

# Build and Scale AI-Enhanced Checkout Solutions

## Streamline development of optimized, AI-enhanced checkout lanes.

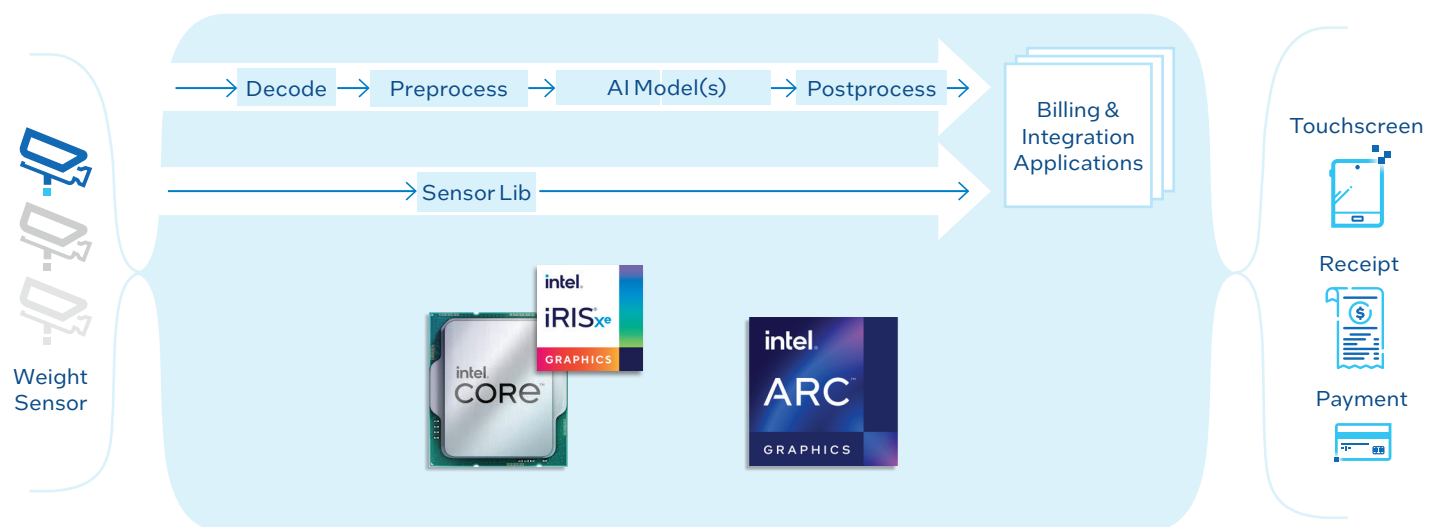
Computer-vision AI is gaining ground among mainstream retailers to enable a frictionless checkout experience that also improves staffing efficiency and reduces shrink. IDC reports that more than one in three retailers plan to invest in computer vision checkout technology in the next three years.<sup>1</sup> For many early adopters, the cost of discrete accelerators to enable AI inference at the edge has prohibited the scale needed to take full advantage of the solution.

Intel provides a comprehensive, integrated range of hardware and software building blocks to streamline development of AI-enhanced checkout solutions. This solution overview discusses variations of AI-enhanced checkout systems with platform suggestions and introduces Intel components, which are designed to give retail-industry developers a streamlined development experience and a starting point for their own solutions. Intel provides the right compute to optimize platform costs, as well as the tools to ease development and in-field management of those platforms.

### Patterns for successful development and deployment

As first principles, AI computer vision solutions must be efficient and scalable. Their paths to production must be as streamlined as possible for fast time to value, with the performance and robustness to deliver differentiating customer experiences. Successful transition from pilot to profit requires optimizing platform cost, managing complexity, providing inference speed and accuracy at scale and seamless integration into the business.

To address these challenges, Intel has a wide range of compute at different price points to ensure you can build the most cost-effective solution at scale while meeting solution performance requirements. Some vision checkout solutions, such as a Weigh & Go smart scale to automatically detect produce, may only require a CPU to run the computer vision pipeline, AI models and the other logic and interface software. Other solutions with larger AI models and complex pipelines such as loss prevention may have more extensive system requirements, including combinations of CPU, integrated GPU and discrete GPU resources.



