Multi-disciplinary Technical Expert Project Meeting

PROJECT FEEDBACK (WP1.5): RTIMS INTERFACES TO TMM SIMULATION MODEL

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science & innovation
Department:
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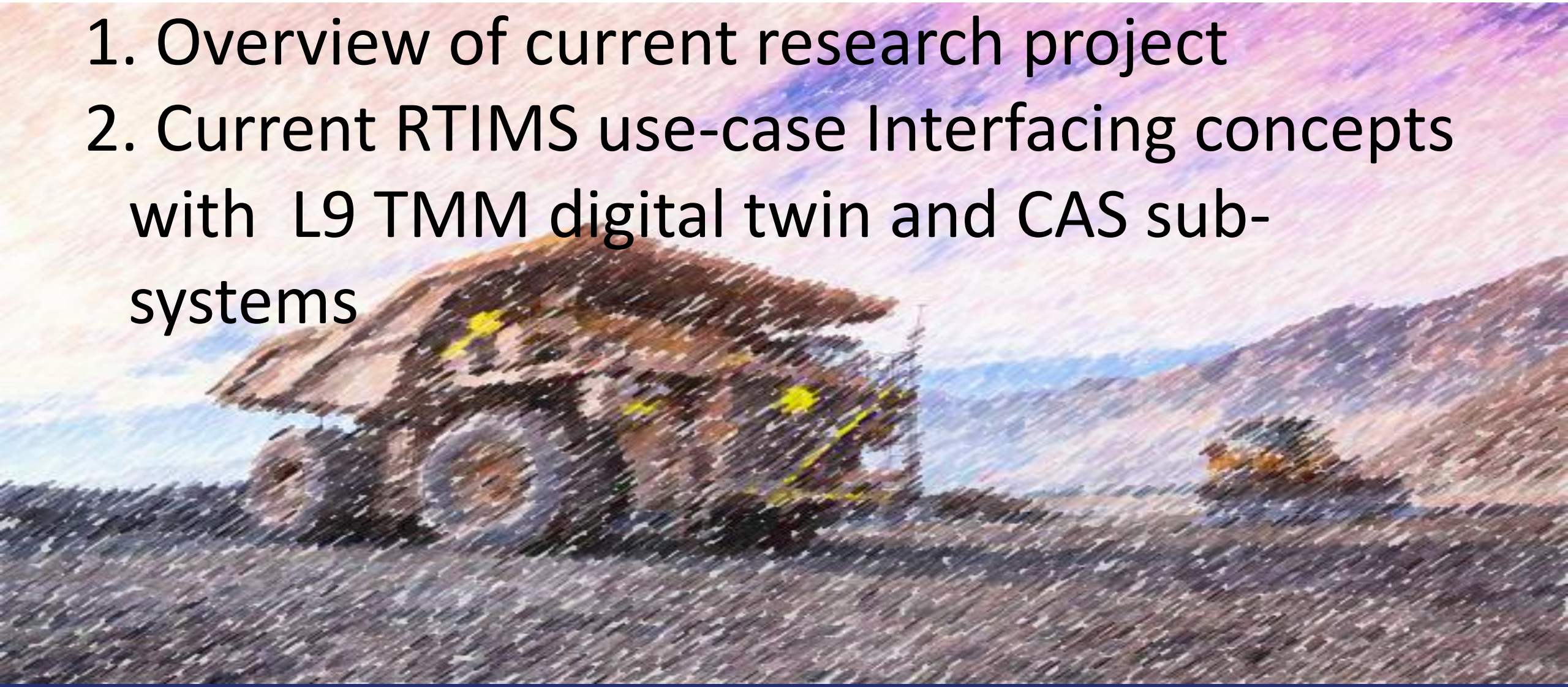
SCOPE

1. Overview of current research project
2. Current RTIMS use-case Interfacing concepts with L9 TMM digital twin and CAS sub-systems



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RESEARCH QUESTION 1

How can the RTIMS information system-architecture platform, in future, be utilized to support safe mining operations: specifically, where Level 9 safety regulations are required?*

** A Program of the MMP (JJ Verhaeghe)*

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RESEARCH QUESTION 2

Would it be possible to use a sub-set of the current RTIMS capabilities to support the current L9 TMM digital twin platform simulation capabilities to process safety predictions in near-real time?

