Solution Brief

AI Vision and Robotics
Logistics and Manufacturing

Vecow simplifies and accelerates mobile robot deployments

11th Gen Intel® Core™ processors, Intel® Edge Insights for Industrial and Intel® Edge Controls for Industrial enable this quick-deploy autonomous robot solution

Vecow
Smarter AIoT Solution Services

"Customers can get faster time to market and save up to six months of time[2] from integrating different software stacks by adopting this preconfigured framework."

—Thomas Su, vice president of Vecow

Autonomous robots for unmanned handling are driving exciting new use cases in logistics, warehousing, and factories, with an expected global market value of USD 290 billion by 2040.[1] By automating the storage and movement of goods on-site, production lines can speed up output and maintain low overhead. Businesses are already benefiting from Automated Guided Vehicles (AGVs) but AGVs need to be guided by wires, magnetic strips, or sensors that are costly to install. The next generation of unmanned handling robots is emerging in the form of Autonomous Mobile Robots (AMRs). These advanced robots use embedded machine vision to visualize, understand, and orient themselves in changing environments, raising the bar for compute performance, power efficiency, and real-time capabilities of processors that power them. This results in smarter robots that aren't dependent on floor markers, and that can interpret and adapt to barriers and obstacles as personnel and equipment move around a facility.

Challenge: Smarter, but costly and complex

AMRs are more advanced than AGVs in that they provide flexible movement instruction, vision AI–oriented solutions, and multirobotic control to network with other robots in a shared facility. However, the learning curve for deploying AMRs is high due to the complex software stack that enables them. A successful deployment integrates multiple ingredients: AI vision inference, navigation, networking protocols, real-time optimizations, high CPU performance, and high graphics performance. According to Thomas Su, vice president of Vecow, "Due to the complicated collaboration process and the high number of open-source software stacks, it's not uncommon that system integrators with a dozen engineers have to spend more than three months to evaluate integrating the software." This high barrier to entry keeps many potential customers from enjoying the benefits that AMRs can offer.

Solution: Preconfigured stacks that cut down deployment time

Vecow's AMR consists of an industrial PC and Vecow's Perception software. The combination simplifies the integration and testing of AMR components, resulting in faster time to market for robot builders. Su comments, "Customers can get faster time to market, and save up to six months of time[2] by adopting this preconfigured framework." The Vecow-enabled AMR also meets the high performance and efficiency requirements to support AI vision and real-time control workloads. These features help customers bypass a lengthy development cycle to integrate software layers, making it efficient to implement AMRs at scale.

Inside the AMR

AMRs use machine vision with accuracy levels comparable to human vision to recognize objects and smartly navigate an environment. The Vecow AMR is equipped with the Intel® RealSense™ Tracking Camera T265 and is fully compatible with Intel® RealSense™ LiDAR Camera L515. The software architecture is based on the combination of Intel® Edge Insights for Industrial and Intel® Edge Controls for Industrial. These two software platforms provide machine-to-machine (M2M) communication, motion control, time-series analytics, cloud connectivity, workload convergence, and 5G support to enable machine networking. The software stack also allows administrators to control the AMR through the cloud with a Vecow-provided API on web-based platforms. Vecow further integrates a robotic control software development kit (SDK) and simultaneous localization and mapping (SLAM) function, which allow human operators to control individual units as needed and give the AMR its autonomous navigational capabilities. Vecow thoroughly tests and validates each layer of the stack, so customers can focus on unlocking value sooner.

Figure 1. The Vecow industrial PC delivers enhanced machine vision, AI performance, and 5G connectivity in a small footprint.

Powerful CPU/GPU performance for AMRs

Under the hood, Vecow's IPC is powered by the 11th Gen Intel® Core™ i7-1185GRE and an integrated GPU with Intel® Iris® Xᵉ graphics. Together, they enable the AMR to self-navigate. Battery efficiency is important for AMRs, so the 11th Gen Intel Core processor is especially suitable for this application with a configurable 12W-28W thermal design point (TDP). The processor also features Intel® Deep Learning Boost (Intel® DL Boost), which includes VNNI instruction support on the processor and DP4A instruction support on the integrated graphics engine, to further accelerate AI inferencing. Up to 96 graphics execution units with Intel Iris Xᵉ graphics allow the AMR to run up to four AI models simultaneously, 2x more than previous-generation robots,[2] to allow for faster inference and deployment. Integrated graphics also help save on hardware costs, according to Su: "The 11th Gen Intel Core processor integrates high-performance graphics processing technology, so there is no need for additional GPUs. With the addition of the Intel® Distribution of OpenVINO™ toolkit, you can also save the cost of additional VPUs."

Vecow-enabled AMRs also benefit from key technologies such as Intel® Time Coordinated Computing (Intel® TCC),[3] which helps establish reliable real-time data processing that's protected from interference caused by other processes happening on the same system. When coupled with real-time networking technologies, Intel TCC helps robots communicate with each other in a more coordinated manner while working on a more complex task.

