the two X1650XT Quad graphics cards into our test PC. To produce the quad output, each X1650XT Quad features dual DMS59 cables that attach to the two outputs on the video card. With four display controllers, each X1650XT Quad can deliver four active desktops. For compatibility, VisionTek also included four DVI-I-to-VGA adapters with each card,

which was handy for adding older monitors to our multimonitor setup.

Vista didn't initially detect both video cards. Following the advice of VisionTek's experts, we connected monitors to only one of the graphics cards and after booting, we attached our other monitors to the second video card, which forced Vista to recognize both video cards. After doing so, all eight outputs worked perfectly. Go figure.

Once all the monitors were connected, it was easy to use ATI's Catalyst Control Center software to order the display's placement and configure each monitor's resolution. For instance, we needed to move the monitor identified as "1" to the far left. We just dragged the monitor icon to the far left side to match up the monitor's real and virtual location.

After the first eight monitors were connected and organized, we realized that setting up the monitors in a single row wasn't a good idea. There was very little space to add more monitors. As you can see from Figure 1, reorganization was necessary. Spreading out the monitors in one long row was actually counterproductive.



Figure 2. Mounting your monitors, seen here using the Visidec Freestanding Quad from Atdec, makes it easier to move windows between monitors and locate your mouse.



ATEN's VSI-164 video splitter replicates a single DVI output on up to four monitors.

When sitting down, we could barely see the displays at the end of the rows and found that we were wasting time just locating our mouse on the screen.

Let's Build A Wall

You could place a group of monitors on shelves, but mounting the monitors makes for more efficient viewing and ease of use. To help us illustrate this point (see Figure 2), Atdec sent us two of its Visidec Freestanding Quad stands (\$555; www.atdec.com). The stands feature both horizontal and vertical adjustments and allow for portrait/landscape rotation. Besides improved organization, the stacked monitors saved us a significant amount of space.

If you plan on connecting more than two or three monitors to your PC, some

sort of hardware for stacking or grouping the monitors is essential. A freestanding design, like the Atdec's range, gave us the freedom to set up the displays without making holes in the wall or ceiling, and it was easy to move. We also decided to move our monitor setup to the corner of the testing lab, which let us angle the monitor wall to the left and right of our test PC.

Time To Split

With room to spare, we were able to add Aten's VSI-164 DVI splitters to the mix. We split our "2" output (virtually located to the direct left of the primary display) to the two bottom monitors in the Visidec Freestanding Quad stands. We sent the "3" output, which was virtually located on the direct right of the primary



Working with multiple monitors means you need to deal with a lot of cables.

monitor, to the two top-mounted monitors. This configuration worked best for keeping our media player and other commonly referenced applications always within view, no matter if we were using the monitors at the center, far right, or far left.

We had still had one of Aten's DVI splitters free, but at that point, we had run out of power outlets, DVI cables long enough to reach one end of the monitor wall, and area to put additional monitor stands. If you look closely at Figure 3, you can see that we used computer cases as impromptu monitor stands. Those with free wall space near their PC may find that rows of wall-mounted displays work best. You won't have to deal with cascading the monitors above and behind each other.

Make A Plan

Initially, it seemed that finding, installing, and configuring the video hardware would require the most effort. However, the two VisionTek cards and Aten's video splitters were relatively easy to set up. We found that monitor organization and cable management took up most of our time. Mounting hardware, such as Atdec's Visidec Freestanding Quad, made for a more efficient and organized multiple monitor system. Cable labels, extra power strips, and five-foot power and video cables would have been wise investments. ▲



Figure 3. The pièce de résistance, 14 monitors running off of our test PC. In this setup, there are eight independent desktops.

by Nathan Lake

Who would have thought energy efficiency could be so powerful?

It ain't easy being green, but PC Power & Cooling delivers a superior balance of efficiency and power that is second to none. Highly efficient and with a trend-setting Single +12V Rail (80A), the Silencer 750 provides optimum distribution to your system, utilizing unparalleled energy management. Heralded by both expert users and top reviewers, the PC Power & Cooling Silencer 750 provides high quality, efficient, first-class performance and can handle some of the most intense applications and component configurations imaginable. When you decide to make a green choice, PC Power & Cooling is the right choice.



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^ SERVING OF HD

Harness The Power OF A RAID NAS

First there was Betamax vs. VHS. Most recently it was Blu-ray vs. HD-DVD. Other than being downright annoying, all of these so-called format wars have another thing in common: Consumers who bought in to the losing format ultimately got the short straw. Thankfully, history has taught us to be leery of format wars. The most recent one turned out to be more of a lover's quarrel than anything else; at least it was for the savvy technophiles that knew better than to get mixed up in the whole mess in the first place.

We think it's time to do one better though and banish format wars altogether. Why should we technologically inclined consumers have to deal with scratch-prone physical media that's loaded with advertisements and does little more than take up shelf space? If we're patient, digital distribution via set-top boxes and the Web is supposed to be the

wave of the future, but there's no reason to wait for giant corporations to set up shop when the technology is here today to do it ourselves. And while it will take a bit of elbow grease, something tells us homebrew digital distribution will be less annoying and crippled by far less DRM.

Project Outline

Our plan was to set up a NAS (network-attached storage) device that contains a multiterabyte storage volume and stream the multimedia content stored on the device to an HDTV via a home network. To do so requires some specific hardware and a network infrastructure that can meet our bandwidth requirements, however.

There are a multitude of ways to set up a large NAS volume, which includes anything from using powerful systems as servers to using simpler standalone network-attached devices that house standard desktop drives. We chose the latter route for the sake of simplicity and its smaller

form factor, but we were decidedly high-end in our hardware choices. For our NAS device, we opted for the Thecus N4100PRO IP. The Thecus N4100PRO is essentially a tiny computer, powered by an AMD Geode LX800 processor, designed specifically to act as a NAS device. The N4100PRO can accept up to four hard drives and configure those drives in RAID 0, 1, 5, 6, or 10 volumes. The unit also features a screen that displays its IP address and status of the RAID volume, which can come in handy in the absence of a PC. Dual Gigabit Ethernet ports with failover support add an element of redundancy to the N4100PRO's network connection, and it supports data transfer speeds of up to 35MBps, which is plenty fast for our project.

For our actual storage needs, we turned to Western Digital. Although their performance is somewhat overkill for this application, the WD Caviar Black 1TB hard drives we chose for this project are a good fit, due to their relatively quiet operation, large 32MB caches, and high capacity. With four 1TB drives configured in RAID 5, we'd have some built-in redundancy, high transfer speeds, and up to 3TB of storage capacity. That's enough space to store hundreds of movies.

To get content from the NAS device to our HDTV, we needed a multimedia extender. We wanted something that was easy enough for a technophobe to use but also powerful and compatible with a broad range of file formats. To that end, we selected the DVICO TViX HD M6500A (\$399 street price; www.dvico.com). The M6500A is what we'd consider an enthusiast's multimedia



Streaming HD content and other media from a central location to an HDTV or home theater requires a fast network, plenty of storage space, and a media extender. We turned to Thecus and Western Digital for a speedy, high-capacity network-attached RAID setup and to DVICO for the slick TViX HD M6500A media extender.

extender. The device is incredibly easy to use and operate and supports a wide range of audio, image, and video formats, including MPEG-1/2/4, AVI, XviD, WMV9, H.264, AVCHD, and VC-1 with full 1080p output capabilities. There is even an online community (www.opentvix.org) dedicated to providing free and open firmware for the DViCO TViX boxes that unlocks new features, similar to the open firmware files available for many Linksys Wi-Fi routers.

To take full advantage of the thecus N4100PRO's and DViCO TViX HD M6500A's capabilities, we needed to set up an adequate network infrastructure. With current prices so low, there's no reason to not run Gigabit Ethernet in your

home. We used a D-Link DIR-655 wireless broadband router, which itself has an integrated four-port Gigabit switch, in conjunction with an 8-port D-Link DGS-2208 with a 144KB-per-device packet buffer and a true 16Gbps switch fabric. Having a 16Gbps switch fabric means the DGS-2208 can handle full-duplex Gigabit transfers through all eight ports.

When all was said and done, our systems, the Thecus N4100PRO and the TViX box, all plugged into the switch. In turn, the switch connected to the broadband router.

NAS Hardware Setup

Getting the Thecus N4100PRO NAS device ready for operation took a bit of

assembly and configuring. Each of our four SATA hard drives needed to be installed in their own individual drive tray. Each tray features a quartet of holes on their underside that line up with the mounting holes on the bottom of any standard 3.5-inch hard drive. We simply slid a drive into each tray, installed a few screws, and slid the trays (with the drives attached) into the slots on the Thecus N4100PRO. (Don't forget to lock the drives in place if you plan a similar project.)

Once physically assembled, we connected the Thecus N4100PRO to the network and configured the RAID array. Connecting the N4100PRO to the network required nothing more than



Setting up the Thecus N4100PRO NAS device required multiple steps. First we had to install the hard drives into the included drive trays, slide the drives and trays into the device, and then connect the assembled unit to the network. Once connected, we also had to log into the N4100PRO's browser-based configuration menu to set up the WAN, LAN, and RAID options.



RAID Configuration					
If you lose a hard disk, data loss will occur.(JBOD,RAID0)!					
RAID Level	<input type="radio"/> JBOD <input type="radio"/> RAID 0 <input type="radio"/> RAID 1 <input checked="" type="radio"/> RAID 5 <input type="radio"/> RAID 6 <input type="radio"/> RAID 10				
Disk No.	Capacity (MB)	Model	Status	Used	Spare
1	953,869	WDC WD1001FALS-0	OK	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	953,869	WDC WD1001FALS-0	OK	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	953,869	WDC WD1001FALS-0	OK	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	953,869	WDC WD1001FALS-0	OK	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Stripe Size	64 KB				
Used Percentage	Data Percentage 95 %		<small>*Note: Please go back to RAID Information page to allocate the unused RAID space</small>		
File System	Ext3 File System				
Create		Remove RAID		Back	



Thanks to an easy-to-use interface, setting up the RAID array on the Thecus N4100PRO was as simple as selecting the drives and choosing the array type from a list (RAID 5 in our case). Actually building that array, however, can take an eternity. Plan on making a seven-course meal while you wait.

plugging one end of a standard Ethernet cable into the unit and the other into the switch. Then, after powering up the N4100PRO, we logged into its configuration utility by opening a browser window on one of our PCs and navigating to <http://n4100pro/>, much like many of today's broadband routers.

When logged into the N4100PRO, we entered the WAN, LAN, and Administrator menus to ensure the device was configured properly for our network. Typically, you'll want to enable DHCP, set a name for the device on the network, and change the administrator password from its default. We then entered the RAID setup menu to configure our array. On the RAID menu, the RAID type is selectable, as are the drives to be used in the array. We checked all four drives and selected the RAID 5 radio button. RAID 5 is a striped set with distributed parity. This means you get the performance benefits of RAID 0 with some level of redundancy, because the array can still operate if one of the drives fails. Should a drive fail, however, it must be replaced because loss of a second drive will destroy the array.

Configuring the RAID array is relatively easy, but it does take some time for the array to build (ours took a little over nine hours). Once the array was built, our final step was to designate a volume name and set user access restrictions. At this point, we could copy the media we wanted to share to the NAS volume.

The Multimedia Jukebox

With our network and NAS device configured, we could then turn our attention to the TViX HD M6500A and HDTV. Configuring the M6500A requires a couple of steps, which include physically connecting the device to a TV and network and setting a handful of options in its configuration menu. The M6500A connects to the network just like any other device; one end of an Ethernet cable connects to its LAN port and the other end to the switch. In our case, we also connected an HDMI cable from the M6500A's output to an input on our Toshiba HDTV, and, of course, we also plugged the M6500A into an electrical outlet.

Once the M6500A was connected to our TV, we powered them up and chose the appropriate input on our TV. When first powered up, the M6500A presents users with a simple icon-based menu system for configuration. From within its menus, using an included remote control, users have the ability to set the date and time, configure output options, video and audio options, and network settings. With our setup, we were able to output at full 1080p resolution with digital audio.

With those low-level settings out of the way, it was time to configure the M6500A to access the multiterabyte shared NAS volume. To do so, we navigated to the M6500A's network configuration menu and first set the unit to DHCP so our router could assign it an IP

address. We then selected one of the device's network drive options (the TViX-M6500A can have up to four programmed network locations) and entered the necessary information to access the shared volume on the Thecus N4100PRO. In our network environment, the Thecus N4100PRO had an IP address of 192.168.0.196, and the name we assigned to the shared volume was called "media_files". We entered the necessary configuration data into the M6500A's menus, pinged the network using the Ping button to ensure it was communicating properly over the network, and finally saved our settings.

Shut Off Your Cell Phone & Enjoy The Movie

With the NAS volume online and loaded with some content, and the media extender connected to the HDTV and the network, we could sit back, relax, and enjoy our handiwork. We ended up with a massive network-attached volume that could hold a ton of digital content and a nifty little box that could access that content and pipe it through our HDTV (or home theater). Once configured, using everything was incredibly easy. We could simply copy whatever files we wanted to watch on the HDTV to the NAS volume and select the files with the media extender. It doesn't get any easier than that. ▲

by Marco Chiappetta

THE PORTABLE PC EMT

Build A USB-Powered Lifeline

We know how it is. You learn a little about computers and suddenly everyone thinks you're Mr. (or Ms.) Fix-it and wonders if you can help them out with a little problem. Of course, unless you're Neo, you can't just fix computers with your mind. You need some tools to figure out what the problems are, more tools to fix them, and still more tools to salvage data files; but who always carries those tools around in their pocket?

Well, to be brutally honest, we do. And, thanks to inexpensive USB flash drives and the explosion of thumb drive-compatible software, you can, too. We'll show you the hardware and software we use to accomplish computer troubleshooting and data salvage without a toolbox or a bunch of CDs.

Choose Your Weapon: The Right USB Flash Drive

If you've strolled down the flash drive aisle of an electronics store lately, you know that USB flash drives come in virtually all shapes and sizes, but we've learned to look for certain things in a flash drive.

The first is capacity. Although a 1GB drive is all you really need to get away with our self-booting, well-loaded rescue pack, with prices being what they are, you might as well pick up at least a 4GB drive. We found such a drive online for less than \$20. With 4GB at your disposal, you'll have plenty of free space for data recovery in addition to your tools. A larger 8GB or 16GB drive is even better, but

such drives can be a little pricey. If you're really hungry for free space, you can use a USB hard drive instead of a flash drive, but you'll lose some portability.

The next is form factor. If you're going to just toss a flash drive in your computer bag or glove compartment, then almost any name-brand drive will do. But if you're one of those folks whose flash drive is never separated from a lanyard unless it's plugged into a PC, look for a drive/lanyard combo that uses a positive "clicking" quick-release mechanism instead of one that relies on friction alone. Trust us, friction mechanisms will loosen over time and drop your drive when you're not looking. For flash drives you attach to your keychain, the important word is "metal." Look for drives with metal cases and/or metal clipping hardware, as plastic tends to break in the rough-and-tumble world of your pocket. Our preferred keychain drive is the A-Data S701, which is all-metal and unbelievably tiny.

Self-Booting Environments: UBCD & Ubuntu

Most computers built within the last three years can boot from a properly configured USB device. This is a huge advantage for troubleshooting and data recovery when an internal hard drive can't boot or Windows is corrupted or full of malware.

A well-built Linux distribution such as Ubuntu is invaluable for two reasons. First, if Windows won't boot or if certain hardware won't work under Windows, a working Linux distro can quickly help you determine if the base hardware is OK. For example, if you can't get an IP address in Windows but you can once

you boot in Linux, you can rule out a bad NIC. It's also amazingly easy to retrieve data from a drive where Windows is messed up but your hardware is fine. Ubuntu can read the files from the NTFS partitions and then either copy them to another hard drive or a second USB flash drive; burn a CD or DVD; or copy files via FTP or over the LAN. It can easily delete or edit files that are otherwise locked and untouchable in Windows. On top of this, Ubuntu has Gparted, our favorite free graphical disk partition manager, plus all the Linux command line tools anyone could ever need.



Ultimate Boot CD works is just as effective on a USB flash drive as it is on a CD.

The UBCD (Ultimate Boot CD) is a completely different kind of self-booting disk. Its creators have combined more than a hundred different hardware diagnostic utilities, file managers, troubleshooters, BIOS updaters, benchmarks, and antivirus tools all onto one bootable CD; a text-based menuing system lets you choose what you need. Although its file management and copying tools have been eclipsed by Ubuntu in terms of ease of use (but they tend to work on hardware Ubuntu doesn't recognize), there's no better set of tools out there to diagnose bad hardware and perform other specific maintenance/support tasks.

There are several methods of "converting" these self-booting CDs into self-booting USB flash drives, but we have a way to add them both to the same drive. You set up menus to choose which "CD" to boot from, and as a bonus, have plenty of Windows tools, too. The process is a little involved, but you can do it in 15 minutes once you've downloaded everything. Take note: This will reformat your flash drive twice, so offload anything you want to keep and put it back later.

First, follow the tutorial at PenDriveLinux.com (tinyurl.com/5q3gux) to convert the latest Ubuntu LiveCD run from a

self-booting USB flash drive; the process takes about five minutes and runs from Windows. Once completed, boot from the flash drive to make sure it works. Check your BIOS boot screens to see what key to press to select a USB boot device. (Hint: F12 and F8 are common ones), and then boot back in Windows. Copy all the files from that flash drive into a temporary directory, making sure you're able to see and copy all hidden, locked, and system files. This last step is important.

Next, follow another tutorial at PenDriveLinux.com to convert the latest UBCD into a self-booting USB flash drive (tinyurl.com/32ewmk), which also takes about five minutes and runs from Windows. And it will also reformat the drive again. As before, once completed, boot from the flash drive to make sure it works, and then boot back into Windows.

Last, we combine the two. Delete the following two files from the UBCD thumb drive: Autorun.inf and Makeboot.bat. Next, copy everything from the temporary Ubuntu folder on your hard drive onto the root folder of the thumb drive except the following five items: the Syslinux folder, Ldlinux.sys, Autorun.inf, Isolinux.cfg, and Syslinux.cfg. Finally, edit the file Custom.cfg in the /custom folder on the flash drive, adding the following four lines:

```

LABEL live
menu label Ubuntu 8.04.1 LiveUSB
kernel /casper/vmlinuz
append file=/cdrom/preseed/
ubuntu.seed boot=casper initrd=
/casper/initrd.gz quiet splash —

```

You can copy and paste these lines from Syslinux.cfg in the temporary Ubuntu folder. Make sure there's a blank line at the end of this file, or Ubuntu might not boot.

Finally, to test the new drive, reboot from it. The normal UBCD menus should appear, but if you navigate to the User-Defined Tools menu, there's a Ubuntu entry. Selecting it boots Ubuntu as if booting from a LiveCD, but it's much faster once it gets rolling. As with the LiveCD from which it's based, you can't install new software or save anything to the flash drive, since it is the boot media.

Windows Tools

Although self-booting environments can be lifesavers, any troubleshooter is also going to need to deal with Windows when it's running. That's where a few vital utilities can really save the day. These are the tools needed to kick-start a misbehaving Windows installation and help get data copied off when Windows' own utilities either can't do the job or malware is actively preventing them from working.

