STRAT & IOT

Think Smart, Act Connected !

Transport Management System in the mining ecosystem



L'industrie du futur, ensemble

Context and challenges

Traceability is a key lever

Mining Services companies operate in a West African mining environment characterized by demanding logistical, regulatory, and environmental constraints. Site security, control of personnel and vehicle traffic, and complete traceability of operations are paramount. constituting key levers for HSE performance and compliance.

This document presents an integrated approach access control and geolocation, designed as a "turnkey" project : from the initial technical audit to commissioning and the transfer of skills to the local teams.

STRATEGIC OBJECTIVES

- Securing the site and controlling the movement of staff, subcontractors and visitors
- Ensuring reliable traceability of truck flows, from loading to final destination
- Reduce the risks of fraud, theft and accidents
- Ensuring the continuity of operations in a mining environment
- Having a single point of contact for design, deployment and maintenance

Access control

Eight pillars of an integrated solution

Access control at a mining site is not simply a barrier at the entrance: it structures the **security**, **compliance** , and **continuity** of the entire operation. A comprehensive approach (study, design, deployment, commissioning) covers **eight complementary dimensions** , from personnel and logistics flows to monitoring and cybersecurity, designed to withstand the constraints of the **industrial mining environment** .



Staff access



Areas with varying levels of criticality



Emergency situations



Continuity of service



Trucks and logistics flows



Real-time monitoring

Access control

Personnel and zone management

Controlling who enters the site and where each person can move is the foundation of any mine security system. This aspect combines individual **authentication** of staff, subcontractors, and visitors with an **architecture of zones with varying levels of criticality** , in order to restrict access to sensitive areas to **authorized personnel only** .

Staff access control

🎯 *Ensure that only an authorized and competent person enters the site*

- Identity management system (employees, contractors, visitors)
- Secure badges (RFID / smart card)
- Reading terminals at entry points and sensitive areas
- Centralized database: rights by zone, time slots
- Interface with the HR database

👉 **Automatic rejection if authorization expires**

Management of areas with varying levels of criticality

🎯 *Prevent access to dangerous or strategic areas*

- Multi-level architecture: external perimeter, industrial zone, high-risk zones, sensitive storage
- Full-height turnstiles, motorized gates
- Vehicle barriers, electromagnetic gates

👉 **Logical site segmentation and logging of each visit**

Access control
Logistics flows and supervision

Securing logistics flows is not enough without a **real-time view.** of what happens on site. This component combines **truck control** (pre-registration, license plate reading, weighing) with a **centralized supervision station** capable of showing, at any given moment, who is present, where, and since when.

Truck control and logistics flows

🎯 *Control entry/exit and reduce theft, errors, and intrusions*

- Digital pre-registration of transport
- Automatic number plate recognition (ANPR)
- Driver badge or QR code
- Automated barriers
- Possible connection to the weighbridge

👉 **Conditional authorization subject to load compliance**

Real-time traceability and monitoring

🎯 *Know instantly who is on site*

- Central monitoring station (PSIM / security hypervisor)
- Dashboards: Attendees, Drivers, Visitors, Subcontractors
- Exportable, time-stamped history for audits

👉 **Critical function for crisis management and regulatory compliance**

Access control

Resilience and crisis management

An incident at a mining site can happen without warning, and neither can the network. This component covers the capacity to **evacuate and count quickly.** personnel in emergency situations, as well as the **robustness of the equipment** (dust resistance, extreme conditions and network outage resistance) to ensure that the system remains operational regardless of field conditions.

Emergency management

🎯 *Ability to evacuate and count quickly*

- Auto-call function
- List of people by area
- "Evacuation" mode: controlled opening of exits, anti-return
- Terminals or readers at assembly points

👉 **Significantly reduced verification time**

Continuity of service

🎯 *Mining operations impose significant constraints*

- IP65/IP66 rated equipment (dust, rain)
- Heat tolerance above 50°C
- Offline operation in case of network outage
- UPS systems, server redundancy, secure fiber or radio network

👉 **The system must continue to function even in the event of a network outage**

Geolocation

Six levers for the supply chain

From extraction to delivery point, each truck carries a **valuable asset that must be secured.** and **data that needs to be tracked** . This component combines **real-time GPS tracking.** vehicles (with load control such as weighing and tonnage compliance) to guarantee **complete traceability** of the supply chain, from loading to final destination.

