

This is Lunar Lake – Intel’s utterly overhauled AI laptop chip that ditches memory sticks

Last year, Intel boasted that its Meteor Lake processors, dubbed Core Ultra, represented the company’s biggest architectural shift in 40 years. But Intel didn’t settle down after that: today it’s revealing how Lunar Lake, its next laptop chip coming this fall, will overhaul the formula yet again.

Facing the existential threat of Arm and the opportunity of AI PCs, Intel has apparently ditched its famous tick-tock cadence for a whole new system-on-chip design, one that not only triples the size and more than quadruples the performance of its AI accelerator, but promises up to 14 percent faster CPU performance at the same clockspeed, 50 percent more graphics performance, and up to 60 percent better battery life than last year’s model.

“It’s x86 power like you’ve never seen it before,” claims Intel technical marketer Rob Hallock, who says Intel tweaked every part of the chip to make it happen. He says it’ll “definitely” beat Qualcomm, too.

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The biggest change? If you buy a Lunar Lake laptop, it won’t have separate memory sticks or chips! Lunar Lake now bakes 16

or 32GB of LPDDR5X memory into the package itself, with no ability to connect more RAM. It's a change that reduces the power consumption of moving data through the system by approximately 40 percent, according to Intel. For those who need more memory, Hallock says a separate Arrow Lake architecture is coming to laptops later this year.

After hours of poring through slide decks and presentations, plus a quick chat with Hallock, here's everything else I just learned.

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But it didn't work. Apps like Microsoft Teams wound up warming the entire chip. So Intel is axing the LP-E cores after only one year – in favor of a new 4 by 4 system. You get up to four new “Lion Cove” P-cores and four new “Skymont” E-Cores in a Lunar Lake chip. Those E-cores now run as fast as an LP-E core at one-third the power, or scale to 2x or 4x the performance (single-threaded vs. multi-threaded).

And with a new thread director, Windows can now create “containment zones” that actually keep “most real workloads” on the Skymont E-cores, Microsoft and Intel claim.

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“This is key to Lunar Lake battery life: we can run more workloads in a lower power environment on a lower power core with fewer things turned on, and still give you a great user experience,” says Intel fellow Stephen Robinson.

Microsoft Teams uses 35 percent less power on Lunar Lake thanks to those changes, Intel claims – though Intel says it can’t yet translate that to hours for me.

Similarly, Intel has finally axed Hyper-Threading because the SMT technology eats more power and real estate than it's worth. "Adding more cores is slightly more die area" than the doubled portions of circuitry needed to make HT work, Hallock admits, but he says the E-cores are so compact and capable now that HT simply no longer makes sense.

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Cove for peak performance,
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performance ISO power or

ISO performance at lower power,” says Intel.

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underline-gray-63”>Here we
are zoomed into the blue
box on the companion graph.
Label your axes, Intel!**

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underline-gray-63">Intel's new P-cores also have more performance at lower power.

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dark:[&>a:hover]:text-gray-e9 dark:[&>a:hover]:shadow-underline-gray-63
[&>a]:shadow-underline-gray-13 dark:[&>a]:shadow-underline-gray-63">Xe2 replaces both Meteor Lake H and Meteor Lake U GPUs.***

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dark:[&>a:hover]:shadow-highlight-franklin
[&>a]:shadow-underline-black dark:[&>a]:shadow-underline-white">A tripled NPU***

Meteor Lake didn't truly kick off the AI laptop generation the way that Intel hoped. In fact, you could argue it left early adopters in the cold – with just 11.5 TOPS worth of AI acceleration, their NPU falls far shy of Microsoft's 40 TOPS requirement for Copilot Plus PCs.

But Lunar Lake triples the amount of NPU hardware on the die, doubles the memory

bandwidth, and boosts the
clockspeed from 1.4GHz to
1.95GHz –offering up to 48
TOPS and an estimated 2x to
4x performance overall.

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Intel

The tripled hardware *does* draw a little more power, but Intel says it's substantially faster: just 5.8 seconds for 20 iterations of Stable Diffusion for Lunar Lake vs. 20.9 seconds for Meteor Lake, while pulling 11.2 watts instead of 9 watts previously.

Intel says its software partners are currently building 350 AI features

for PCs due through 2025.

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AI PC Development
Kit, with 32GB of
RAM, two USB-C,
two USB-A, and
HDMI.**