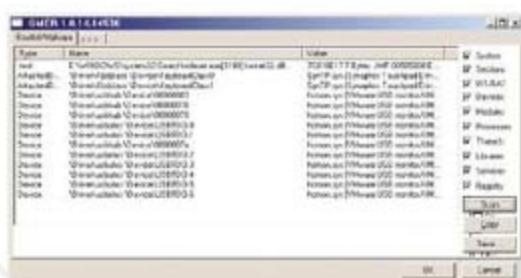
If you've made a bootable flash drive, there are some things to do to make using Windows utilities on it a little easier. First, rename the flash drive to something like "Rescue"; just right-click the drive from the My Computer window and choose Rename from the pop-up menu. Next, since the root folder is now filled with other files and folders, add some easily findable subdirectories, such as "00_WinUtilities" and "00_Data" and install your utilities into the first folder and store recovered data in the second.

As for specific tools—we find the following utterly indispensable, and they run directly from the flash drive, so you don't need to install anything on the troublesome PC. As a bonus, they're all free:

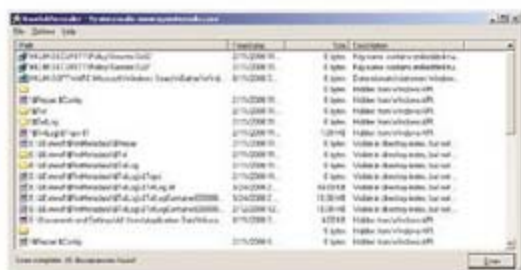


HijackThis 2.02. When Internet Explorer can't find the Internet or Windows is acting strangely, there's a good chance that some browser-helping plug-in or Windows startup program or service is causing a problem. HijackThis scans IE and Windows for browser helpers and Startup programs/Services, and lets you easily disable and delete individual items as easily as clicking a checkbox in a list and clicking the Fix button. If you aren't sure what some of the entries are, Trend-Micro (HijackThis' new owner) maintains

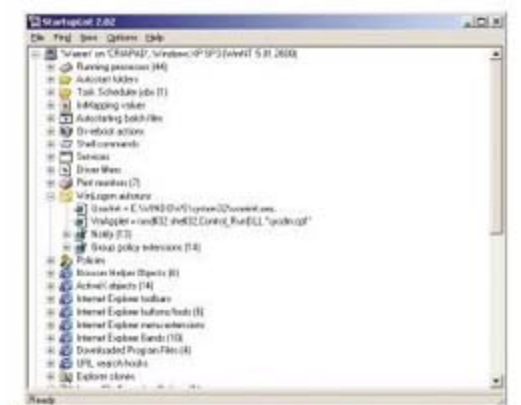
multilingual user forums that help make sense of it all. (tinyurl.com/33qwyx)



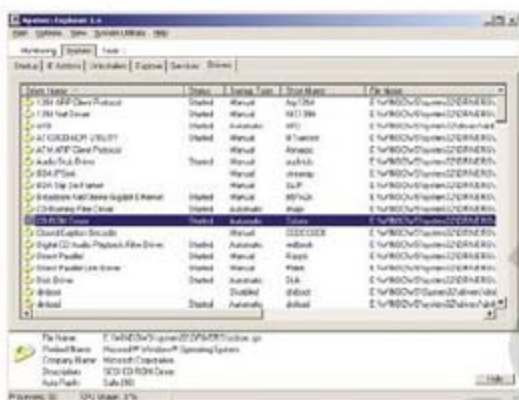
GMER 1.01.4.14536. When a computer acts like it's infected but the onboard antivirus and anti-malware scanners report a clean system, then it's time to suspect a rootkit. Rootkits work by tricking the base OS into hiding certain files or folders from the rest of the OS, and hackers are employing rootkits to subsequently hide their payloads from AV/AM scanners. GMER searches for hidden files, processes, services, drivers, Registry keys, and drivers hooking into the SSDT (System Service Descriptor Table), IDT (Interrupt Descriptor Table), or IRP (I/O request packet). When it finds them, it offers a way to disable and delete them. (gmer.net/index.php)



RootKit Revealer 1.71. A SysInternals creation that's now a Microsoft tool, RootKit Revealer is another free, portable, and effective RootKit scanner (it found the original Sony anti-DRM rootkit a few years back.) It uses methods different than GMER to detect rootkits, comparing what it actually sees to what it expects to see. (tinyurl.com/2gukvq)



StartupList 2.02. StartupList is a shockingly thorough list of everything that starts with your computer (even things like autoexec.bat and config.sys, if they're there), presented in a collapsible tree-view. It can't make changes, but it gives a great bird's-eye view of what you're dealing with. (www.merijn.org/programs.php)



SystemExplorer 1.5. Combine a super task manager with a startup program manager and a TCP/IP connection viewer, and you get the do-it-all SystemExplorer. Although it's a little redundant when you have other tools installed and its GUI is a little cluttered, SystemExplorer is the ultimate general-purpose Windows troubleshooting tool and system monitor. (sysremexplorer.mistgroup.org)

Unstoppable Copier 3.51. If you need to copy thousands of files off of a failing or scratched disk, Unstoppable Copier is much more than Windows' own Explorer. Unstoppable Copier won't choke and die when it can't read individual files from a full folder or drive, and it supports wild-card operations. (tinyurl.com/2gp2se)



PC Inspector File Recovery 4.0. If you need to recover files, then installing an undelete utility to the hard drive is very bad: It could overwrite the very files you're trying to salvage. PCIFR doesn't come with a portable version, but you can install

it to your hard drive as normal and then copy its Program Files folder to your flash drive. Voila, it's a portable application! It restores deleted files, lost directories, and even lost volumes due to damaged partition tables. (www.undelete-plus.com)

NirSoft Password & RegKeys Tools. You'd be amazed how many computer problems boil down to forgotten passwords and registration keys. NirSoft has dozens of free tools, but the ones we rely on the following: ProduKey (which recovers Windows' Activation Keys along with MSOffice, and various servers), Mail PassView (which recovers email passwords from almost all email software), and WirelessKeyView (which recovers the WEP/WPA wireless key that Windows is remembering). (www.nirsoft.net)

Spybot Search & Destroy 1.6.0. One of the granddaddies of anti-malware received minor improvements this year, and you can make it portable by installing it directly to your flash drive instead of your hard drive. (Uncheck all the background and plug-in options.) It will only do foreground scans when run from the flash drive, but that's all you need to clean an ailing system much of the time. (www.safer-networking.org/en/index.html)

ClamWin Portable. Although not necessarily the best antivirus scanner out there, the portable version of ClamWin can download definition updates and run a full foreground scan without installing anything to the troubled hard drive. That's more than other products, commercial or otherwise, can claim. (tinyurl.com/ydyq4r)

Adding More & Moving On

Our suggested tools just barely fit on a 1GB drive, but if you have more space, most of the applications at PortableApps (portableapps.com) are handy to have on-hand to edit Office files (with Portable OpenOffice), browse the Web (with Portable Firefox), deal with RAR and ZIP files (with Portable PeaZip) or do a lot more. All of these tools are free and open-source, too.

Armed with such a flash drive, retaining your Mr. Fix-it title has never been easier. ▲

by Warren Ernst

In the resource-constrained futures of science fiction, whoever controls the oxygen, water, or spice controls the universe. But in the very real universe we currently occupy, energy is the sole resource of which we can't seem to get enough. If (or when, if you're the cynical type) the energy crisis hits and socket-supplied-electricity evaporates, you can make sure you're more energy pirate and less sandworm food by switching on your renewable energy-powered PC.

What's this? You don't have a renewable energy-powered PC? Well it's a good thing we're not currently living in the aforementioned dystopia. Read on to build your own solar-powered PC . . . before it's too late!

Shoot For The Sun

Harvesting the sun's infinitely abundant energy isn't a new idea, and it's been powering household items, such as

calculators and landscape lighting, for a while now. Solar doodads aside, the most compelling argument for solar energy lies in the promise of true energy independence. Under the best conditions possible, the sun radiates an impressive 1,000 watts of light energy per square meter. Believe it or not, creating a solar electric system is surprisingly doable for anybody with a can-do attitude and a wallet to match.

Our goal for this project was to build an off-grid system, or a system not connected to the electric utility grid, relying instead on batteries to store electricity and power the PC at night, when it's cloudy, or when the solar modules are otherwise unable to collect enough electricity to run the PC. Utility providers in CPU's home state of Nebraska don't currently allow for grid-tie solar power systems, or systems that feed electricity back to the utility provider, so an off-grid system is our only option. Users who depend on an off-grid system for some or all of their power generally



Our 390-watt array, soaking up the rays.

GET OFF THE GRID

Build Your Own Solar-Powered Rig

incorporate a gas-powered generator into the system to ensure they have access to power should they encounter several sunless days in succession. To keep costs down, we left the generator out of our plans.

PC Hardware

From the beginning, our goal was to build a solar-powered PC that will run for up to four hours a day on solar power alone. Even though we're building an energy-efficient PC, we weren't willing to sacrifice performance in everyday tasks just for the sake of saving a few watts. Luckily there are plenty of power-efficient parts readily available that will handle everything an average user demands of his PC. The key to building an effective solar array is to determine how much power you need to fit the given application. To arrive at that magic number, we needed to build our PC, test it, and then come up with a power budget.

Choose your components carefully. For the foundation of our energy-efficient PC, we selected the Asus M3A78-EMH HDMI coupled with the 2.5GHz AMD Athlon X2 4850e, cooled with a factory heatsink. The processor has a max 45-watt TDP (Thermal Design Power), which operates on a third of the power of the high-end quad-cores, such as the AMD's Phenom X4 9950 and Intel QX9770.

For our graphics subsystem, we opted to upgrade the M3A78-EMH's integrated 780G graphics with MSI's passively-cooled 256MG Radeon HD 3450, which gives us a GPU boost via ATI's Hybrid CrossFire. The card uses ATI's PowerPlay technology, including clock and memory speed throttling, voltage switching, and dynamic clock gating to cut power consumption when the system is idle or in a state of low GPU usage.

The Western Digital Green Power 500GB drive we selected uses a combination of technologies, including IntelliSeek, IntelliPark, and IntelliPower, to cut power consumption. This drive draws just 5.4 watts during read/write operations, 2.5 watts at idle, and less than half a watt in standby or sleep mode.

For the PSU, we chose a 500-watt PC Power & Cooling Silencer PSU, which is 80 Plus-certified, meaning it's better than

80% efficient at 20, 50, and 100% of the rated load. Our memory, a 2GB DDR2-800 kit, came courtesy of PNY. Razer supplied our keyboard and mouse combo in the form of the Lycosa and Copperhead. We selected the Antec Sonata Designer 500 case to house our PC components, and Antec did its part to drive home the message by sending us a green-accented front bezel. To round out the system, we used a 19-inch W1952TQ monitor and a GBW-H20L Super Multi Blue Blu-ray Disc recorder from LG. Once assembled, we connected the PC to our Extech Power Analyzer and started testing the load.

Determine power consumption. When both cores of the CPU and both GPUs (onboard and discrete) are running at full tilt, our green PC has a maximum power draw of just 120 watts. We used 3DMark Vantage's graphics tests and Prime95 to determine the system demands under load and then restarted the system and let it stand for 20 minutes to determine the power draw at idle (75 watts). To determine the average power draw, we performed some basic tasks—browsed the Web, wrote several emails, created documents, played a few games, watched a portion of a Blu-ray movie, performed some audio and video file encoding, and edited images. Over the course of several hours, our power analyzer reported that the PC drew between 80 to 90 watts. On average, our 19-inch LCD monitor drew another 36 watts of power, giving us a total system load of around 121 watts. With this number in mind, we assume that an extended gaming session will dramatically slash our power budget while leaving the PC idle for several hours will give us extra power with which to work. Now it's time to convert our system power into kWh.

121 watts times the modest four hours a day we plan to run this system equals 484 watts per day. Multiply that by seven days per week, times 52 weeks per year, divided by 1,000 watts per kilowatt equals 176.18kWh per year. Based on this usage pattern and the 7 cents per kWh our local utility charges, it would cost us just \$12.33 per year to run the system on-grid. To keep things simple, we'll just work with kWh



The disconnect box lets you isolate the power source (solar array) from the rest of the system.



This fuse sits on the array side of the battery bank.

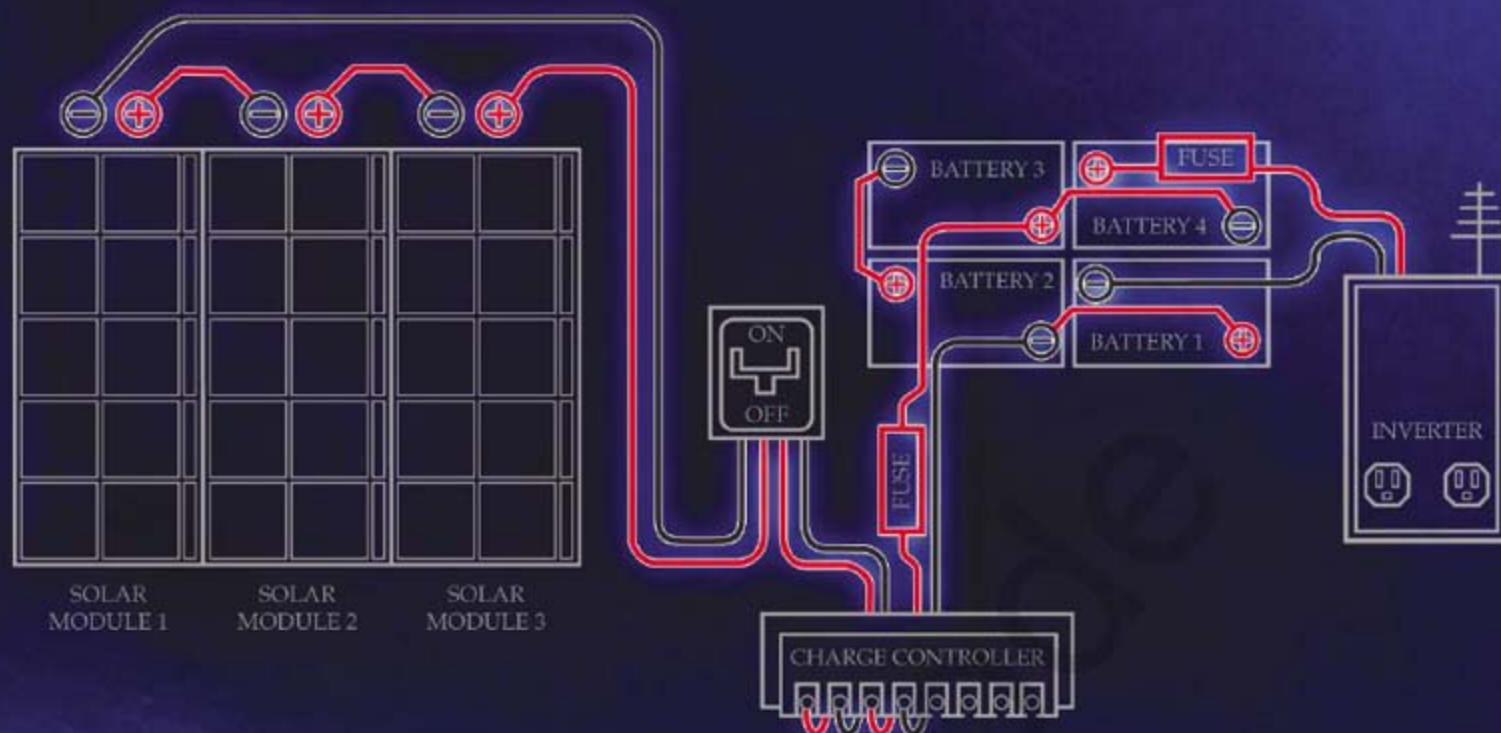


The charge controller intelligently charges our battery bank.

per day, which equals 0.484 kWh. Next we need to determine if a DIY array can collect enough sun under real-world conditions.

First we found the solar isolation level for our area, measured in kilowatt hours per square meter per day, or kWh/m²/day. The NASA Surface Meteorology and Solar Energy Web site (eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi) has a solar energy calculator that let us input our location to

Solar Electric Wiring Diagram



determine the average monthly isolation incident for our area year-round. In August, the month in which we actually built the system, eastern Nebraska had a 22-year average solar isolation of $5.48\text{kWh/m}^2/\text{day}$. The average solar isolation for the year is $4.04\text{kWh/m}^2/\text{day}$. If you plan to use your solar-powered system on a more permanent basis, you'll want to design a solar array that is capable of delivering the requisite amount of power during the least sunny month. In our region, the minimum solar isolation month is December ($1.74\text{kWh/m}^2/\text{day}$). July on the other hand, yields an impressive $6.35\text{kWh/m}^2/\text{day}$. We live in a very solar-friendly region: Central Australia, a region of particularly high year-round solar isolation, gets on average about $5.89\text{kWh/m}^2/\text{day}$ while Helsinki, Finland, gets just $2.41\text{kWh/m}^2/\text{day}$. To play it safe, we used the December solar isolation number for our calculations, and even in this sun-starved time of year, our panels should be able to keep pace with our PC.

Solar Array Hardware

Here at *CPU*, we could select PC components in our sleep. Choosing the solar components for a DIY solar electric

system, however, is another story altogether. The Web offers several good resources to help you understand the basic concepts, but it's clear from our research that this industry has a lot of maturing to do before solar projects become accessible to the average Joe. For much of our solar component selection, we consulted Michael Shonka of Solar Heat and Electric (www.solaromaha.com) to lend a hand, offer advice, and risk life and limb in our stead while wiring the battery bank.

With our solar budget in mind, we selected the main component of our solar array: the solar modules. As we went to



We mounted the charge controller, disconnect box, and fuse together to more easily manage the wiring.

press, there was a worldwide shortage of silicon, the primary component of solar modules, so we didn't have a lot of selection. We selected three 12-volt Alps ATI-130 Multicrystalline Photovoltaic Modules (\$570 each; www.alpstechnologyinc.com), which produce a nominal maximum output of 130 watts each. We purchased the modules from Conergy (www.conergy.us), a solar products distributor and system integrator based out of Santa Fe, N.M. We also purchased a UniRac mounting and tilt kit for the modules.

Once we knew the combined 390-watt output of our array, we were able to effectively calculate the daily kWh output of our solar array. The 390 watt-rated output measured at STC (Standard Test Conditions; 1,000-watt per square meter at 25 degrees Celsius) times a derate factor of 70% to account for DC battery efficiency (390×0.7), times the number of hours the panels will receive direct sunlight (minimum of about 3.73 hours in December; www.energy-product-reviews.com/maps/insolation_map_v4.php), divided by 1,000, gives us 1.638kWh of daily energy for our PC. That's more than 3.3 times the amount needed; our PC should have enough sun to run for extended computing



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Solar Limits

The most obvious limitation for any solar array is that it's only able to generate electricity when the sun is out. At night and when it's cloudy, solar panels are little more than giant paperweights. The thickness of the ozone layer and other atmospheric conditions, region elevation, DC and AC wire losses, inverter losses, and dirt or dust on the solar panels all have an impact on the amount of energy a solar module can collect. Seasonal changes can also affect the panel's ability to generate electricity.

As we stated earlier, eastern Nebraska is a relatively decent area for solar absorption; unfortunately, the month of our build, August, is also one of the hottest months of the year, with temperatures averaging about 75 degrees Fahrenheit. Excessive heat contributes to additional efficiency losses in our solar array. Unlike solar hot water panels, which are designed to capture the sun's heat to provide hot water, our solar panels are the PV (photovoltaic) variety, which use the sun's light to generate electricity. PV panels perform best in cool temperatures with direct, bright sunlight. ▲

sessions, even on the shortest days of the year in the least-sunny month. However, that assumes the sun shines every day and other limiting factors don't significantly impact the array's absorption rate (for more on losses, see the "Solar Limits" sidebar).