……the availability of near-real time data from sensors at the operational site, would enable the L9 TMM digital platform to provide near-real time predictions of possible hazards…

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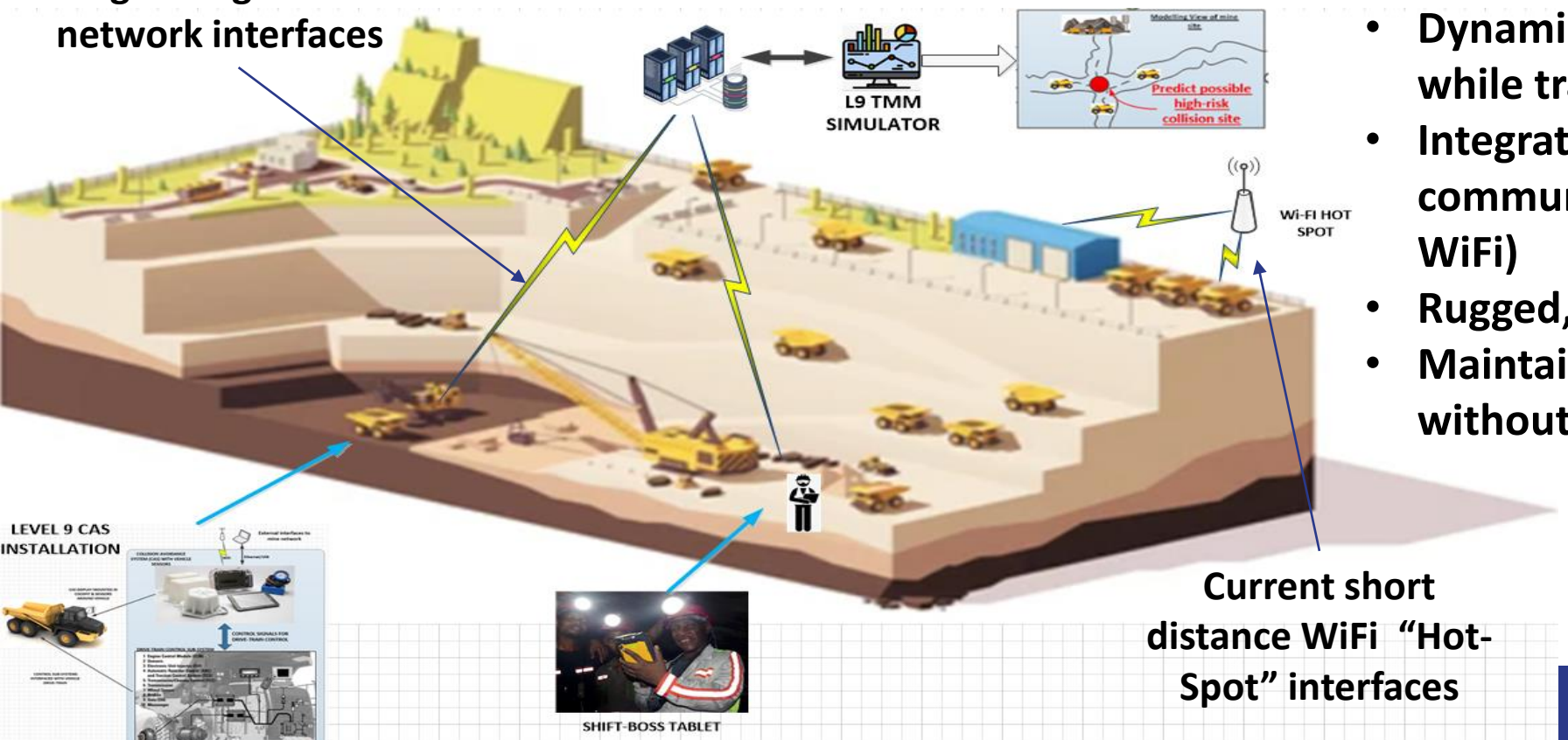
OPEN PIT MINE IMPLEMENTATION CHALLENGES

