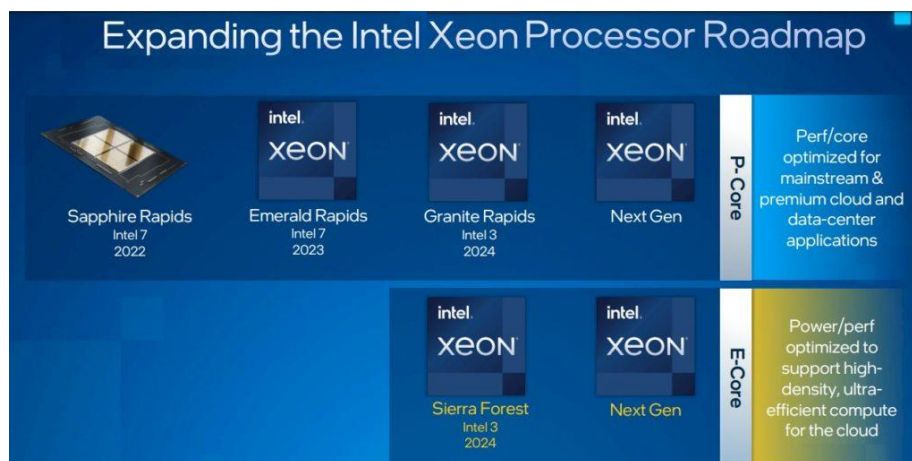


Intel CEO Reviews 4nm, 2nm, 1.8nm Process Yields Every Week - Expects to Beat AMD/TSMC by 2024 with 3nm Granite Rapids & Sierra Forest CPUs

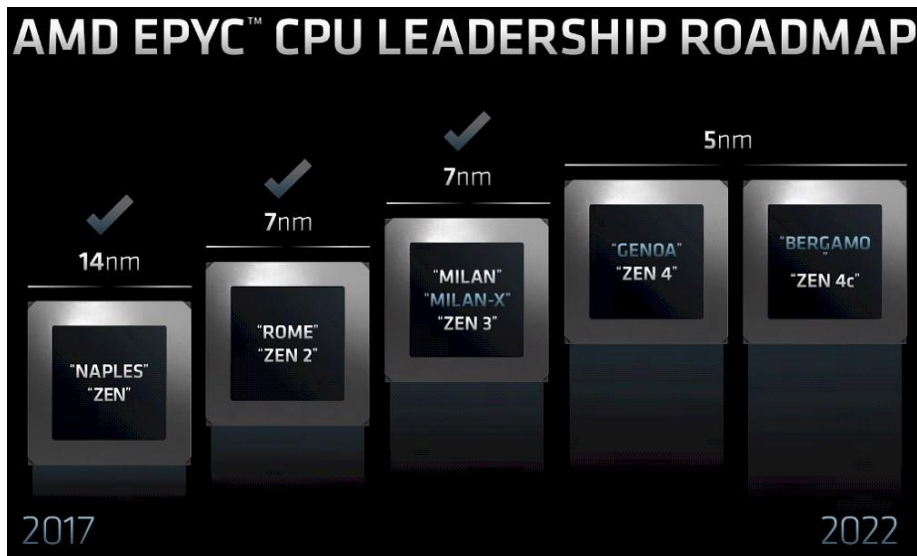
[ABS News Service/10.03.2022]

Intel CEO Patrick Gelsinger has been running a tight ship ever since he took over the helm roughly a year back. At the Investor Day 2022 reveal, he unveiled a revised, amped-up roadmap with an aim to retake architectural and process leadership from archrivals AMD and TSMC, respectively. According to this roadmap, Intel is set to release its 3nm process node in 2024 with Granite Rapids and Sierra Forest, and its 20A (2nm) process the same year with Arrow Lake in the client segment.



We did change the timing of Granite Rapids, and we had a big internal debate show on should we even keep the Granite Rapids name because it was the same platform, but it was a new core on a new process. So to some degree, it was a very different product. But some said, hey, you delayed Granite Rapids. Hey, I say I enhance Granite Rapids, with a much higher performance product, a much — 18% process, a major new core, that's 10-plus percent in the core. So a much better product and aligned to the customers' timing. And they said, hey, Sapphire Emerald Granite was too compressed.