Once we had a good idea of how much sun we could collect, we chose the component that would make the energy usable for our PC. All solar electric systems need some form of inverter, which takes the



Here's the 24-volt battery bank.



Our makeshift vent hood poses for its close-up.

solar array- and battery-supplied DC electricity and converts it into AC electricity, the form of power our PC and monitor need to run. We decided to go with a 24-volt inverter because a higher voltage system carries less current, which let us install smaller wires sizes on the battery side and put more distance between the batteries and the inverter. We chose a Samlex 24-volt, 1,000-watt pure sine wave inverter (\$639; donrowe.com). Although a modified sine wave inverter would have been cheaper, it produces a noisy electrical signal that can sometimes fail to power some devices. This inverter delivers 1,000 watts continuous power and 2,000 watts peak power, even though our PC consumes just a fraction of that. Startup load, or the surge of energy necessary to start the PC, is an important factor to keep in mind. The startup load of some appliances can be as much as five times its rated wattage. For our green PC, startup wattage is closer to two or three times the typical load, but we played it safe with a 1,000-watt inverter.

The next components we purchased were the batteries. Four 6-volt deep cell 220 amp-hour batteries, also called golf cart batteries, will keep a healthy amount of juice handy even when the sun isn't shining. Transporting these batteries can be expensive, so we recommend purchasing them locally. We picked ours up from an Interstate Batteries (www.interstatebatteries.com) dealer. After a \$25-a-battery core charge, each battery cost \$119.95, for a total of \$479.80.

The last major component we selected was the charge controller. Because each solar module is designed to generate 16 to 20 volts of electricity (in order to generate the minimum 12 volts necessary in

less-than-ideal sun) a charge controller becomes necessary to make sure the batteries don't become overcharged, which can damage them permanently. We chose an MPPT (maximum power point tracking) controller, which is sophisticated enough to convert the raw energy coming from the solar array to the correct amps and volts necessary to charge the batteries efficiently and safely. The SunSaver MPPT (\$175; www.morningstarcorp.com) features positive and negative terminals for inputs from a solar array and outputs for a battery bank and other DC loads. This charge controller is also rated to handle 12-, 24-, or 36-volt nominal solar arrays, making it perfect for a three-module array.

Another convenient component is an electrical disconnect box (\$24.50), which is useful for isolating the solar array from the rest of the system. You can pick one up from any hardware store. We also picked up three 1-foot sections of 2-gauge battery cable to wire the batteries together and a 200-amp fuse kit with 2-gauge battery cables to connect our battery bank to the inverter. Based on the recommendations for the solar modules and the charge controller, we used 50-foot lengths of red and black 10-gauge wiring to handle the DC electricity flowing from the solar modules to the battery bank. Another 50-foot length of green 10-gauge wiring was sufficient for the inverter's grounding wire. You'll want to purchase sun-resistant wiring for any portion of the system that is exposed to the elements. We also purchased a second fuse to sit between the charge controller and the battery bank.

Other incidentals we needed to buy include boxes of spade and ring terminals for the wiring and a quartet of cinder



Ground? Got it.



The inverter delivers clean, pure power to our PC with ease.



The power analyzer gives us the raw numbers.

blocks that would give our array a little ground clearance while setting it up. We also used a few pieces of scrap plywood to mount some of the components. Read on for the full installation.

Solar Installation

Working with solar electricity is very similar to working with grid-supplied electricity, and for this reason you should not attempt it unless you're experienced and feel comfortable working with electricity or have an electrician present to supervise. That being said, if you take the proper precautions, you should be running your solar-powered gizmos in no time.

Mount, position, and wire the modules. We started by mounting the three panels to the rack. The UniRac mount we purchased consisted of two 84-inch rails that form the backbone of our solar array, a series of clamps to secure the panels to the rails, and a pair of 30-inch, low-profile legs that let us tilt the panels as needed. Because our solar electric system was just a temporary installation, we decided to position the assembled array in the sunniest portion of our driveway, just 20 feet from a garage where we would house the more sensitive components. When building a solar array in the Northern Hemisphere, you should generally aim your panels due south and adjust the angle monthly so that they are perpendicular to the most direct rays of the sun during the hours of peak sun each day. Based on the sun's altitude in relation to our region, we'll have to tilt the array monthly from its lowest angle in June (18 degrees) to its highest angle in December (64 degrees).

Because we set up the system in August, we needed to tilt our array 29 degrees to get



Our solar-powered PC is chilling in the shade.

the best exposure. You can determine the best position for your array by inputting your location at tinyurl.com/5p9cte. With a bigger budget, tracking equipment or hardware designed to rotate and tilt the array to automatically track the movement of the sun in the sky might be a smart investment.

Some solar modules are prewired, but ours aren't. We popped open the junction boxes and wired them together in a series configuration. It's best to wire the panels at night, in shade, or with the modules covered to avoid shock. We wired the positive terminal of the first module to the negative terminal of the second module and the positive terminal of that module to the negative terminal of the third module. The remaining positive and negative terminals on either end of the array formed the outputs that we would eventually connect to the disconnect box. We left these wires covered and capped until we were ready to plug them into the disconnect box later. Because the junction boxes were well sealed, we used normally shielded wiring, but we recommend using sun-resistant wire for the run between the array and the disconnect box.

Mount and wire the charge controller.

Next, we cut a piece of plywood that would form the base for the disconnect box, SunSaver MPPT charge controller, and the first DC fuse. We drilled the holes and mounted them to the panel and then drilled a pair of spare holes so we could mount the panel to the pegboard in our garage. We then cut sections of red and black wire and connected the disconnect box, charge controller, and fuse together, leaving about two feet of wire to make the connection to the battery bank.

Wire and vent the battery bank. To work with our 24-volt inverter, we need to wire our four flooded, lead acid-filled 6-volt batteries in a series, just like the solar modules. In the case of the batteries, this wiring configuration adds the individual voltages together to equal 24 volts, but the amperage of our battery bank remains the same as the amperage of a single battery. Again, wire the positive terminal of the first battery to the negative terminal of the second battery and so on until all four batteries are connected. You should have a negative terminal open on the first battery and a positive terminal open on the last battery. Because the batteries were fully charged, we didn't connect them until we had the inverter grounded.

Once the batteries were wired, we set about the job of assembling our makeshift vent hood. Batteries give off a toxic gas when charging, so we needed to construct a hood that would trap the gas and vent it to the outdoors. In the name of saving a buck, we purchased a plastic tub, cut a hole in the top, and bolted a few pieces of PVC pipe to it. With the battery bank on the work bench, we were able to direct the

Solar Electric System Components

Building a PC that runs off the sun is a considerably cost-prohibitive proposal. Our initial budget was about \$3,000, but our tendency to err on the side of caution ballooned our budget a bit. A more permanent installation might require additional mounting components, longer and lower gauge wiring, and a more sophisticated venting apparatus, which will impact your bottom line. ▲

Components	Quantity	Total
Alps ATI-130W multicrystalline PV module	3	\$1,710 (\$570 each)
UniRac 84-inch SolarMount two-rail kit	1	\$101.99
UniRac 30-inch low profile tilt leg	2	\$56.42 (\$28.21 each)
UniRac "D" top mount clamp kit	1	\$20.15
SunSaver MPPT charge controller	1	\$175.00
110A class t fuse & holder	1	\$37.95
6 volt DC u2200 deep cell batteries	4	\$479.80 (\$119.95 each)
2 gauge battery interconnect cable, 1-foot	3	\$44.38 (\$14.79 each)
2 gauge battery cable set, 5-feet	1	\$77.29
10 gauge sunlight resistant array wire, 30 feet	1	\$17.22
10 gauge red wire spool, 50 feet	1	\$16.99
10 gauge black wire spool, 50 feet	1	\$16.99
10 gauge green wire spool, 50 feet	1	\$16.99
Box of spade terminals	1	\$5.49
Cinder blocks	4	\$3.96 (\$0.99 each)
Disconnect switch	1	\$24.50
Samlex 1000 watt pure sine wave inverter	1	\$639.00
2 gauge pure sine cable, 6 feet	1	\$47.00
200 amp fuse kit	1	\$25.00
Battery enclosure, gas vent parts	1	\$22.96
Misc. shipping		\$175.00
TOTAL		\$3,714.08

PVC pipe out the window. Next, we simply set the tub over the thick battery cables (not touching the terminals, of course) to let in fresh air. This prevents a dangerous buildup of gasses should the vent clog. We used another piece of plywood with a hole cut into it in the open window to allow the PVC pipe free access to the outdoors. We also made sure the pipe was short enough to remain under the garage's overhang and angled downward slightly to ensure the batteries remain clear of the elements. Finally, we connected the two positive and negative

leads from the charge controller to the negative and positive terminals of batteries two and three respectively. See the Solar Electric Wiring Diagram for more details.

Connect the inverter and solar modules. Next, we got out our spool of green grounding wire and ran a piece from the inverter's grounding nut in the garage to the ground line for our house. Then we ran the fused positive wire from the positive terminal of battery four to the positive terminal on the inverter. Next, we connected the negative terminal of battery one to the

negative terminal of the inverter. With the disconnect box switch set to "Off," we connected the positive and negative wires coming from the solar array to the corresponding terminals in the disconnect box.

Moment In The Sun

Before we introduced our solar array to the sun and flipped the "On" switch, we made sure to tighten all terminals, inspect every connection, check the vent hood, and verify the LEDs on the charge controller were showing the expected battery and charging status. When everything looked good, we uncovered the panels and flipped on the disconnect switch. At this point, it's a good idea to use a digital voltmeter to ensure the batteries and solar array are showing expected voltages in all the right places. Lastly, we turned on the inverter, plugged in our solar-powered PC and booted up.

Once the battery bank was fully charged, we decided to shut off the array and run the PC day and night to simulate several consecutive sunless days. Our PC, running a moderately heavy load (3DMark06), lasted 24:20 (hours:minutes).

Go ahead, energy crisis, make our day. ▲

by Andrew Leibman

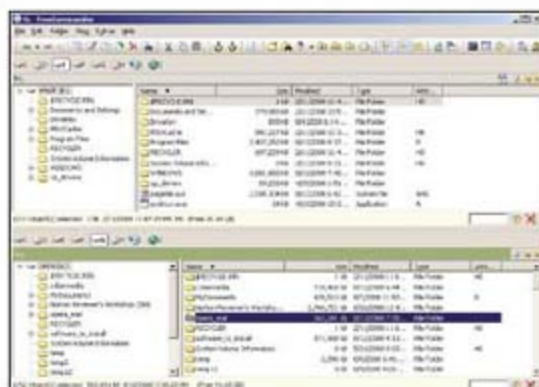


Here it is, running on the power of the sun.

The Bleeding Edge Of Software

Inside The World Of Betas

FreeCommander 2008.06a beta



Product Name: FreeCommander
Version # Previewed: 2008.06a beta
Publisher and URL: Marek Jasinski, www.freecommander.com
Developer and URL: Marek Jasinski, www.freecommander.com
Product URL: www.freecommander.com
ETA: Q4 2008
Why You Should Care: Perhaps the best free dual-pane Explorer keeps improving.

Windows' own Explorer is OK for basic file copying and manipulation but as it lacks any real set of tools, that's pretty much all it's good for. On top of this, you normally need to open two instances of it in order to copy files—one window for the source folder and another window for the destination. Our favorite two-pane Explorer alternative, Directory Opus 9, is outrageously priced at close to \$75, but FreeCommander offers nearly as much "get up and go"

functionality and a similar interface at an unbeatable price: free. Hence the name.

FreeCommander lays out panes with file listings the way you want 'em, either horizontally or vertically, with or without accompanying directory trees. Each pane gets a toolbar filled with drive icons, an FTP icon, and a Network Neighborhood icon. Each also gets tabs if you'd like, allowing you to quickly jump between drives or folders within a single pane. Most operations involve dragging and dropping files

and folders from one pane to another, but there are dozens of operations that just perform work on the files selected in one pane.

"What operations?" you ask. FC can view and extract files from ZIP, CAB, and RAR archives, display file contents with a built-in file viewer, shred files, perform bulk file renames, create and verify MD5 checksums, split files, compare and/or synchronize folders, display folder sizes, modify file and date attributes, open a DOS command line at any selected folder, and a whole lot more. The current beta (which is available only to those who make a \$15 donation) adds the ability to view all the files in a current directory, as well as any child directories, in one window.

FC shows a great deal of polish, typical of software that's been around for a few years, but the active discussion forums reveal that active development is still adding requested features. It's really the best of all worlds and well worth a look and donation, as well. ▲

by Warren Ernst

TeraCopy Version 2.0 beta 4

We've railed against Windows' brain-dead file copying methods before when recommending The Unstoppable Copier, but there's more than one way to skin a cat. Another utility that smashes these file-copying roadblocks is TeraCopy, which is available both as a free-for-personal-use version and a 15 euro professional version with a few more features. We love them both.

TeraCopy's main forte is speed: By automatically utilizing a different buffering scheme and asynchronous copy modes, TeraCopy copies files very quickly and especially so between different drives. A log window shows you exactly what happened with each and every file, but it normally remains hidden. When TC encounters unreadable files, it will make multiple attempts at reading it and then move onto the next file. You

can also pause copy jobs, letting you get in a quick command during a big process.

The current beta adds a few incredibly useful features. While you can use TC as a standalone program, it's most handy when it is integrated with the Explorer. When Shell Integration is enabled, TC kicks in automatically when you copy or move files, and TC options appear in pop-up menus when you right-click files. With that said, the beta lets you integrate or "unintegrate" TC with the Explorer upon command. The beta also ramps up the speed when copying between UNC'd network file stores.

The Pro Version lets you apply filters to batch copy jobs and remove files from the copy queue during jobs, plus the license permits professional use. ▲

by Warren Ernst



Official Product Name: TeraCopy
Version # Previewed: Version 2.0 beta 4
Publisher and URL: Code Sector, www.codesector.com
Developer and URL: Code Sector, www.codesector.com
Product URL: www.codesector.com/teracopy.php
ETA: Q4 2008
Why You Should Care: End frustrating Windows copy jobs forever!

UP TO SPEED

Upgrades That'll Keep You Humming Along

Some old cult favorites enjoy updates this month, including the foobar2000 and Media Player Classic players, CCleaner, WinRAR, and Opera. Apple also offers a much-needed bug fix for the iPhone 2.0 firmware.

Software Updates

Adobe Camera RAW 4.5

The latest plug-in that converts and adjusts RAW files in Photoshop CS3, Photoshop Elements, and Premiere Elements now supports the Olympus E 420/E520, Nikon D300 and 70s, and Sony A700, among many other recent models.

www.adobe.com

CCleaner 2.10.618

The system file cleaner now accesses the Type Library in Registry Cleaner, as well as improved file extension scanning. A shutdown option is available from the command line and the system tray menu. The program also supports Vista common dialogs.

www.ccleaner.com

foobar2000 0.9.5.5

This alternative audio player fixes handling of CDs with 99 tracks and adds a few workarounds for issues the program had with decoding some ADPCM WAV files. It also fixes crashes caused by the Crossfader DSP.

www.foobar2000.com

Komodo Edit for Windows 4.4.1

The editor for dynamic languages such as Perl, Ruby, CSS, and JavaScript integrates Unit Test. There are also improvements to the program's RFind and Replace functions, PHP autocomplete, and Perl 5.1 support.

www.activestate.com

Media Player Classic for Windows 2000/XP 6.4.9.1

Reviving the look and quick performance of early Windows Media Player, Classic updates the MPEG Audio Decoders liba52 and libdts. It also includes multiple additions and fixes for the VSFilter.

sourceforge.net/projects/guliverkli2

OpenOffice.org Portable 2.4.1

The portable version of the open source office suite installs to a USB drive. This version updates code to OpenOffice 2.4.1. It also includes a new Portable-Apps.com installer.

www.portableapps.com

Opera for Windows 9.52 Build 10100 Beta

The cult-favorite browser fixes an issue with lists displaying incorrectly in RTL-rendered text. It also fixes a quality issue with YouTube video previews.

www.opera.com

Orbit Downloader 2.7.3

The download accelerator using P2P technology adds a Softonic.com search option and improves the MMS protocol download. In addition, it fixes a bug when fetching YouTube URLs.

www.orbitdownloader.com

Total Commander 7.04

This file manager supports ZIP encryption of both original and 2.0 versions and is compatible with common ZIP packers. AES (Advanced Encryption Standard) is enabled.

www.ghisler.com

uTorrent 1.8 RC7

The torrent client upgrade will add a download column to the Trackers tab and an advanced mapping option for TCP ports only. This update will also remove redundant error messages and squash numerous bugs.

www.utorrent.com

vLite 1.2

This tool removes select components of Vista and creates a bootable ISO file for custom installations. This substantial upgrade adds 16-bit support and crash dump support, as well as removal options for a wider range of features.

www.vlite.net

WinRAR 3.80 Beta 4

The compression engine for RAR formats fixes a problem with earlier betas not creating recovery volumes. It also fixes a problem in renaming volumes.

www.rarlab.com

Driver Updates

ATI Catalyst 8.7

The latest RADEON drivers enhance the Control Center and support Ubuntu 8.04 and SLED 10 sp2. It includes several performance improvements in some configurations of Company of Heroes, Lost Planet, and Call of Duty 4.

www.amd.com/us-en

Intel Chipset Software Installation Utility 9.0.0.1011

The latest Windows INF files help the OS configure AGP, USB, Core PCI, and ISAPNP services.

www.intel.com

iPhone 2.01

The long-awaited bug fix for the iPhone's 2.0 OS upgrade seems to accelerate the sync process, overcomes some application crash issues, and relieves the keyboard lag many experience with email and text messaging.

www.apple.com

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AOC-UTG-i2
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Model	Controller	Form Factor	Interface	# of Ports	Connector Type	Price
AOC-STG-i2	Intel 82598	Standard Low Profile	Intel 82598	2	CX4	\$441
AOC-UTG-i2	Intel 82598	UIO Full Height	Intel 82598	2	CX4	\$335
AOC-UG-i4	Intel 82571EB	UIO Full Height	Intel 8257 1EB	4	RJ45	\$193

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Scribd iPaper

Adobe Acrobat is great at what it does, which is compactly presenting print-quality documents that others may or may not need to edit, but its tremendous features has led to software bloat over the years that make PDFs less than ideal for Web-only use.

While PDFs are the heavyweights of the digital document arena, iPaper enters as a nimble flyweight, keeping document sizes extremely small by focusing on a few key features most people use and using a tiny Flash plug-in instead of a proprietary stand-alone reader. You don't need to buy any software or force end users to install anything (except a plug-in they likely already have) to implement it on your Web site. There's a complete iPaper JavaScript API available for those who want to get under the hood and handle everything themselves, but you can also let Scribd handle the conversions of existing documents at your site, or let them convert and embed individual

Scribd iPaper
Free
www.scribd.com



PDF, DOC, XLS, RTF, or other documents you upload. You can also CC emails with attachments to iPaper@Scribd.com and the attachments will be converted into iPaper format so other recipients of the email can click a link to open the attachment in their Web browsers.

On the test systems we used, iPaper handily outperformed Acrobat when it came to viewing documents. Documents loaded quickly, and there was no lag or stuttering when scrolling. The viewer interface is compact, putting oft-used features like zoom and search on a single, thin menu bar, and it's possible to download the original document for offline viewing.

