

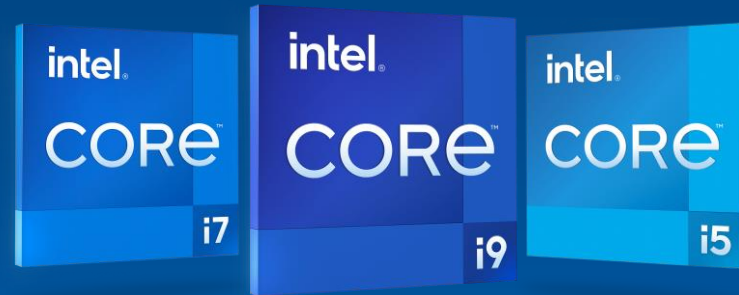
# TECH. tour. il

■ Intel Technology Tour

intel®







# 13th Gen Intel® Core™ S-series Processors

September 12, 2022

# Introducing 13th Gen Intel® Core™

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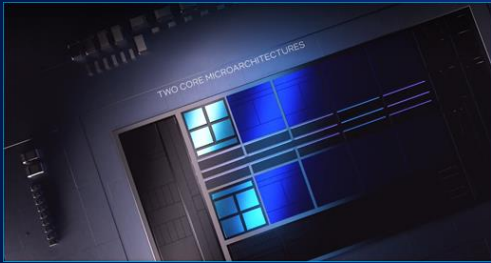
**Mandy Mock**

Vice President and General Manager  
Desktop, Workstation, and Channel Group



# The Performance Hybrid Architecture Journey Continues

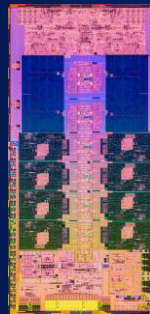
## 12th Gen Processor Family



Intel's first performance hybrid architecture<sup>1</sup> showcasing P-cores, E-cores and Intel® Thread Director<sup>2</sup>

Thank You!

## 13th Gen Processor Family



Continued innovation in performance hybrid architecture

- Today's Focus -

## Meteor Lake / Arrow Lake



Leap in XPU improvement with integrated AI and tiled GPU architecture

# A Strong Partner Ecosystem



"Through close co-engineering with Intel, **we've been able to push the overclocking experience** on Predator gaming desktops with 12th Gen Intel Core processors, allowing gamers to dynamically and reliably custom-tune their processor"

Jeff Lee, General Manager, Desktops, IT Products Business, Acer Inc.



"We teamed up with Intel to design the Alienware Aurora R13, one of the first gaming desktops in the industry chosen for Intel's exclusive Innovation Excellence Program (IEP) in over 5 years. We combined Intel's 12th Gen Intel® Core™ desktop processors with Alienware's custom-built Cryo-tech cooling solution, the latest DDR5 memory, and support for PCIe 5.0 to provide an **incredible gaming experience.**"

Vivian Lien, Dell Technologies, VP of Gaming.



"**Gamers crave the best performance possible** when playing their favorite games, which is why we offer Intel 12th Generation CPUs in our latest gaming desktops from both our OMEN and Victus by HP brands."

Josephine Tan, Global Head and General Manager, Consumer PCs at HP Inc



"With 12th Gen, **Intel brought its leadership back in gaming.**"

Karan Kapur, Lenovo Global Director Of Product Marketing & Head Of Gaming



Intel 12th Gen CPUs have been **amazing for creator workloads!** The new hybrid architecture has enabled us to drive the highest performance yet, but also keep our workstations quiet and power efficient."

Jon Bach, President of Puget Systems



"Intel 12th gen has been the **perfect balance of performance, technology, and value** and it amazes me how Intel continues to innovate and improve on processors every generation.."

Kevin Wasielewski, Origin PC Co-founder and Senior Director Systems Marketing and Partner Alliance at CORSAIR



"Intel 12th gen processors have delivered high end performance at all ends of our product sectors. **Whether gaming or creating, Alderlake product has continued to deliver exceptional results.**"

Kevin Hsu, President of Skytech Gaming

# Unmatched Ecosystem Breadth and Collaboration

## From engineering optimization to the retail shelf

Incredible partnerships for product readiness at launch

- 140+ customers
- 30+ countries
- 70+ motherboards





# Introducing New 13th Gen Intel® Core™ Processor Family

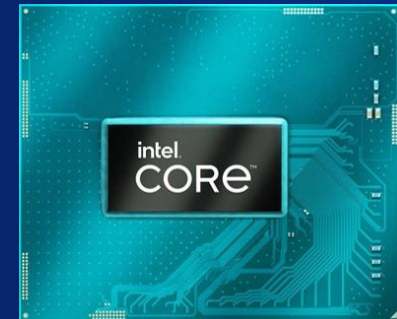
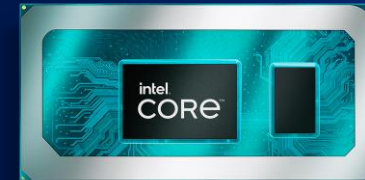
## Desktop

S-series 35/65/125W



## Mobile

U, P, H, HX-series



# 13th Gen Intel® Core™ Delivers the World's Fastest Desktop Processor



## World's Best Gaming Experience

Faster cores and amazing simultaneous gaming, streaming and recording

## A Leap in Creator Performance

Increased cores, threads and cache to keep people in the creative flow

## Unmatched Overclocking Experience

The best experience for everyone – from experts to beginners

Claims as of Sept. 7, 2022. Intel Core i9-13900K is the world's fastest desktop processor at 5.8 GHz. World's Best Gaming Experience based on performance and unique features of unlocked 13th Gen Intel Core processors, including in comparison to 12th Gen Intel Core, AMD Ryzen 9 5950X and AMD Ryzen 7 5800X3D. Best overclocking based on enhanced overclocking ability enabled by Intel's comprehensive tools and unique architectural tuning capabilities. Overclocking may void warranty or affect system health. See [www.intel.com/overclocking](https://www.intel.com/overclocking) for details.

