

Real Time Location Sensing in Mining - Operator's Share of the Pie

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ABSTRACT

"Change is the very core to evolution", these lines were probably never truer. Telecom technology has evolved many a time and the associated services are getting newer, smarter and user friendly. The journey starts with technology evolution and makes many things possible with the business growing more and more complex.

With the advent of IoT enabled 'Real Time Location Sensing' Solution, a number of challenges in the mining sector can be addressed and a turnkey solution can be provided. The backhaul for large scale data capture and communication needs technologies such as 4G/5G for which operators have a really good chance of getting a large share of the pie.

This paper talks about some key customer challenges in the mining space, some specific use cases which can be addressed using RTLS solution. The paper also talks about the comparative analysis of the current RTLS technologies and value proposition by an operator.

Keywords: RLTS (Real Time Location Sensing), IOT, Mining Sector

1. EXECUTIVE SUMMARY

The Mining Industry is being challenged to achieve twin objectives of increasing safety and efficiency and RLTS can help address the same by giving the ability to collect data for analysis from every aspect of operation, vastly increasing the intelligence behind.

- Mining firms can leverage RTLS to address challenges, such as collisions inside a mine, the safety of workers, and evacuation in case of an emergency.
- Preventing Collision inside Mine, and Hazardous Zone Presence Tracking some of the key emerging RTLS use cases addressing the above challenges and based on Industry 4.0 Trends (Forbes, 2017; i-scoop.eu, 2017; McKinsey, 2017; information-age, 2016).

RTLS presents an excellent opportunity for operators to diversify into a related business, draw synergies from core network business, and grow IoT revenue through a new revenue stream.

On the other hand, Operators are facing serious issues from

- tidal wave of network traffic calling out investment to upgrade their network infrastructure.
- OTT free riders using those infrastructures without investing in networks and cannibalizing their revenue share.

2. RTLS -OVERVIEW & SOLUTION

A real-time location system (RTLS) is one of a number of technologies that detects the current geolocation of a target, which may be anything from a vehicle to an item in a manufacturing plant to a person.

RTLS is typically embedded in a product, such as a mobile phone or a navigational system. Most such systems consist of wireless nodes - typically tags or badges - that emit signals and readers (via Anchors and platform) that receive those signals.

Current real-time location systems are based on wireless technologies, such as Wi-Fi, Bluetooth, Ultra-Wideband(UWB), RFID, and GPS. RTLS offers location-

based services to find, track, manage and identify the geolocation of a target on a real-time basis using nodes or tags and readers.

