

Intel® Core™ Ultra Processors for the Edge Overview (PS series) (Formerly codenamed Meteor Lake PS)

Mar 2024



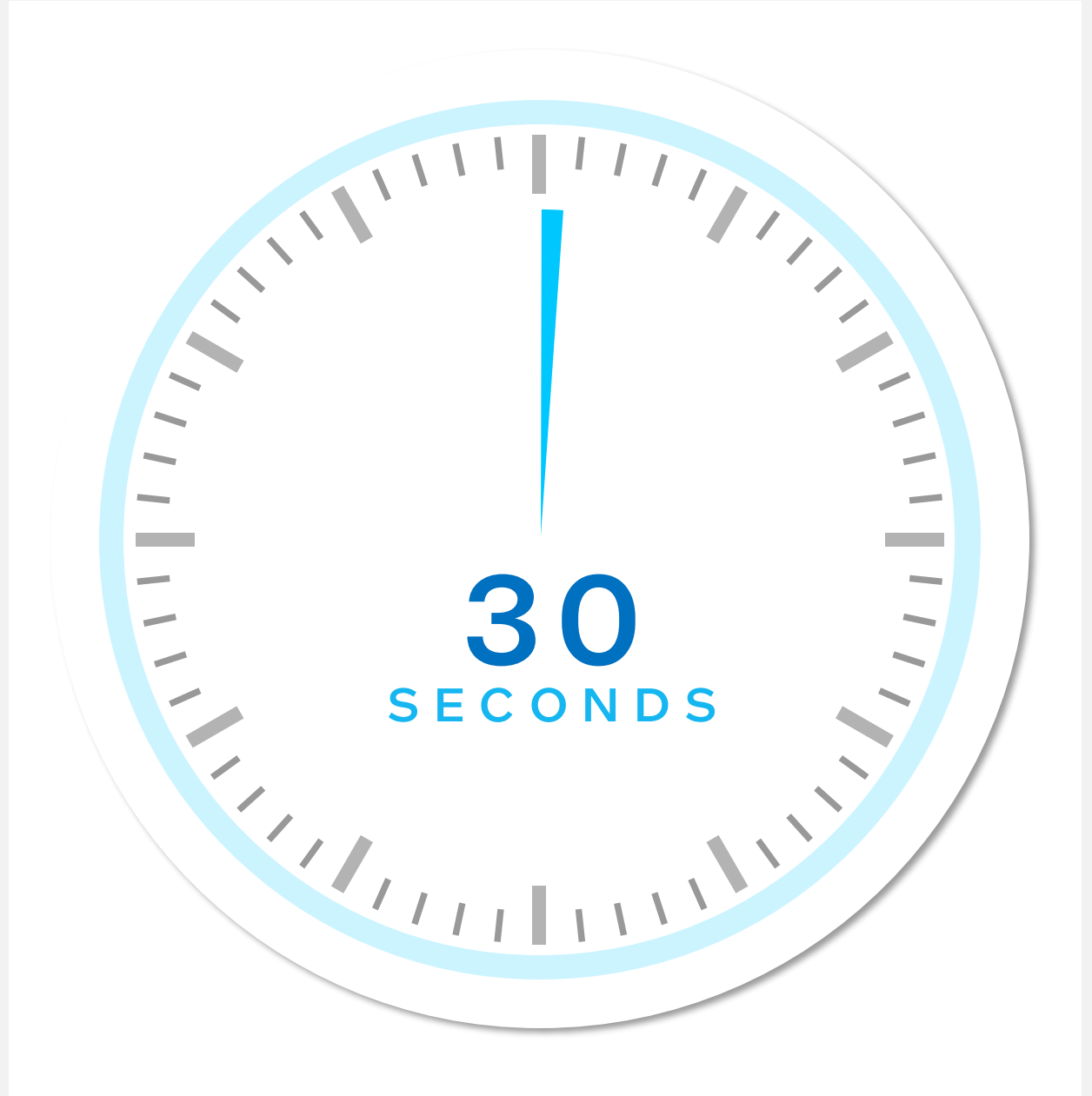
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30-Second
Product
Overview



Intel® Core™ Ultra Processors (PS series) Overview

Overview

- First Intel® Core™ Ultra Processors (PS series) in LGA socket optimized for the edge
- Up to 16 Cores / 22 Threads
- Intel® Arc™ GPU with up to 8 Xe-cores
- Intel® AI Boost, a built-in neural processing unit (NPU)
- SKU stack includes Ultra 3, 5 and 7
- SoC in LGA socket with integrated PCH
- 12-65W TDP options

Value Proposition

The Intel® Core™ Ultra Processors (PS series) represent a groundbreaking fusion of GPU and NPU capabilities from Intel® Core™ Ultra processors with the versatile LGA socket configuration. Offering 4X the graphics execution units (EUs) compared to the S series (12th to 14th Gen), these processors provide a robust alternative for executing AI and graphics-intensive workloads. By eliminating the need for a discrete GPU, they reduce costs and streamline design complexity, making them an ideal choice for efficiency and performance.

