

Addverb Simplifies AGV Maintenance with Speech-to-Text, Generative AI

Addverb's AI control assistant reorients AGVs by translating requests from warehouse workers into AGV commands. Intel® architecture-based server from Supermicro provides edge AI processing



The same scene plays out across warehouses and distribution centers across the globe: an autonomous guided vehicle (AGV) has gone off course interrupting operations in a high-volume warehouse that processes tens of thousands of sorts per hour.

Within minutes, one of the company's maintenance engineers, working at a nearby facility, jumps into a car and heads to the facility. Facing traffic and distance, the engineer arrives in several hours and quickly fixes the problem. But the damage is done as the warehouse has a backup of tens of thousands of products requiring overtime to clear up and the possibility of angry customers.

ADDVERB



Production line AGV problems, like the one described above, are increasing as AGV fleets grow. While engineers can be a scarce resource, there is always an operator onsite who could respond to the malfunction. But too often there are language and training barriers that prevent them from fixing the problem quickly.

A new AGV control AI assistant from Addverb combines the power of generative AI with speech-to-text translation capability that can allow the operator to speak in any one of 98 languages and be understood by the AGV, with those words translated into commands to fix the problem quickly and with minimal lost time.

Global robotics leader Addverb, an Intel® Industry Solution Builders' Industrial Builders Community member is working with Intel® architecture processor-powered servers from Supermicro to make this voice-controlled industrial robot solution a reality for its Zippy family of sorting robots.

Sorting Robots Tackle Warehouse Jobs

A significant part of the work done in a warehouse or distribution center is sorting packages, parts or products to match with orders, to build inventory or to ensure products get sent on the right transport for overnight delivery.

Sorting has been a manual process that is slow, expensive and mistake prone. Warehouse and distribution centers are embracing automation to streamline their distribution centers, and adding sorting robots is a part of those initiatives.

Sorting robots are advanced machines designed to automate pick-and-place items by identifying and categorizing them based on defined criteria such as size, shape, color, or barcode information.

Benefits of Sorting Robots

- Increased number of inventory cycles per hour can boost productivity.
- Fully automatic, helping reduce manual dependency and errors by up to 80% compared to manual sorting.¹
- Replaces humans doing dangerous work to improve the safety of operations.
- Flexible system that allows for easy handling of increased or decreased operational volumes by adjusting the number of robots on the warehouse floor.
- Installation time is straightforward and streamlined compared to conventional sortation systems.

Zippy Family of Sorting Robots

Addverb’s Zippy sorting robots are a family of robotic systems (see Figure 1) that sort items at very high speeds.

The system is complete with obstacle detection and uses grid-based ground markers for direction. Zippy management software allows flexible adding or removing of robots and sorting destinations as package volumes increase and decrease. The complete Zippy product family includes:

- Zippy 6: Sorting robot with a payload capacity of 6 kg
- Zippy 10: Sorting robot with a payload capacity of 10 kg

- Zippy 25: Sorting robot with a payload capacity of 25 kg
- Zippy 40: Sorting robot with a payload capacity of 40 kg
- Zippy Tug: Advanced AGV with a payload capacity of 2,000 kg designed for material movement and tugging applications in various industrial settings
- Zippy X: AGV with a payload of up to 15 kg that utilizes vertical lifting capabilities for flexible material handling and sortation, and to facilitate better ergonomics in manual operations

AGV Control AI Assistant for Native Language Management

To help with managing the Zippy sorters, Addverb has developed an AGV control AI assistant based on generative AI large language models (LLM). It is an autonomous communication system for the Zippy robots to minimize downtime and increase productivity. As seen in Figure 2, a warehouse worker can communicate to the model in their native language via unstructured speech. The generative AI model is smart enough to translate that speech into commands that the Zippy AGV recognizes.

“Addverb is very optimistic about the application of AI in warehouse robotics and in general robotics. AI opens up lot of possibilities in industrial maintenance and inspection. It enables a new paradigm in home robotics using AGI built on Vision Language Action model.”

-Tapan Pattnayak, Distinguished Scientist – Leads Addverb Technology roadmap.



Figure 1. Addverb Zippy sorting robot.

¹Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.