Vehicle tracking and location

Continuity of service

Transport chain traceability

Performance optimization

Securing operations

Loading control

Geolocation

Traceability and operational reliability

A logistics cycle is only legally valid if it can be **fully reconstructed** , and this requirement must not cease as soon as the network weakens. This aspect combines the **timestamping of each stage** of transport (loading, journey, unloading) with **ruggedized equipment** capable of operating despite dust, heat, and limited network coverage.

Transport chain traceability

🎯 *Have permanent visibility over the fleet*

- Event timestamps (loading, departure, arrival, unloading)
- Data association: truck, driver, origin, destination
- Exportable operating log for audit purposes
- Rotation tracking dashboards

👉 **Reconstruct each logistics cycle in its entirety**

Continuity of service

🎯 *Ensuring reliable operation despite difficult conditions*

- Ruggedized equipment (dust, vibration, high temperatures)
- Data transmission even with limited network coverage
- Secure power supply, redundant system architecture

👉 **Continuity guaranteed even in degraded environments**

Geolocation

Performance and Operational Security

Geolocation data becomes a true management tool when it both serves **performance** and **safety** . This component leverages the **analysis of transport cycles** to reduce downtime and operating costs, while relying on **real-time alerts.** (abnormal stops, speed variations, route deviations) to quickly detect any risky situation.

Optimizing logistics performance

🎯 *Improve the productivity of transport cycles*

- Analysis of cycle times (waiting, loading, travel)
- Truck usage indicators
- Identifying bottlenecks
- Reporting and decision support tools

👉 **Reduce operating costs through better resource allocation**

Securing operations

🎯 *Reduce the risks of fraud, embezzlement and accidents*

- Geofencing with real-time notifications
- Alerts in case of prolonged or unauthorized shutdown
- Speed and driving behavior tracking
- Possible integration with mining dispatch

👉 **Quickly detect any risky situation**

Geolocation

Positioning and Compliance of Loads

Knowing the location of a vehicle is not enough if it is carrying a non-compliant load. This feature combines **real-time geolocation.** from fleet (onboard GPS, dynamic mapping, **geofencing alerts**) to **load control** , with automatic reconciliation between theoretical load and controlled load to guarantee **tonnage reliability** .

Vehicle tracking and location

🎯 *Have permanent visibility over the fleet*

- Onboard GPS equipment, real-time position updates
- Dynamic mapping accessible from a supervisory workstation
- List of routes and review of itineraries
- Geofencing with automatic alerts in case of route deviation

👉 **Immediately identify any movement abnormally**

Loading control

🎯 *Ensure compliance of transported tonnages*

- Weighing systems (weighbridge and/or on-board weighing)
- Load or volume sensors
- Automatic reconciliation of theoretical load / set load
- Blocking or alerting in case of overload or abnormal variation

👉 **Reliability of declared tonnages**

Transport Management System

Core functions

A Transport Management System covers the whole life of a shipment, from the first order to the final invoice. Its core functions are planning the right load on the right vehicle, following it in real time, proving it was delivered, and settling the cost. But none of this works in isolation: the value of a TMS depends on its integration layer, because it must exchange data with the ERP, terminal and warehouse systems, telematics, customs and carriers to give one reliable chain of information.



Order & booking	Planning & dispatch	Execution & tracking	Proof of delivery	Settlement & KPIs
▪ Order intake ▪ Lane and rate rules ▪ Booking confirmation	▪ Load building ▪ Route and driver assignment ▪ Gate appointments	▪ Live position and ETA ▪ Geofence events ▪ Driver mobile app	▪ Electronic POD ▪ Load check ▪ Exceptions and claims	▪ Freight cost control ▪ Carrier invoices ▪ Cycle-time dashboards

Integration layer

A TMS only creates value when it exchanges data with the systems around it.

ERP | TOS / WMS | Telematics | Customs | Carrier systems

Transport Management System
Functionalities

A modern TMS turns transport into a lever for **profitability** and **sustainability**. Beyond the core flow from order to invoice, it brings eight functions: it **optimises routes**, **sources and assigns the right carriers**, **automates documents and invoicing**, and gives **real-time performance and carbon visibility**. These functions are the base on which we build, before going further with field extensions.

Planning

Pick the best routes and allocate resources to speed up deliveries.

Route optimisation

Harmonise loading, transport and delivery mode to cut distance and cost.

Transport documents

Centralise key logistics documents such as invoices and picking slips.

Invoicing

Automate documents, match invoices to loads and handle disputes.

Carrier sourcing

Negotiate the best offers and rates directly with transport partners.

Carrier assignment

Precise control of each shipment, with specialised vehicles when needed.

Performance steering

Real-time dashboards and predictive analysis for fast decisions.

Carbon reporting

Cut your carbon footprint and meet regulatory requirements.

