

# Bullet Train Operator, JR Kyushu, Chooses AI-Powered AMD Solution for Track Inspection

Edge AI solution from Tokyo Artisan Intelligence (TAI), powered by AMD Kria SOM, has helped the railway company dramatically improve operational efficiency.

#### PARTNER

**IR** KYUSHU RAILWAY COMPANY

TAI INTELLIGENCE

## INDUSTRY

Transportation

## CHALLENGES

JR Kyushu Railway was looking for a way to improve the efficiency of its track inspection processes.

## SOLUTION

The company deployed a cart-based inspection solution from TAI that uses artificial intelligence to process camera images at high speeds using an AMD Kria SOM.

### RESULTS

The solution has helped JR Kyushu improve operational efficiency of track inspections.

AMD TECHNOLOGY AT A GLANCE

According to the <u>Japan Transport Safety</u> <u>Board</u>, there have been 29 train derailments in Japan over the past five years. That might sound bad, but it's a remarkable feat compared to 6,089 derailments in the U.S. reported by the U.S. Department of Transportation's <u>Bureau of Transportation Statistics</u> over the same period.

Safety is the number-one priority in Japan, which is why Kazuhiro Sakaguchi, deputy manager in the Engineering Division, Shinkansen Department at JR Kyushu, said that track inspections in Japan are carried out without fail at specified intervals based on laws and regulations.

JR Kyushu's train operations cover a distance of 2,342.6 km (1,455 miles) in seven Kyushu prefectures, including Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki, and Kagoshima. Track inspections are crucial – especially for Shinkansen bullet trains traveling at speeds of up to 260 kilometers per hour (about 161 miles per hour).

"Inspections require a variety of instruments and equipment, depending on the type of inspection," Sakaguchi explained. "There are general instruments such as inspection hammers and feeler gauges, as well as specialized instruments for measuring rail distortion. The frequency of inspections varies depending on the type of inspection."

Sakaguchi said meticulous and regular inspection of the tracks is important to immediately detect issues, which is why the company decided to choose an AMDpowered solution from Tokyo Artisan Intelligence (TAI). It uses AI and highspeed image processing to detect and inspect loose bolts and other track issues.

## CHALLENGE

"Traditionally, railroad track inspections are performed on foot and at night, but we have been able to streamline this process using AI," said TAI co-founder and CEO, Hiroki Nakahara.

JR Kyushu's Sakaguchi said that changing the inspection method from walking to using a cart to increase efficiency required faster movement and very careful evaluation of camera and lighting tools.

The condition of the rails also became a problem, especially when trying to avoid detecting fake problems caused by reflected light on wet railroad tracks. "TAI solved these issues, not only with AI, but also by choosing the right cameras, lighting, and image processing tools," he said.

# SOLUTION

The TAI track inspection system is a twoseated cart that rides on the rails at a speed of 20 km per hour (12 mph) with one operator driving the cart, and the other monitoring images and data from the cart on a tablet. If a problem, such as a loose bolt is detected, the cart is stopped, and the issue is examined by the crew.



At the heart of the solution is a vision AI box, named SEASIDE-R5 (A Specified Edge AI SoM for Intelligence Design and Embedding), that is attached to the cart and powered by an FPGA-based AMD Kria<sup>™</sup> K26 SOM. The box features a high-speed camera with pre- and post- data and image processing for AI inferencing handled by the Kria SOM. Data is transmitted from the AI box to tablet via a Wi-Fi connection.



TAI track-inspection cart built for JR Kyushu.



TAI CEO, Hiroki Nakahara, shows off "SEASIDE-R5" Edge AI box powering track-inspection cart.

#### About JR Kyushu Railway Company

JR Kyushu is a Japanese train operator. The company was established in 1987, taking over the railway business from Japan National Railways (JNR) that had been managed by the Oita, Kumamoto, and Kagoshima Railway Management Bureaus, and the Kyushu General Bureau. The railway operates over a distance of 2,342.6 km in seven Kyushu prefectures. More information at: <u>https://www.irkyushu.co.jp/english/</u>

#### About Tokyo Artisan Intelligence

TAI was established in March 2020 as a venture company originating from Tokyo Institute of Technology. The company's mission is to promote the social implementation of AI technology along with the creation of new computation technology. The company is based in Kanagawa, Japan. More information at: <u>https://tokyo-ai.tech/</u>.

"The Kria SOM delivers the performance and reliability that we need along with plenty of DDR memory on board for intelligent AI and embedded applications. It's also better with power and heat dissipation than competing embedded GPUs," said Nakahara.

The Kria K26 SOM is a compact, embedded platform that integrates a custom-built AMD Zynq<sup>®</sup> UltraScale+<sup>™</sup> MPSoC with DDR memory, nonvolatile storage devices, a security module, and an aluminum thermal heat spreader. The SOM is designed to be plugged into a carrier card with solution-specific peripherals and serves a variety of applications, including smart city, machine vision, industrial robotics, and AI/ML computing.

## RESULT

"The most-important benefit of AI, in this case, was reduction of cost," Nakahara said. "Replacing the conventional method of inspecting tracks on foot with inspections using carts has led to a dramatic improvement in operational efficiency."

Sakaguchi added, "Although being FPGA-based was not a requirement for adoption, it was a factor in its adoption in terms of reliability and durability for railways. Since railways are installed in a natural environment, we believe that being able to update them to suit the daily changing natural conditions is an important element. With the new solution from TAI and AMD, we were able to improve the efficiency of conventional track inspection, and we anticipate further improvements in inspection efficiency through future functional enhancements."

WANT TO LEARN MORE? About <u>AMD Kria SOM</u> About <u>TAI</u> About <u>IR KYUSHU</u>

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