For all workloads and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may



# The World's Fastest Desktop Processor

13th Gen Intel® Core™ i9-13900K

Fastest  
P-Cores

5.8GHz

Double  
E-Cores

24C / 32T

Larger  
L2 Caches

2MB per P-core  
4MB per E-core cluster

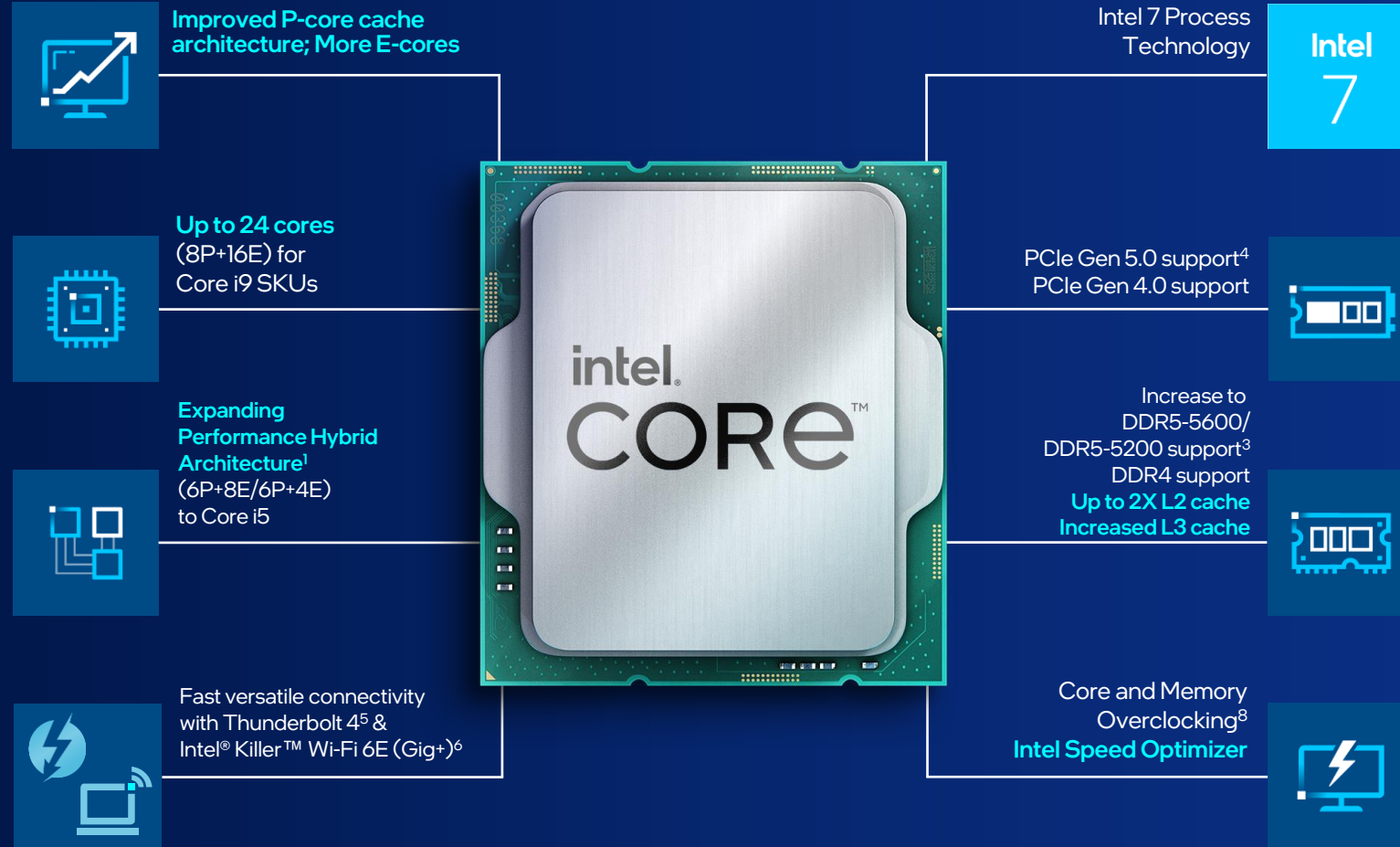
Delivering up to **15% ST** and **41% MT** Performance

Source Intel: As estimated by measurements made using SPECint\_rate\_base2017\_IC2022.1 (1-copy & n-copy) using Intel validation Platforms comparing Core i9 13900K versus Core i9 12900K

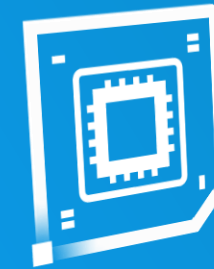


For all workloads and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may

# 13th Gen Desktop Processors: Unleashing the Ultimate Gaming Platform



intel®



CHIPSET  
Z790

Increased  
Chipset  
PCIe  
Gen 4.0

Increased  
USB 3.2  
Gen 2x2  
20Gbps

# Designed For Platform Flexibility

Forward &  
Backward  
Compatibility

ASUS®

GIGABYTE™

msi

ASRock®



Support for  
Both DDR5 &  
DDR4 Memory

CORSAIR

G.SKILL

crucial  
by Micron®

KINGSTON  
FURY

PATRIOT™

T-FORCE  
THE POWER FROM TEAMGROUP





# World's Best Overclocking Experience

## Enhanced Experiences

- New Per Core Tuning Visualizations with Intel® Extreme Tuning Utility
- Easy 1-Click Overclocking with the Intel® Speed Optimizer feature and new simplified "Compact View"
- Robust Memory OC with Extreme Memory Profile 3.0 technology (XMP) offers 1-click automatic memory overclocking experiences with both DDR4 and DDR5

### Extreme Tuning Utility

The screenshot displays the Intel Extreme Tuning Utility (XTU) interface. It is divided into two main sections: 'Performance Cores' and 'Efficient Cores'. Each section has a 'Per-Core Tuning' header and a grid of core selection buttons (Ratio and Monitors). The 'Performance Cores' section shows 'Performance Core 0' selected, with settings for Ratio Multiplier (60.000 x), Voltage Mode (Static), Voltage Override (1.449 V), Voltage Offset (0.000 V), Intel Thermal Velocity Boost, Temperature (0.000 °C), Ratio Offset (Disable), Temperature #2 (0.000 °C), and Ratio Offset #2 (Disable). The 'Efficient Cores' section shows 'Efficient Core 0' selected, with settings for Ratio Multiplier (45.000 x), Voltage Mode (Static), Voltage Override (1.449 V), and Voltage Offset (0.000 V).

### Intel® Speed Optimizer

The screenshot displays the Intel Speed Optimizer interface. It features a large blue button labeled 'Automatic Overclock'. Below this, there is a 'Manual Tuning' section with three sliders: 'Performance Core Ratio' set to 47x, 'Efficient Core Ratio' set to 36x, and 'Core Voltage Offset' set to 0.000 V. At the bottom, there are three buttons: 'Advanced View', 'Apply', and 'Discard'.

Based on enhanced overclocking ability enabled by Intel's comprehensive tools and unique architectural tuning capabilities. Your results may vary. Overclocking may void warranty or affect system health. For details see [intel.com/overclocking](https://www.intel.com/overclocking). For all workload and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may vary.

# Huge Generational Gains Across the Stack

Intel Core  
**i5-13600K**  
14-core up to 5.1 GHz



**+4 cores, +4 threads**  
**+200 MHz Turbo**

Intel Core  
**i7-13700K**  
16-core up to 5.4 GHz



**+4 cores, +4 threads**  
**+400 MHz Turbo**

Intel Core  
**i9-13900K**  
24-core up to 5.8 GHz



**+8 cores, +8 threads**  
**+600 MHz Turbo**

# 13th Gen Intel Core Desktop Performance Overview

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**Marcus Kennedy**

General Manager  
Gaming, Creator, and Esports Segment





# 13th Gen Intel® Core™ Desktop Processors Deliver:



## World's Best Gaming Experience

Faster cores and amazing simultaneous gaming, streaming and recording

## A Leap in Creator Performance

Increased cores, threads and cache to keep people in the creative flow

## Unmatched Overclocking Experience

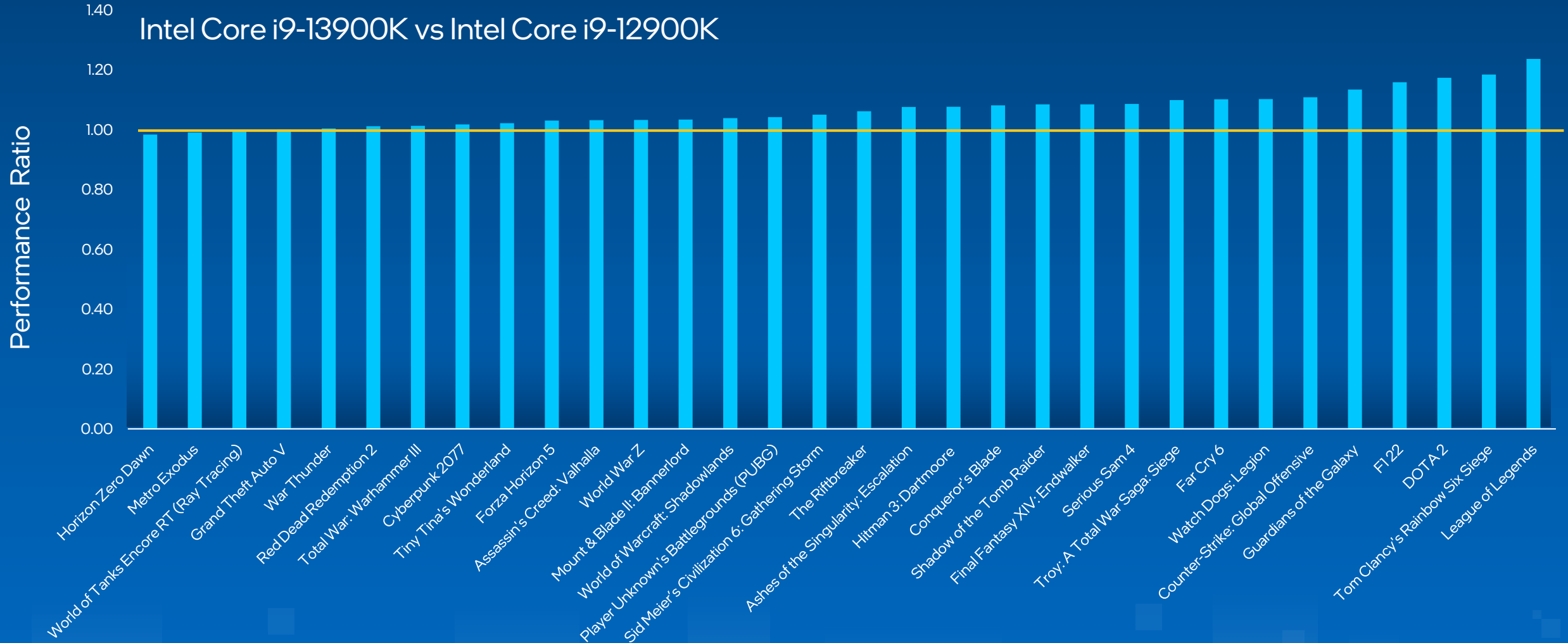
The best experience for everyone – from experts to beginners