There are some limitations. There are graphic artifacts in iPaper documents, especially when viewed at high zoom levels, that don't exist in PDF versions. Because



the reader is embedded in a Web browser it can't be resized as efficiently as can an Acrobat window, but there is an option that lets you fill the entire browser window with a document that automatically resizes to fill the browser window. If you can't live with those limitations, make some PDFs. Otherwise, iPaper provides a simple, convenient, and free way to add some pizzazz to your Web site or make sure others can open your email attachments. ▲

by Tracy Baker

Webroot Secure Backup

With the proliferation of both local and online backup solutions, it's nice to have a product like Webroot Secure Backup that combines both, but the software unfortunately sacrifices much in the name of simplicity. There are no menus or advanced options, just four Wizards that guide you through local and online encrypted backup and restore procedures.

Selecting individual files or folders for backup is as easy as clicking a box next to them, but there are no options for selecting files of a certain type, like all DOC or XLS documents. This means creating a backup set, which requires drilling down folder by folder until you find exactly what you want to include, a tedious process. For example, we wanted

to select only the files in our Documents folder, and not the sub-folders, but the only ways to do that are to either individually select each file, or select the entire documents folder and then manually deselect every sub-folder.

Once the backup set is finalized, the backup process is very simple. When storing files locally you can opt for a full backup, which backs up everything you select at scheduled intervals, or an incremental

backup, which performs a full backup initially and then only backs up files that have changed. Sadly, if you decide to store the backup somewhere other than the default location (which is the C: drive), the software won't automatically create a new backup folder for you. You must create it manually outside the software or use an existing folder. You can then schedule backups anywhere from hourly to monthly, and a LiveProtect option is available if you want to create backups every time a file is saved.

The online wizard works pretty much the same way, and you can share the files with others by emailing Web links. One account covers up to three PCs, and while there are better standalone products for each of these tasks, if all you're looking for is a simple, all-in-one basic solution, Webroot Secure Backup delivers. ▲

by Tracy Baker

Webroot Secure Backup
\$29.95 to \$99.95 per year
(from 2GB to 50GB online storage)
www.webroot.com



CyberLink DVD Suite 6 Ultra

Phrases involving kitchen sinks come to mind when considering CyberLink's DVD Suite 6 Ultra, which includes everything but, well, you know, when it comes to playing and creating DVDs, VDSes, and now Blu-Ray discs (which are referred to as "BDs," in case you're not up with the lingo). In a market dominated by Nero and Roxio, CDS6U has eked out a good niche for itself, focusing on top-notch playback abilities and ease of use for content creation and burning, though it manages this by omitting some of the nitty-gritty options and tools that make power-users swoon.

CyberLink is betting that your inner nerd already realizes that most drives come with OEM versions of Nero Burning ROM, so you already have speed and media tests, bitsetting tools, and audio rippers that handle the millions of combinations of format and bitrate options. As such, CDS6U forgoes such tools and options. Its audio ripping tools, for example, only have settings for four

MP3 and WMV bitrates, though they're the most common ones. In exchange, its individual tools have slicker interfaces and are easier to use than anything from Nero or Roxio, yet are much more fully featured than what freeware tools offer and all work with BD-writable discs.

The installer, which requires you to install the entire suite, adds 1.08GB worth of tools, including the general purpose burner Power2Go (which looks like an old version of EZ-CD Creator with a fresh coat of Aero), PowerProducer and Director (which let you capture media and author

DVDs and BDs), PowerBackup (which archives files to discs, optionally including a scheduler and self-running expander for recovery), and the full BD compatible and surround-sound version of PowerDVD for movie playback, which normally costs about \$100 all by itself, plus many more. Other than PowerDVD, most of the apps feel like they're missing just a few features in order for any to be best-of-breed, but all work as promised and are attractive and easy to use. The CDS6U start screen is especially well-organized and helps you to select the right tool for the job.

If your drive already comes with basic tools, you prefer simple-and-attractive vs. somewhat complex and almost too-thorough burning utilities, and especially if you're already considering PowerDVD, then CDS6U is a good choice. ▲

by Warren Ernst

CyberLink DVD Suite 6 Ultra

\$129.95

www.cyberlink.com



EzBackup101

Companies that decide to simplify software always run the risk of taking things too far, stripping away so many options that the end result is more useless than the basic tools that ship with Windows. EzBackup101 is unfortunately one of those products, and the real irony is that the interface is so unintuitive that the software makes the backup process more difficult instead of living up to its name.

The software lets you pick source and destination drives immediately after firing it up, and that's where we ran into the first snag. It recognized an installed USB drive, the primary internal hard drive, and the secondary internal hard drive just fine, but didn't detect the mounted network drive that we prefer to use for all backups. There is no option to detect

external drives elsewhere, meaning if you use a network share for backups you can forget about this software. Archiving data to CDs and DVDs is supported.

Basic backup categories such as Documents, Photos, Music, etc. are provided for creating quick backup jobs. The option to select individual files for backup exists, but using it requires drilling down through folders using a tiny box

that isn't resizable, making it impractical for most power users. Beyond those features, there are simple file restore and backup scheduling options, and that's it. You can't filter out particular file types, add file types to an existing backup category to customize it, select encryption or compression options, or do just about anything else that a useful backup program allows. Overall, power users would be better off even with a simple freeware tool like Cobian Backup that sports more features and a superior interface. ▲

by Tracy Baker

EzBackup101

\$24.99

www.ezd2d.com



Dialogue Box

by Chris Pirillo

How Does Software Taste to You?

Recently, a friend sent me a link to a video on YouTube. (No, it wasn't a Rickroll this time.) The official "Google Tech Talks" channel is filled with hundreds of insightful presentations. This particular video featured Dr. Chenxi Wang, who was discussing the consumerization of enterprises. This sparked a somewhat heated discussion between us, although we were both on the same side.

The primary problem with enterprise software is that it's designed to be unusable so that consultants/trainers/programmers have job security. It's a policy inherent in the system. The experience doesn't need to be remotely intuitive. Enterprise apps need friendlier interfaces, and consumer apps need better security modeling. It's heading to the middle—a better balance between the two. And that could be a good thing for everybody.

Consumers (that is, people like you and me) are using the apps they want to use already, namely, those found on the Web. Well, maybe not for everything we do, but I don't think we'd forego a fantastic service that couldn't be found anywhere else merely because it was hosted on the Internet rather than our desktop. And that's where it changes—not from decisions handed down from on high but from a groundswell of support from below. But is "big business" (read: enterprise) ready to accept that its users want a different kind of experience with their software? Something far more friendly? You know, something that may not require months of training just because it's incredibly intuitive to use?

Momentum has to be organic, and that's where consumer advocates have to be patient. You can't force change down anybody's throat. Not to beat a dead horse, but look at the iPhone and how Apple is trying to stick its design-centric foot in an overtly utilitarian arena. It's bringing form and function to a marketplace that usually values the latter. Tomorrow's workforce is not going to put up with government "cheese" when they've been used to eating caviar. They'll be used to the interconnectivity afforded to them through a Facebook account, something that keeps them in touch with what all their friends are

doing. I'm not so sure there's a Facebook equivalent, in terms of usability and design, in enterprise today.

I wouldn't even touch Lotus Notes back in 2000, despite it being the groupware app for TechTV. As a user, I didn't care how powerful the backend was; I've always been a software experience connoisseur. Most people, however, are not. They're used to junky experiences, even on their home desktop. As their day-to-day software experiences

and tastes evolve, so will their expectations. But it takes time. As more apps move to the Web, the more likely enterprise will sit up and start to take notice.

It's almost impossible to make someone care. And the last thing they're likely to care about is the software they must use at work. How do we get them to care? We give them comparisons, and that is exactly what's happening in the marketplace outside the enterprise today. The consumers need more, better, and relevant tools. How do you know something sucks? When you find that something else is better.

What gets people to care is incentive and relevance. When you share a perspective on an issue they care about, or a tool they never knew they needed, you're feeding the cycle. People generally only care about software because they have to care in order to get a job done. You, as a power user, care because you just DO. Show them how it could be. Get people excited about software by showing them its power.

From below, we have a chance to give enterprise a good degree of indirect (or even direct) guidance, not the other way around. It may begin with providing open, unfiltered feedback like many bloggers do when anything new is released to the world. Given the amount of opinions floating throughout the Web, I'd be quite surprised to find out that you weren't already doing it for the things you care about most (software, hardware, or something completely unrelated to technology).

And if you're not excited about software, how the hell did you make it to the end of this article without falling asleep? ▲



Chris Pirillo uses software like it's going out of style. Thankfully, it never really does. Sure, this app may go better with that outfit, but since when has he been one to coordinate binaries before leaving the house? Mind you, he never leaves his house in Seattle, where he can be found streaming his life online (24/7) at live.pirillo.com or blogging on chris.pirillo.com or lockergnome.com. He's also meeting people through gnomedex.com and rickroll.me. We're just seeing if you're paying attention to this byline, or if you tuned out after you read the article's headline. Speaking of headlines, that's Chris' question for you this month: If software really had a taste, what would it be?

You can dialogue with Chris at
chris@cpumag.com

Open Apple Sauce

Ditching Mac OS and rebuilding a new desktop operating system, OS X, on a kernel based, open-source BSD Unix was a brilliant idea. In one stroke, Apple got the benefit of a rock-solid open-source platform while retaining proprietary control over the new product (because the BSD license allows it). It's just not the kind of move you'd picture Microsoft taking.

But Apple has control issues, too, which is why, despite being just another flavor of Unix, OS X falls far short of being the open-source software user's dream it could be. Because Apple takes look-and-feel issues so seriously and controls the platform software and hardware to a far greater degree, using many of the thousands of open-source apps developed for *nix is not nearly as easy as it could be.

With its built-in X11 support, OS X is capable of running most of the same applications that run on any *nix flavor, including Linux, but the key word is "capable." First, someone has to recompile those apps for OS X, which not everyone feels compelled to do.

Part of the problem is package management, which is what Ubuntu Linux does so right with Synaptic: You pick a package you want to install, and Synaptic figures out what else needs to be installed, so you're not tracking down dependencies. In other words, you pick the application, and Synaptic figures out all the libraries, extensions, etc. required to run that application.

Figuring out how to get a *nix application to run on OS X was sadly retro. The basic approach—download source and compile from scratch—is so 1996. The last thing I want is to compile source at the command line on OS X. Alternatively, searching out and downloading precompiled binaries for OS X may be OK once in a while, but it's a drag, and not in the good, easy-to-use, drag-and-drop way; that's a big part of the reason why Linux package managers are so popular.

OS X does have two package managers: Fink (www.finkproject.org) and MacPorts (www.macports.org), formerly known as DarwinPorts. Both run in a terminal window and are perfect candidates for GUI front-ends.

The trouble is, there's just one open-source front-end, FinkCommander (finkcommander.sourceforge.net); if you're willing to pay, developer Kevin Walzer offers shareware front-ends for both: Port Authority for MacPorts and Phynchronicity for Fink (www.codebykevin.com).

Unfortunately, if you need to depend on someone else to compile source for your OS, you can't always depend on them to be completely up-to-date. Neither Fink nor MacPorts is current, nor do they have all the software you might want. They might not even be able to install the software you want. MacPorts is hosted at Mac OS Forge (www.macosforge.org), which is an Apple site, so some believe MacPorts has "official standing."

When installing open-source software, I had the best luck with applications downloaded directly from Apple's open-source download page. (Just Google those words; the URL is kind of scary.) Click the Download button, save the file, click to Open/Install. Gimp, the most popular download, was dead simple to install and installed the current version.

Why wouldn't Apple port Synaptic and make available all those thousands of packages that everyone in the Ubuntu World takes for granted? Probably because most of those apps are based on X11 windowing, and that's not the way Apple wants apps to run under OS X. Compare the office suite for OS X, NeoOffice (www.neooffice.org), with OpenOffice.org running on OS X under X11: NeoOffice is "a reasonably stable version of the OpenOffice.org office suite that has been engineered to run natively on Mac OS X." What that means is that instead of the "normal" menu bar system that X11 (and Microsoft Windows) users are accustomed to in the top of the document window, you get application menus that sit at the very top of the desktop screen whether or not a document window is open. It's a Mac thing, and it's a big thing for Mac users that their software all behaves like that. If you start letting in all that X11 riffraff, OS X would suddenly not be so different from Linux . . . or Windows. ▲



Peter Loshin publishes LinuxCookbook.com, a place to learn even more about Linux. And don't forget to check out the new Ninitata.com, Peter's family-friendly fun and learning site.

You can get saucy with Peter at pete@cpumag.com

The Game Changer

iPhone Dials Up The Mobile Data Market

Months after the release of the iPhone 3G in early July, lines still form outside Apple and AT&T stores as consumers continue to pine for the scarce device. By some estimates, over 5 million 3G models flew off the shelves since the launch, nearly doubling Apple's share of the handset market in a matter of weeks. But what's even more staggering to many people in the mobile community is the influence the Apple iPhone browser has had on the mobile Web and in overall data usage. More than a cool phone that set a new standard for handset design and user interface, Apple's wunderkind has become a key driver in overall mobile Web use and an unprecedented magnet for mobile Web and application developers.

Soon after the initial model arrived more than a year ago, metrics companies started noticing an astonishing percentage of Internet traffic coming from the iPhone. Apple's device includes a full Web browser via the onboard Safari application, but it also accesses "Web Apps," specially built Web-based applications with AJAX-like interactivity. Although there are more than 250 million individual mobile phone subscriptions in the U.S., fewer than 10 million have an iPhone. And yet as early as August of 2007, 0.05% of all Web traffic from all desktop and mobile browsers (including Internet Explorer and Firefox) was coming from the iPhone, which mobile industry experts considered astonishing. By July of 2008, however, the iPhone's share of Web use had grown to 0.20%, and only a month after the introduction of the 3G iPhone, its

Web share increased to 0.31%. In a research statement to investors, PacificCrest analyst Andy Hargreaves stated that "iPhone's share of Internet browsing is now four times that of Windows Mobile and nearly 40% of Linux's share."

Major Web developers saw evidence early on of the iPhone's extraordinarily disproportionate role in growing mobile Web use. When AP News launched its ambitious Mobile News Network site across standard WAP and iPhone optimized pages last spring, it received over 2 million page views in its first months. "Most of the traffic came from the iPhone," says Jeff Litvack, global director, New Media Markets, AP Digital. "Only 15% to 20% is from the WAP site." In fact, throughout early 2008 a number of digital companies reported an inordinate share of their traffic coming to standard Web and mobile WAP sites from the iPhone. Despite the small user base, companies such as Facebook, Google, Yahoo, PopCap Games (Bejeweled), and even Banc of America quickly developed sites that made specific use of the iPhone/Safari's AJAX-like functionality: sliding menus, in-page interactivity, and multimedia playback. "The way in which news is read on these smart devices is fundamentally better," says Litvack. "It is not only faster delivery but more visual, more customizable, and

feature-rich." AP News has invested multiple millions in building out its mobile service for smart phones and the iPhone in particular.

Aside from the coolness factor, so many big brands chased the relatively small iPhone audience because these users are influential and dedicated. "Mobile browsing is so much more popular through the iPhone than on any other phone," says Ori Soen, founder and CEO of MuseStorm, which helps media companies and bands like MegaDeth create Web and mobile widgets. "Yes it is a smaller subset of mobile users, but it is a much larger subset of engaged users. The iPhone changed the game on mobile."

According to statistics from M: Metrics/comScore, Soen is quite right. Even more than sophisticated smartphones like previous Blackberry and



Windows Mobile models, the iPhone demonstrates how larger screens, easier input, and smoother interfaces substantially increase mobile access to a range of nonvoice phone functions. While only 13% of general mobile phone users access the Internet on their handset, 85% of iPhone users do.

Rewriting The Rules

Just as Web and mobile developers were starting to flock to the iPhone's Web App platform by early 2008, Apple shifted the playing field once more on July 10 when it opened the App Store. Using a widely available SDK, developers now could create their own applications that worked solely on the iPhone device or in concert with online data and distribute

them through the iTunes App Store. The response among developers was immediate. Hundreds of thousands of large and small programming groups downloaded the SDK in the spring of 2008, and shortly after launch, the App Store had well over 1,000 applications, everything from tip calculators to mapping programs that accessed the iPhone's geolocation features. More than 60 million free and fee-based downloads from the store in its first month produced \$30 million in sales, Apple CEO Steve Jobs told *The Wall Street Journal*. Jobs felt that selling applications to the iPhone could generate over \$500 million annually.

"It's really hard to run away from something like that," says Tammy Robinson, senior director, Sega Mobile.

Her company's Super Monkey Ball game sold 300,000 copies at \$9.99 in the first week in the store. "[That's] phenomenally successful pretty much for any platform in the first month of sales," she says. Sega plans to develop more games here, largely because, unlike other mobile development, the iPhone offers companies a single platform that does not incur the costs of porting an application to hundreds of different handsets. "It is very much more cost effective from that perspective," says Robinson. More importantly, the iTunes storefront lets her merchandise her game and see user reviews in ways that are practically impossible on a typical phone.

Apple rattled the mobile industry's cage by making it easy and lucrative for developers to reach consumers more

FOLLOW THE FROG

According to Jim Bradbury, executive director, Mobile Operations, Konami Mobile, the classic game Frogger is the game the company tests on any new platform. Because the ubiquitous and widely known title is so popular across so many demographic groups, the response it gets on an untested device such as the iPhone tells Konami a great deal about how much to invest in other titles. After launching Frogger shortly after the iPhone App Store opened in July, Bradbury liked what his trial balloon showed him. Konami is the same company that publishes Metal Gear Solid and Castlevania, both in mobile versions on other phones.

CPU: After Frogger, what other titles do you plan to release on the iPhone?

Bradbury: We have several games in production at this time. We are very excited about the platform and will be releasing more information shortly about specific titles.

CPU: What did the early sales of Frogger tell you about the potential of this platform?

Bradbury: Frogger is a relatively safe bellwether for how a newly released platform performs and we're encouraged by the sales the game has been receiving. The performance so far has shown a strong adoption by consumers on downloading commercial applications on the iPhone and that helps us to determine how we should be supporting the platform. We are always analyzing our distribution channels and since this one is so new there will probably be some ongoing changes in regards to pricing strategy, marketing promotions, and other publishing touch points.

CPU: From a developer's perspective, what are the key differences in designing for this platform as opposed to other mobile phones?

Bradbury: The base capabilities of the iPhone and iPod touch greatly surpass what's possible on other mobile platforms. From a developing standpoint, game design needs to be specifically created to support these devices. It's not just the fact that there is touch or accelerometer functionality. It's great to have those features and they do require a different design perspective, but the thought process can't stop there. Publishers need to combine those features with the increased technical capabilities and deliver games that are appropriate for the platform. With our upcoming games, we are really digging in to what can be achieved from a gaming standpoint so that, holistically, consumers engage in very satisfying, high quality gameplay and experience a sense of "play" that keeps them wanting more.

CPU: From a publisher's perspective, what are the distinctions between the iPhone platform and other mobile phones? Is the cost and hassle of distribution substantially smaller here?

