THE NEWS

Rocket Lake Lands

Intel's desktop chips finally get a new core

IT FEELS as though we've been waiting an age for this. Intel has finally released a desktop CPU with a new microarchitecture: Rocket Lake. It carries a Cypress Cove core, a derivation of Sunny Cove, which was first unveiled in 2018. Originally destined to be a 10nm design, due to myriad technical reasons, Intel had to change tack and "back port" the design to 14nm. So, what we have is the CPU from an Ice Lake chip, combined with Tiger Lake's GPU, all rejigged on to a 14nm die. It's a clumsy compromise. AMD smoothly moved to 7nm nearly two years ago. Officially, the new arrivals are 11th Generation S-Series processors.

Whenever a new CPU microarchitecture arrives, the first question is: What is the IPC (Instructions Per Clock) improvement? Intel claims it is 1.19. This is reasonable, and comparable to the steps AMD's Zen design has made. The next question is: How many cores? This is one of AMD's strong suits, of course. All the new Core i9 and i7 chips have eight cores, while the Core i5 range has six. Intel reckons the IPC lift should compensate for the lower core count in the Core i9s, while it should give a reasonable bump for the Core i7 and i5 chips, where the core count is the same. AMD's 16-core beast is $260 on top of Intel's best, but the 12-core Ryzen 9 5900X is only $10 extra for four more cores. Luckily for Intel, game performance currently tends to stutter after you reach eight cores, but for content creation, it's a real advantage. Why stop at eight cores? Apparently Intel ran out of space on the die, if this is to be believed.

14nm lives on—it's not what Intel planned, but at least we get a version of Sunny Cove on the desktop.

There are 20 or so new versions, all middle and high-end models. The Core i3, Pentium, and Celeron brands are being refreshed, with slightly higher clock rates, but no Cypress Cove cores or other goodies. At the top of the tree is the Core i9-11900K, with a base clock of 3.5GHz, an all-core boost of 4.8GHz, and a maximum single-core boost of 5.3GHz given perfect conditions. Intel has a confusing number of "boost" technologies; it lists four variations for the i9-11900 chips in the promotional material. These include a new Adaptive Boost Technology, which can dynamically boost speeds given enough thermal headroom. There has been little real movement in clock rates, bar a modest 100Hz here and there, so this is one area where Intel does score—sometimes there is no substitute for raw clock speed.

There are three unlocked versions, available with or without integrated graphics. These have a TDP of 125W. The rest of the range is a more modest 65W, apart from the slowest "T" variants, which come in at 35W, thanks to significantly slower clocks. As ever, these TDP numbers are little more than a rough guide—pressure a 65W chip and it'll soon draw much more than that. Rocket Lake also brings us integrated Intel Xe graphics, dubbed Intel UHD 750 or 730, and PCIe 4.0 support. Prices range from $157 to $540. There are some small price increases over the old models. New processors mean new motherboard chips, too. If you have a 400-series board, you may well be able to upgrade; if not, there's a new set of 500-series boards sporting the required LGA 1200 socket, PCIe 4.0 lanes, and more.

Is this a solid response to AMD's Ryzen? Well, it's an answer of sorts, but even hardened Intel adherents won't be cheering too loudly. Intel has kept pace, but not much more. The new microarchitecture is welcome, but without a corresponding shrink, it hasn't delivered the jump Intel planned. As clock speeds and core count haven't moved much, it all boils down to that IPC improvement. It's too early to judge this yet, but not every early benchmark shows the kind of improvement Intel is talking about. Intel still can't match AMD's finest clock for clock. There have also been early worries over thermal performance; these chips can get hot under load. The design is intended for 10nm and there have been compromises.

In today's climate, concerns about relative performance aren't too important in the big picture. Both Intel and AMD can sell what they make. Intel has lots of experience at 14nm, and has its own fabrication plants, which should help with costs. It also means it doesn't have to book production slots at busy fabricators. AMD has to compete with Apple and Nvidia for time at TSMC plants. Intel has done enough to stay king of the single thread, but by most other metrics, it's only holding its own. Rocket Lake chips are in our test rigs now, so you'll have the full story next month. **–CL**

Intel Core i9-11900K

Oh boy, here we go...

THERE'S LOTS TO TALK ABOUT here, so we'll keep it brief where we can. This is Intel's latest 11th-gen Core series of desktop processors. It's also the company's seventh iteration on the 14nm transistor design. It debuted 14nm with Broadwell (fifth-gen, successor to Haswell and Devil's Canyon) in 2015, and since then the company has struggled to break past that 14nm barrier, with delay after delay proving costly. There have been several attempts, and Intel did see some success with low-powered laptop and ultrabook chips in 2019, thanks to the 10nm+ Ice Lake CPUs, but desktop parts never arrived.

As AMD has continued to push the limits of its architectural design and manufacturing processes, Intel's had to pivot to keep up, increasing core counts, voltages, IPCs, and frequencies in the process, and working its way around the engineering and design problems induced by those unorthodox methods of improving performance.

