MACHINE LEVEL PROGRAMMING 1: BASICS CS 045

Computer Organization and Architecture

Prof. Donald J. Patterson Adapted from Bryant and O'Hallaron, Computer Systems: A Programmer's Perspective, Third Edition

- HISTORY OF INTEL PROCESSORS AND
 ARCHITECTURES
- C, ASSEMBLY, MACHINE CODE
- ASSEMBLY BASICS: REGISTERS, OPERANDS, MOVE
- ARITHMETIC & LOGICAL OPERATIONS

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HISTORY

INTEL X86 PROCESSORS

- Dominate laptop/desktop/server market
- Evolutionary design
 - Backwards compatible up until 8086, introduced in 1978
 - Added more features as time goes on

- Documentation
 - <u>https://software.intel.com/sites/default/files/managed/39/</u> c5/325462-sdm-vol-1-2abcd-3abcd.pdf

Announcing a new era of integrated electronics

ELECTRONICS NEWS, 11/15/71

A microprogrammable computer on a chip!

Intel introduces an integrated CPU complete with a 4-bit parallel adder, sixteen 4-bit registers, an accumulator and a push-down stack on one chip. It's one of a family of four new ICs which comprise the MCS-4 micro computer system—the first system to bring you the power and flexibility of a dedicated general-purpose computer at low cost in as few as two dual in-line packages.

MCS-4 systems provide complete computing and control functions for test systems, data terminals, billing machines, measuring systems, numeric control systems and process control systems.

The heart of any MCS-4 system is a Type 4004 CPU, which includes a powerful set of 45 instructions. Adding one or more Type 4001 ROMs for program storage and data tables gives you a fully functioning microprogrammed computer. To this you may add Type 4002 RAMs for read-write memory and Type 4003 registers to expand the output ports.

Using no circuitry other than ICs from this family of four, you can create a system with 4096 8-bit bytes of ROM storage and 5120 bits of RAM storage. When you require rapid turn-around or need only a few systems, Intel's erasable and re-programmable ROM, Type 1701, may be substituted for the Type 4001 maskprogrammed ROM.

MCS-4 systems interface easily with switches, keyboards, displays, teletypewriters, printers, readers, A-D converters and other popular peripherals.

The MCS-4 family is now in stock at Intel's Santa Clara headquarters and at our marketing headquarters in Europe and Japan. In the U.S., contact your local Intel representative for technical information and literature. In Europe, contact Intel at Avenue Louise 216, B 1050 Bruxelles, Belgium. Phone 492003. In Japan, contact Intel Japan, Inc., Parkside Flat Bldg. No. 4-2-2, Sendagaya, Shibuya-Ku, Tokyo 151. Phone 03-403-4747.

Intel Corporation now produces micro computers, memory devices and memory systems at 3065 Bowers Avenue, Santa Clara, Calif. 95051. Phone (408) 246-7501.





• 1978: By 1978, microprocessor chip complexity had increased an order of magnitude over the first four-bit processors. Intel's 8086 16-bit processor, shown here, integrates 29,000 transistors, over 12 times as many as the original Intel 4004. [citation]

10MB YOU'VE BEEN WAITING FOR

3398

Included with the system is software for testing, formating, I/O drivers for CPIM⁶, plus an automatic CP/M driver attach program. Support software and Christ driver attach program, Support somware and drivers for MPIM® and Oasis® are also available. The sophisticated formatting program assigns alternate sophisticated formatting program assigns elemente sectors for any weak sectors detected during formatting, assuring the lowest possible error rate — at least

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The system has a full one-year warranty on parts and

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Floppy disk and larger, more expensive hard disks are unbeatable no match for this powerful little system. More data is available on every seek: 64K on 10MB and 32K on

5MB. Faster seek time too — an average of 70MS. It provides solid performance anywhere with only 20 waits of power. Data is protected in the sealed enclosure, and the landing zone for heads provides another margin of safety. The optional power board anomier margin of safety. The optional power board plugs directly into the S100 bus and provides power

for the drive.

The XCOMP controller is the key to this system's high efficiency operation. Speed-up teatures include interleave without table lookup, block-deblock with controller buffer, and read lookahead. OEMs worldwide have already proven the outstanding perior. mance of the XCOMP controller.

