

# LinkOA for Haulage

OEM-agnostic autonomous haulage for mixed fleets



# Safety, productivity and freedom

LinkOA for Haulage brings autonomous control to your fleet of haul trucks, enhancing safety, utilization, and productivity across the board. Whether you're upgrading existing trucks or deploying new ones, LinkOA gives you the freedom to automate without being tied to a single OEM.

Built to work in real mining conditions, LinkOA for Haulage enables mines to automate haulage operations across mixed fleets, helping reduce costs, optimize traffic flow, and improve asset life through consistent, precision-driven control.

## + Main benefits

**OEM-agnostic design** ensures seamless integration with any make or model of haul truck, enabling efficient mixed fleet operations.

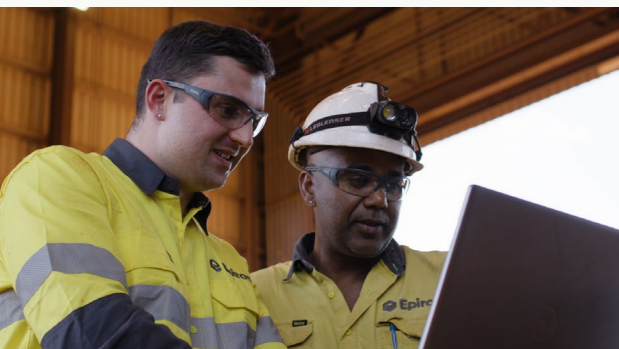
**Retrofittable solution** brings autonomous capabilities to existing trucks, supporting both brownfield upgrades and greenfield deployments.

**Scalable architecture** allows mines to implement automation at their own pace -expanding from single-unit pilots to full-fleet operations without disrupting existing infrastructure.



# Transforming haulage operations

LinkOA for Haulage delivers consistent, measurable improvements across safety, productivity, and cost-efficiency. By combining intelligent control systems with proven vehicle automation, LinkOA helps mines optimize performance in day-to-day operations, regardless of size, location, or conditions.



## + Improved safety, reduced damage

Increase safety by removing operators from harm's way. Reduce damage by precision control and improved driving characteristics.

## + Increased equipment utilization

Eliminate the need to stop equipment for breaks and shift changes to increase the utilization of each vehicle.

## + Increased productivity

Machine control on vehicles squeezes productivity gains from various sources including more efficient spotting, driving behaviors, and real-time information flows.

## + Reduced cost per ton

By controlling multiple vehicles in a single control room, and managing vehicle operations in a consistent manner, mine operations can realize a significant reduction in labor, fuel and maintenance costs.

## + Better asset management

Autonomous haulage allows for programmable operation of vehicles within OEM operating parameters. By better tracking and controlling vehicle operations within prescribed limits, asset life can be extended, including areas such as tires, brakes, and other components.

## + Mine plan optimization and mine design

Regulations imposed for human operations restrict flexibility in mine design. By removing humans from the mine, operators have increased freedom to alter mine designs in areas such as road widths or wall heights which can greatly reduce overburden removal costs.