Going by this schedule, the 3nm Intel Granite Rapids and Sierra Forest server processors will clash with AMD's 3nm Zen 5 and Zen 5c based Epyc CPUs in 2024. Doesn't look like unquestioned leadership at all, to be honest. Rather, we're set to see a close match, probably a stalemate where the rivals will switch to price cuts, and CPU-GPU pairings: Epyc-Instinct for AMD, and Xeon-Ponte Vecchio Next for Intel.



Giving them about 2-year cadence in the platform is exactly what the major customers have been asking us for, give us more life of the platform, and then being able to deliver that with the — to the parallel road map of Granite Rapids with the P-cores and Sapphire Rapids with — or Sierra Forest with the E-cores, a great road map. Customers have responded super well to it

Gelsinger was also quick to mention the chipmaker's parallel data center roadmap consisting of Granite Rapids with P-cores, and Sierra Forest with E-cores. As per the Intel boss, the existence of a low-power E-core design gives the company an edge over its rivals. However, AMD was the first to announce its server chip "Bergamo" with 128 Zen 4c "small" cores last year, pretty much making it a false claim.

Intel 4
manufacturing ready H2 2022
select products shown

Meteor Lake client
Custom ASIC networking

- ~20% improvement in performance per watt
- First use of EUV, significant increase in density over Intel 7
- 2022: Meteor Lake CPU tile production stepping tape out (H2)

Intel 3
manufacturing ready H2 2023
select products shown

Future Xeon data center

- ~18% improvement in performance per watt
- Higher performance library, optimized drive current & metal stack
- 2022: lead product test wafers running in fab (H2)

Our next generation FinFET processes are healthy and will be manufacturing ready on schedule

*Graphics for illustrative purposes only and not to scale. Internal estimates, results may vary. Process readiness timing does not necessarily indicate product production timing. Learn more at www.intel.com/PerformanceIndex. Results may vary.

Intel 20A
manufacturing ready H1 2024
select products shown

Future Product client

- Up to 15% improvement in performance per watt
- Introduction of RibbonFET & PowerVia
- 2022: IP test wafers running in fab (H2)

Intel 18A
manufacturing ready H2 2024
select products shown

Future Product client
Future Xeon data center
Foundry Customer

- Up to 10% improvement in performance per watt
- Ribbon innovation for design optimization, line width reduction
- 2022: foundry customers' test chips (H1); first IP shuttle (H2)

Our first generation RibbonFET with PowerVia processes are demonstrating early health and will be manufacturing ready on schedule

*Graphics for illustrative purposes only and not to scale. Internal estimates, results may vary. Process readiness timing does not necessarily indicate product production timing. Learn more at www.intel.com/PerformanceIndex. Results may vary.

Our Leadership Roadmap
Accelerated with 5 nodes in 4 years

Hybrid Disaggregated Ultra Low Power Performance

2021 - 2022
Alder Lake & Raptor Lake

Intel 7
Real World Performance

2023 - 2024
Meteor Lake & Arrow Lake

Intel 4 Intel 20A External N3
Leadership Compute, AI and Graphics

2024 +
Lunar Lake & Beyond

External Intel 18A
Performance per Watt Leadership

All product plans and roadmaps are subject to change without notice.

The most notable disclosure from the conversation is with regard to the strict quality control and reviewing schedule set for advanced future nodes, most notably 4nm, 3nm, 20A, and 18A. Although these nodes are split into two different production centers (and teams), they're still being overlooked by Intel leadership on a regular basis. The Intel CEO went as far as to claim that he reviews the defect densities of all these nodes on a weekly basis. Defect densities refer to the number of defects present in a wafer. It dictates how many chips you can salvage out of it, while the rest of the wafer is discarded

We also laid out that we've — what I call Tick-Tock [ph] the process development. We have one team working on 4 3 and another team working on 20A, 18A, very much a Tick-Tock like development methodology. We've paralleled those teams, so

put capital into it, put engineering into it to de-risk them. And hey, I'm reviewing the defect densities on these every week. We reorganized that group. So I'll say we've reorganized that we brought in new leadership. We've capitalized on the new ways, a new development methodology.

Sapphire Rapids, when we introduce it, is the best product. Again, hey, we expect AMD is going to respond, but it's going to be a pretty close race, and when we get into the Granites and Sierra Forest, unquestionably, the best again at that point. We're going to go from a deficit in process technology to a leadership in process technology in the server space in this horizon as well. So unquestionably, best products, best process technology, best capacity profile. So that's the area that we're still most challenged, but the execution every day.