- **The implementation of near-real time data sensing integration capabilities at an operational site do present certain challenges**



- **Long (3-5 km) Non-Line-Of-Sight (NLOS) transmission conditions**
- **Highly reflective rugged surfaces**
- **Dynamic conditions, vehicles are moving, while transmitting/receiving data**
- **Integration with existing (static) communication's infra-structure (e.g. WiFi)**
- **Rugged, dusty conditions**
- **Maintain near-real time data services without interruptions**

Current short distance WiFi "Hot-Spot" interfaces

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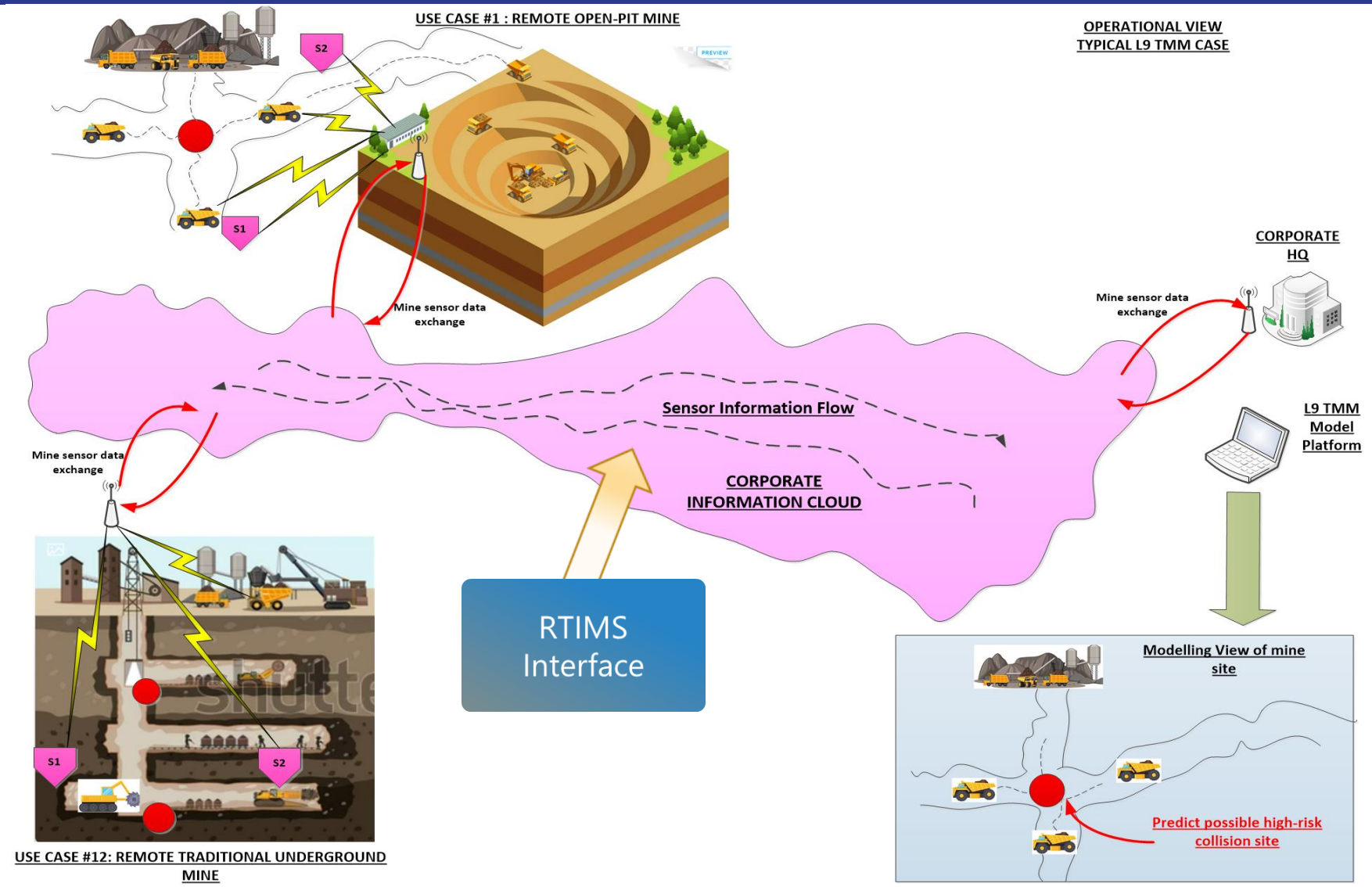
OPERATIONAL VIEW (OV):TMM LEVEL 9 (L9) USE CASE

