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SILICON UPDATE

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The Captain's Back

Captain Zilog is back! Armed with the new eZ80 and Z80S183, he returns to wipe out 20 years of somewhat lackluster performance by Zilog. As Tom explains, these new chips certainly have the potential to boost Zilog. Stay tuned to find out more about the Captain's return



recently attended Zilog's 25th anniversary party, a rather impressive affair from a number of angles. First, the venue was great—San Jose's Tech Museum of Innovation. It's chock full of neat hands-on exhibits (kids, old and young, love it), all with a definite Silicon Valley edge. It has everything from a design-and-ride virtual roller coaster to a mock-up clean room. The Tech also includes an IMAX theatre, displaying those awesome huge screen shows. I highly recommend it next time you're in town.

Now, lest you think I'm on the chamber of commerce, keep in mind the other Silicon Valley alternatives are stuff like the Winchester Mystery House and Trees of Mystery, the main "mystery" being why tourists can't find something better to do.

But, back to Zilog. Food and drink at the party were excellent and unlimited (there was a most delicious desert tray): a definite upgrade from what the press knows all too well. Most delicious dessert tray. I enjoyed the

exhibit of Zilog memorabilia, too, including a bunch of the original Captain Zilog souvenirs (see Photo 1).

Even the program was great. Of course, there had to be a program. The way it works is that you show up for the fun and goodies, then you've got to pay your dues. All too often, you suffer through long-winded marketing pitches that normally wouldn't make it beyond your round file.

But this time, the speakers included the well-known Valley PR impresario (and darn good stand-up comic) Fred Hoar, followed by Zilog founder Federico Faggin, who proved that two guys (he and Ralph Ungermann) who want to change the world can indeed do that. Finally, new chief Curtis Crawford, inspired no doubt by Zilog's recent return to profitability, delivered some big-league inspiration and vision, more befitting a Fortune 500 company than one trying to catch up with the pack.

So, hats off to the PR folks at Zilog. It was a good show! However, I always say that it's the chips that talk, while PR walks. The real question is: Does Zilog have the silicon to back up the sizzle?



Photo 1—Last seen duking it out with Intel and Motorola in 1979, the Captain is back.

WDT	8S180 CPU		8 ch,
RTC	MMU		10-bit A/D
24 I/O	ZDI		10-bit D/A
	2 C/T	2 DMA	
PLL	2 UART	CSIO	PIOS
	1 KB ROM	2 KB SRAM	

Figure 1—The latest member of the ever-growing '180 family is the '183, notable for inclusion of 10-bit A/D converter and D/A converter functions.

ROOTS

As a hands-on guy, I couldn't help getting misty eyed (OK, so I get weepy after a few drinks) as Federico related that day long ago when he and Ralph plugged in their hot-off-the-fab newborn chip and got the ">" prompt. That's the rush that ultimately makes all the blood, sweat, and tears worth it. Given that it's the company's 25th anniversary, it's ironic that the chip that's going to play a big role in the new Zilog traces its roots all the way back to that first Z80.

Of course, when I say Z80, I don't mean that actual circa-'70s chip, though I'm sure they're still selling them into ancient sockets somewhere. Rather, it's the later '180 derivatives. Now, Zilog has announced that the eZ80 is going to be the company's workhorse.

Not that Zilog doesn't have other areas of strength. There's the Z8 MCU and some interesting DSPs, plus the TV and modem chips, that have been their strength in the recent past. Zilog has just announced a dual-DSP Wave chip targeting spread-spectrum RF apps that deserves a close look. In addition, Zilog is making intriguing deals with the likes of Tensilica, Production Languages Corp., Seattle Silicon, emWare, and so on, that hint at changes going well beyond mere evolution.

It would certainly be overstating the case to say, "As it goes for the Z80 ('180, eZ80, etc.), so it will go for Zilog." Nevertheless, as the chip that both put Zilog on the map and still remains popular and recognized in the market, the Z80 is a horse that Zilog

can, should, and will try to ride into the future.

'180S TURN

The on-again, off-again history of the Z80 family echoes the ups and downs of Zilog's uniquely turbulent history. How many companies do you know that have gone private twice?

In hindsight, troubles can be traced all the way back to the late '70s when Zilog got trapped between heavy-weights Intel and Motorola in the 16-bit wars. The Z80 was left on autopilot and went adrift. Periodically, Zilog would muster up a course correction, but it didn't help much (e.g., the ill-fated Z800). Ultimately, it got so bad that other companies were getting more Z80 business than Zilog and, in an odd permutation of NIH (Not Invented Here), Zilog actually ended up licensing the design for their better Z80 (the '180) from Hitachi.