By the numbers vs 14th Gen Intel Core

- Up to **5.02x** faster in GPU image classification performance¹
- Up to **3.85x** faster in GPU object detection performance¹
- Up to **3.13x** better Graphics performance¹

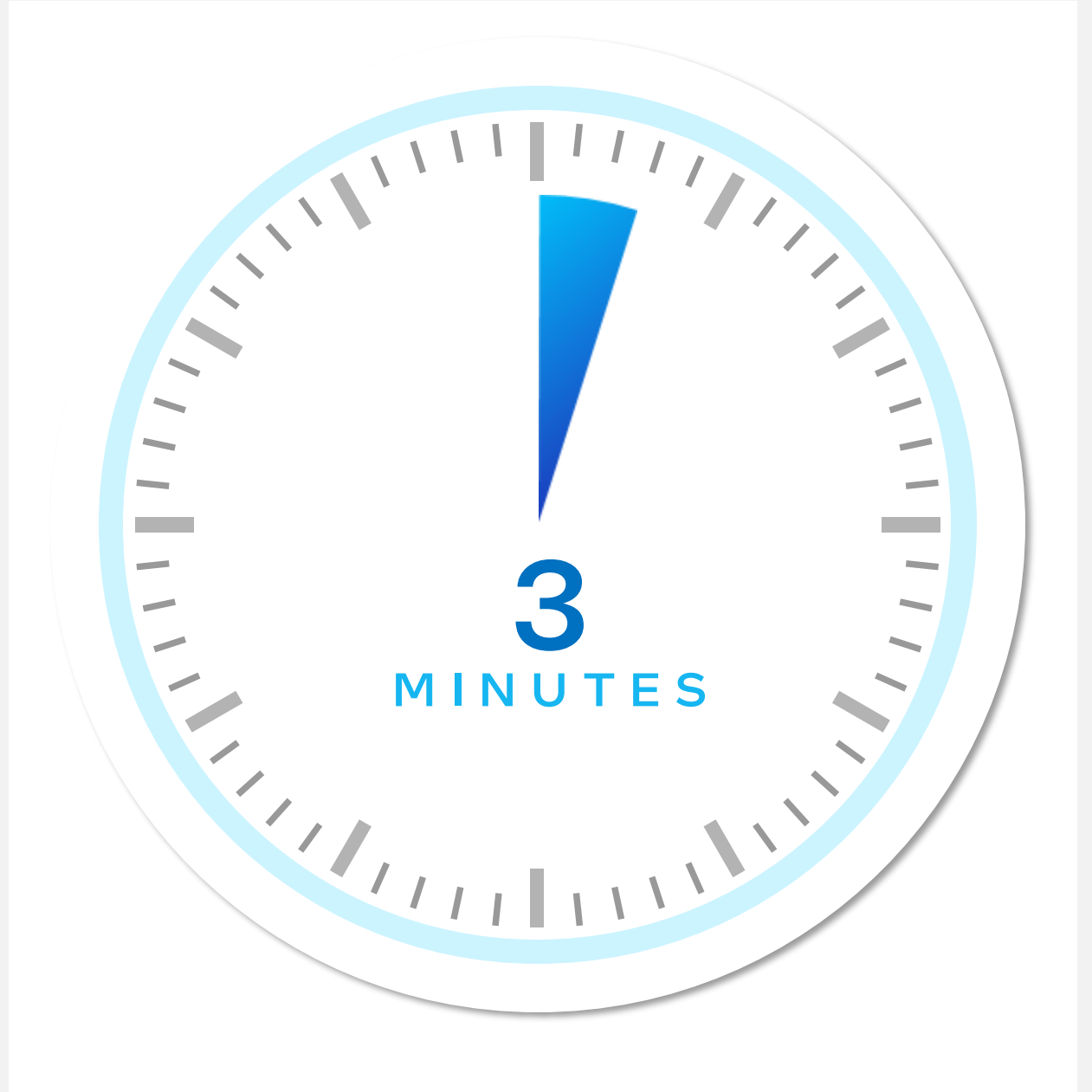


- EDID Correction
- Bezel Compensation
- Pipelock
- HDMI Capture
- Single root I/O virtualization
- Long product availability
- Support for Windows 10 IoT Enterprise 2021 LTSC
- Support for Windows 11 IoT Enterprise 2024 LTSC (2H'24)
- Linux, Celadon (Android) in VM (community support)
- KVM hypervisor (community support)
- Intel® Slim Bootloader, UEFI BIOS

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3-Minute
Product
Overview



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Benefits of Intel® Core™ Ultra Processors (PS series)

AI-ready performance

- Multiple integrated compute engines for AI — P-cores, E-cores, Intel® Arc™ GPU¹ and Intel® AI Boost, a built-in neural processing unit (NPU) for increased edge AI capabilities at low power.
- Enable/accelerate AI inferencing cost-effectively without discrete accelerator.
- More built-in graphics EUs vs S series

Immersive graphics and media

- Up to 8 X^e-cores (128 graphics execution units) for graphics/media-intensive workloads at the edge.
- Built-in GPU reduces power consumption, lower BOM costs and enables smaller form factor design.

SoC in LGA socket

- SoC in LGA allows single board design across UL series (12-28W) and HL series (35-65W)
- Lower R&D and faster time-to-market with LGA flexibility.
- As low as 12W in TDP for fanless design. Full performance with 65W
- Simplify design with integrated PCH

1. Intel® Arc™ GPU only available on select HL-Series, Intel® Core™ Ultra processor powered systems with at least 16GB of system memory in a dual-channel configuration. OEM enablement required; check with OEM for system configuration details.

Customer Quotes



"...delivering top-tier AI performance that rivals the previous generation Intel® Core™ desktop processor (i9-12900K) paired with RTX 3090Ti GPU in both semantic segmentation and object detection tasks but at 90% less power consumption. Thanks to the Intel® Arc GPU and Intel® AI Boost (NPU) built into the processor, we are set to revolutionize next-gen entry-to-mid level pathology analytics devices by incorporating advanced AI functionalities without relying on discrete GPUs..."

