

Intel sets out its plans for 2019: Ice Lake, Lakefield, and Project Athena

Enlarge / Complete Lakefield motherboard.

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Intel had a big presentation at CES last year, which was strange, because the company didn't really have many things to announce. The delays to its 10nm manufacturing process meant that, instead of exciting new chips, the best we could really hope for was rehashed versions of its current chips, which duly arrived. This year's presentation was very different. The company's 10nm process is finally due to achieve volume production this year, and late last year the company told us that 10nm was bringing with it a new architecture named Sunny Cove, a new, much faster GPU, and new manufacturing techniques with 3D die stacking. All this meant that the presentation could actually introduce a range of new products that will ship in 2019.

10nm processors for the masses: Ice Lake-U

The most important product announced, as it will likely be the highest-volume part, is Ice Lake-U. This is a 10nm mobile processor with a Sunny Cove CPU and a Gen11 GPU. Since its

2015 introduction, Intel has produced a number of variations of its Skylake architecture. Performance improvements have come from increasing clock speeds and core counts, with the core design essentially unaltered. Sunny Cove, by contrast, is a meaningful update to and improvement of that architecture and will represent Intel's first improvement in instructions-per-cycle in four years. This means that it should offer across-the-board performance improvements, regardless of workload. The Ice Lake-U parts will retain the U-series 15W power rating and will offer a maximum of four cores and eight threads.

The Gen11 GPU is similarly slated to give a big performance boost. The standard configuration (named GT2 in Intel's parlance) will include 64 execution units as compared to the 24 execution units that are standard in Skylake/Kaby Lake/Coffee Lake processors. This will more than double the floating point performance of the GPU from about 420 gigaFLOPS to 1 teraFLOPS. This increased performance increases the memory bandwidth requirements of the GPU, and the chip will accordingly sport two channels of LPDDR4X memory.

The integrated chipset also includes a couple of notable new features: it includes Thunderbolt 3 support, removing the need for a separate Alpine Ridge controller, and a Wi-Fi 6 (802.11ax) controller.

Ice Lake will also include improved protections against certain kinds of Spectre attack, beyond the existing Meltdown and Spectre protection already shipping in the latest Coffee Lake and Whiskey Lake chips.

A still-mysterious, ultra-low-power x86 hybrid and Project Athena

When introducing its Foveros 3D die stacking, Intel said that it had developed a chip with a Sunny Cove core and four

Tremont Atom cores built on the 10nm process, stacked on a separate 14nm die used for I/O such as PCIe, USB, DDR, and SATA. That chip now has a name—Lakefield. Intel said that it put the chip together to meet a customer requirement for a processor with a 2mW standby power but will sell the part to any OEM that wants it. We still don't know who that original customer is or precisely what the intended purpose is for the processor, but its diminutive size means that it could find a place in a tablet or ultra-thin laptop.

Intel also announced Project Athena, a new initiative to shape the direction of the PC market. Similar to the Ultrabook program, Intel has set guidelines for the features that a laptop should have in the year 2020 and beyond. The spec will be updated annually to emphasize whatever features Intel thinks are most important at any given time, with a broad focus on battery life, artificial intelligence, and always-online connectivity (including 5G). Certified Athena systems should come in the second half of the year, with both Windows and Chrome OS hardware due to arrive.

Finally, the company announced a few more “9th generation” Core processors using the Coffee Lake-Refresh design. Joining the three existing 9th generation parts are five more chips: the i9-9900KF, i7-9700KF, i5-9600KF, i5-9400, i5-9400F, i3-9350KF. The K suffix as before denotes overclockability; the F suffix is new and indicates that the chip has no integrated GPU (or, more likely, that the integrated GPU is defective and non-functional). Oddly, only the 9400F appears to have a price, and Intel is vague on when the processors will ship, but they will possibly release as soon as later this month.

Model	Cores/Threads	Clock base/boost GHz	Level 3 cache/MB	TDP/W	DDR4 /MHz	GPU	Price
i9-9900K	8/16	3.6/5.0	16	95	2,666	UHD 630	\$488
i9-9900KF	8/16	3.6/5.0	16	95	2,666		

i7-9700K	8/8	3.6/4.9	12	95	2,666	UHD 630	\$374
i7-9700KF	8/8	3.6/4.9	12	95	2,666		
i5-9600K	6/6	3.7/4.6	9	95	2,666	UHD 630	\$262
i5-9600KF	6/6	3.7/4.6	9	95	2,666		
i5-9400	6/6	2.9/4.1	9	65	2,666	UHD 630	
i5-9400F	6/6	2.9/4.1	9	65	2,666	\$182	
i3-9350KF	4/4	4.0/4.6	8	91	2,400		

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