

Z80—The 1970s Microprocessor Still Alive

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The history of Zilog Z80 has been fascinating to me. According to reliable sources,¹ in late 1974, Federico Faggin, who was then best known as the designer of the first commercial microprocessor Intel 4004, and Ralph Ungermann, from the Intel 8080 team, left Intel to form their own company. Then, Masatoshi Shima, who was the transistor-level designer of Intel 8080, left Intel in April 1975 to join Faggin and Ungermann. At the beginning, Faggin intended to develop a single-chip computer (microcontroller), but soon realized that it is difficult to compete in the microcontroller market with a company who has its own semiconductor fabrication facility. In December 1975, Faggin came up with an idea of developing a 5-V microprocessor, which was machine core compatible with then popular Intel 8080, and adding most of the functionalities available in Motorola 6800, so that they could pinch both markets. Faggin, Ungermann, and Shima managed to find a venture capital from Exxon Enterprises for the development of a new microprocessor Z80 and formed their own company Zilog.

Shima, as the designer of logic-level components, had the experience of doing the same for the Intel 8080 project, but it was really challenging to integrate two different microprocessors' power and functionalities together. He managed to realize (in hardware) all these with 8,200 transistors in a single chip where the competitor 8080 had only 4,800 transistors. With all these challenges, Zilog managed to introduce the first working prototype of Z80 on March 9, 1976, created by an 11-member team,¹ exactly on the scheduled date. The development of the microprocessor, the software development system, and all other things were done under \$400,000, which was difficult to believe.¹ The developed Z80 microprocessor had an 8-bit data bus and a 16-bit address bus with the capability of running all 78 instructions of Intel 8080 and additional instructions. It had 20 × 8-bit registers and 4 × 16-bit registers and could handle up to 64k bytes of memory.

Z80 was the choice of a microprocessor for then home computers such as Radio Shack TRS-80, SORD

M23P, M5, Sinclair ZX81, ZX Spectrum, KayPro II, and many other manufacturers.³ It was capable of running the CP/M operating system in most Z80-based PCs. Z80 had a reasonable share in the PC market until Intel revealed its 16-bit microprocessor in the mid-1980s. Z80 was very popular as a microprocessor not only in PC applications, but also in industrial embedded applications, and some of the big manufacturers have Z80 core inside their ASIC chips still today or use enhanced versions of Z80 in consumer electronic devices.⁴⁻⁷ Zilog still manufactures ez80, an enhanced version of the original Z80, which is still being used by Texas Instruments in its TI-84 and TI-84 Plus calculators.⁷ It is among the few silicon chips that made a remarkable impact on the electronic device industry.⁸ To this day, Zilog produces a range of Z80-based microprocessors and intelligent peripheral controllers, and they are available from reputed electronics component suppliers.^{2,9,10} This microprocessor is one of the longest living microprocessors of all time.

FROM MY PERSONAL POINT OF VIEW, Z80 WAS A WONDERFUL MICROPROCESSOR, WHICH WAS FAR AHEAD OF THE CONTEMPORARY MICROPROCESSORS WHEN IT WAS LAUNCHED.

I started to program in Pascal with SORD M23P computers as an undergraduate student in 1985 and learned Z80 assembly language programming at the same time. Then, as a young engineer, I worked in a large mainframe computer system based on Z80. This experience made me very familiar with the Z80 architecture and, later in 1990, I developed a software simulator to display register contents of Z80 after executing Z80 assembly language commands (a limited set of instructions) on IBM PC under the DOS operating system as my project for the British Computer Society Examination. The textbook by Lance A. Leventhal on 80 assembly language programming was very useful during that work.¹¹ From my personal point of view, Z80 was a wonderful microprocessor, which was far ahead of the contemporary microprocessors when it was launched. It appeared suddenly

from nowhere, captured the market quickly, and then few years later disappeared from main stream personal computers due to the success of the IBM PC and PC clones. Nonetheless, the Z80 continued to be used in certain markets^{2,9,10} all these decades. It is undoubtedly one of the longest living microprocessors of all time.

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