Dr. Yen-Yin Lin
CEO



"...realized a quadruple boost in resolution (from 2K to 8K) while significantly reducing power usage, courtesy of the built-in Intel Arc GPU. This marks a stark contrast to our existing digital signage solution powered by an 11th Gen Intel Core processor paired with an Nvidia RTX 2060 GPU. Moreover, it met our rigorous response time and latency criteria for ChatScript AI-driven natural language processing, achieving these benchmarks without reliance on a discrete GPU... allows for the creation of advanced AI avatar functionalities within slimmer, more energy-conscious signage devices, thereby enhancing accessibility and reducing operational costs..."

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CEO



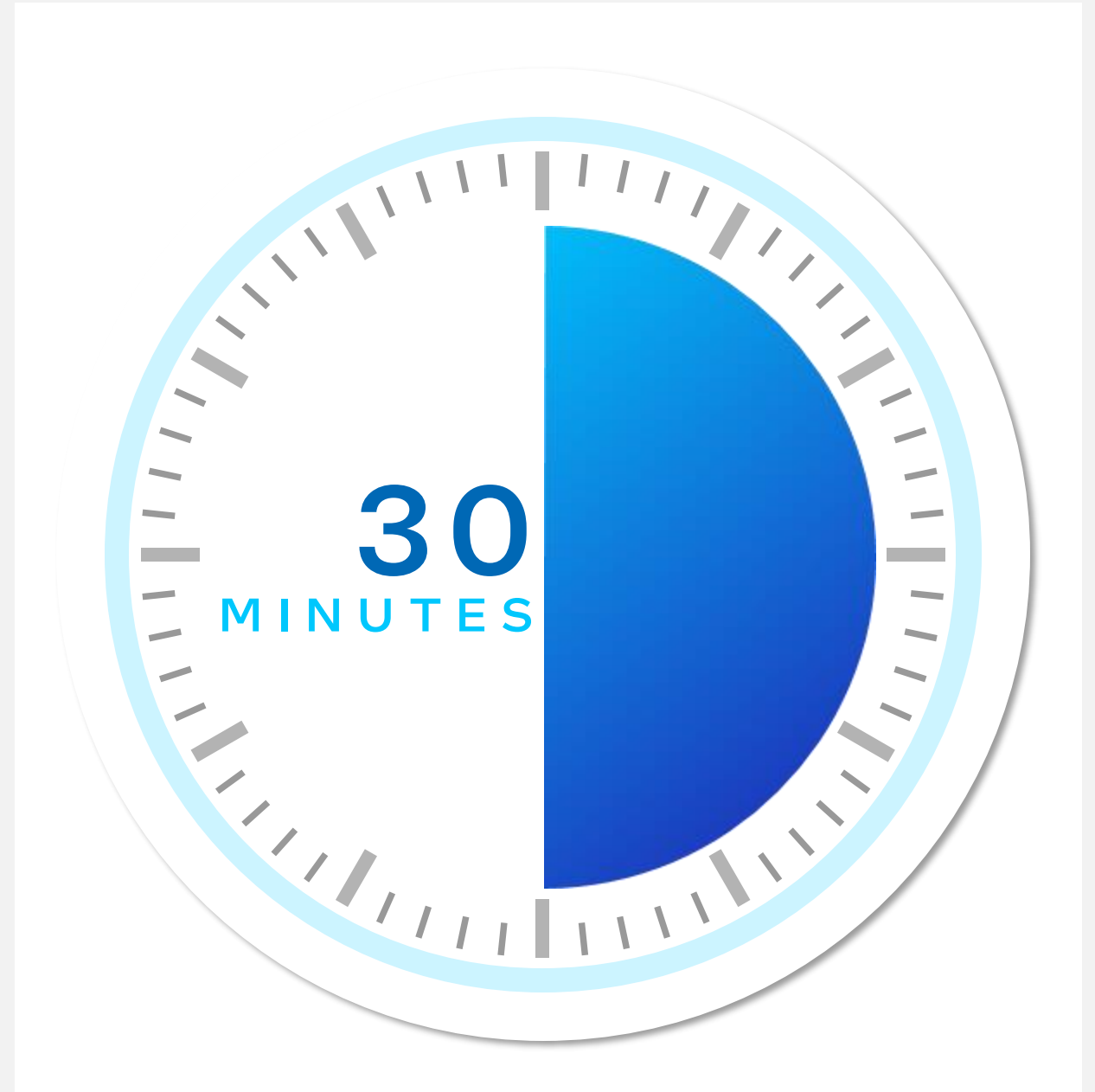
"...it delivered extraordinary performance, especially in object detection and classification tasks, achieving inferencing throughput improvements exceeding 915% and 455%, respectively, thanks to the built-in Intel Arc GPU. This marks a notable leap over prior gen Intel® Core™ desktop processors with no integrated GPU... bring deeper insights into customer behavior, and smarter inventory and quality control to our clients..."

