Intel reveals final details on Ice Lake mobile CPUs

Enlarge / This is a 10th-Gen Intel Core processor, code named Ice Lake. Ice Lake uses Intel’s new 10nm process and offers more IPC (Instructions Per Clock) as well as greatly improved integrated graphics as compared to earlier models.

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Yesterday, Intel launched its new 10nm Ice Lake mobility (read: notebook, ultraportable) processors. The launch consists of i3, i5, and i7 notebook parts, with TDP ranging from 9W to 28W, in considerably more separate SKUs than we’re used to seeing in one generation.

Enlarge / This SKU list and specs for the new Ice Lake U-

series and Y-series launch.
Intel Corporation
The first thing to understand about these parts is the difference between the U and Y series parts. U-series are standard mobile processors with TDP between 15-28W, and Y-series are low-voltage 9-12W TDP parts for ultraportable designs. The under 20W TDP niche that Ice Lake's Y-series fills was formerly occupied only by relatively sluggish dual-core parts, so seeing 4C/8T Core i7 parts like the i7-1060G7 with a TDP this low is a welcome change that should spell greatly improved battery life for thin-but-powerful designs such as Dell's XPS 13 or HP's Spectre x360 in the future.

Compared to 9th-generation Core mobile CPUs, Ice Lake features an 18% improvement in Instructions Per Clock cycle (IPC), but it offers a decrease in maximum clock rate. This means maximum performance is basically a wash, but we should expect substantial gains in battery life, assuming notebook manufacturers don't scale down battery capacities in response. TDP itself is also significantly improved: Coffee Lake mobile i5 CPUs were rated at 45W/35W, while the new Ice Lake U-series i5s and even i7s are down to 25W/15W.

On the higher end, there's even more reason to expect CPU performance to be a wash at best as compared to Coffee Lake parts. Coffee Lake's mobile i7 CPUs featured more cores and threads than the slimmer Ice Lake parts. Ice Lake i7 U-Series CPUs are 4 core/8 thread parts, while Coffee Lake's mobile i7s were 6C/12T.

These performance expectations are borne out by PCMag's benchmark results, which pit an i7-1065G7 against a couple of HP machines with Whiskey Lake i7-8565U CPUs in various productivity tests including Cinebench R15, Cinebench R20, and Blender. The Ice Lake part in its higher-powered 25W TDP configuration pulled ahead in some tests by as much as 15-20%—but that's competing against a 4C/8T Whiskey Lake mobile i7, not a 6C/12T Coffee Lake i7. (It's also worth

noting that so far, Ice Lake has no equivalent at all to Coffee Lake's monster 8C/16T i9-9980H series mobile CPUs.)

- The "Iris Plus Graphics" block over on the right is the truly interesting part of this slide.
  Intel Corporation
- This slide is basically an overview of all the things in your new Ice Lake CPU that aren't the CPU itself. Take it with a grain of salt: especially the bit about Wi-Fi 6 being "nearly 3x faster" than 802.11ac.
  Intel Corporation
- Jury's out on how many people will be performing big AI workloads on a laptop—but if you want to, Ice Lake's apparently got you covered.
  Intel Corporation
- These are the most basic specs for the entire Ice Lake mobile line, including both U-series and Y-series.
  Intel Corporation

In terms of sheer performance, the most interesting thing about the new Ice Lake mobile CPUs isn't really "CPU" at all—it's the new Iris Plus integrated graphics. At the highest levels, in the 64 EU (Execution Unit) parts, Iris Plus is encroaching on territory formerly reserved for dedicated mobile GPUs, like the GeForce MX series. Turning again to PCMag's excellent benchmark coverage, the i7-1065G7's Iris Plus was typically around 75% of the performance of a GeForce MX dedicated GPU in a Whiskey Lake notebook, and double to triple the performance of Whiskey Lake's integrated UHD Graphics 620.

Ice Lake also offers built-in Thunderbolt support, an integrated Wi-Fi 6 (802.11ax) chipset, and supposedly increased AI performance. We're not sure yet how many people are going to be performing big AI workloads on a notebook, but it's good to see Intel thinking about it.

The Wi-Fi 6 is nice to see but probably not anything to get too excited about yet. Wi-Fi 6 routers are still pretty unusual and aren't necessarily performing that well in the real world, and most of the benefits Wi-Fi 6 *should* offer don't really come into play until you've got an environment with lots of Wi-Fi 6 client devices. One or two Ice Lake laptops are probably not going to see a big advantage in a home or office full of 802.11ac (Wi-Fi 5) devices.

If you're a Thunderbolt user, the new CPU-integrated Thunderbolt controller will mean better battery life, much like the CPU itself. Ophir Edlis, a senior Intel engineer, says each Thunderbolt port in use on an Ice Lake-powered device should consume as much as 300mW less than the same device would on an older notebook with a separate Thunderbolt controller. This savings is additive, with a theoretical heavy Thunderbolt user with four active devices connected saving as much as 1.2W in total.

Intel also claims hardware-based mitigations against Meltdown and Spectre speculative-execution attacks, but we've been able to find no concrete details about how those work, how effective they are, or how much less performance impact the microcode mitigations that will still be necessary for users who need to protect against those attacks might be. (To date, Intel CPUs have been hit far harder by the performance impact of microcode security patches than AMD CPUs have.)

The only thing we're sure of about speculative execution attacks (including Spectre, Meltdown, and now Zombieload) is that they'll be with us for a long time yet to come, with no "magic hardware fix" making microcode security patches completely unnecessary anywhere on the horizon.

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