"Claims as of Sept. 7, 2022. Intel Core i9-13900K is the world's fastest desktop processor at 5.8 GHz. World's Best Gaming Experience based on performance and unique features of unlocked 13th Gen Intel Core processors, including in comparison to 12th Gen Intel Core, AMD Ryzen 9 5950X and AMD Ryzen 7 5800X3D. Best overclocking based on enhanced overclocking ability enabled by Intel's comprehensive tools and unique architectural tuning capabilities. Overclocking may void warranty or affect system health. See [www.intel.com/overclocking](https://www.intel.com/overclocking) for details."

For all workloads and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may

# Leadership Gaming Performance

Intel Core i9-13900K vs Intel Core i9-12900K

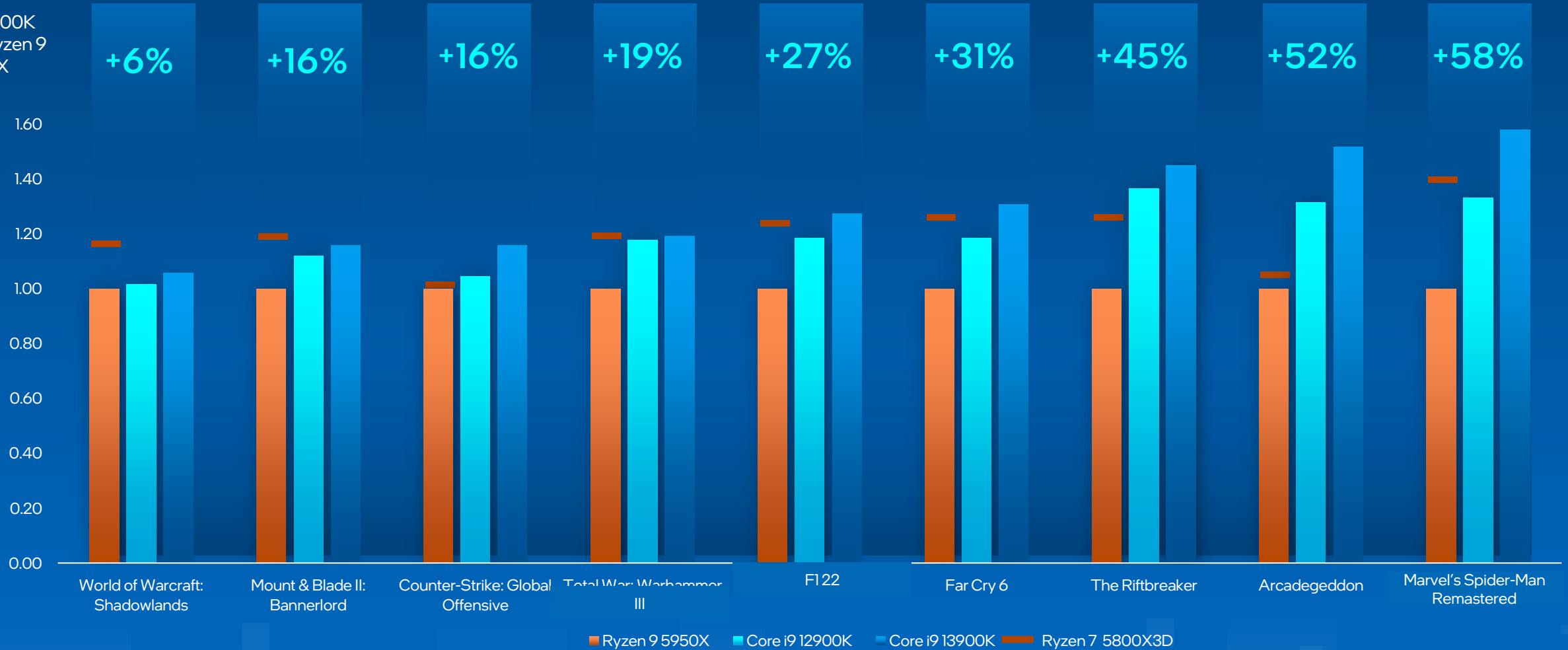


For all workloads and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may

# Leadership Gaming Performance

i9-13900K  
Vs. Ryzen 9  
5950X

AVG FPS Ratio

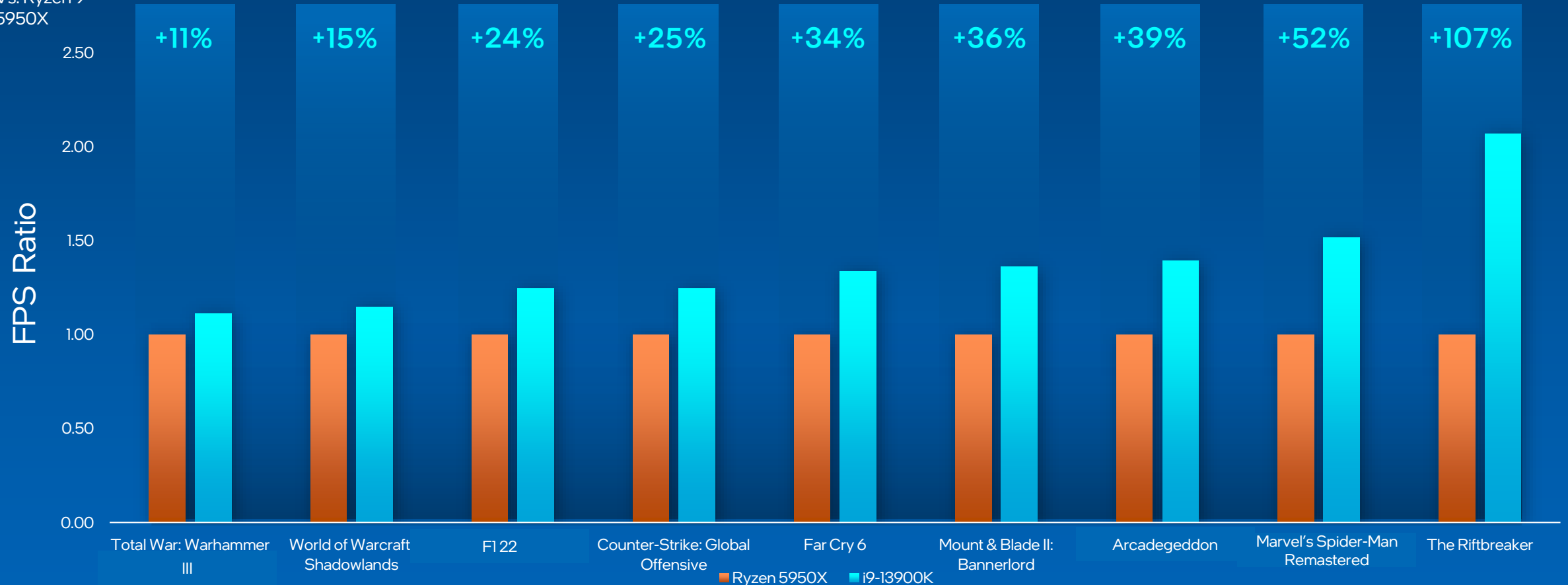


Ryzen 9 5950X Core i9 12900K Core i9 13900K Ryzen 7 5800X3D



# Leadership Gaming Frame Consistency

i9-13900K  
Vs. Ryzen 9  
5950X



Normalized to the 99 percentile FPS for Ryzen 5950X

**Core i9-13900K delivers higher FPS at the 99th percentile low-water mark**

As measured by benchmark mode score and/or fps measurements of 13th Gen Intel Core i9-13900K with internal reference board and DDR5 5600 MT/s DRAM; and AMD Ryzen 9 5950X with Asus ROG Crosshair Hero 8 board and DDR4 3200MT/s DRAM. The Configurations for all systems include Windows 11 Pro, 1920x1080 Resolution – High Quality Graphics Preset with EVGA RTX 3090 GPU.

For all workloads and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may



“We’ve been working with Intel for over a decade to deliver an incredible Total War experience on Intel CPUs.

We’ve optimized Total War: WARHAMMER III for the hybrid 12th Gen architecture, and we’re excited to continue the work with the new 13th Gen Intel Core Processors.”

– Rob Bartholomew, CPO of Creative Assembly