Bradbury: Budgets are bigger for the iPhone due to performance capabilities but publishers don't have to worry about the device fragmentation that occurs with Java, BREW, and other smart devices. The consumer's purchasing touch points are significantly different, as well, and that needs to be taken into account in regards to marketing and promotion. I don't believe we regard anything as either more of a hassle or less of a hassle. Each distribution channel has its own challenges and benefits, and we want to make sure we are supporting all of them appropriately. ▲

directly and with better revenue sharing terms than almost any major wireless carrier in the United States. There are some notable exceptions. Apple did remove a program that “tethered” the iPhone so that it could share its 3G connection with a nearby PC, and it nixed a \$999 do-nothing app. Generally, however, Apple is keeping the bar low for independent developers and promises to give 70% of the revenues on sales back to the developer. For a small developer like Eric Busch of MintApps, the App Store opens a whole new market that would be impossible to access via the carriers. While no super Monkey Ball, his diet program sold 600 units in its first weeks. “I wouldn’t leave my full-time job to take up iPhone development, but the great thing about it is you can reach every user in the App Store. It would be hard to go back to a different mobile platform.”

The App Store model is combining Web connectivity and standalone applications design in interesting new ways. While the code and data for apps like AP News, Facebook, and NYTimes live mainly on the device, these apps can refresh themselves with new data



With its use of the accelerometer and graphics sophistication, SEGA’s Super Monkey Ball quickly became the best-selling iPhone app in the first weeks of the app store, selling 300,000 copies in weeks.

from the Web or even pull in dynamically served ads that help some of the services remain free or cheap to the user. One company, the Hot Phone Hit Factory, is developing iPhone “magazines” that combine on-deck storage with dynamic content.



The original iPhone Web App format allowed publishers like video aggregator MyWaves to access mobile consumers directly with sophisticated multimedia playback functions and interface once associated with downloadable applications.

Scheduled to launch in September during New York Fashion Week, PMc Magazine will be a iPhone-only downloadable application selling for 99 cents an issue, with feature images by famous fashion photographer Patrick McMullin and trendy stories and lifestyle features from the New York City set. Most of the five or six sections will download and remain on the iPhone itself to provide a lush magazine-like page-flipping experience. But several other aspects of the magazine, including new photos, news items, etc., will reach out to the Web for content refreshes until the next formal issue of the magazine drops into

the App Store. The iPod’s larger screen allows for a longer reading experience than standard phones, says publisher Michael Prenez-Isbell. “We want to bring quality of writing back and editorial control and great contacts . . . as opposed to Johnny Weblog.”

Which is not to say that Apple has perfected mobile Web and content delivery. As the App balloons with trivial content (how many tip calculators do we need?) navigation and content discovery become an issue. “How much content can you surf?” asks Sega’s Robinson. As well, the downloadable applications experience now competes directly with the previous Web app model, forcing some developers to divide their resources and time between two iterations for the same device. Unwittingly, Apple may also have lowered the bar for mobile



Many developers feel the App Store gives them new ways to merchandise and promote their products, with larger snapshots, user reviews, and an easy search function.

advertising, since applications here can elect to go free and run all sorts of intrusive banner and preroll spots along with the content.

Clutter, multiple formats, and advertising? Maybe Apple has succeeded in making the iPhone more like the Internet itself. ▲

by Steve Smith

Infinite Loop Dig this dungeon

If you really want the massively multiplayer dungeon experience, ditch your PC and take a walk through True Dungeon, a “real-life” dungeon put on by Gen Con Indy, a gaming convention. A local hotel’s ballroom is converted into a dungeon setting that more than 3,000 people run through each year. Mind your steps, though. There are monsters in there. ▲



www.wired.com/culture/lifestyle/news/2008/08/gencon_walkup

The Department Of Stuff

by Rob "CmdrTaco" Malda

drmsucks.txt

DRM, or Digital Rights Management, has been a part of almost every online music distribution system. It's easy to see why: with the Internet and BitTorrent, music piracy is no doubt affecting the bottom line for the industry. As for how much, that's not quite so clear, but the real problem for the copyright holders is that it's actually easier to deal with pirated music than the crippled files that you are sold.

First off, I'm not advocating piracy here. I'm advocating audio formats that don't interfere with the owner's ability to listen and maintain them. Most pirated audio is shipped in MP3 format, but most anyone can rip a CD they own to MP3. Nobody rips their CDs to a copy-protected format, and the industry doesn't need to even think about why.

The first problem is portability. If you buy a song from Apple's iTunes for \$1, you are limited to listening to it on your laptop and your iPod. What if you are one of the three people on earth who bought a Zune? Well, you're just out of luck. But on a more serious note, if you don't happen to run Windows or a Mac, you are left out in the cold. Heck, what about all those cute little set-top boxes that can stream audio to your stereo? By adding DRM to these files, their playability is strictly controlled. You are locked into only the platforms that are supported today.

Next is the risk of your provider going out of business. This has actually been more of a problem than you would think. Many DRM-based content providers have collapsed. I know people who have invested many hundreds of dollars into songs purchased from the iTunes store. Predicting the death of Apple was a popular pastime for pundits throughout the '90s, but what if it actually happens in 20 years? Maybe you don't care, but I think most people would be pretty angry if you had to mail all your CDs back if the label that released them went bankrupt.

It sounds stupid, but that's effectively what could happen. When you pay for

these locked files, you are agreeing to let them keep the keys in their pocket. They promise to let you use them whenever you want, but a decade from now when they change their mind and your computer crashes, you are out of luck.

Beyond that is the tremendous inconvenience of managing your audio. If you use iPhoto, you know how great it could be: You can share your gallery on your LAN and drag and drop from one machine to another. My wife and I can easily keep our photo libraries conveniently synced up. But iTunes doesn't allow anything like this for audio. We have four Macs in my house, each with a different subset of our audio: one contains every song we have, and the laptops contain tiny sets of music appropriate for their limited drive space. The best way I've found to maintain these libraries is to copy playlists to an iPod and use a shareware iPod-ripping program to reimport playlists onto each machine. This is insanely inconvenient.

Ten years from now I will be using a different laptop and a different operating system. But my MP3 files will still play. Even if my hard drive crashes, I can rerep the pile of CDs back into MP3.

What should commercial vendors do about this? First, if they must use DRM, they should use an open-source system so a dedicated hacker down the line can port support to any device that exists or ever will exist. This can be done but it's going to be scary.

Second, they could disable DRM on older files. After 12 months, let us unlock our data. That way they can still get big opening launch weekends, but we all have a guarantee that in 2015 I don't have to buy "Tommy" again.

Or they could just dump the DRM idea entirely and stop treating paying fans of music like criminals. ▲



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

Contact me at malda@cpumag.com

ROAD Warrior

by Jen Edwards

Vito Technology Gives Windows Mobile Phones The iPhone Touch

Really, there's no pun (or future product announcement) intended. Vito Technology (www.vitotechnology.com) has created a bundle of applications designed to make your Windows Mobile smartphone easier to use, more productive, and slightly more iPhone-like. The package, called iWindowsMobile Communication Suite, includes Fun-Contact, which, despite the lighthearted

name, is a powerful application that completely replaces the standard Contacts program with a finger-friendly interface with fast scrolling, T9 and keypad look-ups, favorites, and call history. SMS-Chat organizes your SMS messages into threaded conversations grouped by date, provides active links and phone numbers, and lets you forward or resend individual messages.

The other two applications in the package are ZoomBoard, which offers three different zoom modes to make finger-typing on your handheld screen more accurate, plus Winterface, a shell application designed to completely replace the standard Windows Mobile UI with something more attractive and functional. The iWindowsMobile Communication Suite is available now for \$39.95. ▲

New Toshiba Laptops Offer Something For Everyone

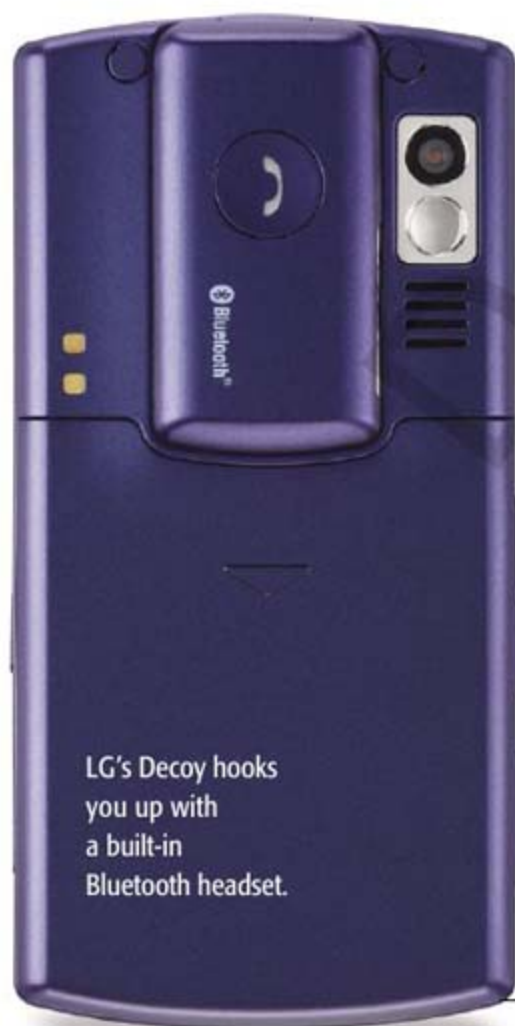
Whether you want a highly portable business computer or a fully tricked-out gaming laptop, Toshiba's recent offerings have you covered. The latest addition to the Portégé line, the R500-S5007V has a 1.33GHz Intel Core 2 Duo U7700 processor, 2GB of RAM, a 12.1-inch widescreen, LED-backlit display, and a 128MB SSD.

Bluetooth 2.0, 802.11a/g/n, and Gigabit Ethernet are standard, as well as one Type II PC Card slot and an SD memory card reader. Toshiba rates 5,800mAh battery for up to 7.5 hours of power. The system comes with Vista Business and also includes a Windows XP downgrade disk. At \$2,999, the Portégé R500-S5007V isn't cheap, but packing all of those features into a machine as thin as 0.77 inches isn't easy, either.

Toshiba also added three models to its Qosmio line. The Qosmio G55 is aimed at hardcore multimedia users such as graphic artists and video editors. Featuring a Quad Core HD processor that's based on the Cell technology co-developed with Sony and IBM (think PS3), the Qosmio G55 has an 18.4-inch widescreen display (16:9 aspect

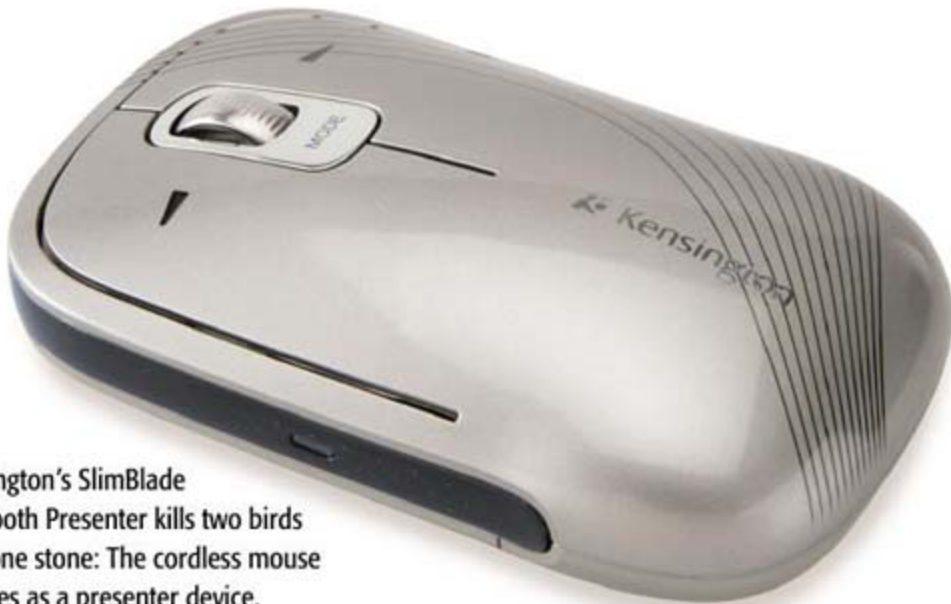
ratio) and up to 500GB of storage. Toshiba placed special emphasis on video editing, with transcoding speeds up to 10 times faster than a comparable Toshiba laptop without the Quad Core HD.

The Qosmio X305 is a gaming laptop with a 17.1-inch display, an Nvidia GeForce 9800M GTX mobile GPU, and dual hard drives for up to 400GB of storage. The 15.4-inch widescreen Qosmio F55 is something of a jack of all trades. It features both better-than-average graphics (GeForce 9700 GTS), which should appeal to gamers, as well as an integrated GPS receiver with Garmin mapping software. The G55, X305, and F55 all include Harman Kardon speakers with a built-in subwoofer. Exact pricing details weren't available at press time. ▲



Instant Headset, Just Add LG's Decoy

Finally, we have a way to avoid hearing a sales rep drone on about why only the most expensive Bluetooth headset will do for our newly purchased phones. The Decoy, manufactured by LG, is the first mobile phone to feature a built-in Bluetooth headset, which conveniently docks on the back of the phone when not in use. According to LG, the headset should provide up to two hours of talk time (80 hours standby), while the phone itself offers just under four hours of talk time and almost two weeks of standby. Other features include a 2.2-inch display, speakerphone, a 2MP camera with video capture, and a microSD slot that supports cards as large as 8GB. The phone is compatible with Verizon's V Cast services, VZ Navigator, and Mobile Web. Hotmail, Yahoo!, and AOL email are also supported. The LG Decoy is available for \$1,499.99 (after a \$50 MIR) after signing a new two-year contract with Verizon. ▲



Kensington's SlimBlade Bluetooth Presenter kills two birds with one stone: The cordless mouse doubles as a presenter device.

Kensington Accessories Lend A Hand To Mobile Users

Securing your laptop is crucial, whether you're warding off Internet threats or trying to keep a sticky-fingered thief from making off with your system. To help with the latter, Kensington has updated its ComboSaver Combination Notebook Lock Ultra (\$39.99), which uses a 5.5mm-thick, 6-foot-long, coated carbon, tempered steel cable. The lock gives you 10,000 possible different combinations, and a reset tool prevents accidental combination changes. If you register the ComboSaver lock online, you can retrieve a lost combination. The portable version (\$24.99) has a self-coiling cable for increased portability.

Kensington also introduced two new wireless mice. The SlimBlade Bluetooth Presenter Mouse (\$49.99) toggles between mouse and presenter mode with a quick double-click. It automatically enters sleep mode when your computer does and has a three-month battery life. The Ci95m Wireless Mouse with Nano Receiver (\$39.99) operates at 2.4GHz, features a slim profile and a rubberized exterior, and delivers up to six months of battery life. (Both battery life ratings are according to Kensington.) ▲

Enterprise Features Abound On New Nokia Phones

The latest phones from Nokia are designed for both style and productivity. The E71 has a 2.36-inch QVGA color display, full QWERTY keyboard, 3.2MP camera with flash and video capture, Bluetooth 2.0, and a microSD slot. Yet, the smartphone is a slender 0.39 inches thick. The "thicker" E66 slider phone is 0.51 inches fat but offsets this with a slightly larger screen. Both quad-band phones also feature HSDPA, Wi-Fi, GPS, and Bluetooth 2.0 connectivity.

Nokia's Mail for Exchange client is pre-loaded on both phones, and a setup wizard provides quick and easy setup for multiple email accounts. Thanks to built-in VPN support, enterprise users can easily access their corporate accounts and intranet sites.

Both phones are also serious contenders for anyone who considers security a top priority. The E71 and E66 include encryption for both the phone memory and the data stored on a memory card, as well as device lock and wipe features in the event of loss or theft. Two customized home screens for each device let users quickly switch between work and personal accounts for extra convenience. Carrier and pricing details have not yet been announced. ▲

Origami Experience 2.0 Ready For Vista UMPCs

If you have a Windows Vista UMPC, you might want to check out the latest free download from Microsoft. Origami Experience 2.0, which contains four new applications designed to help you get the most out of your portable computer. Origami Central is the control hub for your UMPC, letting you quickly access your favorite applications with one touch, instead of cluttering up your desktop with icons or wading through the Start menu. Origami Now provides instant access to weather forecasts, stock quotes, maps, date and time, etc., as well as the battery and Wi-Fi signal strength meters for your device.

Origami Picture Password will unlock your device when you tap specific points on a picture, rather than requiring a traditional typed password. Finally, Touch Settings let you customize your UMPC easily. Origami 2.0 requires 1GB of RAM, 100MB of storage, Internet Explorer 7, and Windows Media Player 11. Microsoft Outlook 2007 is required if you wish to use the calendar and mail functions. ▲

HP Pavillion tx2500z Does The Twist

The latest tablet PC from HP is the Pavilion tx2500z, which features a 2.2GHz AMD Turion 64 X2, ATI Radeon HD 3200 graphics card, up to 4GB of RAM, and up to 320GB of hard drive storage. The 12.1-inch display (1,280 x 800 resolution) can be used in a variety of positions, such as slate mode, presentation mode, or traditional laptop mode. Use your finger to launch applications or scroll up and down, or use the included digitizer pen (which docks inside the computer for recharging) to draw or write directly on the screen.

Additional features include a DVD burner with optional LightScribe support, Altec Lansing speakers, up to an 8-cell lithium-ion battery, a 5-in-1 card reader, and an ExpressCard slot. A host of wireless options are available; 802.11a/g/n and Bluetooth is the top-shelf choice. You can also add Verizon Wireless' V740 ExpressCard and choose between Vista Home Premium, Business, or Ultimate. Prices start at \$899.99. ▲

At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for the most part) love and recommend, read on.

Audio Video Corner

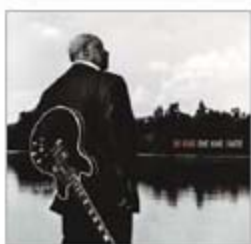
by Blaine A. Flamig



\$11.99
Steamhammer Records
www.imotorhead.com

"Motorizer"—Motorhead

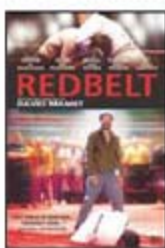
If heavy metal was a spaghetti western, Lemmy Kilmister would be Clint Eastwood, Motorhead would be his horse, and "Ace of Spades" would be the soundtrack thrashing in the background that Lemmy did his bidding to. On the excellent "Motorizer," the inventors of speed metal show no sign of fading into the sunset, as Lemmy proves more than able to still ride high in the saddle despite approaching retirement age. If anything, Motorhead is as relevant as ever on "Motorizer's" 11 tracks, all capable of blasting your face off with distorted speed and fury. From the hard-charging "Time Is Right" to the pulsing, anthem-worthy "Rock Out" ("Here comes the bass/Thunder in the guts/Rock you till you can't stand"), Lemmy and company still pack serious heat.



\$13.98
Geffen Records
www.bbking.com

"One Kind Favor"—B.B. King

Ask a member of The Church of The Blues to describe blues heaven and he might very well offer up a bent note from B.B. King's beloved guitar Lucille as an example. Closing in on 85, King displays why he's blues greatest ambassador on "One Kind Favor," a back-to-the-basics beauty masterfully honed by producer extraordinaire T-Bone Burnett. For "One Kind Favor," Burnett—whose recent magic also includes Robert Plant and Alison Krauss' "Raising Sand" and John Mellencamp's haunting gem "Life, Death, Love, and Freedom"—puts King's weathered voice and trademark vibrato guitar licks at front on Blind Lemon Jefferson's "See That My Grave Is Kept Clean," John Lee Hooker's "Blues Before Sunrise," and "Sitting On Top Of The World" from The Mississippi Sheiks. Spare and built on feeling, "One Kind Favor" is American music personified.



