Intel Processors

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History of Intel

- Intel was founded on July 18, 1968
- Founded by semiconductor engineers Robert Noyce and Gordon Moore
  - Both engineers left Fairchild Semiconductor to start Intel
- Originally called “NM Electronics” (NM for Noyce and Moore)
- Purchased the rights to use “Intel” from a company called Intelco
  - Intel is short for Integrated Electronics
Intel Processor Timeline

Throughout Intel’s history, new and improved technologies have transformed the human experience.

Decades of Intel chips, including the 12th generation Intel® Core™ processor with its revolutionary 3-Gil Core transistors, illustrate Intel’s unwavering commitment to delivering technology and manufacturing leadership to the devices you use everyday. As you advance through the chart, the benefits of Moore’s Law, which states that the number of transistors roughly doubles every couple of years, are evident as Intel innovates smaller, denser, and more capable chips that transform both our work, life, and play.
Intel 4004

- 4-bit central processing unit
- 10 \( \mu \)m technology size
- 2300 transistors
- Clock rate of 740 kHz
- Could not handle interrupts
- First Available Microprocessor from Intel
- First CPU in one chip
  - Contained CPU, ROM (4KB), RAM (640 bytes) and a shift register (10 bit) for I/O
- Mainly used in calculators
**Intel 8008**

- 10 μm technology size
- Clock rate of 800 kHz
- 16 KB of memory (ROM + RAM)
- Could handle interrupts
- Bigger stack than the Intel 4004
- 8 inputs ports
- 24 output ports
- No direct memory addressing
- First commercially available 8-bit CPU
- Mainly used in calculators, industrial robots (i.e. Bottling Machines), computer terminals
Intel 8080

- 8-bit CPU
- 6 μm technology size
- Clock rate of 4 MHz
- 64 KB of memory (ROM + RAM)
- 256 I/O ports
- Source code compatible with 8008
  - Easy to port old applications
- Introduction of the stack pointer (SP) register
  - Stack could now grow to the size of RAM
- Mainly used in early microcomputers, MITS Altair 8800 Computer
- Big part of the launch of personal computers
Intel 8088

- 16-bit CPU
- Up to 10 MHz clock speed
- 3 μm technology size
- 1 MB of memory (ROM + RAM)
- Used in the original IBM PC
- Established what we know today as the x86 architecture
- First commercially available 16-bit CPU
Intel 80386

- 32-Bit CPU
- Up to 40 MHz clock speed
- 1 μm technology size
- 4 GB of memory (ROM + RAM)
- Intel’s first 32-bit x86 CPU
- Mainly used in Personal Computers
- Introduced “Virtual Mode”
  - Ability to run legacy 16-bit applications while providing protection to memory and other resources
Intel Pentium 4 (Prescott)

- Intel's first successful implementation of a 64-bit x86 CPU
- 90 nm technology size
- Up to 3.8 GHz
- 2 MB L2 cache
- 800 MHz Bus Speed
In 2006, Intel released a new platform named Intel Core 2 Duo.
- 65nm technology size.
- This was the first processor based upon the Core architecture which is still used by Intel today.
- It contained two cores, with each core being able to process four instructions simultaneously.
- The popular Core i3, Core i5, and Core i7 all stemmed from the Core 2 Duo.
The first Core i7 released by Intel was given the codename “Bloomfield”.
- Released in Q4 of 2008.
- 45 nm technology size
- Quad-Core Design with a shared L3 cache between the four different cores.
- Each core has a split 8-way set associative L1 cache and a unified 8-way set associative L2 cache.
- To further improve the effectiveness of the cache, Intel added prefetching.
- Main memory controller reduced time taken to access main memory.
Intel Core i7 - Sandy Bridge

- First released in early 2011
- 32 nm technology size
- Similar cache to the Bloomfield generation of i7.
- Integrated Graphics Processor on same die as cores.
- Improved integrated memory controller
Intel Core i7 - Ivy Bridge

- 22 nm technology size
- Estimated 4%-6% gain in IPC
- Improvement in cache prefetching
- Virtualization of move operations
Intel Core i7 - Haswell

- 22 nm Technology Size
- Increase in Reservation Stations from 6 to 8
- Additional integer ALUs and branch unit
- One of the highest rates of per-clock throughput at the time
Intel Core i7 - Broadwell

- 14 nm technology size
- Released in Early 2015
- Estimated 5% increase in IPC
- Increase in L3 cache size
- Not very successful, replaced within a few months
Intel Core i7 - Skylake

- 14 nm Technology size
- Released late 2015, a few months after Broadwell
- 10% faster than Broadwell
Intel Core i7 - Kaby Lake

- 14 nm+ Technology size
- Released in Early 2017
- 256KB L2 cache
- 8MB L3 cache
Intel Core i7 - Coffee Lake

- 14 nm Technology size
- Released October 2017
- Increase to six cores over Kaby Lake’s four
- As a result, L3 cache increased to 12MB
- Base clock of Coffee Lake same as turbo boost of Broadwell
References

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