

# Rajant Kinetic Mesh® Delivers Real-Time Slope Car Visibility for Safer Hoist Operations



Enlow Fork Mine, part of the Pennsylvania Mining Complex in Washington County, Pennsylvania, is a high-production underground coal operation extracting high-volatility bituminous coal hundreds of feet below the surface. To keep development and long wall operations supplied, the mine relies on a slope car hoist traveling more than 800 feet between surface and underground. Historically, the hoist operator could only judge the car's position by reading the footage on the hoist cable, with no direct visibility into what was happening in the slope. Working with Rajant and integration partner Control International, the mine implemented a real-time wireless video solution powered by Rajant Kinetic Mesh® to give operators and management continuous visibility of the slope car's movement, improving safety, situational awareness, and operational confidence.

## The Challenge

Enlow Fork Mine depends on a slope car hoist system to move supplies, materials, and equipment between the surface and underground workings more than 800 feet below. Previously, the hoist operator could only estimate the car's position using a footage counter on the hoist cable. There was no direct visibility into the slope, no way to confirm whether the track was clear, and no visual indication of potential obstructions or unsafe conditions. As production demands grew, the mine wanted a safer, more reliable method to monitor slope car movement in real time. The goal was to give the hoist operator continuous video coverage of the slope and the car's position without sending personnel into the confined space and without relying on fragile, fixed infrastructure that would be difficult to maintain in a harsh, underground environment.

## The Solution

Working with Control International and Rajant, the mine implemented a wireless video monitoring system built on Rajant Kinetic Mesh® technology. Hawk BreadCrumb® nodes were strategically positioned at the top and bottom of the slope to provide strong anchor points for the network. Additional Hawks were installed at the 200-foot and 600-foot levels, creating overlapping wireless coverage zones along the 800-foot slope.

A Hawk node was mounted directly on the slope car itself, effectively turning

### Customer Description

- **Location:** Washington County, Pennsylvania, USA

### Partners

**Control International** - A longtime designer and manufacturer of rugged industrial communication and control systems, delivering durable, high-quality solutions for harsh environments.

**Rajant Corporation** - Pioneers of peer-to-peer radio communications enabling real-time voice, video, and data to connect machines, robots, and people together as part of a secure private mobile network.

### Solution Components

- Rajant Hawk BreadCrumb® wireless nodes deployed along the slope and on the slope car.
- 2450 antennas (directional) to maintain strong links up and down the 800-foot slope
- PoE equipment powering Hawk nodes and IP cameras.
- Upward- and downward-facing IP video cameras mounted on the slope car for full visual coverage.
- Secure VPN connectivity to extend viewing access to authorized remote users.

### Outcome and Impact

**Continuous Coverage:** Reliable connectivity along the 800-foot slope.

**Real-Time Visibility:** Hoist operators see live video from the slope car.

**Remote Access:** Management can securely view operations via VPN.

**Enhanced Safety:** Visual checks help prevent collisions and obstructions.

**Operational Confidence:** Better awareness supports safer, smoother hoist moves.

the car into a mobile networked asset. IP cameras on the car were oriented up and down the slope, allowing the system to capture a complete visual of the car's surroundings and the track it was traveling on. As the car moved, Rajant's InstaMesh® technology enabled the nodes to dynamically maintain connectivity, automatically selecting the best available links and paths to keep video streaming without interruption.

Directional 2450 antennas were aligned along the slope to strengthen the RF links between nodes and maximize reliability in the confined, high-attenuation underground environment. Power-over-Ethernet (PoE) equipment supplied both radio and camera power via a single cable run, simplifying deployment and minimizing infrastructure complexity on the car and at each slope level.

Live video feeds from the cameras are transmitted over the Rajant Kinetic Mesh® network to the surface hoist house, located approximately 3,000 feet from the slope. There, the hoist operator can continuously monitor the slope car on dedicated displays, seeing its location, direction of travel, and track conditions in real time. The system is also integrated into a secure VPN, enabling authorized management personnel to log in and view the slope car operation remotely from any location with IP connectivity.

## The Results

The Rajant solution transformed slope car operations from a largely "blind" process into one driven by real-time insight. With uninterrupted wireless coverage along the entire 800-foot slope, video from the slope car's cameras now streams continuously to the hoist operator, eliminating guesswork around the car's position and surroundings.

Operators can visually confirm that the track is clear before moving the car, watch for potential obstructions, and verify that the car is loading and unloading safely. This increased situational awareness supports safer, more confident hoist operations and helps reduce the risk of incidents in a critical vertical access route. Management teams gain additional oversight through secure VPN access, allowing them to review conditions and support operational decisions even when offsite.

“

I prefer Rajant's technology in this case. It provides the higher bandwidth required to support mining applications and video while maintaining a resilient, high-performance network.

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— Alan Quinn  
CEO Control  
International

By leveraging Rajant Kinetic Mesh® and Hawk BreadCrumbs, Enlow Fork Mine has implemented a resilient, mobile wireless infrastructure that delivers the visibility its team needs without sacrificing flexibility or safety in the underground environment.

## Conclusion

The Enlow Fork slope car project demonstrates how Rajant Kinetic Mesh® and Intelligent Edge solutions can unlock real-time visibility in some of the most challenging parts of an underground operation. What began as a need to "see" the slope has evolved into a resilient, mobile wireless platform that supports safer hoist movements and faster decision-making. Hoist operators and management now have the real-time insight needed to move people and materials more safely and confidently, while laying a scalable wireless foundation for additional underground applications in the future.

“

In a situation where time and safety were critical, Rajant's Kinetic Mesh® solution delivered exactly what was needed: rapid deployment, reliable performance, and seamless integration with the tele-remote system. It allowed us to restore operations quickly and with complete confidence in network stability.

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— Chuck Masters  
Operations Technology  
Manager

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