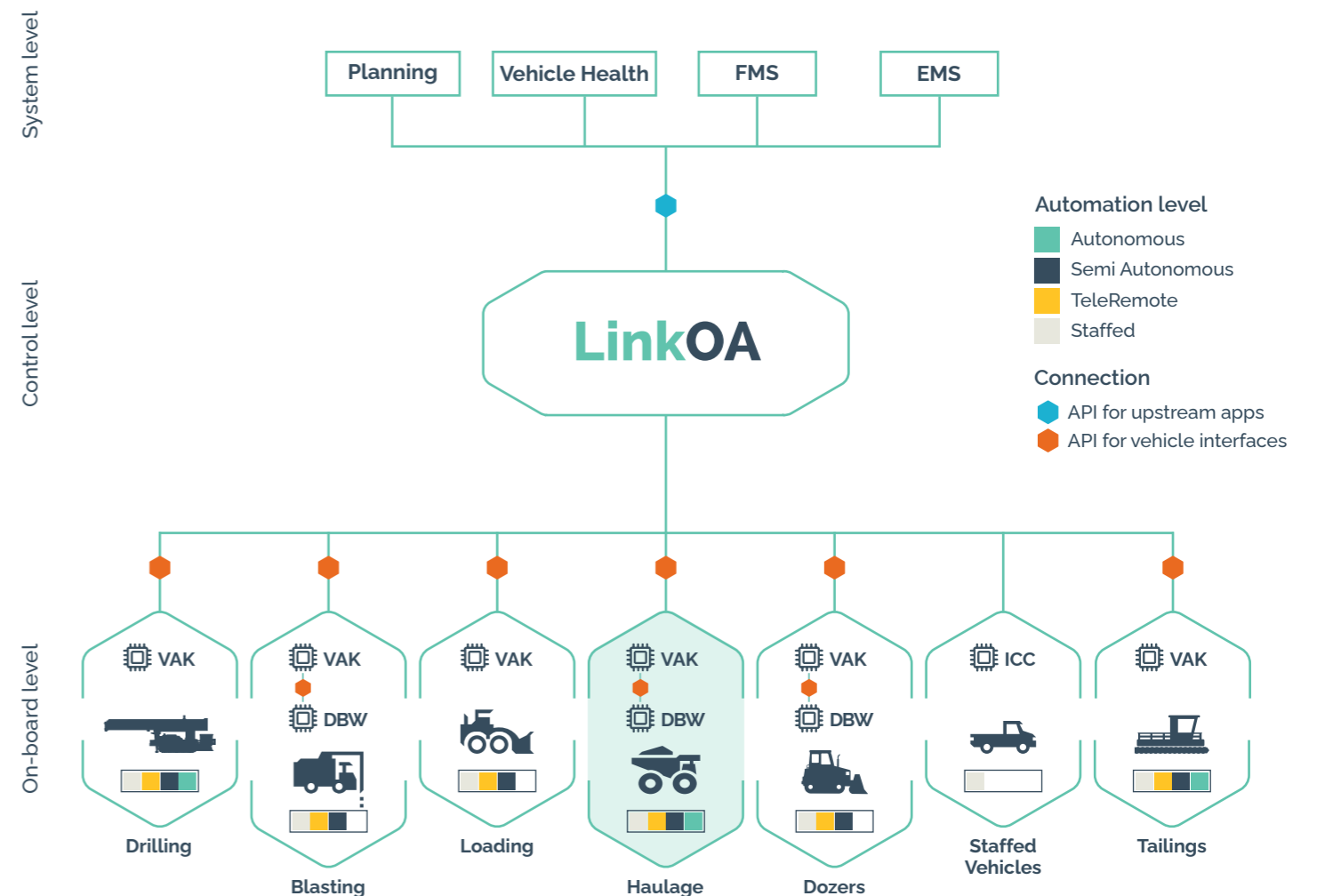
## + Smarter decisions through better data

Autonomous haulage LinkOA generates real-time, high-quality operational data, enabling mines to make faster, smarter decisions that improve performance, reduce risk, and support continuous optimization.

# LinkOA System Architecture

Epiroc's flagship software, LinkOA, is the central intelligence of autonomous mining operations, seamlessly integrating with a mine's existing infrastructure. Designed for flexibility, it connects with any system-level controller and can function as a Fleet Management System (FMS) when required.

LinkOA coordinates vehicle movement through Traffic Management System (TMS) applications, ensuring efficient routing, collision avoidance, and optimized fleet performance. It tracks all vehicles in real time, providing situational awareness to staffed equipment via the In-Cab Client (ICC) while controlling autonomous vehicles through the Vehicle Automation Kit (VAK) and Drive-By-Wire (DBW) interface. This unified architecture allows staffed and autonomous machines to operate safely together, minimizing disruptions and maximizing productivity.



By enabling precise fleet coordination and intelligent automation, LinkOA enhances efficiency, safety, and decision-making, giving mines greater control over their entire fleet.

## Powering this autonomy are two core components: The Vehicle Automation Kit and the Drive-By-Wire

### Vehicle Automation Kit (VAK)

The VAK equips trucks with GPS, radar, lidar, and additional sensors that enable obstacle detection and full situational awareness.

### Drive-By-Wire (DBW)

The Drive-By-Wire system electronically controls steering, braking, and throttle, allowing the truck to drive without human input in the cab.



### Communications and GNSS

Track and communicate with each vehicle.



### On-board control

A local processor unit allows the user to interface with and control the vehicle's on-board systems.



### Obstacle detection and avoidance

Radar, lidar, and other sensors combine to detect and avoid obstacles.