He, ZhengTing
Information CTO

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30-Minute
Product
Overview





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The Shift Toward Edge AI

More than 75% of enterprise-managed data will be created and processed outside the data center or cloud.¹



“Things” are intelligent
Lightweight deep learning
inference



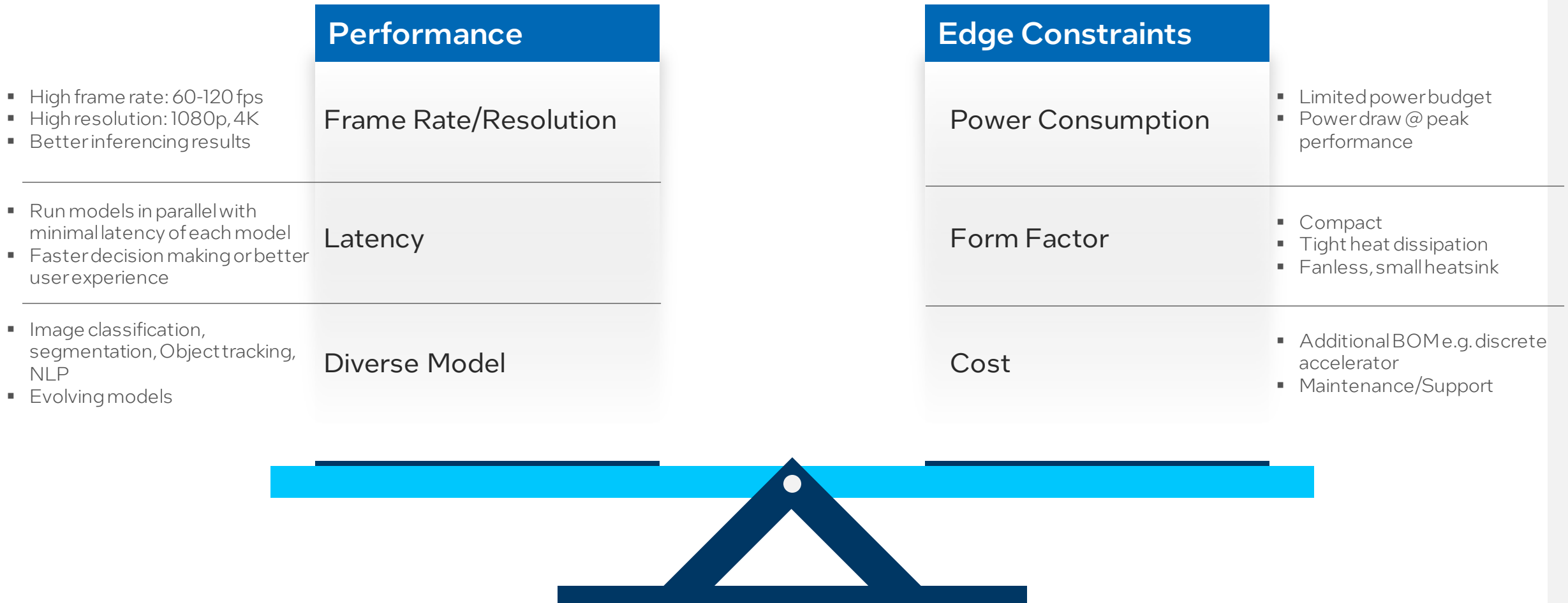
**They react in real time,
like we do**
Ultra low-latency 5G;
private local networks



**They improve the
human experience**
Automating
repetitive, detailed,
or dangerous tasks

¹“Computing on the Edge Can be Transformative—But Look Before You Leap,” Forbes, March 15, 2021,

Edge AI Design Challenges



Effective edge AI solution needs to satisfy power, performance, and cost.

Edge Workloads Examples



Data Collection and Preprocessing

Edge devices often collect and preprocess raw data from sensors and **other** sources before transmitting it to the cloud. This can involve tasks such as data filtering, noise reduction, and data aggregation.




Image and Video Processing

Edge devices in surveillance, industrial monitoring, and IoT cameras often process images and videos locally. This can include tasks like object detection, tracking, facial recognition, and image compression.



Sensor Data Analysis

Edge hardware can analyze data from various sensors, such as temperature sensors, accelerometers, and gyroscopes. These analyses might involve anomaly detection, pattern recognition, or predicting system failures.



Real-Time Analytics

Edge devices might perform real-time analytics on incoming data to extract insights and trigger immediate actions. Examples include monitoring machinery for predictive maintenance or analyzing customer behavior in retail settings.



Natural Language Processing (NLP)

Edge devices with speech recognition and NLP capabilities can enable voice-controlled interfaces and language processing without relying on cloud services. This is common in smart signage/kiosk and voice assistants.




Local AI Inference

AI models are often deployed on edge devices for tasks like image recognition, natural language understanding, and sentiment analysis. These models make predictions locally, reducing latency and dependence on cloud resources.



Autonomous Systems

Edge devices in robotics and autonomous vehicles process sensor data to make decisions and navigate in dynamic environments.



Security and Surveillance

Edge devices can process video feeds for intrusion detection, access control, and identifying security threats.

Expanding Edge Offering with Intel[®] Core[™] Ultra Processors (PS series)

S series	PS series	U/P/H series
CPU in LGA socket	SoC in LGA socket	SoC in BGA package
35-65W	12-65W	12-65W
Discrete PCH	Integrated PCH	Integrated PCH
Max CPU Performance	Max iGPU Performance	Max iGPU Performance
Extensive I/O for platform connectivity and scale	Tailored I/O for power sensitive applications	Tailored I/O for power sensitive applications

Long-life Availability, Intel[®] Deep Learning Boost, Performance hybrid architecture, Enhanced for edge, Intel vPro[®] platform eligible

Max CPU performance, memory, and I/O

Power saving, density, and graphics

Benefits of Intel® Core™ Ultra Processors (PS series)