Look-back

- **The focus is to define the information flow requirements to implement a scenario where the L9 TMM digital twin model platform can receive real-world data as it is generated at a mining operation site.**



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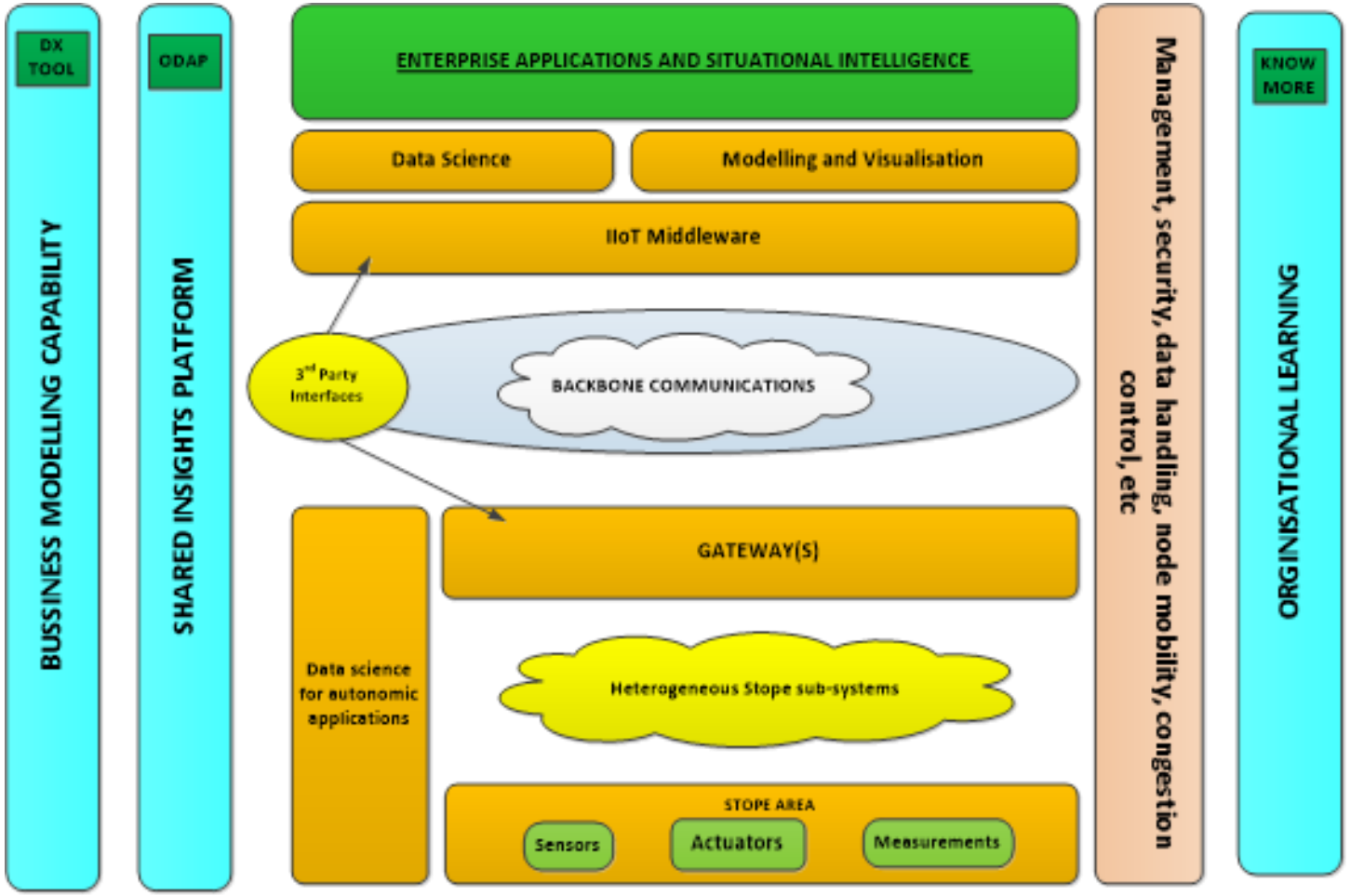
RTIMS INTEGRATION PLATFORM CONCEPT