Ingredients in a Vision Checkout Solution

## Frictionless checkout, at any scale

There is no one-size-fits-all for AI-enhanced checkout, so it is important to have the flexibility to scale up or down depending on customers’ needs. Retailers will tailor AI-enhanced checkout solutions based on individual use cases, requirements and desired customer experiences. Factors in sizing the compute platform include the following:

- **Number of items to be recognized.** Solutions range from hundreds to thousands or potentially even millions of constantly changing SKUs. Model and pipeline complexity may grow with the number of SKUs to be recognized, and it is important to have a robust infrastructure to handle the new data collection, model retraining and MLOps to manage updated models.

- **Robustness of experience.** Optimizing usability can create complexity, such as requiring additional cameras for accuracy when placing more items at once on the checkout plate.

- **Type of customer interaction.** For example, requiring customers to place items on the plate versus allowing them to simply swipe impacts pipeline complexity, supported frame rate and camera requirements.

Intel also provides the software tools to allow developers to adapt to multiple, changing use cases without requiring providers to redesign architecture or refactor software. Solutions can scale up or down across existing and future generations of CPUs, GPUs and other hardware. This approach also opens the door to balancing AI and non-AI workloads across the different types of compute hardware, optimized for key requirements including performance and cost.

AI-enhanced Checkout Sample Configurations				
Config	Produce	Mini	Convenience	Big Box
# SKU	~500	<2500	Up to 20K	>20K
# Items in Frame	Single	Single	Multi	Multi
Stream / Frame	Frame	Frame	Frame	Stream
# Cameras (3840x2160)	1	1	6	8
Example Pipeline	Decode + Object Detect (Small)	Decode + Object Detect (Medium)	Decode + Object Detect (Medium) + Classification + Text Recognition	Decode + Object Detect + Tracking + Classification + Text Recognition + Barcode Recognition
Target Platform for CV Pipeline + POS App + ERP Modules	Intel® Core™ i3	Intel Core i7	Intel Core i7 + Intel® Arc™ discrete GPU	Intel Core i9 + Intel Arc discrete GPU (for single station) Or Intel® Xeon® + Intel Flex Series GPU (to run multiple stations)

## Executing Inference at the Edge

While cloud-based deployment may initially be attractive, challenges around latency, quality of images/video, cloud costs, reliability and availability have led many providers to move vision-based AI-enhanced checkout solutions to the edge, with growing momentum to capture benefits such as:

- **Greater responsiveness** by using local inference to eliminate network latency.
- **Improved accuracy** using higher camera resolutions, without compression requirements for long-haul transmission.
- **Service resiliency** against network outages that would impact connectivity to cloud resources.
- **Reduced operating costs** by avoiding ongoing network-bandwidth and cloud expense.

## Intel's software tool suite

The Intel value proposition for AI-enhanced checkout extends beyond hardware platforms to software tools for developing and scaling solutions everywhere, with maximum agility, efficiency and value. This toolset is designed to minimize the impact of technology transitions using existing models or to provide the best start possible for new projects. Key offerings include the following:

- **Intel® Distribution of OpenVINO™ toolkit** enables optimization of existing AI models for Intel hardware to boost deep learning performance for computer vision and other AI usages.
- **OpenVINO Model Server** provides a comprehensive framework to serve and manage machine learning models at scale, exposing the power of Intel hardware over a network interface.
- **Intel AI-Enabled Computer Vision Checkout Framework** provides a set of optimized AI-pipeline reference implementations, including automated self-checkout, that help developers get started developing and benchmarking their own AI-enhanced checkout solution.
- **Intel® Geti™ platform** enables building computer vision models in a fraction of the time and with less data, simplifying the tasks of data labeling, model training and optimization.
- **Intel Developer Cloud for the Edge** is an online sandbox to learn, prototype, test and run your workloads for free on the latest Intel hardware and software.

## Learn more:

[Automated Self-Checkout Retail Reference Implementation](#)

[Intel Retail Technology Solutions](#)

## Contact

Connect with an Intel representative today to discuss solutions for your retail challenges.

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<sup>1</sup>IDC, September 2023. "IDC Innovators: Computer Vision for Automated Checkout and Self-Checkout, 2023." <https://www.idc.com/getdoc.jsp?containerId=US47252721>.

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