AI-ready performance

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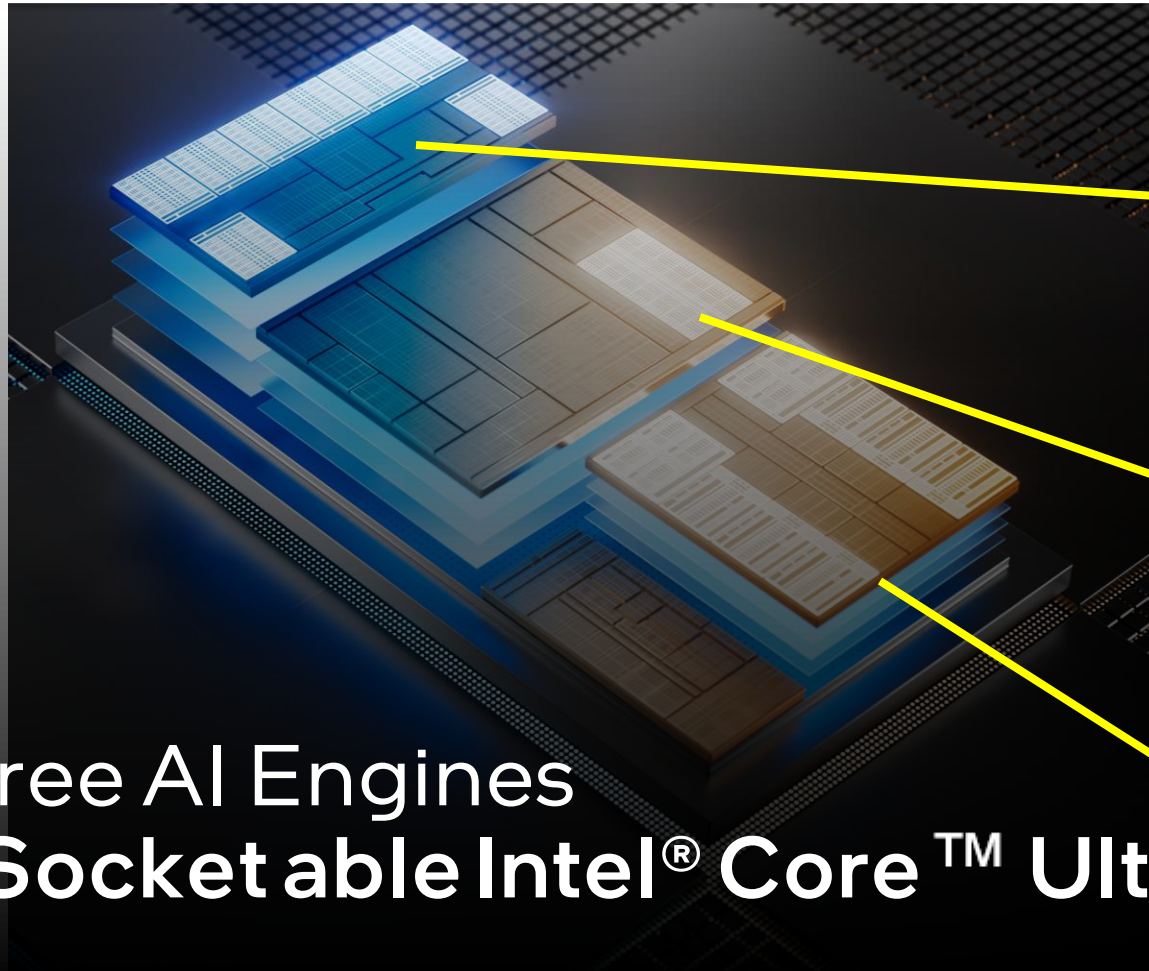


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AI-Ready Performance

**Delivers up to 1.5x
AI performance** vs. previous generation¹



GPU

High Throughput

- Ideal for AI-accelerated high complexity workloads
- 18 TOPS

NPU

Low Power

- Ideal for sustained, complex AI workloads with up to **2.56X** AI perf/watt efficiency vs previous generation¹
- 11 TOPS

CPU





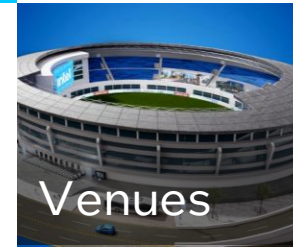


Fast Response

- Ideal for low-latency AI workloads
- 3 TOPS

**Three AI Engines
in Socketable Intel® Core™ Ultra**

¹. Learn more at intel.com/processorclaims: Intel® Core™ Ultra processors, Edge. Results may vary.

Segments Applications

 <p>Retail</p> <ul style="list-style-type: none"> ▪ AIO POS* ▪ Digital Signage ▪ Interactive Kiosk ▪ Video Wall 	 <p>Education</p> <ul style="list-style-type: none"> ▪ Interactive Whiteboard ▪ Remote Classroom ▪ Video Conference 	 <p>Hospitality</p> <ul style="list-style-type: none"> ▪ Digital Signage ▪ Interactive Kiosk ▪ Thin Client ▪ In-Store Analytics 	 <p>Gaming</p> <ul style="list-style-type: none"> ▪ Slot Machine ▪ Electronic Table Game ▪ Lottery Ticket Kiosks ▪ Physical security 	 <p>Venues</p> <ul style="list-style-type: none"> ▪ Broadcast satellite and live transmission infrastructure ▪ Signage/Kiosk ▪ Physical security and crowd management 	 <p>Smart Cities</p> <ul style="list-style-type: none"> ▪ License Plate Recognition ▪ Traffic Management ▪ Network Video Recorder 	 <p>Industrial</p> <ul style="list-style-type: none"> ▪ Vision based Defect Detection ▪ AI-Augmented Process control
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Key Features