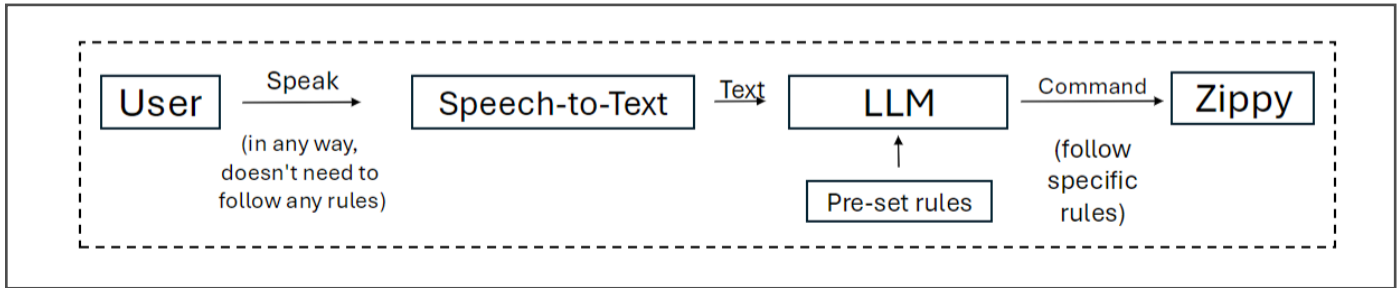


Figure 2. Process used to translate verbal requests into AGV commands.

The system uses two large language model (LLM)-based generative AI technologies:

- Llama 3 is an openly available and free-to-use LLM developed by Meta. It is cost effective enough for Addverb to deploy it on edge servers for onsite AI inference workloads.
- Addverb also utilizes ChatGPT, a commercial LLM for generative AI that resides in the cloud and can be accessed by the Addverb model when performance is needed. For this application, ChatGPT offers reduced time to generate the instructions (tokens) that are sent to the Zippy AGVs.

For speech-to-text, the solution makes use of OpenAI’s Whisper speech-to-text solution running on the local server.

“Our work showcases large language model inference at the edge. These projects have demonstrated the versatility of Intel® architecture servers as a complete edge AI ecosystem.” Yifei Lyu, Addverb Engineer.

Supermicro Server Provides Edge Compute

Addverb selected the Supermicro IoT SuperServer SYS-111E-FWTR high-performance server to run the AGV control system. The SYS-111E-FWTR (see Figure 3) is designed to meet the demands of generative AI and machine learning workloads. With a single socket design that uses 4th Gen Intel® Xeon® Scalable Processors, this server offers computing power with up to 32 cores (or up to 64 threads). The server supports up to 2TB of DDR5 RAM.

For I/O, the server features 1GbE and 10GbE ports as well as USB ports and a video port. These network connections are critical for handling large datasets and ensuring fast communication between nodes in AI clusters. This level of flexibility is essential for organizations looking to scale their AI infrastructure to meet expanding robotic fleets.

The system has three PCIe 5.0 expansion slots (one PCIe 5.0 x16 LP slot and two PCIe 5.0 x16 FHFL slots) for network