\$27.96
Sony Pictures
www.sonypictures.com/homevideo

Red Belt

Honestly, any movie that promotes itself with "written by David Mamet," we're there, no questions asked. That said, not everything Mamet touches turns to gold, including "Red Belt," a "Rocky"-like tale centered on Mike Terry (the wonderful Chiwetel Ejiofor), a Los Angeles jiu-jitsu instructor living by a strict moral code rather than in a pursuit of money, despite everyone in his life trying to convince him there's money to be made by fighting professionally. Swimming with stereotypes and plotlines run astray, "Red Belt" still manages to convincingly maintain interest throughout.

That's largely to Mamet's mastery, but also to a surprisingly great turn from Tim Allen, here a charmingly viscous movie star set on using Terry for his own good.



\$19.98
Weinstein Company
www.thepromotionmovie.com

The Promotion

"The Promotion's" plot is a familiar one, but the route writer/director Steve Conrad takes to deliver it isn't. Appreciatively subdued and restrained, "The Promotion" sets aside the current Hollywood comedy trends of gross-out humor and let-everything-hang-out sight gags to actually develop characters and scenes. Here, the scenes revolve around local boy Doug (Seann William Scott) and transplanted Canadian Richard (John C. Reilly), both in line for a manager's position within the Chicago supermarket chain they work for. Interestingly, neither character is the heavy here, as Conrad ("The Pursuit of Happyness," "The Weather Man") presents Doug and Richard as guys we can relate to and like. Add Fred Armisen as the pair's boss and Jenna Fischer ("The Office") and the always terrific Lili Taylor as their wives and "The Promotion" exceeds expectations.

DVD Byte

11/4

Gregory Peck Film Collection
Star Wars Prequel Trilogy
Wild Wild West: The Complete Series
Futurama: Bender's Game

11/11

The Sopranos: The Complete Series
Band Of Brothers (Blu-ray)
Lone Ranger: 75th Anniversary—Seasons 1 & 2

11/18

Encounters At The End Of The World
Hawaii Five-O: Seasons 1-5
WALL-E



Gonzo: The Life And Work Of Dr. Hunter S. Thompson

11/25

24: Exile
Beautiful Ohio
Fred Claus
George Carlin: It's Bad For Ya
Hancock

See the full reviews from A/V Corner at www.cpubmag.com/cpubnov08/AYL

SAM & MAX

SEASON TWO

CPU
Game Of The Month

A Non-Sophomoric Sophomore Effort—by Dr. Malaprop

\$34.95 (PC-DVD) • ESRB: (E)veryone • Telltale Games • telltalegames.com/samandmax

We previously reviewed Sam & Max: Season One for the PC back in the October 2007 issue as Game Of The Month. Season Two nails some one-upmanship on its predecessor and returns bundled as an even stronger series. We also like that Telltale Games has paid attention to customer feedback. *CPU* magazine appeals to power users, so it's nice to see that the game now plays at your native screen resolution. It's a simple change but something that we expect for games being purchased to play on high-end rigs.

Videogames are not known to bring out emotions, such as laughter and tears, so it's impressive to find a game that makes you laugh out loud with some regularity. Steve Purcell's whacky dog (Sam) and zany rabbit (Max) are back in form, albeit with one less episode than Season One. Each roughly two-hour episode went by quicker than we wanted, but only because we were having such a blast. Let's take a quick look at Season Two:

Episode 1: Ice Station Santa. You'll find no zebras. However, Sam and Max head to the South Pole and discover the troublemaking pagan, weapon-laden Santa Claus.

Episode 2: Moai Better Blues. Things get warmer in the second episode this season when a massive tropical volcano erupts and our intrepid duo have their vacation interrupted.

Episode 3: Night Of The Raving Dead. Zombies get better treatment than George Romero's current movie fare. And thwarting an emo vampire and other undead can be a deadly treat.

Episode 4: Chariots Of The Dogs. Hard to discuss this one without giving away key spoilers, but Mariachi singers, former selves, and gravitational singularities lead to hilarious results.

Episode 5: What's New, Beelzebub? Our furry lads have to deal with Hell LLC. Yes, that hell. Maybe it's time to make hell freeze over. It's also a tear-jerker because, after all, we need to wait until 2009 for Season Three.

The DVD-ROM package comes with extra features for playback on a standard DVD player, including behind-the-scenes items, four hours of audio commentary for the episodes, and a 20-minute holiday special episode to name a few features. Telltale Games even tips its hat to doing the right thing: Players that have already purchased Season Two directly from Telltale can order the DVD-ROM from the official site for just a shipping and handling fee. Let that be a lesson to the more greedy publishers.

The hilarious writing and DVD extras make Season Two an excellent choice to sit down with over the fall and winter months. The puzzles are logical and make sense in the game world context (unlike many adventure games we can recall). The price makes it yet more attractive. This is worth checking out, especially if—oh, the horror!—you've never played an adventure game. ▲



Sam & Max: Season One Hits The Console

The first season of Sam & Max is now deservedly being presented to a broader audience: Nintendo Wii gamers. The point-and-click nature of this delightful series is a natural for the Wiimote control. We'd love to see this series also hit the PlayStation 3 and Xbox 360. If these ventures prove successful, it may lead to bringing back classic adventure games as downloadable content. Just think of replaying the best that LucasArts and Sierra Online have to offer from the glory days. It makes us feel warm and fuzzy inside.

\$29.99 (Wii) • ESRB: (T)een • The Adventure Company • www.samandmax-seasonone.com



TOO HUMAN

Set Aside The Hype—by Dr. Malaprop

\$59.99 (360) • ESRB: (T)een • Microsoft • www.xbox.com/toohuman

Too Human is an action-heavy RPG that blends Norse mythology and futuristic cybernetics in a narrative retelling of the story of Ragnarok. As Baldur, you start off in the thick of the action with flashbacks leading to the present day situation. You'll encounter a well-known stable of Viking gods if you have even a cursory familiarity with the mythology, but the game assumes a certain degree of knowledge on the player's part at the outset.

The game looks good. Action plays out by pushing the right analog stick toward enemies and using range or melee weapons to take them out. As you level Baldur up, you'll have more powers and skills to choose from. Enemies come as a constant swarm throughout the game, and the controls typically feel accurate. Level designs are not as extensive as we would have liked, and the loot drops (the hook for playing the typical action-RPG) occur too frequently to make the loot feel valuable. It's nice that Too Human doesn't reset you to a beginning of a level when you die, but the single

unskippable 15-second death animation wears out its welcome early on.

Developer Silicon Knights has some ambitious gameplay concepts and is looking at Too Human as a trilogy. We expect to have a cliffhanger ending to make us want the next game, but Too Human's abrupt ending occurs as you finally begin to understand the game and it truly begins to get interesting. The pacing feels artificial and we were disappointed to end where we did. Setting aside the game's problems, it's a lot of fun overall—something more casual gamers can pick up with ease. There's much improvement to be made to the solid concept, and we look to more seamless gameplay and storytelling experiences in the upcoming sequels. ▲



SPACE SIEGE

Clichéd Click-fest—by Dr. Malaprop

\$49.99 (PC) • ESRB: (T)een • Sega • www.spacesiege.com

In humanity's effort to touch space, we unknowingly trigger the genocidal Kerak. These aliens strike Earth, and humanity flees into space. You are awoken several weeks into cryofreeze to discover that the aliens have breached your ship. As Seth Walker of the Allied Security Force, you set out to rescue survivors and plot the course of the Kerak's destruction.

Space Siege is a spiritual sci-fi sequel to the Dungeon Siege games, but it lacks their personality. (It also strikes us as a prettier Shadow Grounds, which we've previously reviewed.) Bland is the name of the game, so to speak. The various space locations are glorified dungeons in space that look very similar as you move about the spaceship. Movement and combat are repetitive click-fests, story and design are linear, and the game's loot (parts you pick up to level up various inventory items) is generic. There are no classes, there is limited character customization, and there is no co-op in the campaign. It's not all sour grapes, though. We enjoyed building and upgrading our robotic sidekick (HR-V), but felt that the choice between retaining your humanity and becoming cybernetic was not effective in the way intended.

We expect more from Gas Powered Games, the developer behind Supreme Commander, Dungeon Siege, and the upcoming Demigod. Space Siege is a value proposition challenge when you consider that Mass Effect is available on PC and 360, Titan Quest is available in discount bins, and that a tiny action-RPG called Diablo III is waiting in the wings. Our criticisms don't make Space Siege a bad game, only an average one. Paying full-price for a tedious and clichéd sci-fi action-RPG with limited replayability and approximately a dozen hours before completion is not recommended, so you may do well to hold off until Space Siege is discounted. ▲





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The Cutting Edge

by Barry Brenesal

Use 3D Glasses To Read This Column

It's easy to dismiss early motion pictures as being nothing but grainy, silent black-and-white films, conveniently forgetting that our grandparents and great-grandparents were just as savvy about exploiting the commercial possibilities in any new medium as their descendants. As far back as the turn of the 20th century, when films began to draw curious shoppers in urban areas, producers were already considering ways to colorize, add sound, produce wraparound screens, and turn 2D pictures into 3D.

Take 3D films. By 1901, British film pioneer William Friese-Greene had patented a 3D process that involved two film prints projected simultaneously and viewed through a stereoscope. In the United States, Frederic Eugene Ives (who demonstrated color photography as early as 1885 at Philadelphia's Franklin Institute) had acquired a patent for "stereo cameras" with a pair of fixed lenses less than an inch apart. The Frenchman Claude Grivolas had developed a 3D projector whose audience would use red and blue filtered glasses. This was cutting-edge stuff, but there were some rather large obstacles in the way: putting it all together, making it economically feasible, and interesting the public.

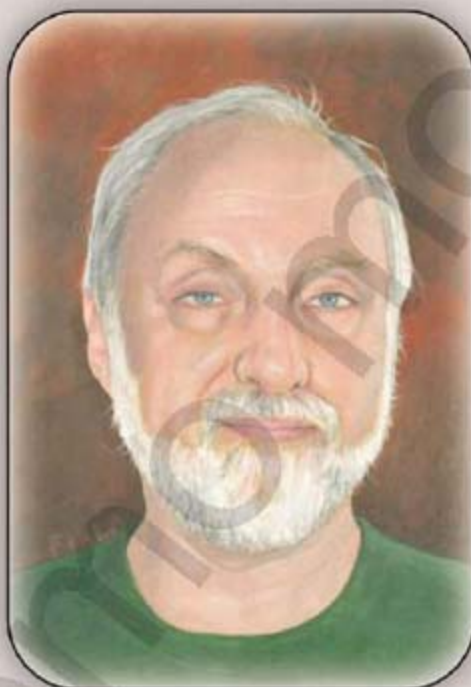
The first major attempt along these lines occurred in 1915. Edwin S. Porter and William E. Waddell showed a 3D film at New York's popular Astor Theater, using superimposed red and green images. The audience saw three shorts: scenes from a play, rural images, and a Niagara Falls travelogue. Pretty exciting stuff, no? Porter was a technical expert, a favorite of his boss, Tom Edison, and the director of the prototypical western, "The Great Train Robbery," in 1903—actually shot in the woods of New Jersey. He never understood how sophisticated film language had quickly grown, however. A reviewer for *Moving Picture World* also complained about the technical quality of the imagery, so it's probable that a combination of artistic and technical reasons retired the venture.

The first feature-length 3D film, "The Power of Love," appeared in 1922. It was a great hit (though sadly, long since lost) and produced the usual reaction in Hollywood: a number of inventors and producers started

work on their own 3D technologies, in order to bypass paying on existing patents. One typical example was Prizmacolor, developed by William van Doren Kelley, using film coated with a red image on one side and its green counterpart on the other. Kelley forged a deal with Samuel "Roxy" Rothafel (yes, the creator of all those Roxy Theatres, everywhere) to finance and display a pair of shorts requiring cellophane glasses, "Movies of the Future" and "Through the Trees: Washington, DC." Audiences preferred 2D fictional tales and big stars to 3D promotional pieces, and Prizmacolor was shelved.

The most outlandish if fascinating idea in 3D film at the time came from Laurens Hammond. He called it Teleview, and it fell back on Ives' stereo cameras method. But the projectors would show the two films so that they were exactly one frame out of sync, while viewers would use special viewing devices containing powered whirling shutters, running in sync with the projectors. The one film made this way was a costly failure, but Hammond was a prolific and brilliant inventor who also designed a tickless clock, a light-sensing device for bomb guidance, a card table with an automated dealer, and, most importantly, the electric organ that bears his name. Teleview was just a speed bump on his road to a French chateau.

Though development subsequently slowed on the technology, it didn't die. In 1947, the Soviets' interest in 3D films surged and produced a series of color features. Curiously enough, the first one was titled "Robinson Crusoe," and the 3D effect was achieved not through glasses but by utilizing "raster grooves" to reflect slightly differing screen images to each eye. This takes us up to the 1950s, when most people assume 3D first appeared, thanks to Hollywood's second intense affair with the technology. It was brief, and considering several of the films that it produced—"Cat Women of the Moon," "Robot Monster," "It Came from Outer Space," "Gorilla at Large," "Revenge of the Creature," etc.—it's probably just as well. Some things are simply better left unseen, 3D or otherwise. ▲



Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100. It was last seen functioning as a boat anchor.

Wax nostalgic with Barry at
barry@cpumag.com

Software

Tips & Projects

Geotagging Your Images: The Quest Continues

Geolocation is the new black, a stylish way to index and understand information. IMS Research predicts that shipments of GPS chips for noncellular devices such as cameras and laptops will increase sixfold in coming years. One of the innovations digital media brings to the information age is turning the map into an interface for data. Slowly but surely, we're starting to see tools for mapping geotagged images online.

Mapping Made Easy

Perhaps the quickest way to get your tagged images on a map is to use Google's own image library, Picasa. Once you open an account and download the desktop portion of the program, you can upload your tagged images to the Picasa Web Albums site (picasaweb.google.com/home). Picasa can map all geotagged images automatically. First, at the Picasa Web Albums site, go into the Settings item (upper right). In the Content Controls section, check the box labeled Use EXIF Location Information. If GPS information is already present in the image file, Picasa will recognize the latitude and longitude and map it in a thumbnail frame to the lower left of your collection. If no map appears, either the images are not properly geotagged or the EXIF location option is not turned on. Fair warning, geolocation can be sensitive information, so think before you map. If you have public albums, do you want the world to know where you work and live? See below for instructions on removing mapping functions from images and albums.

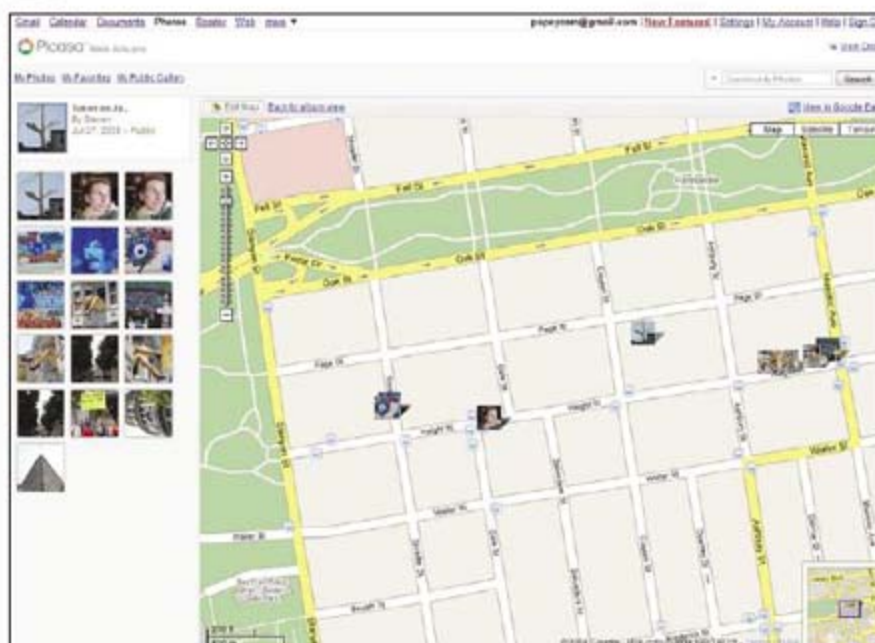
You can use the map interface in Picasa to place an image in a location. In Picasa, click one of the images without a location tag to bring it up in a fullscreen view. Click the Add A Location text link in the lower right of the screen. This action brings up a map and a push pin you can place down to the street corner level. Alas, we found that this method of locating an un-tagged image on a Google map does not add a GPS location tag permanently to the image when you download it. For that you will need to use Google Earth. The location tagging made within Picasa seemed to work only in the Picasa Web Album. You can also remove specific images in an album from a map. Just click the Edit Location command for any image, and in the pop-up box, look for the Remove From Map command in the upper right. To remove mapping functions from an entire album, click into the

album and use the Edit Album Properties functions to uncheck Show Location On The Map. Take care with this function. We succeeded in removing individual images from our Picasa maps but attempts to "unmap" the entire album failed repeatedly.

Google Earth View

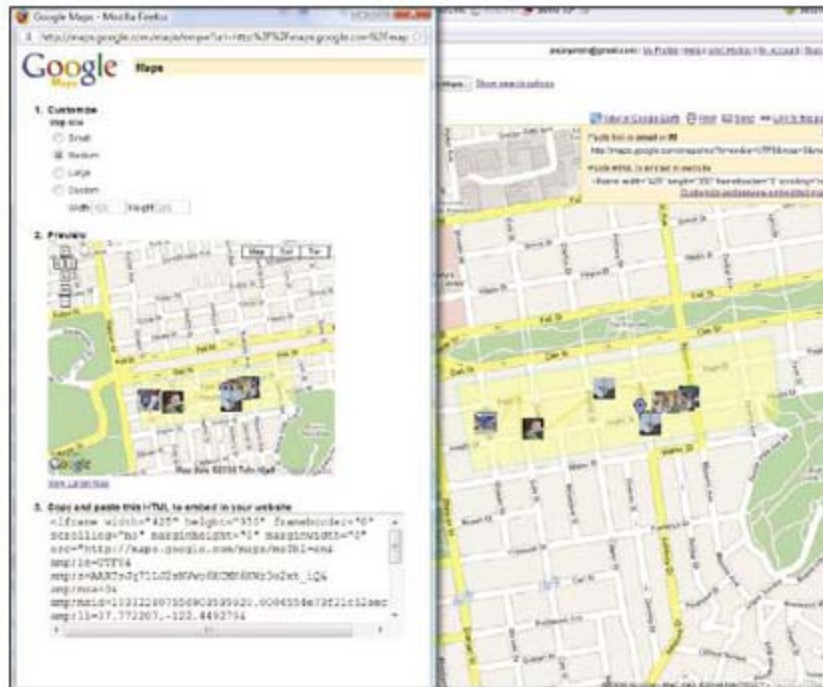
Things get really interesting when you import your geotagged images into Google Earth, where the mapping and views are much more robust. First, install Google Earth. Back in Picasa, go to the map view on your Web Album. Click the View In Google Earth button in the upper right. Depending on how you have your PC configured, your browser will download a .kml file, which you can use either to open Google Earth or open within Google Earth. When your KML file is open in Google Earth, it will appear in the Places box either as Temporary Places or My Picasa Pictures.

Your Picasa images should appear as a layer of thumbnails you can zoom into on your Earth map. For a unique blend of geotagging and Earth views, go to the Layers section and check the Street View box. Small camera icons appear on the map that indicate places where Google has incorporated its own 360-degree Street View images of given locations. In our example, we used images taken along colorful Haight street in San Francisco, a spot that is especially well covered by Street Views. Clicking on a camera icon near one of your own mapped



Geotagged images can be mapped automatically in Google's Picasa.