- Display: 4 concurrent 4K displays, 8K, Pipelock, EDID, Bezel Compensation
Media: Integrated HDMI capture
GPU virtualization with SR-IOV
- AI-Capable: Intel Deep Learning Boost with INT8 support, Inferencing with CPU+iGPU+NPU, Up to 50 simultaneous 1080p streams ingestion
- Intel Core Ultra Processors (PS series): Up to 16 Cores / 22 Threads, 8 X^e cores, 20 lanes PCIe 4, 4x Thunderbolt 4, DDR5-5600 memory

*All-in-one point-of-sale (POS) systems that combine self-checkout, AI analytics, and digital surveillance (see next slide)

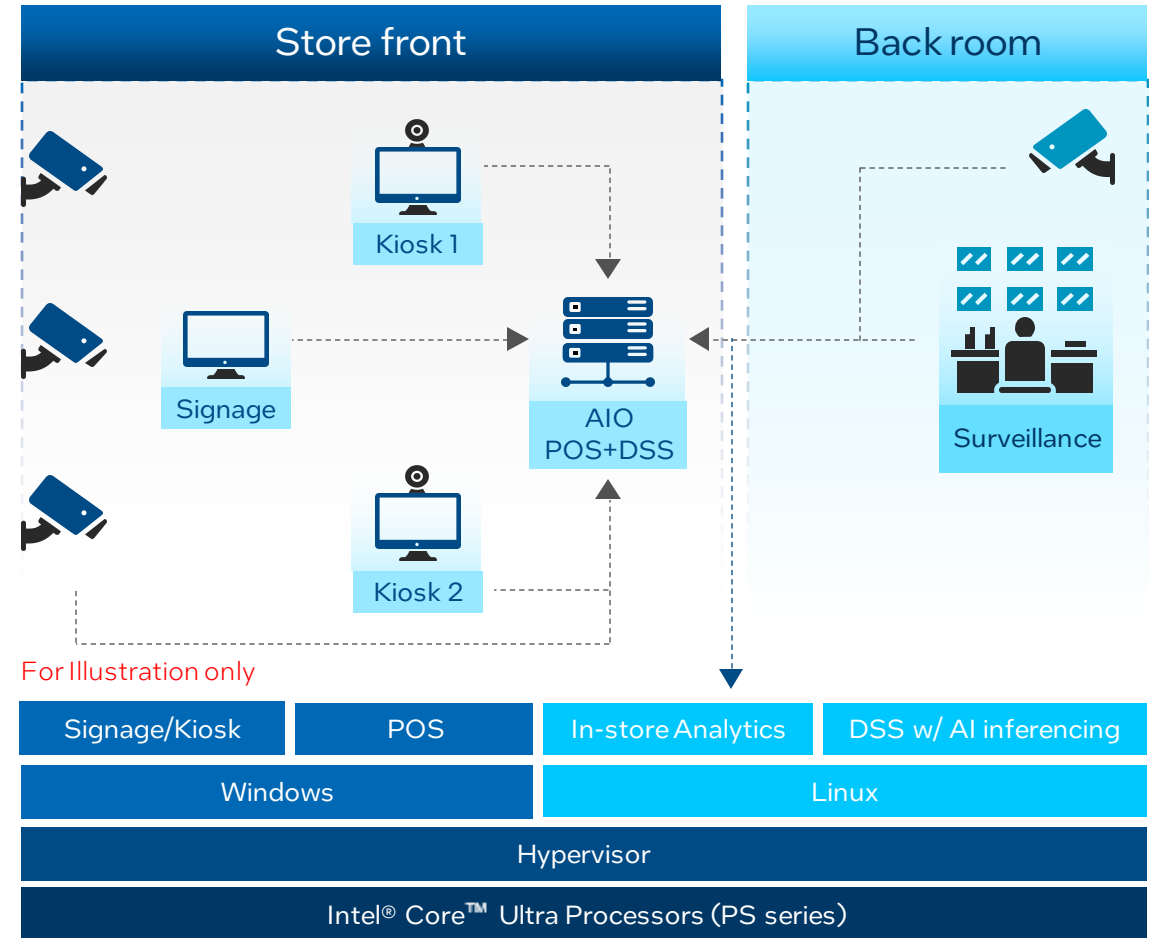
Retail Use Case Deep Dive Example

Integrated Retail Solution encompasses POS, security surveillance, digital signage and video analytics in a cost-effective package for small-medium sized retailer e.g. convenience store.