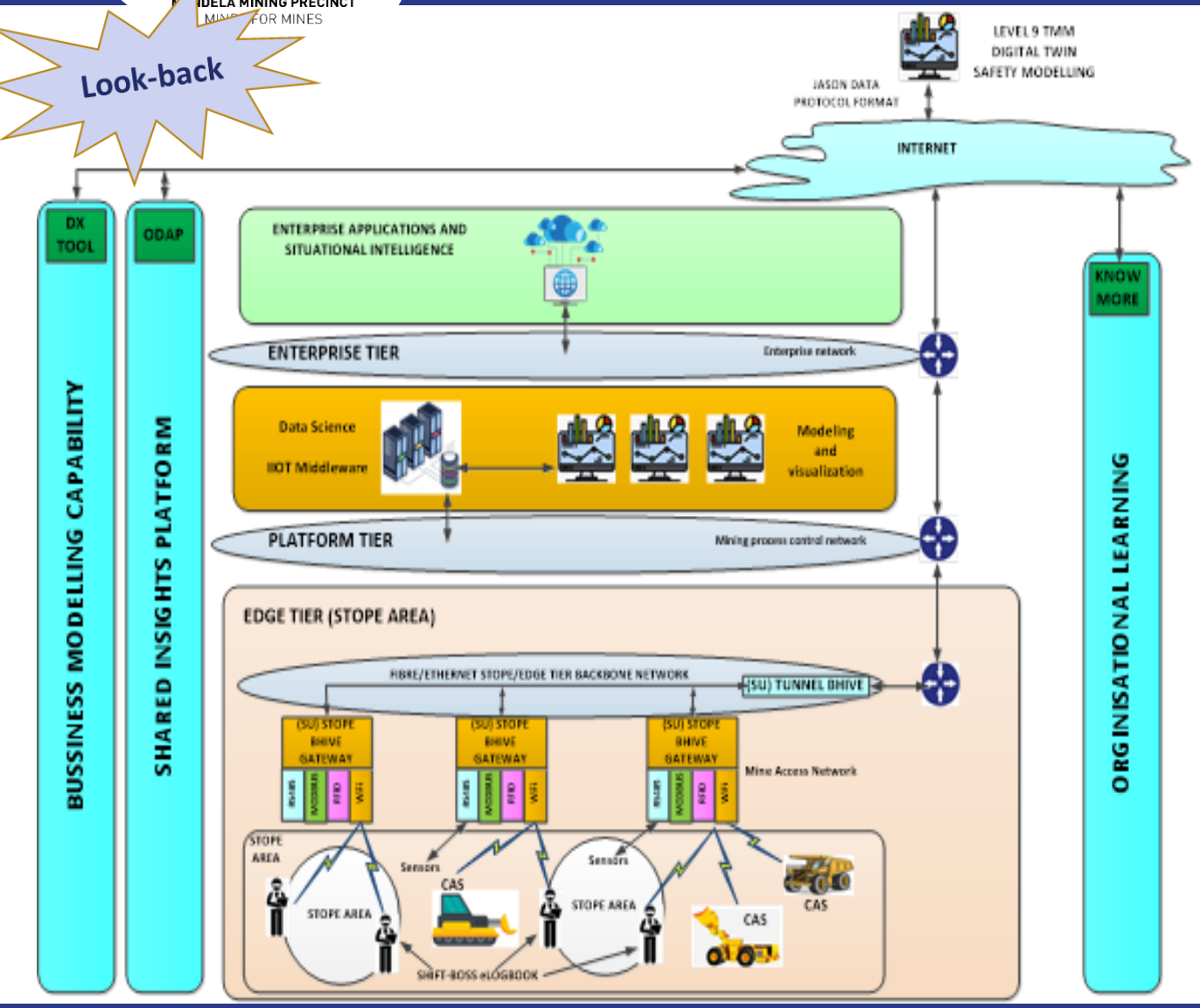


(Source: RTIMS, JJ Verhaeghe)

Look-back

- **Utilizing past RTIMS research outputs, the RTIMS mine integration platform is ideally suited for L9 CAS sub-system integration**
- **Interfacing concepts for collating sensor data from the stope area has been defined**

RTIMS INTERFACING ARCHITECTURE CONCEPT



- **Integration of L9 TMM CAS sub-systems will be imperative for future “Digital Twin” safety simulators**
- **Valuable data such as how many break command, near misses, hazardous events, Etc needs to be collated in a near-real time format**
