

WEB APPLIANCES ARE GOING AFTER TWO GROUPS OF PEOPLE THAT BOTH WANT TO BROWSE THE WEB AND SEND E-MAIL. BUT ONE GROUP LOVES TECHNOLOGY, AND THE OTHER BARELY TOLERATES IT. CAN YOU BUILD A DEVICE THAT APPEALS TO BOTH MARKETS?



A Web appliance by any other name is still...a PC?

TYPE WWW.WEBPC.COM INTO YOUR WEB BROWSER, and it will take you to a Dell Web site, telling you that you have requested a page that does not exist—sort of like Dell's WebPC itself. Dell pulled the plug on its first attempt at a Web appliance, introduced in 1999,

after only six months. Last year 3Com, Compaq, and Gateway all introduced their own interpretations of a Web appliance. But, according to Cahners In-Stat Group, 2000 was a bad year for these devices, too. In fact, 3Com announced in March that it is discontinuing its Audrey Web appliance for business reasons. Despite this bad news, Sony and Intel will both this year introduce their versions of Web appliances. Just because a product flops the first few times doesn't mean it's a bad idea. PDAs (personal digital assistants) are good examples. After Apple embarrassed itself with the Newton, Palm refined the concept into the successful Pilot.

Web-appliance companies hope to find the sweet spot in features and price to create a compelling product. The market will determine whether any of them succeed, but you may until then find it interesting to see what engineering trade-offs these companies are facing and what they think is the right answer.

Before peeking behind the bezel of a Web appliance, it's helpful to understand what market these devices address. In-Stat believes that they address both the tech-savvy and the techno-phobe markets. The tech-savvy market includes people who own PCs; they understand technology and aren't afraid of it. The techno-phobe market includes people who find PCs intimidating but are intrigued by the idea of sending e-mail and exploring the Web. The early adopters will be the tech-savvy PC owners who want access to the Web and their e-mail in a convenient location, such as the kitchen counter or coffee table. But In-Stat believes that the technophobe market has the most potential.

YOU CAN TELL THEY'RE RELATED

Web appliances and PCs are architecturally related, but they have differences (**Figure 1**). One of these differences is their requirements for processing power. Because you might use a PC for any-

At a glance..... **98**

For more information..... **102**

thing from simulating a supersonic gas-flow- dynamics problem to balancing your checkbook, manufacturers put the highest frequency processor they can afford in a PC of a given price range. But if you know the most demanding application you will ever run is a Web browser, then you can get by with considerably fewer megahertz and save some money. In fact, National Semiconductor's Geode integrated processors take advantage of this characteristic by sacrificing a high clock rate for a high level of integration, yet they deliver Web-browsing performance comparable with microprocessors running at a much faster clock rate. The 233-MHz Geode SC3200 integrates an MMX-compatible x86 processor with a memory controller, a 2-D graphics accelerator, a video processor, a PCI-bus controller, an audio interface, and three USB ports (Figure 2). Several Web appliances, including 3Com's Audrey (Figure 3), use National's integrated x86 processors.

It's no coincidence that the CPU in most Web appliances is an x86 processor.

AT A GLANCE

- ▶ Web appliances are trying to fit into both the tech-savvy and the technophobe markets, and neither has proved viable.
- ▶ Web appliances are architecturally similar to PCs, and most are based on the x86 core.
- ▶ The high cost of LCDs keeps the price of Web appliances close to that of low-end PCs.
- ▶ There is no allegiance to Microsoft when it comes to Web-appliance OSs.