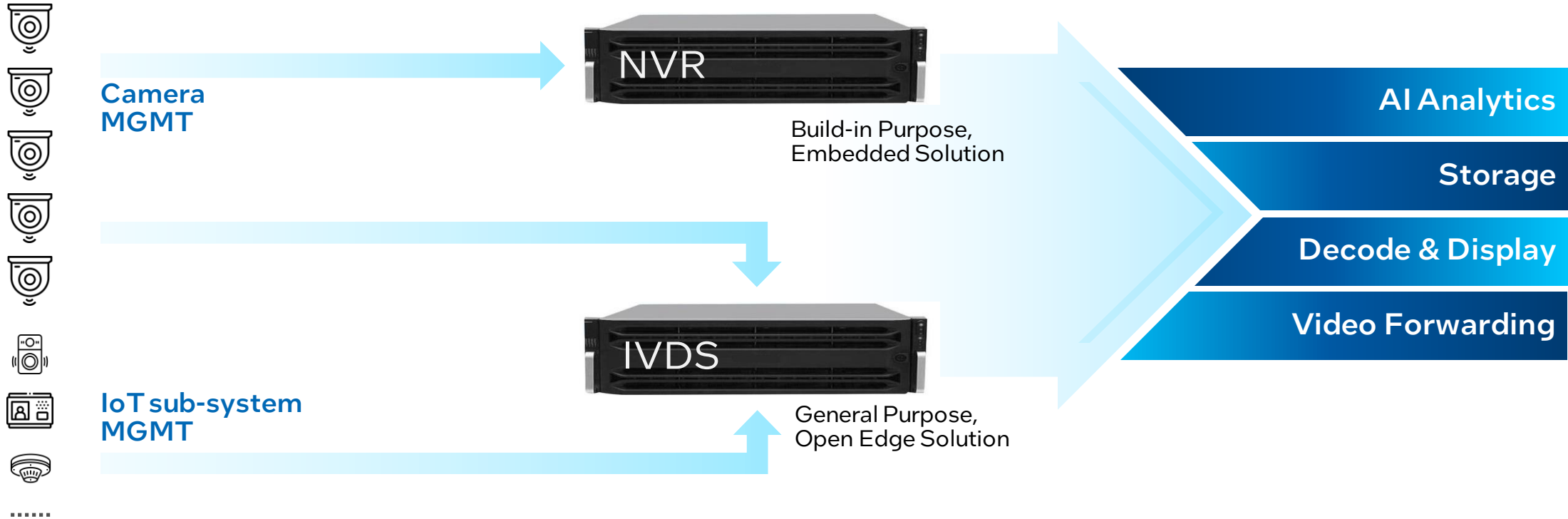
Drivers include labor shortage, enhance customer experience and better compete with bigger retailers. Managing multiple retail systems is challenging for the smaller retailers.

Intel® Core™ Ultra Processors (PS series) based integrated retail solution eliminates the need to invest in multiple, small and often unreliable systems for these applications..

Value prop: With up to 128 graphics EUs and power-efficient NPU, Intel® Core™ Ultra Processors (PS series) can drive 4x4K signages, support AI-based loss prevention and in-store analytics. The socket-able CPU provides more agility for OEM "build to order" scenario.



Network Video Recorder (NVR) Deep Dive Example



Key Workloads

- Camera/Video management
- Video and IoT data storage
- Multi-view display
- AI Inference
- Video streaming
- IOT sub-system management (IVDS)

Benefit of PS series

- High EU counts compared with S series, providing up to 32 TOPS AI performance for video analysis
- Higher media capability, can decode up to 64x H264 HD video streams
- Support more features for video processing such as HDMI-in

Key Advantages of Intel® Core™ Ultra Processors (PS series) vs S series

Processor Family	Intel® Core™ processors (14th Gen) (RPL S Refresh)	Intel® Core™ Ultra processors (PS series) (MTLPS)
TDP	35-65W	12-65W ✓
Core/Thread	Up to 24 cores and 32 threads	Up to 16 cores, up to 22 threads New Core architecture & 2 low power E cores
Socket	LGA1700 + discrete PCH	LGA1851 with integrated PCH ✓
Graphics	Integrated GPU with up to 32EU	Intel® Arc™ GPU with up to 8 Xe-cores (up to 128EU) ✓
AI	Intel Graphics Intel Deep Learning Boost	Built-in Intel® Arc™ GPU Integrated NPU Intel Deep Learning Boost ✓
Memory	Up to DDR5-5600	Up to DDR5 5600
I/O	Up to 16x PCIe 5.0 + up to 4x PCIe 4.0 off CPU Up to 12x PCIe 4.0 + up to 16x PCIe 3.0 off PCH 4x Thunderbolt™ 4 / USB4	Up to 20x PCIe 4.0 4x Thunderbolt™ 4 / USB4

Note: Platform benchmarks, benefits, and features will vary by SKU. Not all features are available on every SKU. Consult the product lineup for additional details

Positioning of the 2 PS Products

For edge designs that prioritize scalability with proven GPU/AI inferencing performance