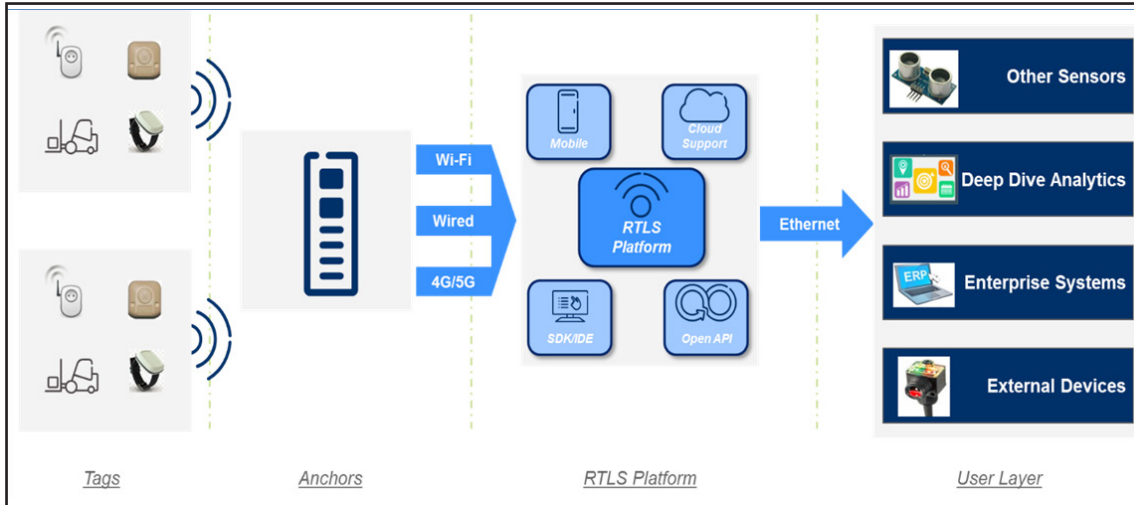


Fig. 1: RTLS Solution

3. KEY ACTIVITIES, CHALLENGES AND USE CASES IN MINING

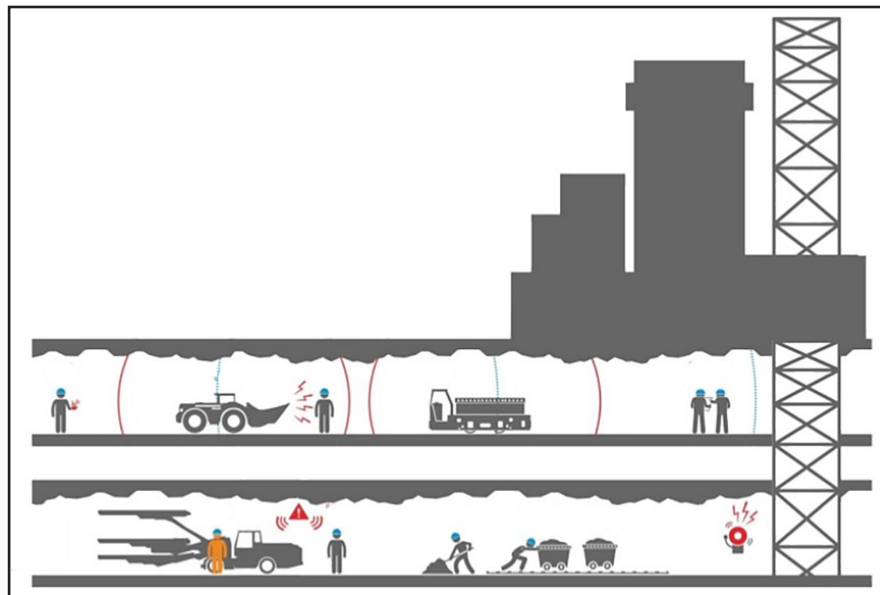


Fig. 2: Types of Mining

Worker Safety: Detect any safety issues and promptly evacuate worker for further care.

Challenges:

- Lack of automated incident alerts & worker safety.

- Lack of proximity detection and collision avoidance.
- Lack of automated zone breach detection & alarms.

- Lack of real-time tracking of assets & equipment.
- Lack of real-time predictive capabilities.

Transportation: Carts used to transport ore and waste rock through tunnels.

Mining, Crushing & Grinding

Cut through the rock and break larger rocks down to a size suitable for transport. Ores are stockpiled in the mill and then ground to finer particles by grinding the ball.

Challenges:

Challenges:

- No position or movement tracking of carts.
- Prone to collisions and breakdown.

- Maintenance problems and frequent breakdowns.

3.1 Preventing Collision Inside Mine -Use Case

Coal Mine Accidents Due to Human Error (per year):

>70%

Mining Industry Pain Points:

- Human Error - Many of the accidents in mines are caused due to human error
- Safety - Collision of vehicles and people in short range visibility is a common safety threat

Use Case Features:

- Registers dangerous proximity
- Detects a person on a vehicle's path of motion
- Issues a warning about a potential collision

Benefits:

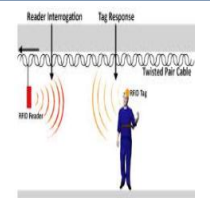
- Decreases downtimes caused by vehicle collisions
- Decreases industrial injuries caused by collisions between vehicles and personnel

"Ensures safety in spite of poor visibility"

RTLS Tracking Setup

1


RTLS tags are placed on all moving objects such workers, forklifts, and other vehicles for monitoring the real-time location within the mines



Continues Proximity Tracking

2

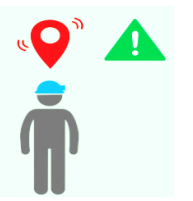
With the use of RTLS tags on assets and workers, the proximity and location are continuously tracked and communicated with RTLS engine in control center



Collision Prediction

3


Based on the proximity and location of assets and workers, the smart RTLS engines predicts any collision that may happen between assets and worker inside



Automated Vehicle Control

4

With prediction of a possible collision or extreme dangerous proximity, the RTLS engine triggers precautionary actions, such as overriding vehicle's drive and stop



(Source Citeseerx)

3.2 Hazardous Zone Presence Tracking -Use Case

Average Mining Death in China (Deadliest):

13 per day

Mining Industry Pain Points:

- Hazardous Environment Casualty - Due to over-exposure to poisonous or explosives gases present in the ground that goes unnoticed, triggering explosion and fatalities
- Lack of automated alarm system integrated with hazardous zones

Use Case Features:

- Personnel Location - Supervisor receives information on the current location of any personnel inside mine
- Motion Tracking - Path of motion of individual miners can be tracked

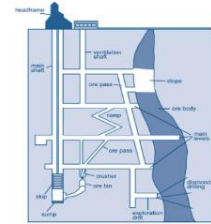
Benefits:

- Registers dangerous proximity
- Issues a warning about a person located in hazardous area

“Ensures safety in spite of poor visibility”

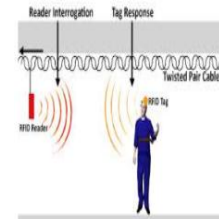
RTLS Tracking Setup

1 With the use of RTLS tags, a digital blueprint of a mine is created by clearly marking the hazardous zones and setting up perimeter control accordingly; further, the miners are also tagged with RTLS tags



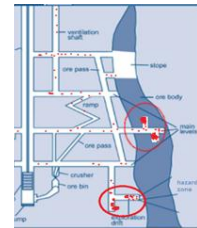
Miner’s Position Monitoring

2 Miner’s precise location is continuously monitored and tracked and is relayed to RTLS engine, which is monitored by the control center