"Working in partnership with Intel has allowed us to bring Call of Duty Modern Warfare II to even more players than before. Gamers from around the world running brand new PCs equipped with the latest Intel CPUs will be able to enjoy the best Call of Duty experience to date.

We're excited to bring the latest Intel CPU technologies to support the Call of Duty family. Their work helped us raise the game's performance to higher levels and meet expectations even from our most demanding and competitive players. This is essential for a AAA First Person Shooter, even more with the release of Call of Duty Modern Warfare II, launching later this year, October 28th."

- Philippe Troie, Technical Director, Beenox



intel







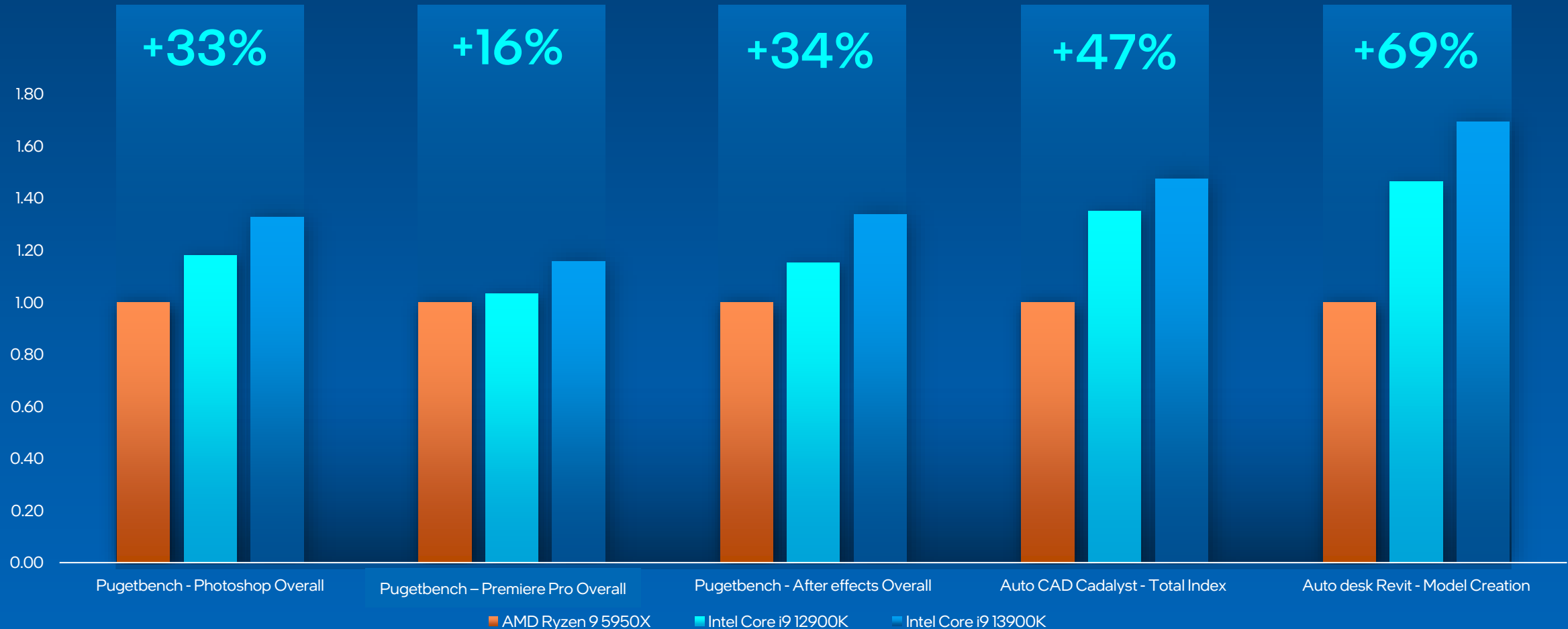
"Intel's affordable CPUs featuring high thread count enable Oxide Games to use its proprietary, highly threaded Nitrous engine to bring experiences to gamers that have never been seen before.

Without Intel's continued innovation, a game such as our upcoming Ara: History Untold would simply not have been possible."

- Oxide Games Senior Representative

# Leap in Performance for Content Creation

i9-13900K  
Vs. Ryzen 9  
5950X



Leadership across various usages of content creation  
including photo & video editing & 2D, 3D modeling

For all workloads and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may vary



# 13th Gen Intel Core Desktop Processors

## Powerful Multitasking for Creative Professionals

### Content Creation Multitasking

Media Creation



**Photo Video Workflow**  
**Adobe Media Encoder + Adobe Photoshop**

Core i9 13900K

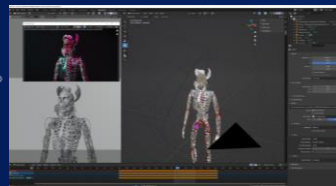
**27% faster**

Core i9 12900K

Baseline

Lower is better

### Media Creation



**Game Development**  
**Blender + Unreal Engine**

Core i9 13900K

**34% faster**

Core i9 12900K

Baseline

Lower is better

# ISV Engagement

## Optimizing performance and enabling features with software partners



"We appreciate the major leap forward that Intel's 13th Gen processors deliver. Modern video editing, formats, and technologies demand more and more processing power, and can benefit greatly from the improved efficiency and power that comes with Raptor Lake and additional E-Cores."

