



# Upgrading **Mine-Wide Wireless Network** – with Zero Downtime

## Rajant Connects Huge Mine **with a Robust, Unified Network.**

To the layman, mining operations are a gritty, noisy and perilous undertaking involving huge machines and intrepid men burrowing deep into the earth to access and remove valuable materials. It's all mammoth trucks, scoops, conveyor belts, drilling and explosions – carried out in rugged, remote locations.

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**This Rajant customer mine**  
is one of the largest in North  
America, spanning more than

**70** square miles,

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with a workforce of approximately

**1,300** people,

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that inject over

**\$100M** annually  
into the regional economy.

### Challenge

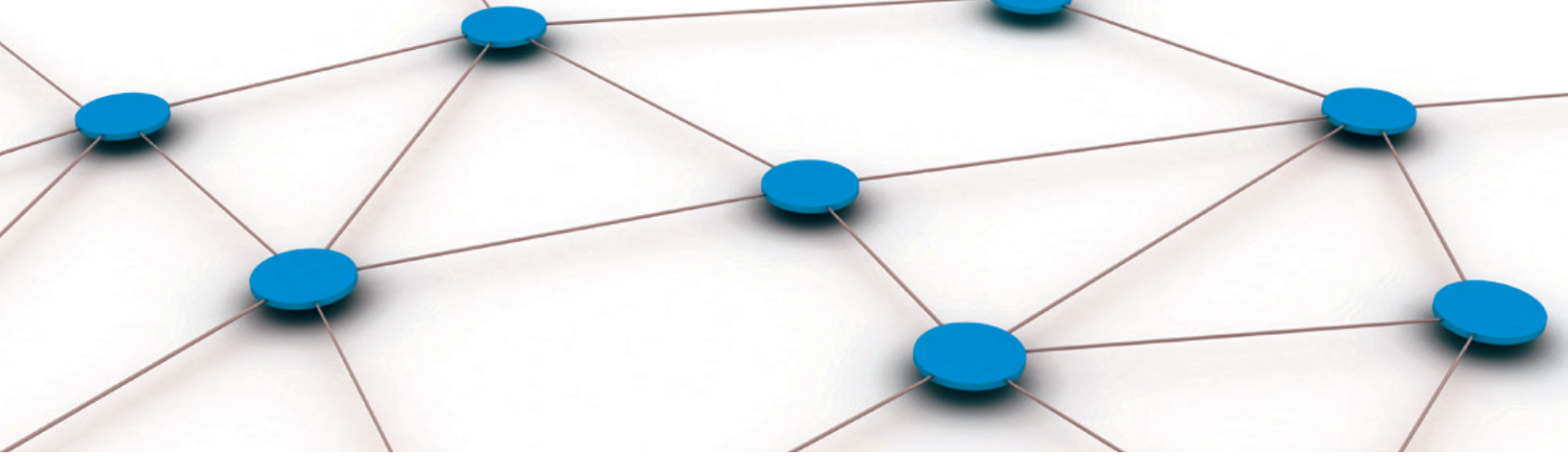
Global leader in clean coal solutions urgently needed to upgrade its network, without disrupting the mine's 24x7x365 operations. Its two wireless networks lacked the bandwidth to support its existing dispatch, mine operations and equipment health monitoring applications – and those planned.

### Solution

Rajant developed a transition plan to migrate to a new, unified network with no downtime and 100% application availability, leveraging Rajant's BC | Commander network management utility. They also developed a new project -specific BreadCrumb configuration including 900 MHz, 2.4 and 5.8 GHz radios.

### Results

With no single point of failure, the Rajant solution resulted in a more robust and reliable network for the applications that keep the mining operations running at peak productivity, and provides a platform to accommodate the mine's expansion and implementation of additional applications.



Ultimately, mining really is all about moving tons of earth to extract economic ores. But beneath the surface, modern, efficient mining is more a carefully choreographed ballet in which fleets of multi-million dollar high-tech vehicles and equipment are dispatched, managed and monitored using sophisticated hardware and software running over advanced broadband networks. The terrestrial shovel and drill are guided by GPS satellites orbiting miles above. It's where the dump truck meets the data center. The shovel, truck and dragline are all integrated with voice-video-data networking on a 24x7x365 basis to optimize mine efficiency, production and safety.

When one of the world's largest private-sector coal companies and a global leader in clean coal solutions realized an urgent need to upgrade its network, the challenge was not in the installation of the infrastructure, but ensuring that the upgrade to the new network would not disrupt the mine's 24x7x365 operations. The facility is one of the largest and most productive mines in North America, spanning an area of more than 70 square miles and with a workforce of approximately 1,300 people. Annually, mining operations inject over \$100 million into the regional economy in wages and benefits. The facility's operations are also known for industry-leading safety and reclamation practices that have been recognized with numerous awards.