Transport Management System
Architecture

The architecture rests on **one platform with four layers**: operator screens, the **TMS core**, our **field extensions** and the **integration layer** connecting existing systems and equipment. Because the extensions share the **same data model** as the core, they **add to the platform rather than sit beside it**. **Cybersecurity**, **offline operation** and **audit trail** apply to every layer from the start.

Usual TMS | Going further | Integration & field

Experience	Dispatcher console	Driver mobile app	Customer portal	SCADA-style supervision	
TMS core	Orders & booking	Planning & dispatch	Tracking & ETA	Proof of delivery	Carriers & settlement
Going further	Access control	Geolocation & geofencing	Driver monitoring	Load control	Video integration
Integration & field systems	API connectors	Common statuses & alarms	GPS & telematics	Readers & plate recognition	ERP, TOS, WMS

Across all layers: cybersecurity, offline operation, role-based access, audit trail

Strat & IoT

From industrial needs to the right technology

When we meet mining operators in **West Africa, India** and **beyond**, they rarely ask for "IoT" or "telematics". They ask for **six things**:

Site security
Only authorised people and trucks on site

Continuity
Equipment that holds up in dust, heat and outages

Traceability
Every load tracked from pit to delivery point

Driver safety
Fewer accidents on long mining routes

Load compliance
Tonnages that match, with no losses on the road

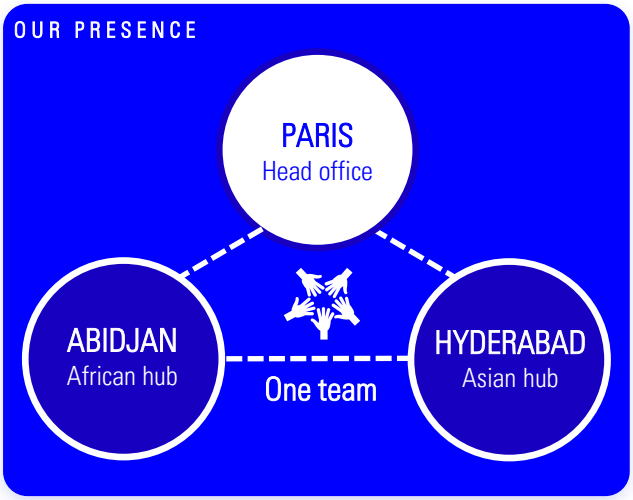
Transport management
One TMS for all trucks, sites and loads

In a mine, technology only creates **value** when it works **in the field**. A camera nobody watches or a GPS that **loses signal** only adds **cost**. We start from your **operational risks**, then choose the **right equipment** and connect it to **one TMS**. **Let's talk about your sites.**

Aurélien Pallavisini, *CEO, Strat & IoT Group*

WHO WE ARE

Strat & IoT is a consulting and engineering group in **industrial IoT**, **energy** and **digital transformation**. Our Paris head office steers and supports every subsidiary: **one team across three continents**.



Paris *Head office · all subsidiaries*
Steers the group and supports every subsidiary with strategy, consulting and governance.

Hyderabad *Asian hub · group IT expertise*
Project delivery in India and Asia, and IT and OT expertise for all subsidiaries.

Abidjan *African hub · implementation*
Implementation capacity and financing partnerships for projects across the group.

OUR DIFFERENCE

- ✓ TMS software + turnkey field delivery
- ✓ Vendor-neutral: we specify for your interest
- ✓ 20 years of senior OT and IT field experience
- ✓ 21 mining sites in 8 West African countries

Strat & IoT

Why Strat & IoT ?

Building a TMS is not only a **software project**: it also means **connecting heterogeneous systems** and **equipping the field**. We bring these skills together under **one contract and one point of contact**, from **development** to **integration, field installation** and **maintenance**. Our teams in **Paris, Hyderabad** and **Abidjan** keep the project **close to the client** and **cost-efficient**.

TMS software

Planning, dispatch, tracking and settlement modules with SCADA-style supervision: live maps, alarms and operator screens. Development capacity in our Hyderabad hub.

Integration

Multi-supplier integration of ERP, TOS, WMS, telematics and equipment, with common statuses and alarms. Long OT/IT convergence experience.

Field IoT

Two decades of field deployment: GPS and telematics, readers, plate recognition, weighing and cameras, in harsh and low-network conditions.

Turnkey delivery

Supply, installation, commissioning, training and maintenance under one contract, with a single point of contact.

Delivery hubs

Paris, France | Hyderabad, India | Abidjan, Côte d'Ivoire

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