- Gary Rebholz, VEGAS Creative Software



"With Nuke 13.2 and the new top-down architecture we released a performance feature on modern CPUs – especially hybrid architecture, that allows our customers to speed-up their work up to 150% with the help from Intel"

- Jen Goldfinch, Senior Director of Industry Marketing, Foundry

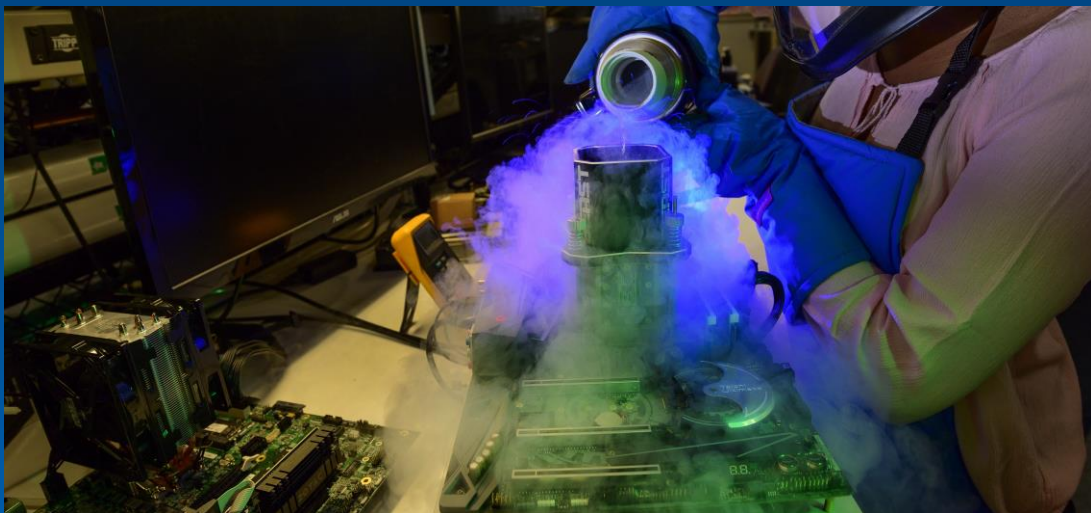


"Faster! Impressive! We've worked closely with Intel on 13th-generation processors to provide Wondershare Filmora users with a great experience. We're excited about Intel's AI performance boost on next-generation platforms, leveraging technologies such as hybrid-core architecture optimization. Compared with the previous generation processor, the results of the 13th generation processor have improved the performance of Filmora AI features by 1.85 times.

- Liu Qiuwei, Wondershare Technology Group VP, GM of Video Creative Division



# Intel's Highest Overclocked Frequencies



## Liquid Nitrogen (Extreme Cooling)

- P-Cores reaching well **beyond the 8 GHz** threshold!
- DDR5 speeds in excess of **10,000 MT/s**
- Anticipating numerous new OC World Records



## Liquid Cooled

- Higher OC frequencies with headroom similar to 12th Gen
- DDR5 XMP memory speeds ranging to 6,600 MT/s and beyond.

**Higher frequency for Beginner, Intermediate, and Extreme Overclockers!**

# The World's Best Experience for Desktop Enthusiasts

## 13th Gen Intel® Core™ i9-13900K

Up to

**5.8 GHz**

**15% better ST**

**41% better MT**

Up to

**24% Better  
Gaming  
Performance**

Up to

**34% Faster  
Creator  
Workflow**

**70+ Top Gaming Titles  
60+ Top Creator Applications**

Claims as of Sept. 7, 2022. World's Best Experience for DT Enthusiasts based on performance and unique features of unlocked 13th Gen Intel Core processors, including in comparison to 12th Gen Intel Core, AMD Ryzen 9 5950X and AMD Ryzen 7 5800X3D.

For all workloads and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may vary.



# Raptor Lake Technology

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**Daniel Rogers**

Sr Director, Mobile Product Marketing

# Raptor Lake

## The Fastest Performance Core

### Upgraded Intel 7 Process

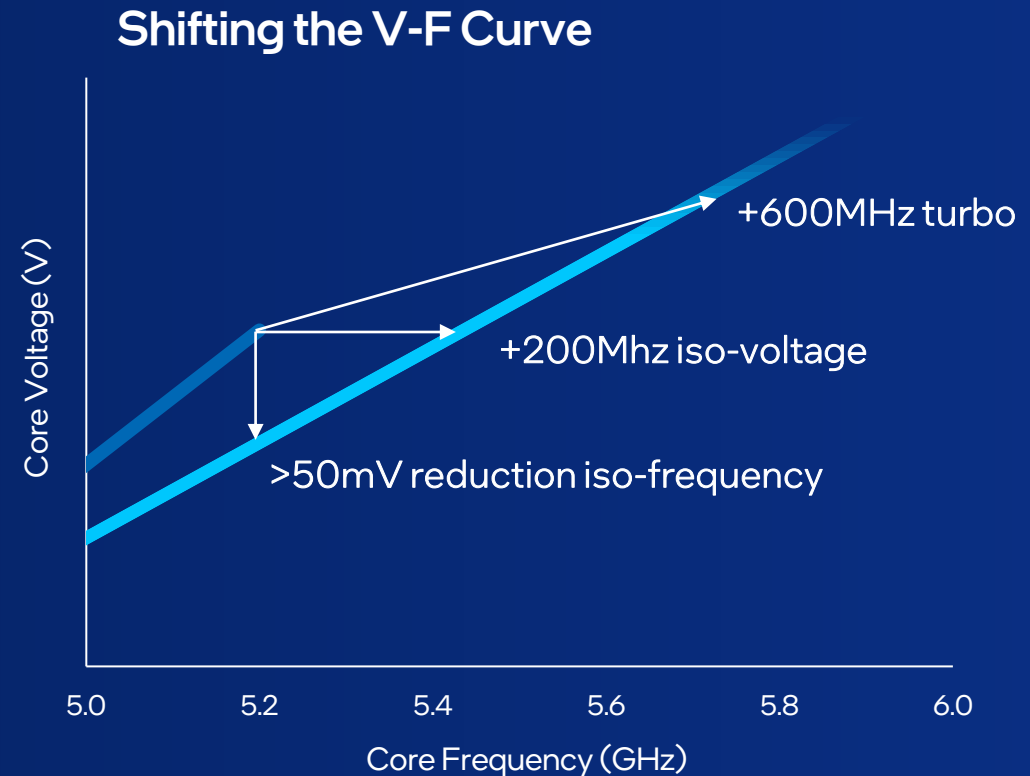
3<sup>rd</sup> gen Intel SuperFin transistor  
Significantly better channel mobility

### Faster 'Raptor Cove' Core

Updated design with improved speed paths  
Up to 600MHz faster

### Larger L2 Cache

2MB L2 cache per core  
New dynamic prefetcher algorithm "L2P"