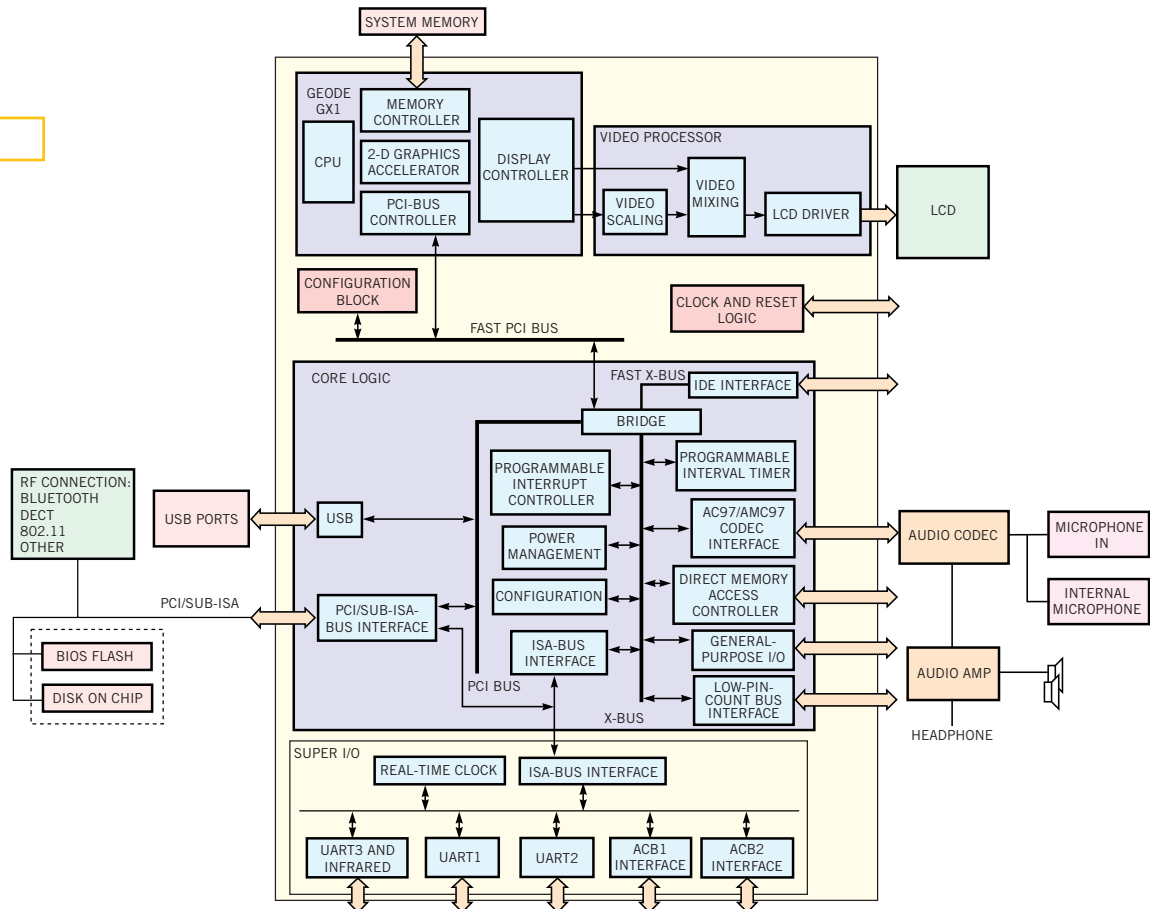
By using an x86, you can leverage the millions of lines of code written for it, plus take advantage of the tools, support, and experience base that the processor enjoys. The most popular Web browsers and browser plug-ins are written for the x86. Using the x86 almost guarantees that your browser will support the media for-

formats available on the Web, including formats you haven't yet heard of. National's x86 chips also show up in Honeywell's WebPAD and Qubit's Orbit Web Tablet. But National isn't the only low-cost-x86 manufacturer. The Compaq iPaq IA-1 and IA-2 use AMD's K6-2 processor, and Gateway's Connected Touch Pad uses Transmeta's TM3200 chip.

Ironically, one of the only companies bucking the trend to use Intel x86-compatible processors is Intel. The company previewed its ARM-powered Web Tablet at CES (Consumer Electronics Show) in January. The Web Tablet uses Intel's 32-bit StrongARM SA-1110 integrated processor running Wind River's Vx-Works RTOS.

Using a low-power processor in a battery-powered Web appliance, such as the WebPAD and the Web Tablets, seems obvious enough, but line-powered Web appliances also use them. The reason is twofold. First, the manufacturers can eliminate some cost by obviating the need for a cooling fan. More important, eliminating the fan eliminates noise. If Web

Figure 1



The wireless WebPAD is architecturally similar to a PC.

appliances are going to live with us in our living rooms and kitchens, they must blend in with our surroundings and not give off that constant drone we've become accustomed to with desktop PCs.

The biggest trade-off Web-appliance engineers face in their designs is the display. Their choices are the LCD and the CRT. LCDs offer low power, light weight, and compact size but are relatively expensive. LCD prices have recently been falling, but they still account for one-third to one-half of the total bill-of-materials cost. Among LCD technologies, TFT (thin-film-transistor) LCDs offer superior low-light performance over DSTN (double-layer supertwist-nematic) LCDs. Most vendors have settled on the 10-in. LCD as a good compromise between cost and readability. CRTs, on the other hand, are much less expensive for a given screen size. However, they consume more power, dissipate more heat, and outweigh equivalent LCDs. Almost all Web appliances use LCD screens. One exception is Compaq's iPaq IA-2, which comes with a 15-in. color CRT display. As a comparison, the iPaq IA-1 costs



Figure 2

The National Semiconductor Geode SC3200 is an integrated x86 processor targeting Internet appliances.

\$100 more than the IA-2, but its LCD screen measures only 10 in. diagonally.

CHOOSING AN OS

Diversity among Web appliances appears in an area that their users will probably never notice: the operating system. Intel's Web Tablet runs VxWorks from Wind River. Compaq and Honeywell chose to go with Microsoft's WinCE. Sony's eVilla and Qubit's Orbit are running BeIA from Be. QNX powers 3Com's Audrey, and Gateway bases its Connect-

ed Touch Pad on a version of Linux that Transmeta developed.