# Retrofit

## Automate your existing fleet

Epiroc retrofits existing haul trucks and equipment to run on the LinkOA platform, offering a practical and scalable path to automation. Instead of replacing entire fleets, operators can retrofit or replace vehicles as needed, basing purchase decisions on performance, not OEM system dependence.

This Open Autonomy approach gives mines the flexibility to automate older and mixed fleets, extend the life of existing assets, and maintain legacy FMS and infrastructure—without costly, large-scale replacements or upgrades.

# Proven at scale

350+ million tonnes hauled autonomously with LinkOA



At the Roy Hill mine in Western Australia, Hancock Iron Ore operates the world's largest autonomous mixed fleet, powered by LinkOA.

Since deploying the OEM-agnostic haulage solution in 2021, the operation has moved over 350 million tonnes of material, safely traveling more than 8.5 million kilometers and completing more than 1.4 autonomous haul cycles. These achievements reflect not only the scale of Roy Hill's operation, but also the reliability and performance of LinkOA in real mining conditions.

With LinkOA, Roy Hill has improved operator safety by removing people from high-risk environments, while increasing equipment availability and optimizing haulage efficiency across a variety of vehicle makes and models.

By enabling the use of both new and existing trucks within a single autonomous system, LinkOA has allowed the operation to maximize fleet value without the need for large-scale capital reinvestment.

The platform's OEM-agnostic architecture has proven essential for long-term flexibility, allowing Roy Hill to scale operations with freedom of choice, avoid dependence on a single OEM, and maintain control over system integration. Whether supporting daily dispatch or enabling long-term production strategies, LinkOA has become a critical tool for driving predictable, high-performance outcomes in a complex operational environment.

"This milestone proves that OEM-agnostic AHS is not only possible, it's real, and it's working at scale," said Diederik Lugtigheid, General Manager AHS Business, Epiroc.

Today, LinkOA continues to set the benchmark for open autonomy. The Roy Hill deployment demonstrates how scalable, proven automation can unlock safer, smarter, and more sustainable mining—delivering real results every day.

## Runtime statistics

### Cycles completed

1,500,000+

### Distance travelled

8,500,000 km+

### Tonnes moved

350,000,000+

- No serious system safety incidents
- Consistent, better-than-conventional haulage productivity (based on t x km EFH / cal h metric)
- Meeting system availability & reliability targets



## Vehicles automated with LinkOA\*

### Haul trucks

- Caterpillar 793F
- Caterpillar 793D
- Caterpillar 777D
- Caterpillar 793F-CMD
- Volvo A40F
- Komatsu 930e-2
- Komatsu HM400
- Liebherr T282
- XCMG XDE110
- Hitachi EH-5000
- Hitachi EH-4000

### Dozers

- Komatsu D375a
- Caterpillar D9R
- Caterpillar D10

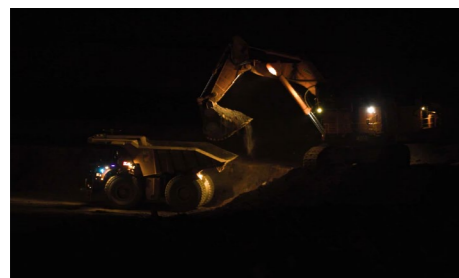
### Excavators

- Caterpillar 390D
- Caterpillar 374D

### Blast trucks

- Mack Granite

\*This is a partial list and does not reflect all vehicles automated with LinkOA worldwide.



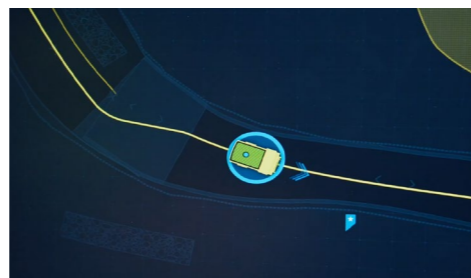
### Proven and reliable performance

With over three years of continuous operation, LinkOA has demonstrated sustained reliability in tough mining conditions—proving it can deliver day after day, year after year.



### Smarter operational planning

Access to consistent, high-quality autonomous haulage data enabled better forecasting, shift planning, and decision-making—turning real-time insights into real operational improvements.



### Flexibility for future growth

LinkOA's modular architecture gives mines the ability to scale and evolve—integrating future technologies like zero-emission trucks without costly system replacements.



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