To Zilog's credit, they have carried on, upgrading the architecture (with the S version of the core) and introducing a number of derivatives. The most recent addition to the family, the Z80S183, pictured in Figure 1, could be considered the analog '180 since it incorporates an 8-channel, multiplexed by 10-bit A/D converter and a 10-bit D/A converter. The A/D converter offers separate resistor ladders for the chip's upper and lower five bits, contributing to a speedy 8-ms conversion.

The original '180 peripherals are all there—UARTs, clock-serial I/O, timers, DMA—but with a number of refinements and enhancements. For instance, the UART now features more versatile baud-rate generators (up to 512 kbps) and 4-byte receive FIFOs, while the DMA controllers are upgraded with a chaining mode for nonstop service.

As well, there are new features like a watchdog

timer (WDT) and real-time clock (RTC). The RTC takes advantage of the PLL clock logic that lets the CPU run at high speeds (up to 33 MHz) off a watch crystal (32.768 kHz).

There's also an interesting programmable I/O sequencer (PIOS) that can be set up to offload from the CPU the details of I/O and timing operations. The CPU and PIOS share access to 256 bytes of the on-chip 2-KB SRAM, in which the programmer can detail the nature and timing of various high-speed operations, including digital and analog (both A/D and D/A) I/O and interrupt generation. Subsequently, the PIOS autonomously performs the specified operations without host CPU intervention.

EZ WAY OUT

Most daring of all, Zilog has announced the eZ80, depicted in Figure 2. Although I don't have enough technical specs in hand to get a complete picture, on paper the eZ80 appears to be quite a radical extension to the Z80 architecture. As mentioned earlier, Zilog's previous efforts to upgrade the architecture haven't been especially successful. Are the prospects for the eZ80 any better? Here's what's known so far.

The chip can mimic three CPUs: the Z80, the '180 (including its MMU architecture), and a new variant that incorporates a 24-bit ALU and features linear addressing of a 16-MB address space. The former modes are strictly upward object-code compatible with their existing 8-bit brethren, while the latter includes new registers and in-

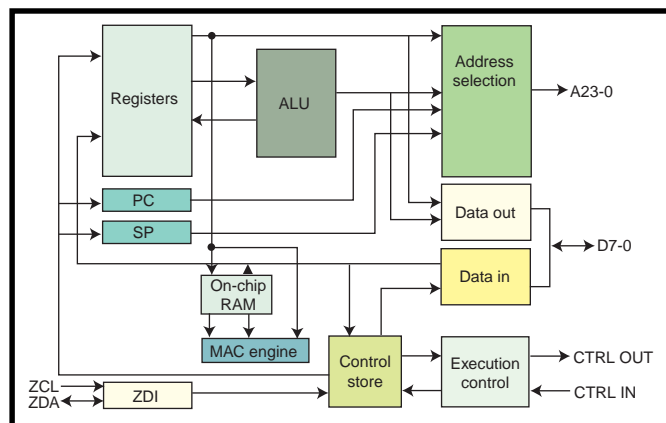


Figure 2—Although the full details aren't available yet, the just-announced eZ80 intends to fast-forward the Z80 architecture up to current specifications and standards.

structions that extend operations to 24 bits. Multiple virtual 8-bit machines can reside in the 16-MB address space and a mixed mode dynamically switches between existing Z80 and '180 and new eZ80 native software.

I don't have any details, but Zilog's claims of up to 80 MIPS would be consistent with a modern pipelined design. Actual performance would likely be derated somewhat by practical concerns, such as branch penalty and memory bottleneck. Nevertheless, it's clear the combination of modern architecture and higher clock rate can deliver significant performance, especially with the addition of an optional MAC engine featuring 16 × 16 multiply and accumulate with a 40-bit result.

CAPTAIN AT THE CROSSROADS

So, it's time for the Captain to hike up his pants (er, tights?) and go for the gusto. Some might say that the Z80 is too little too late. On the other hand, look at the other popular 8-bit chips like the PIC, 8051, and 6805. They're not exactly spring chicks. In fact, as with the other chips, evolving and emerging market forces could mean that the '180 and eZ80 make as much, or even more, sense today than the Z80 did years ago.

Where might Zilog be headed? Here are a couple of clues. First, Zilog has announced a TCP/IP stack will be available for the eZ80, though terms haven't been disclosed. Indications are—unlike some of the extremely (and arguably overly) minimalist 8-bit solutions emerging—Zilog is talking a full-blown stack with all the bells and whistles.

Next, don't forget Zilog has a heck of a lot of modem know-how in-house. In fact, they already have chips that combine micro, DSP, and analog front end in an almost single-chip modem solution. You only need a DAA to complete the connection to the phone jack.

Throw in some commodity EPROM or flash-memory chips for page storage and you've got the brains of quite a nifty little embedded Internet gadget, wouldn't you say? Stay tuned...

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