With its 5000-series CPUs, however, AMD presented something that even Intel couldn't match, with dominance in both single-core IPC and multicore capacity, and continued support for PCIe 4.0. Intel's 10th-gen series, when it launched, was a hard pill to swallow for most people wanting to upgrade, as it only represented increased core counts, with slightly higher clock speeds and IPC, more heat, and, of course, a new socket.

Something had to change, and with the multicore, IPC, and gaming crowns absent from Intel's marketing decks, a bold plan was put in place to back-port a well-established 10nm architecture to the 14nm manufacturing process. Thus Rocket Lake was born, built off the Cypress Cove architecture, itself a derivative of Sunny Cove, used in the 10nm Ice Lake laptop CPUs we mentioned.

That's led to some interesting hand-offs between the two very different platforms. Intel's still using a monolithic chip design, as opposed to AMD's modular style, but the cores, despite remaining on the 14nm process, are far denser than previous generations. Intel has also added its Xe integrated graphics (named UHD 730 or 750) to these CPUs for a gain of 40–50 percent performance dependent on model, finally included support for PCIe 4.0, with 20 lanes available, increased native DDR4 support to 3,200MHz, and added a few memory overclocking features here and there.

INTERESTING INTERFACE

More interesting are the chipset updates. With the new 500-series boards, we have a new DMI, with x8 PCIe 3.0 lanes (same bandwidth as x4 PCIe 4.0 lanes), memory overclocking enabled on H570 and B560 boards, discrete Wi-Fi 6E support as standard, Thunderbolt 4 support, and support for USB 3.2 Gen2x2. The reason for doubling the width of the DMI is likely because the boards also support 10th-gen CPUs, so it's not unreasonable to think you could install a 10th-gen chip and still get PCIe 4.0 performance from drives that aren't running directly native to the CPU, but through the DMI. Neat. But we're going to have to check that.

When we look at performance, things get even more interesting—because, sadly, it's not that impressive. In our testing, we saw figures on average about 3 percent slower than our AMD Ryzen 9 5950X in single-core applications. In multicore scenarios, well, it just wasn't pleasant to watch. Admittedly, that last part isn't entirely a fair comparison, as the 5950X has twice the number of threads as the 11900K, but all the same.... It is better compared to the previous generation of chips, by about 8-14 percent on average, but as they weren't competing anyway, well, yeah, it's a tough sell.

So, what's the positive takeaway from this? Well, it is an interesting architecture, perhaps a little lower on cores than we'd like, but it's a solid contender. Being manufactured on a 14nm process in a time where we're in a chip drought could be a massive boon to supply. As we've said multiple times, even this issue, you can have the best processors in the world, but if they're not available for sale, it's all for naught. The lower-end chips might actually be the more interesting parts—the Core i5-11400, in particular, could be ideal for a budget 1080p gaming machine. And if the architecture holds true, and Intel finally manages to deliver on its 10nm processes later this year, we could see some significant improvements, including more cores across its range. Is it going to be enough to beat AMD though? Hmmm.... **–ZAK STOREY**

BENCHMARKS

	Intel Core i9-11900K	Intel Core i9-10900K	AMD Ryzen 9 5950X
Cinebench R15 Single (Index)	257	228	**269**
Cinebench R15 Multi (Index)	2,345	2,608	**4,312**
Tech ARP's x264 (avg FPS)	50.32	54.64	**91.84**
Fryrender (m:s)	1:15	1:23	**0:49**
Total War: Warhammer II (fps)	**85**	81	84
Ghost Recon Wildlands (fps)	58	**59**	58
Price Per Thread	$34	$27	**$25**
Recommended Retail Price	$540	$530	$799

Best scores are in bold. Intel test bed consists of a Gigabyte Z490 Aorus Pro AX, 32GB of Corsair Vengeance RGB Pro DDR4 @ 3200, and an Nvidia GeForce GTX 1080. All games were tested at 1080p on the highest graphical profile, with average fps noted. AMD motherboard is the AMD ROG Crosshair VIII Dark Hero.

VERDICT **7**

Intel Core i9-11900K

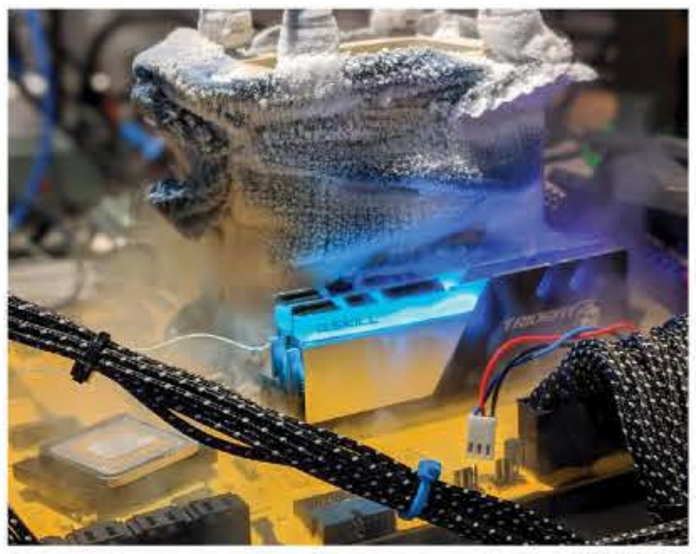
+ VOLATILE Good integrated graphics; still a solid processor; PCIe 4.0 finally.