# Raptor Lake

## Double the Efficient-Cores<sup>1</sup>

### Wider

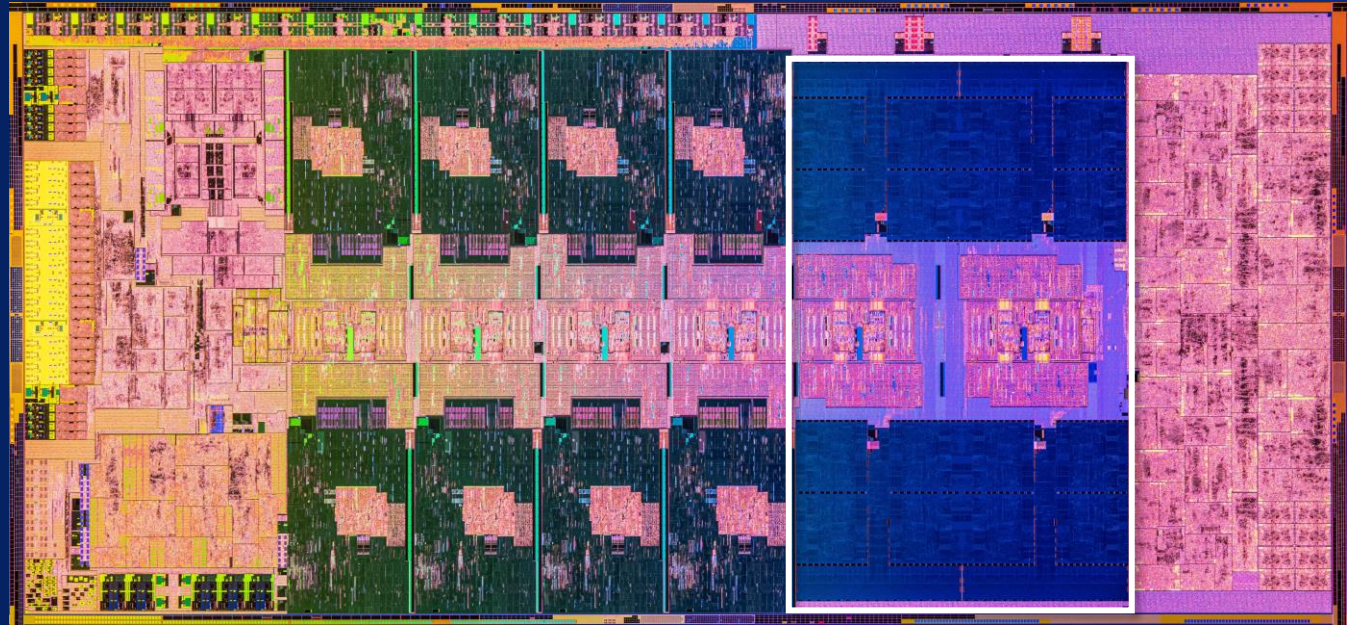
Up to 16 E-cores  
4MB L2 per cluster

### Faster

Up to 600MHz faster (ACT)  
Up to 4.3GHz turbo

### Smarter

Significantly optimized  
prefetcher algorithm





Raptor Lake

# Better Memory Latency & Bandwidth

## Faster DDR5<sup>3</sup>

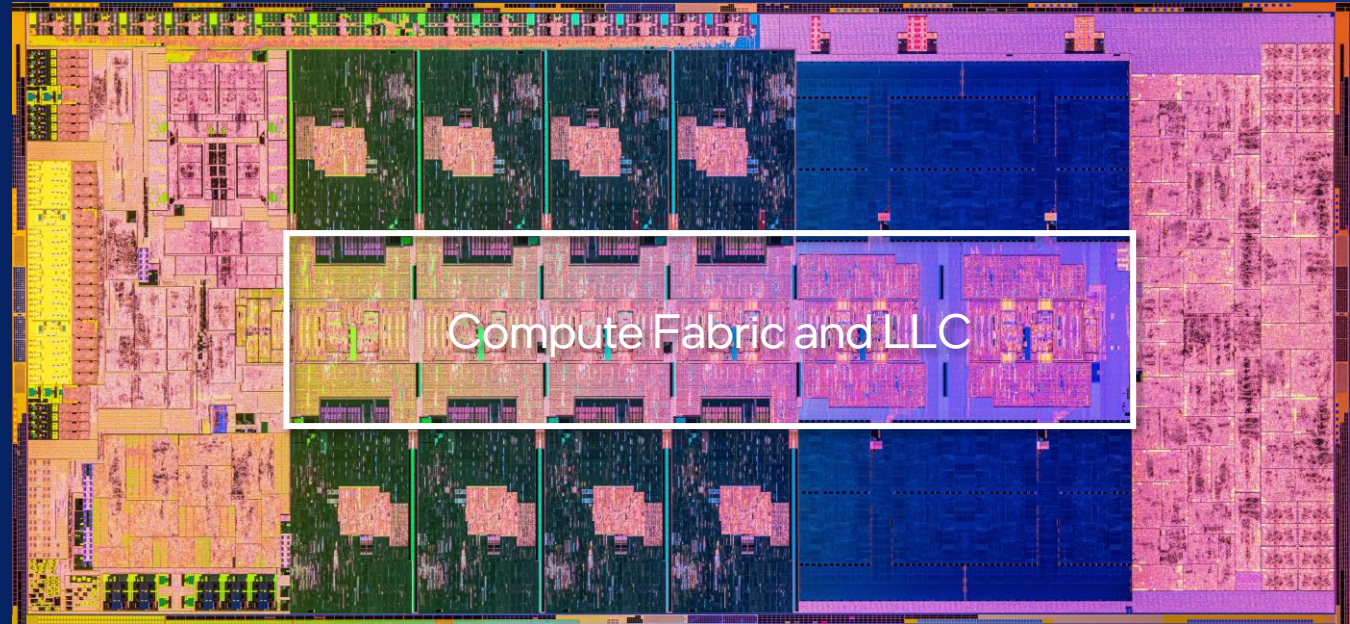
Up to 5600 MT/s with 1DPC  
Up to 4400 MT/s with 2DPC

## Faster Fabric

Up to 900MHz faster (ACT)  
Up to 5.0GHz max turbo

## Larger LLC

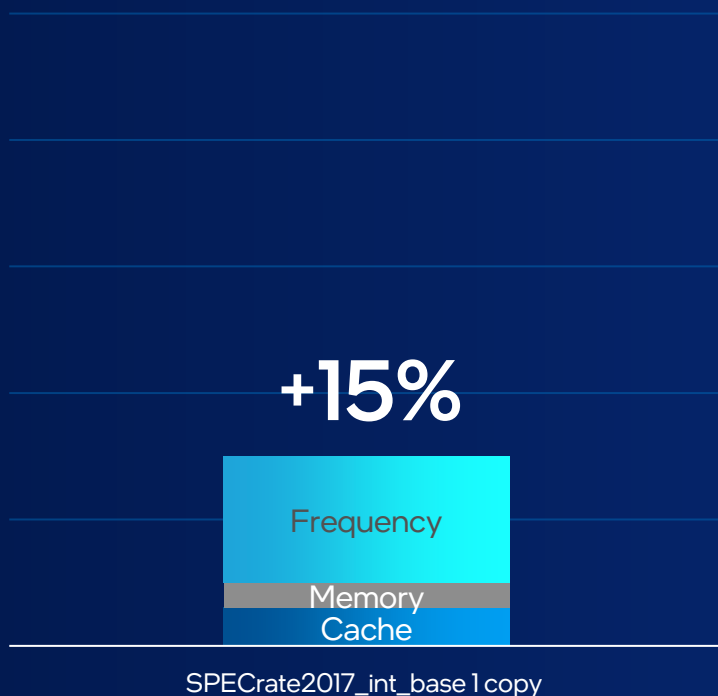
Up to 36MB shared L3  
New dynamic inclusive/non-inclusive "INI"