For edge designs that prioritize best AI inferencing and GPU/CPU performance

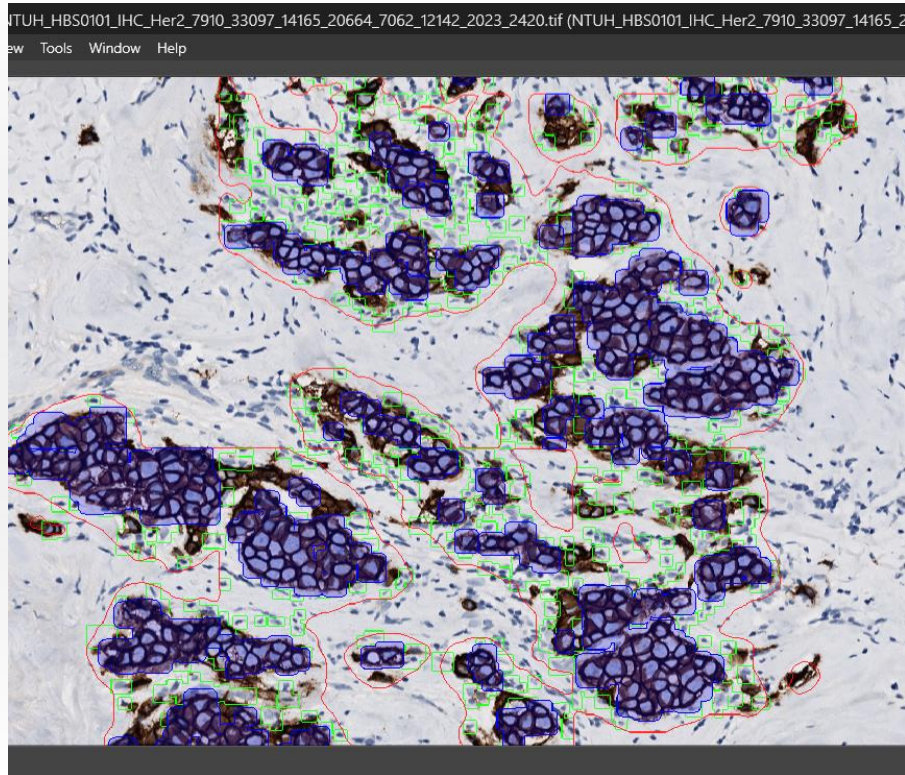
Processor Family	Intel® Core™ processors (PS series) (RPLPS)	Intel® Core™ Ultra processors (PS series) (MTLPS)
AI	Integrated GPU with up to 96EU Intel Deep Learning Boost	Built-in Intel® Arc™ GPU with up to 8 Xe-cores (128EU) Integrated NPU Intel Deep Learning Boost
Graphics	Integrated GPU with up to 96EU	Built-in Intel® Arc™ GPU with up to 8 Xe-cores (128EU)
Core/Thread	Up to 14 cores, up to 20 threads	Up to 16 cores, up to 22 threads New Core architecture & 2 low power E cores
Memory	Up to DDR5 5200	Up to DDR5 5600
Media & Display	Up to 4x4K 60 HDR or 1x8K display(s)	Up to 4x4K 60 HDR or 2x8K display(s)
SKU & Compatibility	Intel processor, Core 3, 5 and 7 Backward compatible with ADL PS boards	Core Ultra 3, 5 and 7 Forward compatible with next gen PS boards

Scalability / SKU Options

GPU Performance/Power Efficiency

Note: Platform benchmarks, benefits, and features will vary by SKU. Not all features are available on every SKU. Consult the product lineup for additional details

Featured Use Case: Pathology Analytics



“The PS series Intel® Core™ Ultra processor showcases unparalleled power efficiency, delivering top-tier AI performance that rivals the previous generation Intel® Core™ desktop processor (i9-12900K) paired with RTX 3090Ti GPU in both semantic segmentation and object detection tasks but at 90% less power consumption. Thanks to the Intel® Arc GPU and Intel® AI Boost (NPU) built into the processor, we are set to revolutionize next-gen entry-to-mid level pathology analytics devices by incorporating advanced AI functionalities without relying on discrete GPUs. This breakthrough makes cutting-edge imaging technology more accessible and cost-effective, paving the way for broader adoption and innovation in the digital pathology field. Additionally, the flexibility of the processor’s LGA socket ensures that our solutions are not just at the forefront of technology but also adaptable, providing our customers with future-proof diagnostic tools that evolve with their needs.”

Dr. Yen-Yin Lin
CEO



Featured Use Case: AI Employee for Retailer



"The PS series from the Intel Core Ultra lineup has showcased extraordinary capabilities in natural language processing and 3D rendering at 4K/8K resolutions for our AI character. In extensive testing, it realized a quadruple boost in resolution (from 2K to 8K) while significantly reducing power usage, courtesy of the built-in Intel Arc GPU. This marks a stark contrast to our existing digital signage solution powered by an 11th Gen Intel Core processor paired with an Nvidia RTX 2060 GPU. Moreover, it met our rigorous response time and latency criteria for ChatScript AI-driven natural language processing, achieving these benchmarks without reliance on a discrete GPU."

"Such efficiency in energy use, combined with the processor's ability to support 4K/8K resolutions and real-time natural language processing, allows for the creation of advanced AI avatar functionalities within slimmer, more energy-conscious signage devices, thereby enhancing accessibility and reducing operational costs. Furthermore, the processor's versatile LGA socket design allows our customers to easily scale with their growing demands, securing their investment in technology for the long term."

David Colleen, CEO



Featured Use Case: Gen AI Chatbot for retail edge

"Our testing of the Intel Core Ultra processor (PS series) surpassed our expectations for Time to First Token (TTFT) and token generation rates in Generative AI with 7B parameters, impressively without the need for a discrete GPU. This stellar performance allowed us to introduce a cost-effective, high-efficiency customer service chatbot for retail in-store use. Our edge-optimized AI solution enhances retail customer service, providing a smooth and insightful interaction, showcasing that advanced AI is not only accessible but also prioritizes privacy by processing sensitive data locally.

Brian Sathianathan, CEO



iterate.ai



Featured Use Case: AI POS for Quick Service Restaurant



Shanghai Kaijing

AI Cashier

Committed to create a intelligent digital canteen system

AI vision pricing

Payment aggregation

Big data analysis



“As the leader in AI self-checkout POS systems for restaurants, we've seen transformative results with the PS series of Intel® Core™ Ultra processor. In comprehensive tests, it delivered extraordinary performance, especially in object detection and classification tasks, achieving inferencing throughput improvements exceeding 915% and 455%, respectively, thanks to the built-in Intel Arc GPU. This marks a notable leap over prior gen Intel® Core™ desktop processors with no integrated GPU. With the improvements, our next-gen systems bring deeper insights into customer behavior, and smarter inventory and quality control to our clients. Furthermore, the processor's versatile LGA socket design allows our customers to easily scale with their growing demands, securing their investment in technology for the long term.”

He, ZhengTing
Information CTO

Additional Resources

CNDA

- [NEX Meteor Lake PS Platform Gold Deck](#)

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