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# SUMMER 2005 EXTREME TECH™

## FEATURES



52

### **Build It! Special Feature**

#### **Build Every PC In Your House**

We build dedicated PCs all the time, whether they're media-center boxes running Linux or super-high-end SLI gaming systems. In this mega-round up, we break it down for you, room by room.

- 34 FAMILY ROOM** Killer Gaming Rig
- 46 BASEMENT** Linux Home Server
- 44 LIVING ROOM** Linux Media Center
- 48 JUNIOR'S BEDROOM** \$800 Gaming PC

#### **Robotics**

**52** While the Roomba may be capturing headlines, children could make a more interesting robot. And they are—in Atlanta, at the FIRST Robotics convention. We sent a reporter down to get the inside scoop on Dean Kamen's latest venture.

#### **New Military Technology**

**60** Audio systems that can hear snipers. Cell-phone detonator detectors. Self-regulating spy networks. In Iraq, soldiers are fighting a war unlike any in recent memory. War has changed...and military techniques and technologies are changing as well.

#### **Speed Kills!**

**70** Intel's new 3.8-GHz Pentium4 870 is speedy, but AMD's new FX-57 chip is—simply put—the fastest CPU we've ever Doomed with. Meanwhile, nVidia just dropped the killer 7800 GTX, the most expensive card we've ever tried. We challenge you to afford it.

### **APPLIANCES: MORE DIY PROJECTS**

#### **76 Circuit Bending**

First ET phones home on an old Speak & Spell. Now ExtremeTech shows how to rewire it and achieve a whole new type of sound.

#### **79 Put Linux on your iPod!**

Apple on Intel won't really affect things much one way or the other. Linux on iPod is another story. Use the alternate OS to turn your ordinary music player into a (reasonably good) portable recorder.

#### **82 Podcasting 101**

Apple's finally built Podcasting capability into iTunes, throwing open the doors to the entire world. Now everyone can find out what you ate for breakfast! We step you through setting up your own station.

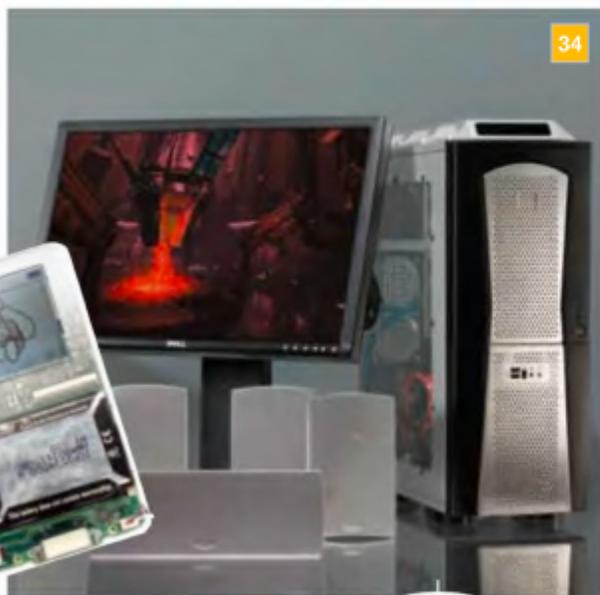
#### **85 From the Forums**

Folks chat about so many things in our forums. We've gathered up a few of the best tips and suggestions, including the best temperature monitor, when to update a mobo, and more.

### **GEEK MEETS GEEK**

#### **88 Waaaayback Machine**

What kind of maniac would make his own CPU? Our kind.



34



79



88



60



# Waaaayback Machine— A DIY CPU / By Gary Berline

A guy works on compilers for the first HP PA-RISC architecture, helps develop what becomes the IA-64 CPU, works with (and briefly, under) Linus Torvalds on Transmeta's code-morphing team, and does advanced research at HP. Then he builds his own processor—from 1970s logic chips? Our resident retro-techie went back to the future to assess geek extraordinaire Bill Buzbee's Magic-1 (and his stability).

**ExtremeTech:** You do high-level stuff, sure, but building a CPU out of individual logic chips from the seventies? You want to explain that one?

**Bill Buzbee:** Well, I've been a compiler guy for a long time, but I never really had any electrical engineering training.

**ET:** And you suddenly longed to program by flipping toggles?

**BB:** Something like that (laughs). As a compiler guy, you're thinking, "If I had an instruction that did this..." but I never knew how much that hardware feature would cost. So I read [some articles], and it seemed like, "Gee, I could do a simple, couple-of-weekends thing—I could make a 4-bit, baby microprocessor."

**ET:** And that couple of weekends lasted...

**BB:** Four years. At first I figured, "Well, I'll just design it, I won't actually build it." But eventually it got solid enough that I was going to have to.

**ET:** So what did you design?

**BB:** An 8-bit architecture with 16-bit addresses seemed right. Then I decided I needed more address space—23 bits. I went with a microcoded machine [and put] microcode in EPROM.

**ET:** EPROM? You cheated! That's an integrated circuit, not an individual logic chip! Don't you feel deep guilt?

**BB:** No (laughs). My point was not to make some historical re-creation. I remember TTL and remember wishing I knew how to use it, so I used it because it was fun. At some point I will probably—just because it's twisted—wire up some core.

**ET:** You weren't a hardware guy—what happened when you hit real-world considerations, like fan out?

**BB:** Compiler people spend a lot of time around hardware folks; you pick up some concepts. But people chipped in unasked. The Web site [I created] saved me. On the first attempt to bring the machine up, I ran into a fairly serious flaw, so I wrote up this long thing. The next morning two people had sent great solutions. The machine came up less than 36 hours after the last chip getting plugged in.

**ET:** Are your kids in danger of inheriting your strange predilection?

**BB:** The girls are not. They just roll their eyes. The boy is likely to be weird like his dad. **X**



LARA HATTA

**PIMP MY PC!** Do you have any modified or custom-rigged stuff? Drop us an e-mail at [letters@extremetech.com](mailto:letters@extremetech.com) and let us know. Be sure to send pictures!