



Automated railcar inspections increase security and revenue with AI at the edge

Duos Technologies Group utilizes sophisticated artificial intelligence (AI) at the edge coupled with Dell EMC PowerEdge servers to perform automated safety inspections without halting trains.

duostech

Technology Services

North America

Business needs

Providing industry and government customers with intelligent inspection, automation, safety and security solutions, Duos Technologies Group, Inc. ("Duos" or the "Company" - Nasdaq: DUOT) continually pushes the boundaries of IT. To keep pace with expanding AI-enabled data capture analytics for its edge railcar inspections, the company chose the latest Dell EMC PowerEdge servers.

Solutions at a glance

- Dell EMC PowerEdge XR2 with Intel® Xeon® processors
- Dell EMC PowerEdge R740 and R740xd with Intel® Xeon® processors
- Dell EMC PowerVault ME4 Series
- Dell EMC OpenManage Enterprise
- integrated Dell Remote Access Controller (iDRAC)
- VMware vSphere Enterprise 6.7

Business results

- Up to 120:1 gain in efficiency compared to manual inspections.
- 8 minutes or less for an intelligent visualization inspection of a typical train
- \$3000 savings per instance using iDRAC 9
- Up to 1.3TB of data processed daily at each remote inspection site
- Scalability and reliability to provide applications across multiple industries



1.3 TB

of data processed and analyzed daily per inspection site



8 minutes

or less to visualize a typical freight train



120:1

reduction in inspection time



\$3,000

savings per instance using iDRAC9

Trains need to keep moving. Every second a train spends idling creates what is called “dwell time.” With thousands of locomotives intersecting across North America pulling millions of railcars, the impact of prolonged dwell time is substantial. Through time consuming manual inspections, there are major impacts to crew, locomotives, railcars, fuel and lading which can impact traffic across the continent and costs rail companies and consumers millions of dollars annually.

That’s why leading freight railroads such as CSX and others have turned to Duos for automated inspections. These solutions rely on PowerEdge servers deployed at the edge to capture images, model data and handle sophisticated analytics and reporting without halting the trains.

Intelligent 360 visualization at high speeds

Duos Technologies’ challenge was finding a way to leverage technology as a force multiplier to meet customer requirements for a better, faster inspection process for trains running at full speed. Duos developed innovative data analytic solutions with AI at the edge to conduct more reliable railcar inspections, which are available 24/7/365 in all climates and conditions.

Duos’ railcar inspection portals acquire a wide array of data. The PowerEdge XR2 rugged servers are deployed for image capture with the PowerEdge R740 servers with NVIDIA Tesla GPUs for AI inferencing. The PowerVault ME4 Series provides data retention with the Networking S-series switch optimizing traffic flows.

This data includes 360° visualization of railcar defects as well as vibration, laser and LiDAR sensor readings, all while trains travel through portal “barns” at high speeds. Data is processed and analyzed in real time to provide prompt, actionable insights to inspectors and operators.

“We count on PowerEdge servers to process and analyze the images and other data from the cameras and sensors 24x365, using our AI models.”

David Ponevac,
Chief Technology Officer
Duos Technologies

The system can flag broken wheels, brake issues, dragging chains, steel gouges, open doors, and other concerns - some of which could lead to a derailment or another catastrophic event. Duos’ solution also provides data for customs or other regulatory-mandated inspections.

“In the eight minutes it takes to use a flashlight and piece of chalk to inspect a single car, we can inspect a full train of 120 cars or more,” says Wm. Scott Carns, Chief Commercial Officer at Duos Technologies. “We strategically locate these systems 50 to 100 miles from inspection points. This way, when a train arrives, needed repairs and further inspections can begin immediately based on the data we provide.”

Pushing technology to the edge

Duos’ inspection portals are situated along the 140,000 miles of track in the U.S., Canada and Mexico - from a Midwest cornfield to a scorching Mexican desert and a windblown Canadian prairie. The portals are powered by “data centers in a box” at the edge - with 45U cabinets stacked with Dell Technologies servers, storage, networking and more.

The volume of data collected daily at each site can be enormous: 700 GB in images alone, with a total of as much as 1.3 TB of data per

inspection portal including the various sensor readings. Data captured as each train passes must be processed and analyzed within minutes. This constraint makes it virtually impossible to stream all that information back to a centralized data center.

“We count on PowerEdge servers to process and analyze the images and other data from the cameras and sensors 24x365, using our AI models,” states David Ponevac, Chief Technology Officer at Duos Technologies. “This gives customers the actionable intelligence they need when they need it.”

Duos builds dozens of proprietary AI models for the applications in its data center in Jacksonville, Florida. Training models can take anywhere from 16 hours to a week for the most complex sets containing hundreds of thousands of images. These models are then released for inferencing at the edge where they deliver up to 99% accuracy.

“PowerEdge servers equipped with six to ten GPU cards provide the throughput to process and analyze data in microseconds,” Ponevac explains. “Our goal is to use our PowerEdge-driven edge computing portals to replace manual inspection points, so we can automatically detect issues at track speed.”

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Powerful remote server management

To remotely manage and administer its far-flung estate of servers, storage and other solutions, Duos relies on Dell EMC OpenManage Enterprise and integrated Dell Remote Access Controller (iDRAC) and VMware vSphere 6.7 Enterprise.

The iDRAC solution provides system logs and event notifications that enable Duos to keep tabs on the health and performance of its IT infrastructure wherever deployed. This includes tracking trends, responding to hardware failures and easily handling tasks such as firmware upgrades and BIOS updates.

“With iDRAC, we can completely rebuild a server operating system from right here in Jacksonville,” adds Derrick Schmenk, Vice President of Information Technology at Duos Technologies. “Doing that remotely saves us money and speeds recovery time. Every time we use iDRAC to get a server back up and running, we save \$3,000 a pop.”

VMware vSphere is used to host servers running internal applications for development, accounting, monitoring, authentication and security.

An expanding range of solutions

Beyond its innovative freight railroad solutions, Duos has built multi-layered intelligent systems to address complex challenges in wide-ranging industries - from protection of critical oil, gas and petrochemical infrastructure to movement control and situational awareness systems for correctional facilities all with the support of Dell Technologies.

For example, the company's Automated Logistics Information Systems (alis®) documents trucks entering and leaving distribution centers and other delivery points. An intelligent kiosk running on a Dell Technologies micro workstation scans driver's licenses and waybills while collecting other information needed to validate deliveries. Average entry times have been cut in half from six to three minutes.

"The investment per inbound and outbound lane is only about \$200,000 - compared to \$350,000 per year in payroll costs for a manned gatehouse," Carns comments. "That makes the return on investment as little as six to eight months."

He continues, "Because our applications are unique, it's hard to find providers that can perform at the level we need. Dell Technologies offers the best combination of highly reliable products, solutions, services and support for our AI-based solutions."

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Dell Technologies Artificial
Intelligence solutions
and **PowerEdge Servers**



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