Client Story

Increasing Railroad Maintenance Productivity With the IoT and Azure

A railroad company wanted to enhance its maintenance process and improve rail safety for its workers. Insight created a drone-based computer vision solution that uses Internet of Things (IoT) edge processing to prioritize images that indicate the need for maintenance.

Industry:
Transportation

The challenge:
The client sought a solution that would enable faster and more efficient rail inspections, real-time alerts for maintenance issues, and reliable data collection and control for continual process improvements.

The solution:
- Custom IoT edge and data architecture platforms
- Microsoft Azure
- Drone-based computer vision solution

Accident prevention is a top priority for railroad companies. The sooner maintenance issues are identified, the faster repairs can be done to ensure the rail is safe. Railroad companies are also concerned about the safety of workers in the field inspecting or repairing the rail. Minimizing on-site inspection time helps protect workers and decreases labor costs.

With approximately 32,000 miles of track, this client required support from thousands of field workers to conduct railroad maintenance inspections. In 2018, the client dedicated $2.4B in capital investments for maintenance projects, which primarily involved replacing and upgrading rail, rail ties and ballasts — and maintaining rolling stock.

The client sought a solution to minimize the time required for personnel to be in the field visually inspecting miles of rail, enabling workers to focus on actual maintenance. The company also wanted real-time alerts to accelerate repairs.

Matching solutions to desired outcomes

The company believed that a central dashboard for analyzing inspection data would allow subject matter experts to identify top priorities, further enhance maintenance productivity, and lower risks for workers and freight travel. Enabling measurable outcomes, such as inspecting high-risk equipment or areas where inspections were particularly critical or cumbersome, was a priority. The client also wanted a simplified way to combine and analyze data for additional process improvements in the future.

Insight designed and built a drone-based imaging solution that uses IoT edge processing to prioritize images to be sent to a cloud data platform for analysis and escalation to track inspectors. Workers can then shift their time from inspection to investigating or initializing any maintenance required.

An evolving solution

To enable monitoring and alerts for rail assets, the client had begun investing in connected solutions such as Unmanned Aerial Vehicles (UAVs, otherwise known as drones), moving rail cars, intelligent switches and more. At the same time, the client was enhancing its engineering platform to generate real-time data consisting of telemetry: ambient measurements, sensor readings, and video and still images.

The client used a third party to deploy UAVs to fly over the rails and collect images in designated zones where drones were more efficient than personnel. The UAVs flew up to 400 miles per sortie. When the UAVs returned to the base, the image data was combined with geotagging data and analyzed to determine the status of the rail asset. The solution met some primary goals for the railroad company, but a few challenges remained.

First, the data was collected on a USB memory stick after the drone returned to its base, which meant that the data couldn't be received in real time and the process couldn't be automated. Furthermore, the collection was done by a third party, leaving the client without direct control of its data — which could end up being decentralized, depending on the drone base and the employee who physically retrieved it.

Second, the drones collected images along the rail line, but the client also wanted the ability to focus on maintenance required on the frogs, or rail switches.

> *Because the railroad company didn't have the ability to collect the data in real time, it was looking for opportunities to speed the process of data collection and make analysis faster and more efficient.*

The client sought a solution that would enable real-time alerts if the images identified an issue requiring maintenance. The company also wanted to address potential security issues that could arise from transferring data from drones or other remote data collection appliances to the corporate network. Finally, the client wanted absolute control over its data collection.
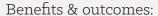
Delivering meaningful outcomes

By partnering with Insight, the client transformed its maintenance process to increase productivity, optimize its workforce and improve rail safety.

Our team built a reusable IoT edge and data architecture platform that enables automatic video file analysis, initiates real-time alerts and streamlines image uploads from the drone to the Microsoft® Azure® cloud for additional analysis.

Insight developed the IoT and data architecture platform to:

- Provide an Azure **cloud-based, scalable and centralized** data repository.
- **Reduce the number of manual inspections needed** and, consequently, reduce labor costs associated with inspection.
- **Improve time-to-discovery of a defect** by enabling more frequent inspections, leading to a reduction in incidents and costs associated with liabilities and time out of service for damaged cars and tracks.
- **Improve time-to-discovery of conditions** indicating a need for preventive maintenance in advance of a failure condition.
- Improve **consistency and quality of inspections** relative to the variation that can occur in manual inspections.
- Enable the collection of sufficient time-interval data to **improve preventive maintenance guidelines**, further reducing incidents.

Benefits & outcomes:

Automated track inspection

Faster response time to safety issues

Lower cost of inspection

Improved rail and worker safety

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