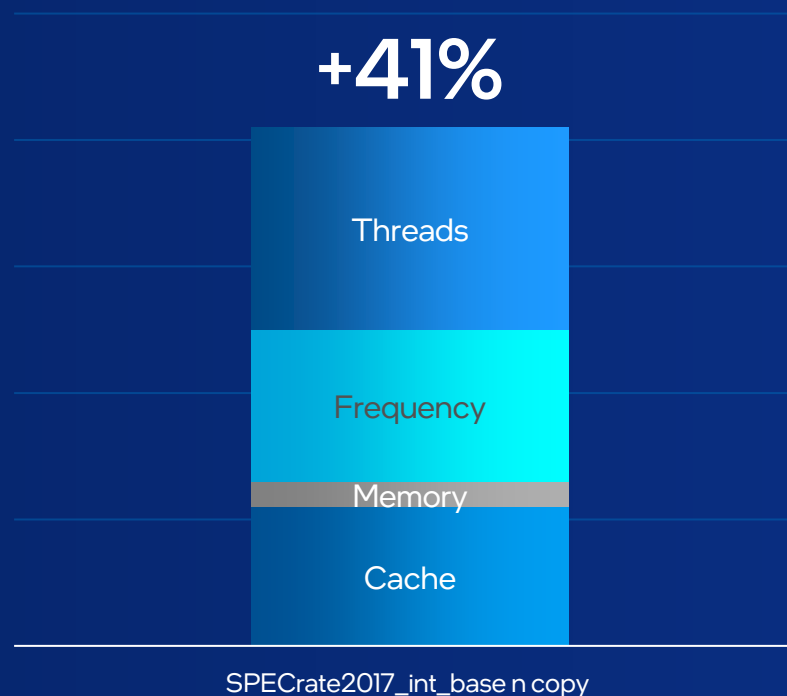
# Raptor Lake

## Leading Performance

### Single Thread Performance



### Multi Thread Performance

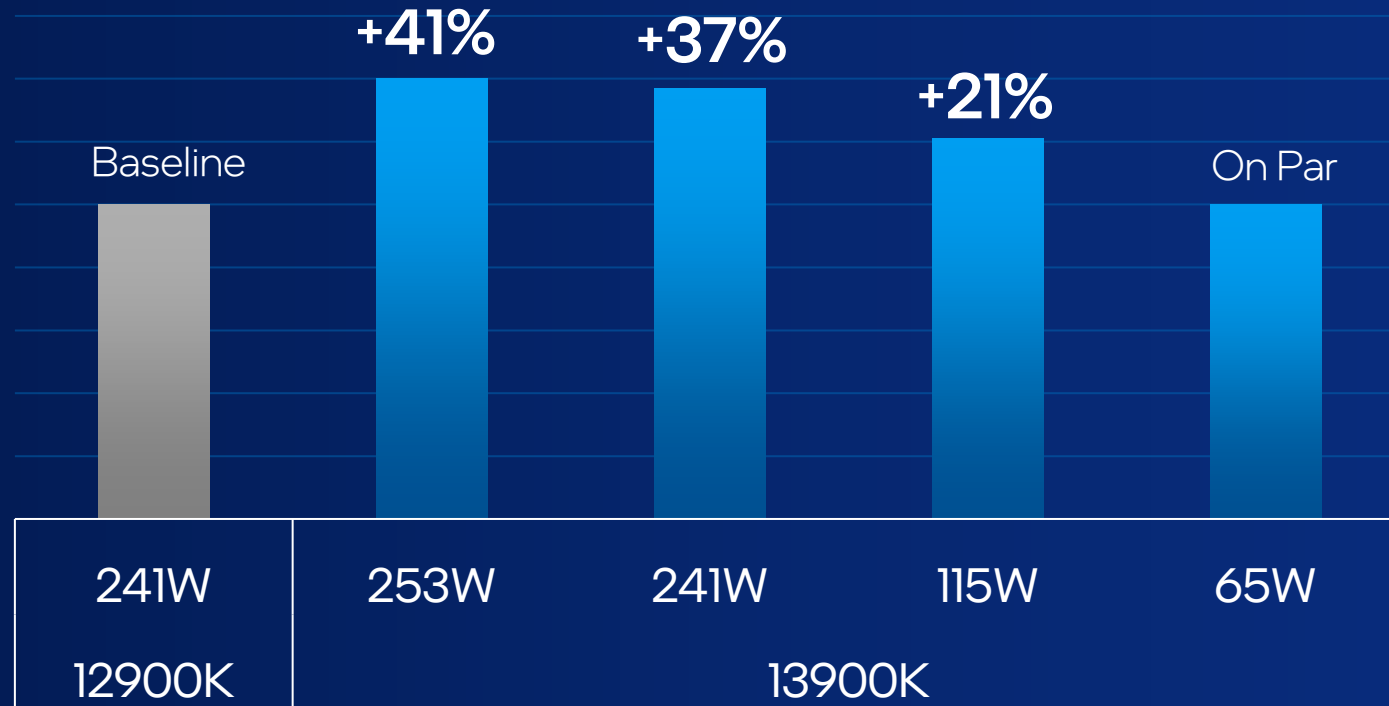


Source Intel: As estimated by measurements made using SPECint\_rate\_base2017\_IC2022.1 (1-copy & n-copy) using Intel validation Platforms comparing Core i9 13900K versus Core i9 12900K. Frequency includes enhancements to the CPU and the Fabric.

# Raptor Lake

## Scalable Performance per Watt

### Multi Thread Performance



Similar  
performance  
at ~25% power

Source Intel: As estimated by measurements made using SPECint\_rate\_base2017\_IC2022.1 (n-copy) using Intel validation Platforms comparing Core i9 13900K versus Core i9 12900K

# Raptor Lake Software Improvements

## Intel Thread Director<sup>2</sup>

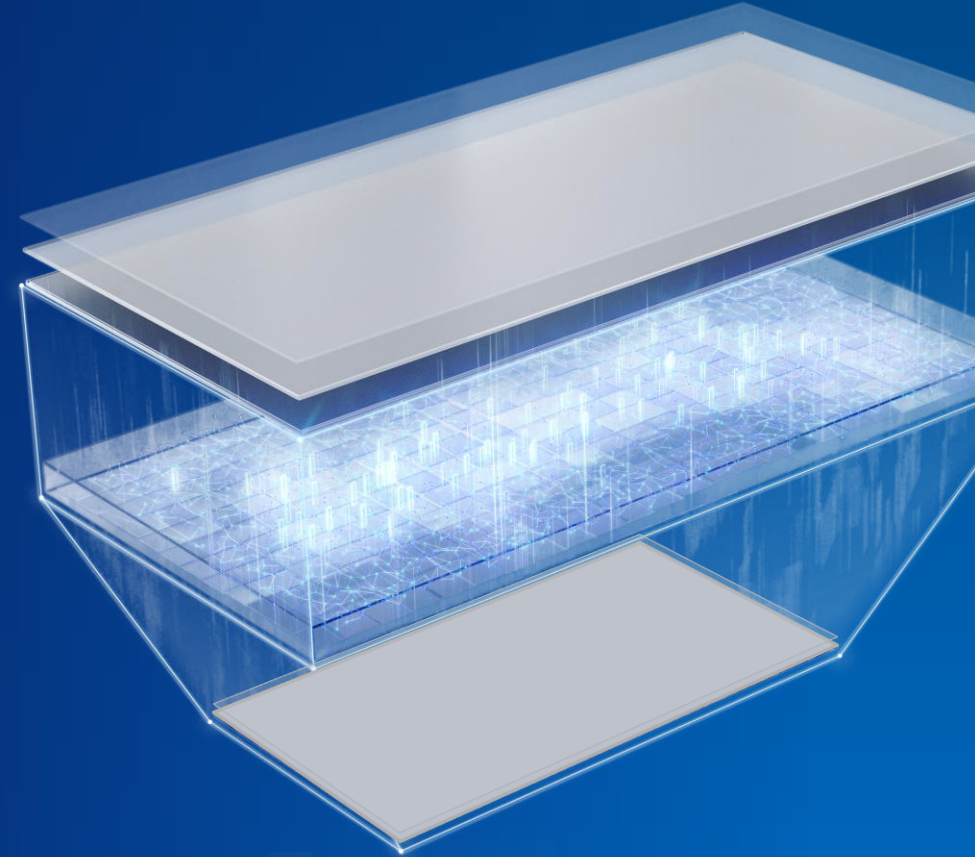
Updated thread class boundaries (0,1,2,3)  
via machine learning techniques

## Windows 11 22H2

Optimized handling of background services (utility QoS)  
vs. user-initiated background tasks (low QoS)

## Dynamic Tuning Technology

Coming soon to mobile ... new core parking techniques



# 13th Gen Intel® Core™ Unlocked Desktop Processors

Processor Number	Processor Cores (P+E)	Processor Threads	Intel® Smart Cache (L3)	Total L2 Cache	P-core Max Turbo Frequency (GHz)	E-core Max Turbo Frequency (GHz)	P-core Base Frequency (GHz)	E-core Base Frequency (GHz)	Unlocked	Processor Graphics	Total CPU PCIe Lanes	Max Memory Speed (MT/S)	Memory Capacity	Processor Base Power (W)	Max Turbo Power (W)	RCP (USD)
i9-13900K	24 (8+16)	32	36MB	32MB	Up to 5.8	Up to 4.3	3.0	2.2	√	Intel® UHD Graphics 770	20	DDR5 5600 DDR4 3200	128GB	125	253	\$589
i9-13900KF	24 (8+16)	32	36MB	32MB	Up to 5.8	Up to 4.3	3.0	2.2	√	n/a	20	DDR5 5600 DDR4 3200	128GB	125	253	\$564
i7-13700K	16 (8+8)	24	30MB	24MB	Up to 5.4	Up to 4.2	3.4	2.5	√	Intel® UHD Graphics 770	20	DDR5 5600 DDR4 3200	128GB	125	253	\$409
i7-13700KF	16 (8+8)	24	30MB	24MB	Up to 5.4	Up to 4.2	3.4	2.5	√	n/a	20	DDR5 5600 DDR4 3200	128GB	125	253	\$384
i5-13600K	14 (6+8)	20	24MB	20MB	Up to 5.1	Up to 3.9	3.5	2.6	√	Intel® UHD Graphics 770	20	DDR5 5600 DDR4 3200	128GB	125	181	\$319
i5-13600KF	14 (6+8)	20	24MB	20MB	Up to 5.1	Up to 3.9	3.5	2.6	√	n/a	20	DDR5 5600 DDR4 3200	128GB	125	181	\$294

Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families.