The complex employs three draglines and five shovels, along with a substantial truck fleet operating on two 12-hour shifts per day, 365 days per year. Coal is mined from three pits and is hauled by truck to one of four hoppers at the complex, where it is crushed, conveyed to silos, and then loaded on rail cars for transport to market.

## Orchestration & Execution

The logistics involved in the efficient dispatch and monitoring of the hundreds of trucks, dozers, graders, drills and other equipment over such a huge and topographically diverse area are particularly challenging. The mine's production – and profitability – ultimately hinges on the ability to maximize the availability and utilization of the equipment fleet. Maintenance on these critical assets is one of the biggest expenses in mining. A single haul truck costs over \$4

million and a shovel runs as much as \$15 million, so removing one from the fleet for maintenance directly impacts production. Equipment health monitoring enables mine operators to identify equipment issues before they result in catastrophic failure and extended down time.

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## This Rajant customer complex operates:

- > **3** draglines
- > **5** shovels
- > Large truck fleet
- > **2** 12-hour shifts/day
- > **365** days per year

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For dispatch, equipment health monitoring, mine planning, and monitoring of myriad fixed and mobile assets throughout the facility, the mine relied on multiple applications running over two wireless networks that were operated and maintained by separate groups on site. However, neither network had the bandwidth to accommodate the data volume generated by the existing dispatch, mine operations and equipment health monitoring applications – or the additional applications planned for deployment. To compound the situation, many pieces of equipment relied on systems that ran on both networks, requiring multiple transceivers and dependant on the availability of both networks. The mine was expanding operations and needed to add new applications, yet neither network was up to the task.

The sheer number and mobility of the personnel, trucks, shovels and reclamation equipment required at the site requires a network that is robust, flexible and able to accommodate a broad range of applications and massive amounts of data.

## The Challenge: Transition 24x7x365 Apps without Disruption

The company readily recognized the need for a new, unified network, and was ready to make the investment in new technology. The only caveat was that the transition to the new network must be completed without any disruption in operations. Everything needed to be migrated to the new network without any communication interruption between the equipment and the mines mission critical applications.

Rajant Corporation's Kinetic Mesh Networking technology was selected based on its ability to connect the many fixed and moving assets with a reliable, flexible mesh network with no single point of failure and the ability to grow more robust as nodes are added. Rajant BreadCrumb network nodes and InstaMesh routing software were already in use at many other large mines, and were known to be able to handle the projected volume of data.

## Incremental Migration to a Single Network

Rajant engineers developed a transition plan to migrate to the new, unified network with no downtime and 100% application availability. Key to this plan was Rajant's BC | Commander network management utility, which enables full management and configuration, including remote flashing of software and configuration of Rajant BreadCrumb network nodes.

To meet the need for a multi-frequency network, **Rajant developed a new BreadCrumb configuration** specifically for the project that included **900 MHz, 2.4 and 5.8 GHz radios**.

Rajant realized that the project required a multi-frequency network, and developed a new BreadCrumb configuration specifically for the project that included 900 MHz, 2.4 and 5.8 GHz radios. To complete the transition, the multi-frequency BreadCrumb network and the existing 2.4 GHz and 900 MHz networks would operate in tandem, with individual applications ported to non-overlapping channels on the new network.





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## Rajant engineers developed a transition plan to migrate to the new, **unified network with no downtime and 100% application availability.**

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After trial testing the concept, Rajant engineers, along with its local dealer, implemented the new infrastructure throughout the mine – starting with the fixed points and mobile trailers that provide the general coverage for the mine. While Rajant did add a few new mobile trailers to improve and extend network coverage, all trailers from the existing network were re-used. The legacy trailers were modified to handle the additional power demand of hardware for both networks during the transition. This re-use of existing assets was not only a significant cost avoidance but added to the long-term reliability of the network by extending the period of time the solar-powered trailers could operate in very cold weather without sunlight.

Once all infrastructure nodes were installed, the incremental migration began, with applications moving from the old networks to Rajant's Kinetic Mesh network using non-conflicting channels within the frequencies. As part of the transition, the Caterpillar Computer Aided Earthmoving System (CAES) and AQUILA drilling applications were also upgraded to the latest version.

As the project progressed, the Rajant team encountered radio interference from 900 MHz radios being used outside of the facility for railroad and nearby oil and gas well monitoring. The flexibility of the Rajant platform and the frequency utilization capabilities of the InstaMesh routing software helped mitigate this interference issue.

The implementation strategy employed by Rajant allowed the transition to occur smoothly over a long period of time. The first phase of the project involved 165 nodes, which provided the foundation to support all of the mine's primary applications and the most critical elements of the fleet, with the remainder of the fleet gradually migrated over the next year. Meanwhile, the mine itself expanded significantly. The combination of these activities resulted in the addition of another 110 Rajant Breadcrumb nodes, along with additional applications running over the network. This expansion was deployed primarily by mine personnel – attesting to the scalability of the Rajant network and the utility and simplicity of its network administration tools.