Google Maps lets you map geotagged images, customize the map, and then embed it in your blog.



images will zoom to a street level perspective surrounding the image you just added to the map. This way your images are placed within a larger 3D context.

Finally, you can use Google Earth to geotag images in Picasa. In Picasa, highlight one or more images and use the Tools menu to open Geotag/Geotag With Google Earth. This will open Google Earth with a small window of images in the lower right. Navigate to the location you took the picture in the map, position the crosshairs, and then click Geotag or Geotag All, and they will be placed accordingly.

Blogging Your Map

There are a number of ways to include your geotagged map in your blog, but we'll demonstrate one of the more straightforward ways. Create and save the KML file produced by Picasa or by saving one of your Places in Google Earth to a file. Go to Google Maps (maps.google.com), and click the My Maps tab. Use the Create A New Map text button and click the Edit button beneath the Featured Content window. Now click the Import text link to bring up the Import KML window. Use the Browse button to find the KML file and then click the Upload button. This will upload the location and image data and map it.

Before embedding this map, however, there is some customization you can perform. Most of the items you can add to a

Google Map, such as Placemarks or line and shape drawings, can be done in the main map window, and they will be retained in the embedded map. For instance, we used the Draw Shape tool in the upper left of the Map window to layer a colored rectangle around the zone of San Francisco where we were walking and taking photos. Once you close the rectangle, you can click any of the shaded space to pop up a window. In this pop-up, you can add a text description. Click the square in the upper right of this window to edit the shade of the shape, its outline color, etc.

To port this information into a blog, use the Link To This Page item in the upper right. At the bottom of the pop-up window, click the Customize And Preview Embedded Map item to bring up an editing window. Here is where you can customize how the geotagged map will appear on your Web page. When you have the map looking as you want it to appear in the blog, copy the HTML code from the windows below and simply paste it into your blog code.

Windows Tip Of The Month

While some users dislike Windows Vista, many love its new conveniences such as system-wide search. But no one loves it when this function over-indexes your PC and slows all queries to a crawl. To streamline the process, go into the control Panel and activate System And

Maintenance and then Indexing Options. Click Modify. In the Indexed Locations window, open the directory branch of your main drive and uncheck the folders you don't need indexed. Click OK. You should see the unchecked items appear next to the drive listing in the Exclude column of the Indexing Options window.

Registry Tip of the Month

If you work on a communal system with multiple logons and want to ensure every last shred of privacy, then you don't want the next person on the machine to know you were the last one to use it. By default, Windows' logon display shows the last username to log in. To disarm this feature, go to the Registry key HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\System and double-click the DontDisplayLastUsername Value. Change the Value Data to 1 to turn the feature off (no last username shown) or to 0 to turn it back on. ▲

by Steve Smith

Infinite Loop

The new face of iPhone?

You never know when fame will come a knockin'. A young Chinese woman working in an iPhone factory suddenly found her 15 minutes of Internet fame when a fellow worker snapped her photo on the job, and the person who eventually bought the phone found it on the device. He posted the photo at Macrumors.com,

and another Internet star was born. ▲



news.yahoo.com/s/nm/20080828/nc_nm/iphone_star_dc_1



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Warm Up To Penguins

The Many Editors Of Linux

Whether it's writing a shopping list or tweaking a Linux configuration file, editing text files is one of the more mundane but important tasks that users need to perform on a regular basis. As such, one of the most heated debates among hardcore Linux users is what Linux text editor reigns supreme. The "Vi vs. Emacs" war has been on a continual boil for at least 20 years, while others swear by nano. There are even some pragmatists (we count ourselves among them) who use a mixture of editors depending on the task. So, presented for your inspection are some of the many choices you have when you need to edit a file under Linux.

Groceries, For Example

As a standard for comparison, we'll assume that there's a file called "shopping-list" that we wish to edit, which has the following contents:

```
1 loaf bread
1 jar strawberry jam
1 jar peanut butter
1 pint strawberry ice cream
```

We want to add a quart of milk to the list, remove the peanut butter, and

change strawberry to blueberry in the two locations it occurs.

Ed

The ed editor is probably the most "primitive" editor available on a modern Linux system. How primitive? Well, ed dates back to the days before there were computer terminals that could move the cursor around on the screen. Think of the old teletype terminals you see in movies from the '60s, and you're not too far off. Everything you do in ed is done by commands typed to a prompt. Like all the editors we'll look at, you edit a file in ed by typing `$ ed shopping-list`. In other words, you type the name of the editor followed by the file you wish to edit.

When we run ed on our file, we receive the helpful response "83." What in the world is 83? Why, the number of characters in the file, of course! We'll begin by adding the quart of milk to the end of the list. We do this by typing `a` and pressing ENTER, which enters append mode. Then we'd type `1 quart milk` and press ENTER, then a lone period (.) all on the next line to exit append mode. When ed first starts, the append command will append to the end of the file.

Assuming we added the milk at the end, we'll next delete the peanut butter. To do that, we move to the line we want to delete, then use the `d` command. We type `3`, press ENTER, then type `D` and press ENTER.

Finally, we want to replace strawberry in two locations with blueberry. We can actually do that in a single command, typing `1,$strawberry/blueberry/`. This says, "between line 1 and the end of file (\$), substitute blueberry for strawberry." Finally, we type `w` to write the file and `q` to quit.

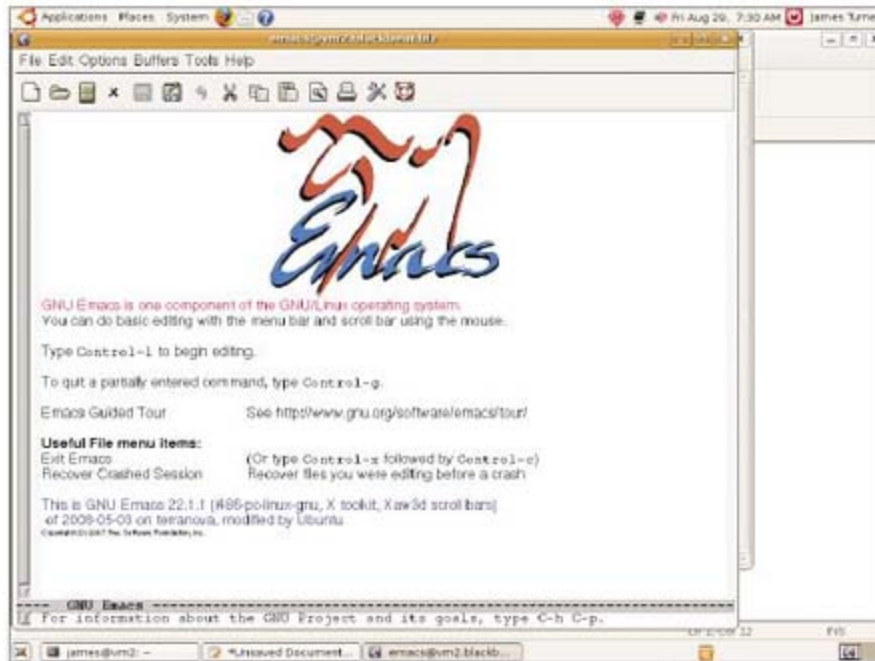
Vi

Although ed may be great if all you have is a dumb terminal, most old-school Linux power users would rather use the vi editor. You can still use all the same ed commands, but you get the advantage of having a constantly updated view of the file. You can also maneuver around inside the file using single keystroke commands. So, to perform the same editing tasks, you'd type `vi shopping-list`, and the window would clear, leaving only the file (or as much of the file as will fit on the screen) displayed. To delete the peanut butter, we press the `J` key twice, which moves the cursor down to the line in question. Then, we type `dd` to delete the line. The line will instantly disappear from the display, leaving the cursor blinking on the ice cream line. Typing `$` moves the cursor to the end of the line, and `a` enters append mode. Then we can press ENTER, type in our line for milk, and press ESCAPE to exit append mode.

The substitution command in vi is identical to ed, with one exception: place a colon (:) before the command to run it. The display will instantly update to show the change. The `w` and `q` commands write the file and exit the editor, respectively, but again, you must put a colon in front of each command.

Nano

Many people these days prefer nano to vi, as it's a little simpler to use. When you



Emacs is an incredibly powerful editor that you can run from a terminal window or as a GNOME or KDE application.

invoke nano on the shopping list, you can open a main window that displays the file and a small help window below that shows commonly used commands. You can navigate around the file using the arrow keys, so to add the milk, we press the Down arrow four times and start typing. Then we press the Up arrow to move to the peanut butter line and press CTRL-K to delete it. Finally we move our cursor back up to the top and press CTRL-\, which is the replace string command. This causes nano to prompt for the string we're searching for, at which point we'd type **strawberry** and press ENTER. Nano will ask for the string to replace it with; in this case, we type **blueberry**. When we press ENTER again, nano will move to the first occurrence and ask if we want to replace it. You can press Y for yes, N for no, or A to replace all occurrences in the file. Press CTRL-X to exit, and nano will ask if you want to save the file.

Emacs

The joke about Emacs is that it's as much an operating system as it is an editor. It's huge compared to ed and vi, requiring

much more memory. It also starts up much slower than ed or vi. Because of this, vi is often preferred for quick file edits, reserving Emacs for more complex tasks, such as software development. Like vi, when we invoke emacs on our file, we get a window that displays the contents of the file with the cursor at the upper left.

Most commands in Emacs involve using CTRL, ALT, or both. For example, to move down to the peanut butter line, we press CTRL-N twice. This drops the cursor to the beginning of the third line. We then press CTRL-K (kill line) twice. The first time deletes the contents of the line, leaving it empty. The second time deletes the blank line.

You could then press ALT-> (go to end of file) and enter the quart of milk. Pressing ALT-< returns you to the beginning of the file, and you could then use the query-replace function to swap strawberry for blueberry, just like we did in nano. To do this, you'd press ALT-X, which prompts you for the command name; type **query-replace** and press ENTER. Emacs then

prompts for the string to search for, at which point you'd type **strawberry** and press ENTER. Then, type **blueberry** and press ENTER. Like nano, Emacs moves the cursor to the first occurrence of strawberry and asks if you want to change it. You can press Y for yes, N for no, or ! to replace the rest of the occurrences in the file. Then press CTRL-X and CTRL-S to save the file.

Although we explained how to navigate around files using keystrokes in Emacs, you can also use the mouse with modern, window-system aware versions of Emacs. Emacs is an incredibly powerful editor, with built-in functions such as a mail reader and the ability to view two or more files at once on the same screen, moving back and forth between them.

As you can see, Linux has a wide variety of editors available, including some we didn't even mention, such as GNOME's Text Editor. Selecting which one to use can be a matter of taste, or using the right tool for the right job. There's really no wrong choice you can make. ▲

by James Turner

Infinite Loop

Dead Sea Scrolls Get Digital Upgrade

If you've ever wanted to get up close and personal with the Dead Sea Scrolls, you'll soon be able to do so online. A team of Israeli scientists has undertaken the task of snapping digital photographs of the two-millennia-old text, which consists of approximately 9,000 individual fragments. The Israel Antiquities Authority, the scrolls' caretaker, estimates the project will take over two years to complete. ▲

Source: africa.reuters.com/odd/news/usnLR699315.html

Shavings From The Rumour Mill

by Mike Magee

AMD Worm Begins To Turn

Advanced Micro Devices has certainly had its share of misfortune over the last 18 months.

But, according to several sources we talked to during the Intel Developer Forum in San Francisco in August, that's all about to change, so don't count them out just yet.

The company has imposed heavy nondisclosure agreements on people about the first iteration of its "Fusion" technology, which combines elements of a CPU with elements of a graphics processor. As I write this, AMD is expected to sample this chip within days. It is scheduled to be announced in the fourth quarter of this year.

So why isn't AMD offering a song and dance about the miracle chip? Sources tell me that it's very nervous about talking up future tech too much, particularly after the debacle with its Barcelona product, which really dented the chipmaker's reputation. It wants to be absolutely sure that it's got everything right before the launch and hence the few early samples to a very few trusted journalists and industry partners.

Where does that leave Intel's Larrabee initiative? Intel didn't tell journalists at its forum much that they didn't already know. It's clear that the company is dead serious about launching against Nvidia and AMD-ATI, but to me it seems likely that it will be pipped to the post.

Intel spent a great deal of time at IDF talking about its future "Nehalem" architecture, which bears an uncanny resemblance to AMD and ultimately Alpha processor technology. That will be available by the time you read this, or very soon after, with large quantities hitting the market in 2009. But other sources in the know tell me that the first iteration of Nehalem, while good, could be better. Which brings me back to AMD.

AMD is readying its "Shanghai" CPU generation, too, and this is also hot stuff, according to people close to the firm's plans. As with Fusion, AMD has been somewhat modest about this prior to its

launch—again, it doesn't want to mess things up if some glitch turns up just before it's about to go-go.

The truth is that in the last month or two there's been something of a palace revolution going on at AMD. Successive quarters of losses have left Dirk Meyer, the former chief operating officer and the architect of AMD's success, as the chief executive officer. Meyer was the lead architect of the Alpha microprocessor when he was at DEC and, just the day before I wrote this column, sold AMD's Digital TV division to Broadcom. There will be more trimming of excess fat at AMD, as the firm seeks to recover from its parlous financial state.

Seeing as Intel will no doubt deliver on its Larrabee graphics chips, all of this must be worrying Nvidia. It's in the position of having to fight the AMD-ATI graphics team, which has grabbed market share, as well as chip giant Intel itself.

That led to a number of news outlets openly speculating during the Intel Developer Forum that Nvidia could be the subject of a takeover. This would not necessarily lead to any kind of antitrust action; there are two and a bit x86 firms (Intel, AMD, and Via), and two and a bit graphics processor companies (Nvidia, AMD-ATI, and S3). A period of consolidation seems inevitable in the graphics industry, and as we've noted in previous columns, the "fanboy" stage of blindly worshipping Nvidia and ATI seems to be at an end.

There was a curious lack of excitement at the Intel Developer Forum. While Intel's foray into solid-state drives looks interesting and performance is expected to be highly impressive, the next Nehalem architecture was greeted by most journalists with mild indifference.

So, if AMD can arise from the doldrums it's been in, with both a superior microprocessor and a Fusion chip that means business, it is bound to generate much-needed buzz in the industry. ▲



Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.

Send rumours to "Mad Mike" Magee at mike@cpumag.com

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Wagging The Dog

by Rahul Sood

Intel Goes Hard On Solid State

I have been writing quite a bit about Intel lately, often about the company's quest to increase its platform real estate from within a personal computer. Last month I touched a bit on Intel's much-anticipated Larrabee graphics platform; this month I'm writing about the chipmaker's solid-state drives. Unless you're living in a Unabomber shack somewhere in the deep woods, you probably heard that Intel announced its new SSDs at IDF this year.

Let me start by saying that I have a pair of these babies running in my Blackbird PC in RAID 0. Based on my experience, Intel has completely changed the game with these drives. Not only has the company made SSD relevant in high-performance scenarios, but through some complex algorithm management, Intel has managed to wipe the floor with any other storage technology on the planet.

Of course performance is important, but what about battery life and drive efficiency for notebook applications? Months ago, Tom's Hardware wrote about the SSD battery life issue. They missed a few points, one of the most notable being that there is a direct correlation between the efficiency and performance of the drive and the overall battery life on the device. In other words, the slower the SSD, the longer it takes to run a task, thus the more battery life it eats. This is not the case with Intel drives; they are fast, efficient, and they actually extend the battery life of the machine compared to other SSDs. After installing a pair of them in RAID, my system literally boots Windows Vista Ultimate in seconds. Overall, I would say these new SSDs rock, both in notebook applications and in desktops.

You might wonder what this means for Intel, and you wouldn't be alone. My guess is the company is working to increase its aforementioned platform real estate through technologies like NAND, SSD, chipsets, CPUs, wireless, and soon through graphics. Imagine if Intel can pull off the seemingly impossible by making its next-generation

graphics much better than the previous Intel Extreme graphics. I'm not speaking from insider information here; I'm simply guessing that Intel has some incredible things in the back room at the moment, based in part on rumors that the company is apparently hiring some of the best graphics engineers in the industry. I can only imagine what the new Centrino will be like; after all, if the company can suddenly jump into the storage business with an industry-leading product, then anything is possible.

The industry is changing. The days where customers would spend thousands of dollars on a huge, 2-kilowatt, multi-GPU desktop PC just to play one game well are almost gone. People are generally very well-informed in making buying decisions, and they're looking for "greener," more efficient PCs. They want a system that works and supports all of their applications.

So, what's the point?

If Intel can pull off creating the ultimate integrated graphics part, it will likely make third-party discrete graphics irrelevant in notebooks. Why would anyone want to integrate a third-party discrete chipset when all you need is an Intel processor combined with whatever Centrino-branded devices you need to create a hardware simple platform? Now throw in the Intel SSD and you have a bigger, even uglier Intel than you do today.

As a builder of systems, I've learned that the success in this industry isn't as simple as taking the best components and tossing them into a box. The secret is to look at what companies like Intel are doing, listen to what your customers are looking for, and work backward into cool, innovative new products. As such, we spend a lot of time imagining ways to create thinner, lighter, less expensive, and more powerful devices. Yeah, it's a continuing process, and Intel seems to be leading the way, again. ▲



Rahul Sood's love for computers started at the young age of 11. Much to the shock and dismay of his parents, he ripped apart his brand-new Apple IIc and painted it red before turning it on. His parents' dreams of having a doctor for a son were shattered when college drop-out Rahul founded what is now one of the most respected high-end computer companies in the world, Voodoo Computers.

Send your opinions to this opinionated guy at rahul@cpumag.com

Technically Speaking

An Interview With Dr. Raymond Soneira, CEO of DisplayMate Technologies: Part II

Dr. Raymond Soneira is the founder, president and CEO of DisplayMate Technologies Corporation. He has a Ph.D. in Physics from Princeton University, where he spent five years as a long-term member of the Institute for Advanced Study. He has authored more than 35 research articles in scientific journals on physics and computer science.

by Barry Brenesal



CPU: When it comes to evaluating displays, how far back do your credentials go?

Soneira: Embarrassingly far. Before I became a physicist, more than 30 years ago, I worked for the CBS Television Network building mathematical models to quantitatively test the accuracy of studio cameras and television displays. Once I started DisplayMate Technologies in the early 1990s, I became involved in testing and evaluating displays here in my lab. I've also helped lots of publications do their own testing. We started out in the computer monitor area, but now that HDTVs have become digital, the two worlds have essentially merged from my perspective.

CPU: You've seen and tested a lot of displays over the years. What kind of advice can you offer to a person looking to drop a couple of thousand dollars into a new entertainment center?

Soneira: It's unfortunately much more complicated than it really should be. There's lots of misinformation floating around. That's true of all product marketing, whether it's soap or cars, but HDTVs have many more subtle, very technical

issues than most products. The manufacturers, of course, are just playing the normal marketing game, but there's a line they shouldn't cross. Some of them unfortunately do. As for retailers, all but a tiny fraction are ignorant of what it is they're selling in an HDTV. At best, they've gotten the minimum amount of training and are feeding regurgitated manufacturer's puffery to the public.

There are a number of publications both online and print that seriously test displays. Depending on a person's ability to digest enhanced information, they should consider those publications, because they're the best sources of technically competent and reasonably objective analysis.

CPU: What do you think of in-store presentations and demos, for all those who aren't technically inclined?