The frequency of cores and core types varies by workload, power consumption and other factors. Visit <https://www.intel.com/content/www/us/en/architecture-and-technology/turbo-boost/turbo-boost-technology.html> for more information. Max Turbo Frequency for P-cores may include Intel® Thermal Velocity Boost and/or Intel Turbo Boost Max 3.0.

All SKUs listed above support up to DDR5 (5600 MT/S)/DDR4 (3200 MT/S) memory. See [ark.intel.com](https://ark.intel.com) for more specification details







# The World's Fastest Desktop Processor

## 13th Gen Intel® Core™ i9-13900K

Up to

**5.8 GHz**

**15% better ST**

**41% better MT**

Up to

**24% Better  
Gaming  
Performance**

Up to

**34% Faster  
Creator  
Workflow**

**The World's Best Gaming Experience**

**A Leap in Content Creation**

**Unmatched Overclocking Experience**

**Platform Innovation & Flexibility**

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For all workloads and configuration see [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex). Results may

# Notice and Disclaimers

Performance varies by use, configuration and other factors. Learn more at [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex).

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex) for configuration details.

For additional 13<sup>th</sup> Gen Intel® Core™ processor family details learn more at <https://intel.com/13thgen>

No product or component can be absolutely secure.

Your costs and results may vary.

Intel technologies may require enabled hardware, software or service activation.

6 GHz Wi-Fi 6E operation requires use of Intel® Wi-Fi 6E (Gig+) products in conjunction with operating systems and routers/APs/Gateways that support Wi-Fi 6E, together with regional spectrum allocation & required regulatory certifications. Visit [www.intel.com/PerformanceIndex](https://www.intel.com/PerformanceIndex) (connectivity) for details.

Altering clock frequency or voltage may void any product warranties and reduce stability, security, performance, and life of the processor and other components. Check with system and component manufacturers for details.

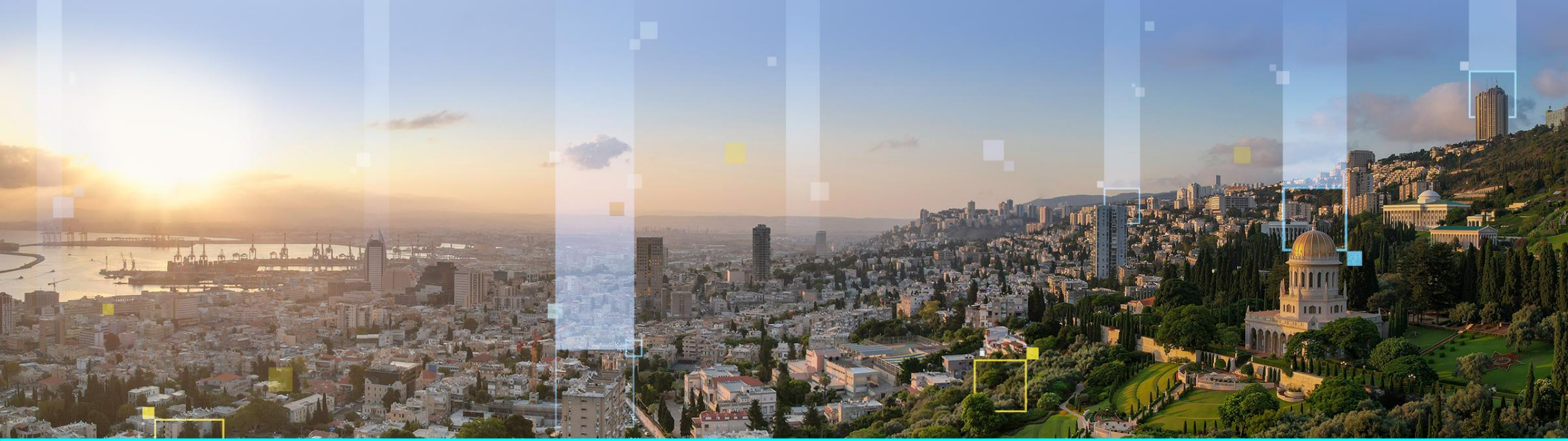
Results that are based on systems and components as well as results that have been estimated or simulated using an Intel Reference Platform (an internal example new system), internal Intel analysis or architecture simulation or modeling are provided to you for informational purposes only. Results may vary based on future changes to any systems, components, specifications or configurations.

All information provided here is subject to change without notice. Contact your Intel representative to obtain the latest information.

1. Performance hybrid architecture combines two core microarchitectures, Performance-cores (P-cores) and Efficient-cores (E-cores), on a single processor die first introduced on 12th Gen Intel Core processors. Select 13th Gen Intel Core processors do not have performance hybrid architecture, only P-cores, and have same cache size as prior generation; see [ark.intel.com](https://ark.intel.com) for sku details.
2. Built into the hardware, Intel® Thread Director is provided only in performance hybrid architecture configurations of 12th Gen Intel® Core™ processors; OS enablement is required. Available features and functionality vary by OS.
3. DDR5 Memory speeds are associated with 1DPC configurations. For additional 2DPC configuration details refer to the Alder Lake Processor External Design Specification (EDS), Doc ID 619501.
4. CPU PCIe 5.0 lanes are only validated for discrete graphics (x16) and PCIe storage (1x4). 1x16 bifurcated to 2x8 provides discrete graphics (x8) + additional storage configuration support (1x8).
5. Discrete Intel® Thunderbolt™ 4 (Maple Ridge) is only validated and supported from Intel® 600 and 700 Series Chipset PCIe lanes.
6. 'Best in Class wired and wireless connectivity with Wi-Fi 6': Intel® Wi-Fi 6 (Gig+) products support optional 160 MHz channels, enabling the fastest possible theoretical maximum speeds (2402 Mbps) for typical 2x2 802.11ax PC Wi-Fi products. Premium Intel® Wi-Fi 6 (Gig+) products enable 2-4X faster maximum theoretical speeds compared standard 2x2 (1201 Mbps) or 1x1 (600 Mbps) 802.11ax PC Wi-Fi products, which only support the mandatory requirement of 80 MHz channels. Gigabit Wi-Fi Requirements: To achieve speed of over 1 Gbps requires Gig internet service, router/gateway with either Wi-Fi 6 or 12ac with 160 MHz channel support, and PC with Intel® Wireless 9260/9560 or Intel® Wi-Fi 6 (Gig+) AX200/AX201.
7. CPU PCIe 5.0 lanes are only validated for discrete graphics (x16) and PCIe storage (1x4). 1x16 bifurcation to 2x8 supported on select Intel® 600 and 700 Series chipsets
8. Unlocked features are present with select chipsets and processor combinations. Altering clock frequency or voltage may void any product warranties and reduce stability, security, performance, and life of the processor and other components. Check with system and component manufacturers for details.

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# Thank You