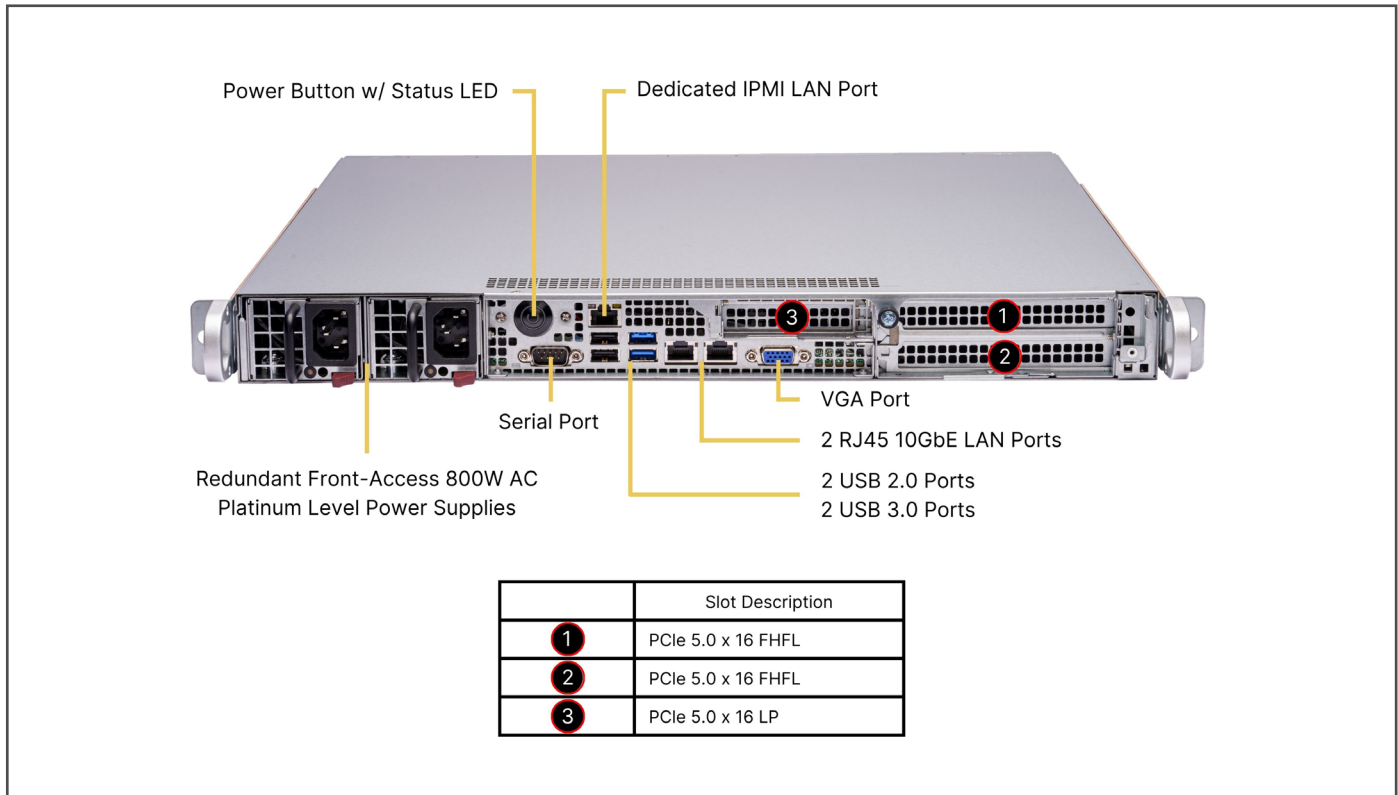


Figure 3. Front view of Supermicro IoT SuperServer SYS-111E-FWTR server.

devices and accelerator cards. These PCIe expansion slots can support graphics processor units (GPUs), such as the Intel® Data Center GPU Flex Series, for additional AI/LLM processing power.

CPU Accelerates AI Processing

Other 4th Gen Intel Xeon Scalable Processor advanced features that are available in the SYS-111E-FWTR and are important for cost-effectively accelerating AI inference and training tasks in the Addverb application include:

- Intel® Deep Learning Boost (Intel® DL Boost) is an instruction set architecture for Intel architecture CPUs, allowing them to improve performance on deep learning tasks such as training and inferencing.
- Intel® Advanced Vector Extensions 512 (Intel® AVX-512) is a set of instructions with ultra-wide 512-bit vector operations capabilities that addresses a wide range of demanding computational tasks including AI and deep learning.

Intel DL Boost and Intel AVX-512 instructions improve the performance of the edge servers, giving them the capability to run the Llama 3 model at the edge where its close proximity to warehouse operations provides the low latency processing that delivers no user-discernable delays.

Conclusion

The growth in AGV fleets will mean more maintenance issues and more demand for maintenance engineers. But in many cases these issues can be resolved by untrained warehouse

staff using Addverb's AGV control AI assistant that allows anyone to speak into the system and have their words turned into commands that are understood by the AGV.

The system leverages the use of speech-to-text to translate words in many languages so that it can be understood by the Llama 3 and ChatGPT LLMs that turn those requests into commands for the AGVs. To deliver the compute performance needed for the AI models Addverb has turned to Supermicro for an edge server that is based on 4th Gen Intel Xeon Scalable Processors and is optimized for edge AI applications.

Learn More

[Addverb Homepage](#)

[Addverb Zippy Sorting Robots](#)

[Supermicro Homepage](#)

[IoT SuperServer SYS-111E-FWTR](#)

[4th Gen Intel® Xeon® Scalable Processor](#)

[Intel® Deep Learning Boost \(Intel® DL Boost\)](#)

[Intel® Advanced Vector Extensions 512 \(Intel® AVX-512\)](#)

[Intel® Data Center GPU Flex Series](#)

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