Soneira: Unfortunately, the problems are multifold. First of all, the environment in the store—unless it's a high-end A/V store—is not very good for viewing. The lighting is awful, the TVs are not properly set up, and the signal quality and content quality generally aren't good, either. The demos are also designed to be eye candy,

meaning everything is made to look as deceptively good as possible. I get very little information when I travel through the major retailer stores. I do study the units on display, but until I get them in my lab, I really have no idea how well they will perform.

CPU: You've implied that spec claims aren't always accurate. Is that, in your opinion, a fairly common problem, or is it limited to specific manufacturers, retailers, or product models?

Soneira: The display industry is no different from any other product group, but there are a lot of misleading and exaggerated specifications with lots of built-in wiggle room. Some of these specs are, in my opinion, intentionally misleading.

CPU: Can you give us an example?

Soneira: A good one that's hot at the moment is viewing angle. If you look at the specs for LCDs as both HDTVs and computer monitors, they all list a viewing angle of typically 176 out of a possible 180 degrees. So you might think, "Wow, I can look at this display from anywhere in the

room, and this picture will look great!" That's just wrong, because the industry's standard LCD specification for an adequate viewing angle is anything where the contrast ratio is above 10. Most good quality LCDs have contrast ratios of 1000 to 2000, so when it falls to 10 the picture is essentially unwatchable.

Measuring by contrast ratio is not the best way to determine a satisfactory viewing angle, in any case. The eye is much more sensitive to color shifts. In my own lab, I can show that in top-of-the-line LCD models there are significant color variations with a position shift by the viewer of only five to 10 degrees. This means that if two people are watching a quality LCD HDTV, even if they're sitting side by side, they'll see noticeably different pictures. Or as I tell people, the viewing angle spec is great for digital watches—just not for HDTVs.

CPU: What should a potential buyer look for in an HDTV set when they go to a store?

Soneira: The TV should look reasonably well set up. Shift your viewing position when sitting through at least five or

Soneira: Most of the LCD, plasma, and rear projection units are much more reliable than they were even five years ago. But speaking strictly as a consumer, I'm most worried about my return privilege. If I've just spent \$2,000 and I get a unit that isn't performing well, I want to be able to return it without a hassle. There are good brands and bad brands, and an excellent source for repair rates is Consumer Reports, which lists them in most of their HDTV reviews.

CPU: You've mentioned one spec that you feel is very important but often misstated. Are there others to pay attention to when hunting for an HDTV?

Soneira: Another prominent spec that is frequently exaggerated is screen brightness. As just one example, take plasma displays: If they do publish a screen brightness spec, it's frequently without the absorbing layer that improves contrast by reducing ambient light reflections. So it's the naked panel rather than what the consumer sees and is typically off by a factor of two.

CPU: What specs are important in achieving a quality image?

buy. If, however, you have controlled ambient lighting, then you have a lot of choices and the possibility of getting good picture quality.

The second question involves viewing angle. How many people are watching? One? Is it two? Is it a whole family? Do you have chairs and sofas all over the room, so that people are watching from a series of differing angles? If yes, then plasma is the best choice.

Another matter is that people have varying levels of sensitivity to picture quality. Some just don't notice or care about certain issues, while others are going to spend hours tweaking and worrying that the colors are right. I go into the homes of friends and relatives, and their TVs are set up terribly. But they're happy with the results, so I bite my tongue and say nothing. You need to be aware when looking for an HDTV of your own personal sensitivities.

CPU: You've discussed ambient light affecting viewing quality. Is there a viewing distance that's ideal?

Soneira: That's an excellent point that involves two considerations: the size of

When people come and ask me what HDTV they should buy, the first question I always ask is, what's the ambient lighting condition where you're viewing it? —Dr. Raymond Soneira

10 minutes of the demo. Flip your eyes between comparable sets. I also suggest bringing along reference materials to try out, like a favorite DVD you are very familiar with. Some retailers will actually let you try it out, but not many. Or bring pictures of your family on a thumb drive. Any reasonable retailer should let you plug in JPEG pictures into the side slot of a single HDTV. Then, since you know what everybody looks like, you can make your own picture quality and accuracy judgments.

Or consider going to a friend's house. That's a good way to pick an HDTV.

CPU: Do you think a good warranty is important in buying an HDTV?

Soneira: When people come and ask me what HDTV they should buy, the first question I always ask is, what's the ambient lighting condition where you're viewing it? If you're watching TV in a sun room where you don't have drapes or blinds to close off the outside light, you have only one choice at the moment, which is a direct view LCD that is pumping out a tremendous amount of light. People should be aware that it's impossible to have good picture quality in bright ambient lighting, no matter how much they spend or what the technology they

your display, and the distance you want it at. For sets that are full HD, 1,920 x 1,080, you want to sit at roughly three times picture height. I think that most people tend to watch TVs in their living rooms at 9 feet or more, so they're often not getting the true HD effect. What they want to do is sit closer, without sitting so close that it causes eye fatigue or where they can make out individual pixels. For a 50-inch diagonal widescreen TV, that's about 6 or 7 feet. For lower resolution or Standard Definition TVs that distance will be greater. **CPU**

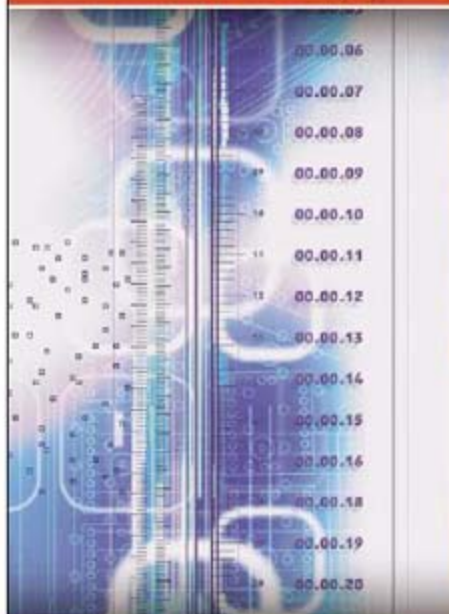


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Under Development

A Peek At What's Brewing In The Laboratory

Your Baseball Cap Knows How You Feel

You're pushing yourself to get the last leg of a long drive done when suddenly you hear, "Please pull over and shut off your engine. You have become too drowsy to drive." Your BCI (brain-computer interface) system has just kicked in and saved your hide. You pull over, take a power nap, and continue on your way.

It's not nearly as far-fetched as it may seem, as researchers from National Chiao-Tung University, National Cheng-Kung University, and the University of California San Diego have recently published their work on their BCI system. It fits in a baseball cap and is a mobile wireless device that reads EEG signals from the brain via noninvasive dry electrodes that are attached to the forehead and behind the left ear. These

signals are a pure read of a user's physiological and cognitive states (sleepy, upset, excited, etc.).

Those signals are transmitted to a data receiver, which then processes them in real time via a dual-core processor. Two types of wireless transmission are part of the BCI system: Bluetooth for short distances (up to 10 meters) and RF for longer distances (to 600 meters). Once the signals are assessed, the results are sent back to the cap, where the information is then stored. This information can then be displayed on a screen or set off an alarm for the user.

In the current developmental state, a user could expect the BCI system's

lithium-ion battery to hold a charge for about two days with continual usage. However, the researchers are working on extending the life of the battery beyond this limitation.

Although initially focusing their experiments and testing on driving applications, the team is also developing additional uses for their BCI system. They're also exploring the following potential applications: home health care monitoring for the elderly or infirm, sports training, and eventually, control of home appliances for the disabled.

And although plenty portable at the moment, the team is also working on an improved miniaturized system. ▲

Military Spybots Take A Page From The Birds & The Bees

Collaborative behaviors are honed to perfection in nature. Bees gathering honey, lions hunting large prey, migrating birds in formation—all benefit the group mutually.

Taking a page from these collaborative behaviors, and the communication involved, will be part of the MAST (Micro Autonomous Systems and Technology) Collaborative Technology Alliance's work while they develop bug- and birdlike spybots for the U.S. Army Research Laboratory. Led by BAE Systems, the Alliance, which comprises other companies, the government, and academics, will be creating miniature robots to be used by soldiers in difficult wartime situations.

The plan is to have the crawling, flying, hopping, and hovering spybots work in cooperative swarms to mine data that can be sent back in a unified form via PDA. Spybots may take infrared and digital photos, record audio, read thermal

waves, operate radar, and or utilize mapping technology. The gathered information would allow troops to safely manage highly dangerous situations.

In addition, says Dr. Joseph Mait, MAST cooperative agreement manager for the Army Research Laboratory, the micro robots will be able to perform operations that were previously impossible, too costly, or deadly for the troops. Currently the U.S. military has much bulkier drones on the ground in Iraq and Afghanistan, but the information they glean is not sent real-time to the soldiers. Instead, it's processed by a central system and relayed.

The plan is not without challenges, however. Engineers involved in the project will be pushing the envelope in developing lightweight materials, multifunction sensors and actuators, and extended-life micro fuel cells, which though may exist in some

A dragonfly micro reconnaissance robot is one of the tiny spybots MAST is developing for the U.S. military.



form already, are not fully developed enough for deployment. Aaron Penkacik, BAE's CTO, also notes that multifunctional design (creating bodies that work as batteries or legs that also perform as antennas) will be extremely important.

Although MAST has a five-year initiative (with an option to extend for five more), Penkacik hopes to have early test models out in the field before then. Once fully developed, the team expects each micro robot will cost about as much as a cellular phone. ▲

Automated Protein Patterns Analysis Assists In Determining Disease



Doctoral student and researcher Justin Y. Newberg views protein patterns on a cell in a Carnegie Mellon lab.

How proteins are scattered in a cell or in a host of cells can indicate whether those cells and their surrounding tissues are healthy. By identifying and categorizing the difference between healthy and diseased protein patterns, researchers could assist pathologists in disease detection and diagnosis. This ability has been the goal of Carnegie Mellon graduate student Justin Y.

Newberg and Professor Robert F. Murphy as they have developed their Automated Protein Pattern Recognition Tool.

Newberg explains how the tool works in a three-step process: "We have trained a classification system to identify protein patterns in human tissue. This automated system is trained to distinguish patterns using various statistics that describe

textures. This tool thus works by taking an image of tissue that has been stained for a particular protein, performing any necessary processing on the image, and then extracting texture features from the image." Once the image processing and feature extraction is completed, the images are then classified according to type.

The tool's ability to process large amounts of data is particularly beneficial in helping to better understand how cells work and how they become diseased. Currently, the tool is analyzing tissue images in the Human Protein Atlas, a database of 2,940,744 images detailing over 3,000 proteins derived from 48 different normal tissue types and 20 different types of cancer.

"The biggest challenge has been determining which images are suitable for analysis," reveals Newberg. "These images depict tissues that have been sectioned, so tissues are highly variable from sample to sample. Moreover, the method used for staining these tissues can sometimes yield noisy data." The researchers have been able to accommodate the issue by programming the tool to report its level of confidence in the protein pattern assignment and to toss low-confidence designations.

Newberg explains that the software will not be commercialized, but instead used in conjunction with other tools developed by his colleagues. The software is also available via his group's Web site (murphylab.web.cmu.edu/software). ▲

Quantum Computing Inches Closer To Reality

Although quantum computers have existed in the theoretical realm for many years, a team of engineers and researchers from Stanford and the University of California Santa Barbara have recently made great strides toward bringing them to reality.

One of the barriers to creating a quantum computer is the fact that photons do not interact with each other. The team, led by Associate Professor Jelena Vuckovic, has been able to create a QIP (quantum information processing) solid-state device that allows the photons to interact via a "logic gate."

The gate involves single photons, along with a quantum dot (comprised of indium

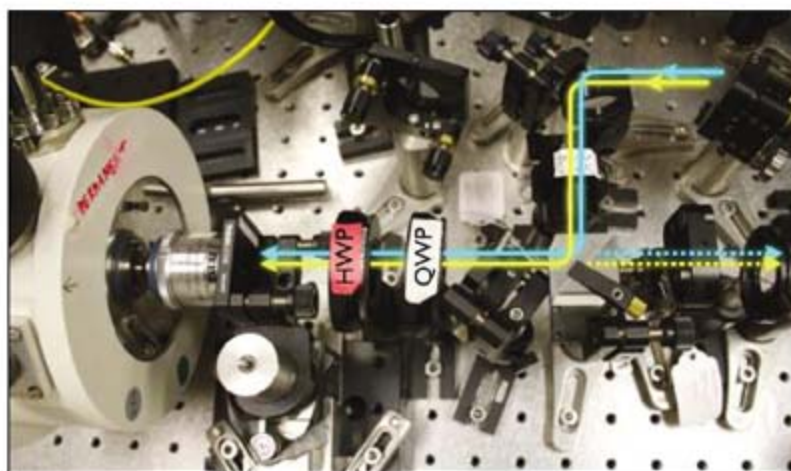
arsenide molecules), which is tucked in a photonic crystal cavity (also known as an atomic qubit). Via laser beams, an initial photon will come in contact with the quantum dot in the cavity and alter its spectral properties so that the second photon reads a different system, allowing the two photons to exchange information.

Doctoral student and team member Ilya Fushman explains more about their project, "In general, this is a proof-of-concept for photonic logic, but real quantum computing with photons is still quite challenging. What we've been able to do is to show that semiconductor devices that facilitate quantum information

processing with photons and enable basic logic elements can be constructed."

And as far as next steps, Fushman notes, "Because of the semiconductor architecture, this kind of system is scalable and can be extended to large circuits in the future."

The team is hopeful that other challenges, such as engineering imperfections and reliability (appropriate placement of the quantum dots), can be solved so that a path will be paved to producing computers utilizing chip-based high-fidelity logic with photons. ▲





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LAN Parties Across The Nation!

10.10.08

Necronomicon - Florida
www.seads.org/LANParty/necrolan.htm

10.11.08

LAN Lordz - Wichita, KS
www.lanlordz.net/index.php?page=home

LAN Party Extravaganza - Kenmore, NY
www.lanpartyextravaganza.com

Nexus LAN - Dayton, OH
www.nexuslan.org

OnTargetLan - Hot Springs, AR
www.ontargetlan.com/news.php

10.18.08

Whempy's LAN Party - Columbus, OH
whempyslan.org

10.24.08

Fragocity - Johnson City, TN
www.fragocity.com

GVCCLAN - Placerville, CA
www.gvcclan.com

Lantacular - Cincinnati, OH
www.lantacular.com

10.25.08

ATD Arena - Charlotte, NC
www.atd-arena.com

Peace, Love, and Rockets - Keller, TX
www.peaceloveandrockets.org

Warfactory LAN - Missouri
www.warfactory.net

11.07.08

ALL Your Base Lan - Winnipeg, Manitoba
www.allyourbaseonline.com

Netwar 15.0 - Omaha, NE
www.netwar.org

TusLAN - Tuscan, AZ
www.tuslan.net

11.08.08

E-Town LAN - Emporia, KS
www.etownlan.com

11.14.08

Big Shot Gaming - Mount Pleasant, MI
www.bigshotgaming.com

11.15.08

CapLAN - North Vancouver, BC Canada
caplan-bc.com

Carolina Armageddon - North Carolina
www.carolinagaming.com

Maximum Overkill - Binghamton, NY
www.core.binghamton.edu/maxover/

Whempy's LAN Party - Columbus, OH
whempyslan.org

12.05.08

GVCCLAN - Placerville, CA
www.gvcclan.com

12.13.08

E-Town LAN - Emporia, KS
www.etownlan.com

Nexus LAN - Dayton, OH
www.nexuslan.org

Whempy's LAN Party - Columbus, OH
whempyslan.org

12.31.08

LAN OC - Ohio City, OH
lanoc.org

01.01.09

MAGFest 7 - Alexandria, VA
magfest.org/index.php

01.02.09

North Bay LAN's - ON, Canada
pc-solutionz.ca/lanparty/index.html

01.17.09

Whempy's LAN Party - Columbus, OH
whempyslan.org

02.07.09

Carolina Games Summit - North Carolina
www.CarolinaGamesSummit.com

02.20.09

AWOLLAN - Wisconsin
www.awollan.com

04.01.09

Arkansas LAN - Arkansas
www.arkansaslan.com/index.php

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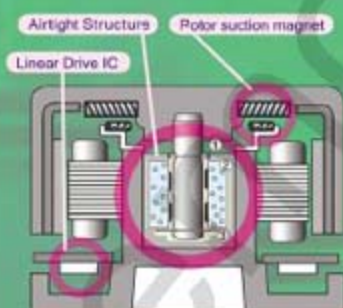
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Q&A With Nathan Hamiel

Nathan Hamiel, an information security researcher at Idea Information Security, is one of those security experts who will scare you away from the Internet. He has been testing the security of social networks such as MySpace and Facebook, and what he has found isn't pretty. He recently gave a talk with co-researcher Shawn Moyer at the Black Hat security conference titled, "Satan is on my friends list." During that talk, the two showed how easy it was to hack into somebody else's private MySpace page or add friends without the page owner's approval. He hopes to make Web applications of all kinds more secure by pointing out these flaws and suggesting ways to make the networks better.

Q Social networking security problems have been in the news for many years. We're shocked at how easy it is to hack them. Does it surprise you?

NH I'm not surprised by it. There are a lot of problems with Web application security in general. If you think about the function of a social network, it is to serve to users a lot of content that doesn't belong to the social network itself. There is a lot of content on Web pages that is made by its users. Whenever you have a model that exists that way, there are bound to be vulnerabilities. That is especially true when you link to off-site content. It seems like a lot of social networks have taken an extreme interest in security matters relating to Javascript. They have seen worms like Sammy. That seems to be their focus. They are not looking at social techniques where you are tricking a user into doing something. Sammy was a proof of concept that replicated itself through social networks. But what people do is they look at how they were negatively impacted by something and then they overreact to that.

Q What is the problem with user-generated content?

NH It's hard because there isn't much to see on the sites without it. If you make it hard for users to share things, they will just go somewhere else. Functionality breeds exposure.

Q The whole idea behind a social network is to be open and sharing.

NH Yes.

Q So is that idea incompatible with security?

NH To some extent. Open-source software can technically be more secure. That's because it is peer reviewed. With regard to your personal privacy, openness often isn't the best policy. We don't hate social networks. We use them. What's scary is that business social networking platforms become a way to target businesses. You can, for instance, store your credit card information in some of the social networks. If you treat a social network as an untrusted means of communication, that's OK. I use instant messenger clients. I know they are unsecure. I act accordingly. Businesses typically approach problems from business aspects. It's not always in the interest of others, like those who want to protect their privacy.

Q What are things you would never put into your social networking site?

NH You should never put things in there that someone will use to discriminate against you. If you are open about it and don't care who knows it, it's OK to put it in there. But think about whether someone will find that content and make a decision about you. It could be a job screener. Maybe your political views will turn someone off or your sexual preferences. It could be anything. To me, that is really scary. It's like a lot of Web 2.0 stuff. You hear about identity theft in the media. If you give your credit card to



Facebook you deserve to fail. The information you share is stuff you wouldn't care if it were given out to someone.

Q My perception is that messages coming to me on Facebook are safer than those coming to me via email.

NH That's because people have used email as a way to attack for such a long time. You know that it isn't safe and could be a way someone is attacking.

Q Which network is more secure?

NH We have a very hard time saying one is more so than others. Something with reduced functionality is safer. The business sites don't let you do all that much. You're not seeing little babies hatch into dinosaurs. With more of that, there is more of an attack surface.

Q Your inbox and private pictures are really easy to get?

NH If they're private pictures, what are they doing on the network? That sounds like fail to me. ▲

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