## High Availability Platform Geared for Future Growth

With no single point of failure, the Rajant solution resulted in a more robust and reliable network for the applications that keep the mining operations running at peak productivity, and provides a platform to accommodate the mine's expansion and implementation of additional applications. The Rajant Kinetic Mesh network provided an exponential increase in network bandwidth and allowed the mine's operators to standardize – using the same radio hardware across all mobile and infrastructure nodes. The numerous configuration options provided ample security, and consolidating onto a single network helped lower operating and maintenance costs.

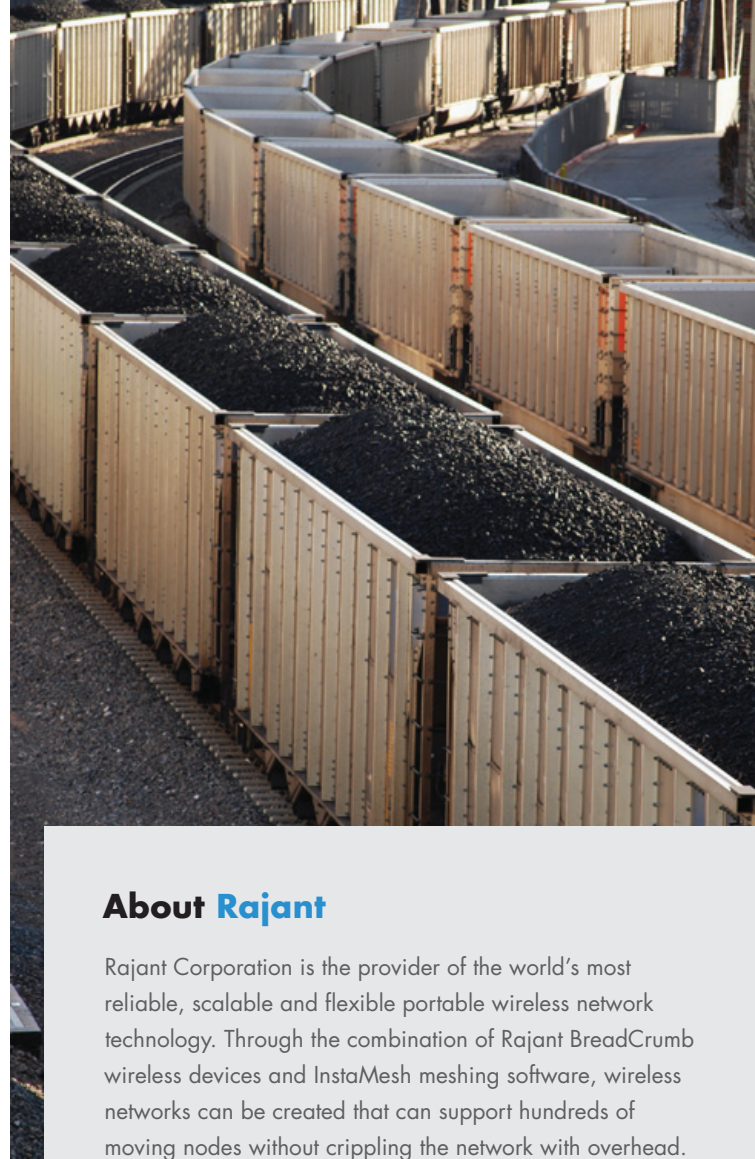
Today, there are 275 Rajant network nodes, with more being added. They provide the mine with secure, reliable, and flexible mesh networking. The system has been running continuously since 2010, supporting data from 17 applications, at last count, running simultaneously and keeping the mine operating at peak efficiency.

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“This network has been operational for more than one year – reliably running critical mining operation applications all that time without a single failure. This massive deployment demonstrates the reliability of our networks, their ability to scale, and how we address mobility with nearly 200 pieces of equipment in constant motion.”

- **Bob Schena, CEO**, Rajant

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### About Rajant

Rajant Corporation is the provider of the world's most reliable, scalable and flexible portable wireless network technology. Through the combination of Rajant BreadCrumb wireless devices and InstaMesh meshing software, wireless networks can be created that can support hundreds of moving nodes without crippling the network with overhead. By preserving valuable bandwidth for communications, a Rajant network also unlocks higher levels of productivity and speed than other available solutions.

Rajant technology is designed for and proven in the most demanding applications, and is rapidly becoming the ideal choice for ultra-resilient networks that are equally adept in everyday situations and in times of crisis. Rajant also provides its technology to service providers and manufacturers who are looking to extend their own offerings with the power of Kinetic Mesh Networking.

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