**The history of the Intel**

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## Intel Begins with The 4004

The first microprocessor sold by Intel was the four-bit 4004 in 1971. It was designed to work in conjunction with three other microchips, the 4001 ROM, 4002 RAM, and the 4003 Shift Register. Whereas the 4004 itself performed calculations, those other components were critical to making the processor function. The 4004 was mostly used inside of calculators and similar devices, and it was not meant for use inside of computers. Its max clock speed was 740 kHz.

The 4004 was followed by a similar processor known as the 4040, which was essentially an improved variation of the 4004 with an extended instruction set and higher performance.

## 8008 And 8080

The 4004 made a name for Intel in the microprocessor business, and to capitalize on the situation, Intel introduced a new line of eight-bit processors. The 8008 came first in 1972, followed by the 8080 in 1974 and the 8085 in 1975. Although the 8008 was the first eight-bit processor produced by Intel, it is not as notable as its predecessor or its successor, the 8080. It was faster than the 4004 thanks to its ability to process data in eight-bit chunks, but it was clocked rather conservatively between 200 and 800 kHz, and the 8008's performance simply didn't attract many system developers. The 8008 used 10-micrometer transistor technology.

Intel's 8080 was far more successful. It expanded on the design of the 8008 by adding new instructions and transitioning to six-micrometer transistors. This allowed Intel to more than double the clock rates, and the highest-performance 8080 chips in 1974 came running at 2 MHz. The 8080 was used in countless devices, which lead to several software developers, such as the recently formed Microsoft, to focus on software for Intel's processors.

Eventually when the 8086 was released, it was made source compatible with the 8080 to maintain backwards compatibility with this software. As a result, the 8080s and key hardware elements have been present inside of all x86-based processor ever produced, and 8080 software can technically still run on any x86 processor.

The 8085 was essentially a less expensive and higher-clocked variant of the 8080, which was highly successful as well though less influential.

## 8086: The Beginning Of x86

Intel's first 16-bit processor was the 8086, which helped to boost performance considerably compared to earlier designs. Not only was it clocked higher than the budget-oriented 8088, but it also employed a 16-bit external data bus and a longer six-byte prefetch queue. It was also able to run 16-bit tasks (though most software at this time was designed for eight-bit processors). The address bus was extended to 20-bit, which enabled the 8086 to access up to 1MB of memory and therefore increase performance.

The 8086 also became the first x86 processor, and it used the first revision of the x86 ISA, which nearly all of the processors created by AMD or Intel since the introduction of the 8086 have been based on.

Intel also produced the 8088 around the same time. This processor was based on the 8086, but with half as many data lines and a four-byte prefetch queue. This caused a loss of balance, as the narrower bus cut into instruction fetch rate, forcing Intel's execution unit to idle much of the time. It still had access to up to 1MB of RAM and ran at higher frequencies than previous processors; however, it was quite a bit slower than the 8086.

## 80186 And 80188

Intel followed up the 8086 with several other processors, all of which used a similar 16-bit architecture. The first was 80186, aimed at embedded applications. To facilitate this, Intel integrated several pieces of hardware typically found on the motherboard into the CPU, including the clock generator, interrupt controller, and timer. As a side effect, certain instructions ran notably faster on 80186 than 8086, even at the same clock rate. But of course, Intel naturally pushed the CPU's frequency up over time to further improve performance.

The budget-oriented 80188 similarly contained several pieces of hardware integrated into the processor. But like the 8088, its data bus was cut in half.

## 80286: More Memory, More Performance

The 80286 was released the same year as the 80186 and had nearly identical features, but it extended the address bus to 24-bit, which enabled the processor to access up to 16MB of memory.

## iAPX 432

The iAPX 432 was an early attempt by Intel to diverge from its x86 portfolio in favor of an entirely different design. Intel expected iAPX 432 to be several times faster than its other offerings. The processor ultimately failed, however, due to some major design flaws. Although x86 processors are relatively complex, the iAPx 432 took CISC to a whole new level of complexity. The hardware design was rather large, which forced Intel to craft it out of two separate dies. The processor was also quite data hungry and failed to perform well without extremely high amounts of bandwidth. The iAPX 432 managed to outperform the 8080 and 8086, but it was quickly outpaced by newer x86 products, and eventually it was abandoned.

## i960: Intel's First RISC

Intel created its first RISC processor in 1984. It was not designed as a direct competitor to the company's x86 processors because it was intended as a secure embedded solution. Internally, it was a 32-bit superscalar architecture that used Berkeley RISC design concepts. The first i960 processors were clocked relatively low, with the slowest model running at 10 MHz, but over the years it was improved and transitioned to smaller fabs that enabled it to hit up to 100 MHz. It also supported 4GB of protected memory.

The i960 was widely used inside of military systems as well as in business systems.

prefetch data = transfer (data) from main memory to temporary storage in readiness for later use

to fab = to produce a microchip