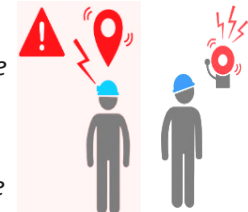
Proximity with Hazardous Zone

3 Based on the miner’s proximity to a hazardous zone, an alert is raised and the respective miner is immediately notified by alarming him that he is in a close proximity to a hazardous zone



Alarm Trigger

4 Ignoring early warning, if the miner stills steps into a hazardous zone, the RTLS engine raises alerts to both the miner and supervisor, and a perimeter alarm is triggered in the hazardous zone to notify the breach in the zone



(Source BBC, October 2010)

3.3 Emergency Evacuation-Use Case

Global Mining Accidents Death (per year):

12,000

Mining Industry Pain Points:

- **Mining Accidents** - Despite the advancement of monitoring facilities, accidents still occur in mining annually in the world
- **Fatalities** - Many miners get killed because they get trapped and are unable to escape. Panic, asphyxia, stampede add up to the reasons for death inside mines during evacuation

Use Case Features:

- Emergency announcements, notifications, issuing warnings, necessary instructions and triggering alarm devices such as: sirens, emergency lights, etc.
- The process of evacuation can be controlled and monitored


Benefits:

- Decreases industrial injuries caused by unorganized evacuation
- Locating trapped personnel

“Ensures safety in spite of poor visibility”

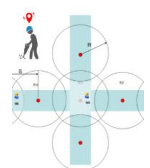
1 Emergency Zone Locator

The RTLS tags are connected to miners and assets along with sensors such as gas, temperature, etc. and in case of an emergency/ accidents/ poisonous gas leakage, the RTLS engine is able to pin point the location inside the




2 Detecting Miners

Based on RTLS tags, the precise location of miners is identified and traced onto the digital layout, and based on the movement of the miners, the RTLS engine determines if the miners are trapped, injured or dead inside the mine



3 Emergency Communication


As per the location of emergency, targeted announcements are done and alarm devices are activated for emergency evacuation of miners from the danger zone to a safe location



Announcement

4 Route Optimization & Evacuation

The evacuation process is controlled and monitored by the use of RTLS engine, and based on information, such as time spent, and paths of motion, the RTLS engine first localizes those who did not manage to get gathering points, and then guides each individual trapped inside to the best exit route



Evacuation

(Source: www.industrialinjuryattorney.com)

4. MINING KEY VALUE PROPOSITION

4.1 Pain Points

Vehicular Collisions	Lack of Effective Emergency/ Panic Alarms	Hazardous Zone Breach Monitoring	Emergency Evacuation Challenges	Inefficient Operations Monitoring
Process Inefficiencies	Ineffective Vehicles Movement Tracking	Lack of Automated In-mine Fleet Management	Cost Overruns	

4.2 Value Proposition

Value Proposition

Real-time monitoring of mine vehicles to preemptively reduce collisions

Immediate detection of safety incidents, and providing real time alerts

Using precise location monitoring and 2D/3D mine models to expedite navigations & evacuations

Detecting breaches of personnel or equipment into hazardous zone and raising immediate alerts

Real-time tracking of equipment and resources improving utilization with least idle time

UWB aids in tracking location, speed of mine vehicles and controlling their movement overriding drivers if required

4.3 Tangible Benefits

Increase Mine Safety

- Detection & safety evacuation of workers. Reducing industrial injuries caused by vehicle collision
- Quick tracking and transportation of critical equipment
- Monitoring proximity to dangerous zones & preemptive alerting

Improve Efficiency

- Real-time monitoring to improve resource utilization
- Reducing downtimes caused by vehicle collisions

Achieve Monetary Gains

- Reducing compensation and medical expenses due to less accident
- Increasing per worker production & per day production

5. WHY IS OPERATOR BEST FIT TO OFFER RTLS?

Experienced Partner	Rich experience of providing varied mobility and connectivity solutions meeting Enterprise needs, ranging from network planning, designing, and roll-outs to cloud services and to new age IoT solutions, and indoor positioning services is an extension to the same
Backhaul	Real-time positioning services require high data rates, low latency and high reliability, and existing infrastructure of operators can serve as a backbone for anchors with a 3GPP interface (LTE) backhauled to the RTLS engine that can be leveraged for 5G in the future
Core Competence	Indoor positioning use cases require intelligent information capture & processing over wide areas - planning and designing such complex large scale networks is a core competence for operators
Leverage Cloud	Cloud based RTLS platform requires high-reliability cloud deployment, which fulfils regulatory compliance norms, and carrier grade cloud solutions offered by operators can ensure reliability of positioning services
Security	Indoor positioning solutions generate critical and sensitive data on operations and assets, and operators have wide-ranging security solutions that can help keep this data protected while maintaining the QoS, and, in turn, help reduce the risk for security threats
Leverage Field Force	Large workforce of field service professionals ensures timely, on-ground customer support, enabling businesses to make use of the full value of investment made in a positioning solution
One-Stop Shop	One-stop shop for all positioning needs i.e. both indoor and outdoor positioning services, which can be integrated to build robust intelligence, as well as for other needs, such as devices, connectivity, hosting, and deployment

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