Because choosing a Microsoft operating system for your platform isn't the automatic decision it may be for PCs, you need to consider the pros and cons of the alternatives. As with the x86 architecture, a Windows-based OS has definite advantages. Windows CE has a familiar look and feel, but that feature may be irrelevant if you want to create your own graphical-user-interface experience. CE also has all the standard applications and plug-ins for your browser, but, if you want enhancements and customizations, consider the effort you'll face in negotiating these changes with Microsoft versus a smaller company, such as Be or QNX. Also, these smaller companies have a lot riding on getting their OSs into your platform. Check to see which ones support the features and browser plug-ins you want and which companies are willing to add it. If customization and control over your OS is critical, then Linux should be at the top of your list. Linux lets you tweak the code to your heart's content, and its price is right, too.

Another issue to consider is the amount of memory the OS requires—not just for the OS but for any applications you want to run. A common configuration is 32 Mbytes of SDRAM and 16 Mbytes of flash memory. Also, think about how you will update the software running on your appliance. And don't forget about one of the more annoying aspects of your PC's OS: its boot time. A true appliance suggests that it's instantly available. How many of us would put up with a microwave oven that required waiting a minute or two before you could punch in 15 seconds on the keypad to heat your blueberry muffin?

Bandwidth is another trade-off that Web-appliance designers face. Most vendors include at least a modem port to access the Internet. Even at 56 kbps, modems make a lot of sense because practically every home, apartment, office, and hotel room has a phone jack. But if your market is the tech-savvy crowd, it most likely has broadband Internet access and may not even consider your product if an Ethernet port isn't at least



Figure 3 Audrey from 3Com (now discontinued) is one of several Web appliances that use an x86 processor.

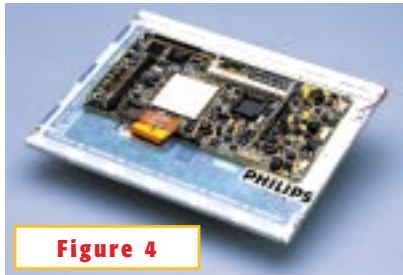


Figure 4 Philips' Net Display Module integrates Web-appliance electronics within an LCD panel.

an option. Because phone jacks and network hubs are less common than AC wall outlets, Honeywell's WebPAD and Intel's and Qubit's Web Tablets give you wireless Web access. The downside to eliminating cables is adding the cost of radio transceivers in both the handheld device and the base station. No cables also means no line power, so you must add either rechargeable batteries and a recharging dock or use disposable batteries.

Whether to provide for expansion is another issue to consider. By including a PC Card slot, for example, you allow your customer to add features later. Expandability is also a way to reduce the initial purchase price because the basic configuration need not include a lot of features. Of course, any provision for expansion adds to the cost in connectors and support circuitry. By making a Web appliance expandable, however, you begin to cross that threshold to PCs. One reason that PCs are unreliable is that users can add third-party software and hardware to them. It does make sense, however, to allow a user to print a Web

page or an e-mail. Most Web appliances come with at least one USB port so that you can connect a printer, but these appliances usually support only one or two models of printers. If they are not standard, some of the appliances can also accommodate an optional USB keyboard or mouse.

WHAT YOU CAN THROW AWAY

As for adding or upgrading software, Web-appliance vendors are relying on the device's Internet connection. Some of the appliances can download patches and upgrades under the direction of their vendor or Internet-service provider, making it much easier to control what software is on the system. Installing upgrades in this way also eliminates the need for a floppy-disk or CD-ROM drive. Doing away with a removable-media drive not only reduces cost but also prevents users from installing unsupported software. Keeping user-installed software off Web appliances increases reliability and reduces the chances of a virus' finding its way onto the system.

Web appliances lack not only floppy-disk and CD-ROM drives, but also hard-

disk drives. Using an efficient OS and only a few basic applications allows Web-appliance designers to get by with a 16-Mbyte flash chip. Another trick engineers use to reduce the amount of persistent storage is to compress the OS and applications while they reside on flash. By eliminating the hard drive, manufacturers reduce costs and eliminate another source of noise.

For those of you who are not into designing a Web appliance from scratch, some companies will sell you the guts and let you add your own customization and value. One example is the Philips Net Display Module (Figure 4). Philips believes that the Web-appliance market needs an economy of scale to succeed and drive down LCD prices. By providing 80% of the functions of a Web appliance, Philips hopes its Net Display Module will attract enough customers to get the volumes that lead to lower costs. Philips offers the module in the lower cost S10LP-NG version, which uses National's SC3200 system chip, and the higher performance

S10LP-TC version, which features the Transmeta TM3400 processor. Both support wireless-Internet access and have 10.4-in., thin-film-transistor LCDs. The Net Display Module integrates the motherboard in the LCD panel, yielding a relatively thin assembly and lower overall cost.

The jury is still out on whether Web appliances are the future or a fad. Most tethered appliances retail for around \$500, which is close to what a low end desktop PC with a CRT monitor costs. If your company sells both products, you may not care which one sells the most. But if you are betting your company or division on a Web appliance, you need to offer the consumer a compelling reason to buy one instead of a cheap PC. LCD prices are keeping the cost of a Web appliance too close to the low end of the PC market. Even if LCD prices drop drastically, the cost of manufacturing a low end PC may sympathetically drop. Web appliances need a convincing answer to the question, "Why not a PC?" □



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