See backup for configuration details. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

Refer to https://software.intel.com/articles/optimization-notice for more information regarding performance and optimization choices in Intel software products.

Powerful developer tools enhance AI learning

Vecow's Perception SDK is composed of three major stacks: robotic operating system 2 (ROS 2), Robotic Control based on Intel Edge Controls for Industrial, and Vision AI based on Intel Edge Insights for Industrial. Edge Insights for Industrial software enables the AMR to ingest and analyze video feeds and is optimized on Intel® architecture. Su explains, "Regarding the vision AI function, we adopted the Edge Insights for Industrial platform to perfectly work with Intel® CPU infrastructure for AI inference workloads and optimize, quantify, and execute the model." Edge Insights for Industrial supports image collection, recognition, segmentation, and object detection, fulfilling many of the industrial edge AI needs in a simple, single software package.

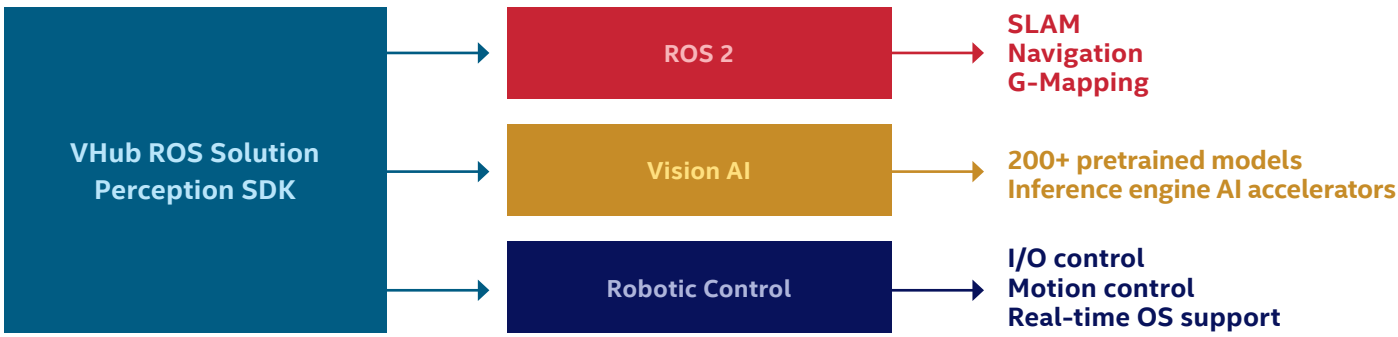

Figure 2. Intel® Edge Insights for Industrial drives vision AI acceleration and optimization in the AMR's software stack.

One of the key benefits of the Perception SDK is that it gives customers access to 200+ common-use models to facilitate AI training for most industrial use cases, which helps speed up the deployment process. Vecow estimates that with this SDK, typical AI training and deployment can perform up to 30 percent faster and requires 20 percent fewer engineering hours.[2] With the full Vecow software stack, customers are able to accelerate their trial and testing of the AMR units by 3x over a three-to-four-month period.[2]

Making the autonomous more accessible

Vecow's innovations demonstrate creative integration of software tools and Intel solutions that make autonomous robots more cost- and time-efficient to deploy. This ultimately allows greater segments of the industrial market to tap this resource, opening up new opportunities to lower overhead and to improve production floor efficiency.

Learn more

Vecow AMR

Enabled by the VHub ROS software stack that helps reduce deployment times, the Vecow AMR delivers advanced navigation capabilities for industrial spaces.

Learn more ›

11th Gen Intel Core processors

11th Gen Intel Core processors deliver robust integrated graphics capabilities to support AI vision and inference workloads in embedded use cases.

Learn more ›

Up to four
simultaneous
AI models[2]
With Intel® Iris® Xᵉ graphics

Up to 30% reduction
in AI training time[2]
With the Vecow Perception SDK

Up to 3x faster
deployment time[2]
With the VHub ROS software stack

About Vecow

A global team with embedded expertise, Vecow designs and delivers industrial-grade computer systems with leading performance, trusted reliability, and innovative concepts.

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1. "Mobile Robots, Autonomous Vehicles, and Drones in Logistics, Warehousing, and Delivery 2020-2040," IDTechEx, 2020. https://www.idtechex.com/en/research-report/mobile-robots-autonomous-vehicles-and-drones-in-logistics-warehousing-and-delivery-2020-2040/706.
2. Source: Internal Vecow measurements. "Four AI models simultaneously, 2x more than previous-generation robots" claim based on AMR with Intel® Core™ i7-1185GRE vs. previous-generation AMR with Intel® Core™ i7-8665UE.
3. Not all features are available on all SKUs.

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