– MEEK Pricey; not enough performance; fewer cores; hot and thirsty.

$540, www.intel.com

SPECIFICATIONS

Cores/Threads	8/16
Base/Turbo Clock	3.5/4.7GHz (5.3GHz single core)
Architecture	Cypress Cove
Lithography	14nm
Memory Support	DDR4 3200
PCIe Support	20x PCIe 4.0 (x16x4)
Integrated Graphics	Intel UHD Graphics 750
TDP	125W



INTEL PULLS OVERCLOCKING PROTECTION

Is the age of overclocking over?

INTEL HAS DECIDED to ends its Performance Tuning Protection Plan. It will honor existing warranties, though, and the Xeon W-3175X will still be covered. Under the PTPP, you could pay an extra $20 or $30, depending on the model, to cover frying your chip while running it outside the published specifications. If things did go pop, you were eligible for a replacement.

Intel claims customers "increasingly overclock with confidence," so there is little demand for PTPP. There is something in that—chips are (nearly) impossible to burn now. More pointedly, the overclocking scene has changed. When PTPP launched, it was the days of Sandy Bridge, and chips were sold with acres of unused headroom. You could take a Core i5-2500K and wring anything up to an extra 1GHz out of it. No modern chip has anything like that level of unrealized performance.

Intel now has strong competition from AMD, and the market for high-end chips is healthy. Virtually every chip has been carefully graded and optimized to reach its maximum potential. This, along with various new boost modes and thermal management systems, means there is often little to be gained by tinkering. Overclocking isn't dead as such—adding some serious cooling remains a viable option—but the days of making a couple of quick tweaks and getting big returns are gone. Mid-range chips can be bumped by 5 to 10 percent for some tasks; the low end has more potential, but that's only useful if budget is the primary concern. Overclocking won't be popular until Intel and AMD sell chips that aren't already running near potential, and in this competitive and speed-hungry market, they don't. **–CL**

150,000 Cameras Hacked

VERKADA OFFERS "hybrid-cloud" security camera systems, and customers include numerous public institutions, as well as some big-name companies, such as Tesla, Nissan, and web security firm Cloudflare. Its server was hacked, and images and video clips totaling 5GB were taken from its 150,000 active cameras and released to the press. These included scenes from inside county jails and hospital.

The breach lasted over 36 hours, and was made by a collective called APT-69420, seemingly simply to make a point. A spokesperson, Tillie Kottmann, cited curiosity, anarchism, and fun as motivations, along with more politicized concerns. The security on Verkada's systems was described as "non-existent and irresponsible." The hackers managed to obtain super admin access, so had free rein to view supposedly secure footage from sensitive locations. Verkada has assured its customers that it is "confident that all customer systems were secured" after the breach went public.

There are a lot of cameras watching us. Legal protection from surveillance is minimal, and based around the concept of an expectation of privacy. This is open to interpretation, leaning toward acceptance. Who has access to footage is similarly poorly defined. Meanwhile, untold amounts of footage of us are piling up on server racks. Now add Internet access to that footage. The hack shows again that going to the cloud without solid security isn't always going to end well. Where we are watched is one debate, but if we are watched, it must be done securely. This hack was done to make a point, other groups may have different concerns. **–CL**

Who's zooming who?

PS5 Winning Console War

Sony's PlayStation 5 is the fastest-selling hardware platform ever in the US, according to analyst NPD. Only Nintendo's Switch sells more. Last year Sony shifted 4.5 million PS5s worldwide, matching the start the PS4 made. The company expects to sell over 100 million in total. Microsoft's Xbox managed around 2.9 million. The entire market is buoyant. Gaming hardware sales reached $406 million in February—the highest since 2011—and games sales hit $4.6 billion, 35 percent more than last year. All this in the face of supply shortages. Microsoft and Sony can sell every console they can make. Part of Sony's success is that it has managed to maintain supplies more effectively. **–CL**

3nm Chips This Year

Despite the troubles in the chip business, and rumors last year, the road to 3nm is still on course. TSMC is to start production this year. This will be "risk" production, where yields are low as problems are addressed. Production will start at 30,000 wafers a month. Full-scale production is expected to start in the second half of next year at 100,000-plus wafers a month. Shifting to 3nm from 5nm brings a transistor density bump of 1.7. Power requirements are an estimated 27 percent lower, and up to an 11 percent speed increase is forecast. The chief recipient of this good news will be Apple, which has booked much of the 3nm capacity. Expect to see the 3nm chip to make its debut in an iPhone. **–CL**