

AUTONOMOUS VEHICLE PROVIDER BUILT EDGE-TO-PERCEPTION STACK FOR AGRICULTURE ROBOTICS

Embedded engineering across BSP, perception, simulation,
and ground truth

Challenge

A global autonomous vehicle technology provider building self-driving systems for agriculture lacked the in-house embedded software expertise to develop and validate a production-grade perception stack on NVIDIA platforms. The team needed to engineer everything from low-level BSP and high-speed sensor fusion to 3D simulation environments and ML-ready data pipelines — much of it requiring niche skills the client could not source internally. Without an expert partner, the autonomous roadmap stalled at integration.

Approach



Built the full edge computing stack on NVIDIA NRU-110V (ARM 64-bit) — BSP with Kernel, DTS, and Rootfs, plus fastRTPS+DDS and ROS — controlling sensor data buffers with low latency and high accuracy for autonomous driving.



Engineered the perception software for Carnegie and surround-view cameras with GNSS, optimizing fastRTPS+DDS, ETH driver Tx/Rx, and time synchronization to deliver real-time, high-resolution media streams to the GPU.



Developed a 3D simulation environment combining MATLAB Simulink, Unity3D, Blender, and Unreal Engine — including custom UE C++ plugins, fisheye cameras, depth maps, and semantic and panoptic segmentation for agricultural scenes.



Implemented a Ground Truth and ML data pipeline on AWS using video and Ouster LIDAR — automating data labeling, privacy masking of faces and plates, fruit-ripeness classification, and Jenkins-based validation and reporting.

Outcomes Delivered



Reduced sensor-to-viewer streaming latency from 2 seconds at initial integration to 200ms, enabling real-time perception for safe autonomous operation in agricultural fields.



Delivered a production-grade autonomous software stack on NVIDIA — full BSP control, low-latency sensor fusion, and high-resolution perception across camera, LIDAR, and GNSS sources.



Established a complete simulation and ground-truth framework that accelerates model training, validation, and feature rollout across the autonomous vehicle program.

Closing

Veltris combined deep embedded systems engineering, NVIDIA platform expertise, and applied computer vision to give an autonomous vehicle technology provider a production-ready perception stack — bridging niche skill gaps and turning sensor data into reliable, real-time intelligence for agricultural autonomy.