- **Near-real time L9 events supports the vision of pro-active zero harm policies**
- **A holistic systems approach towards the implementation of L9 safety principles would be possible**

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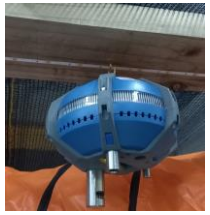
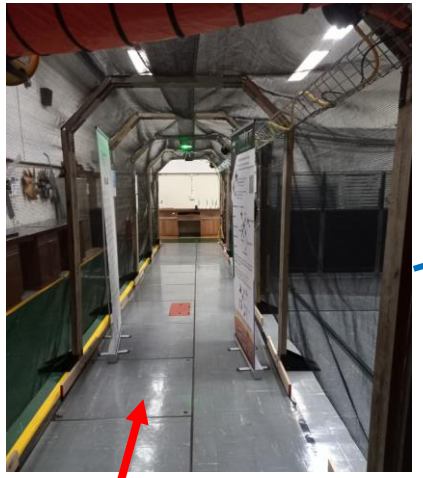
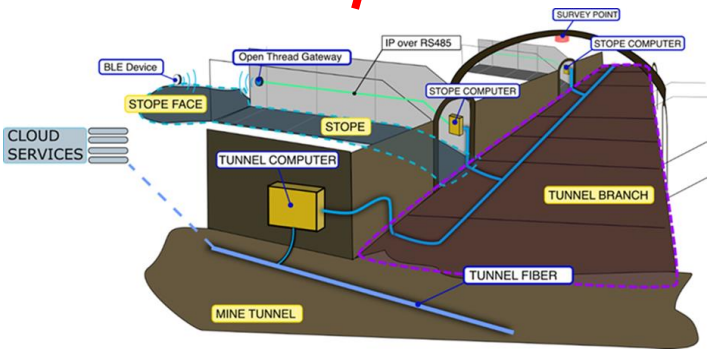
USE-CASE : RTIMS CAPABILITIES INTEGRATION

Stope hazard sensing







TMM Digital Twin
Data Analytics

TMM Digital Twin
Framework

TMM Digital Twin
Simulation Frameworks

Collision Avoidance Sensors (CAS)

Mesh-communications (NLOS)

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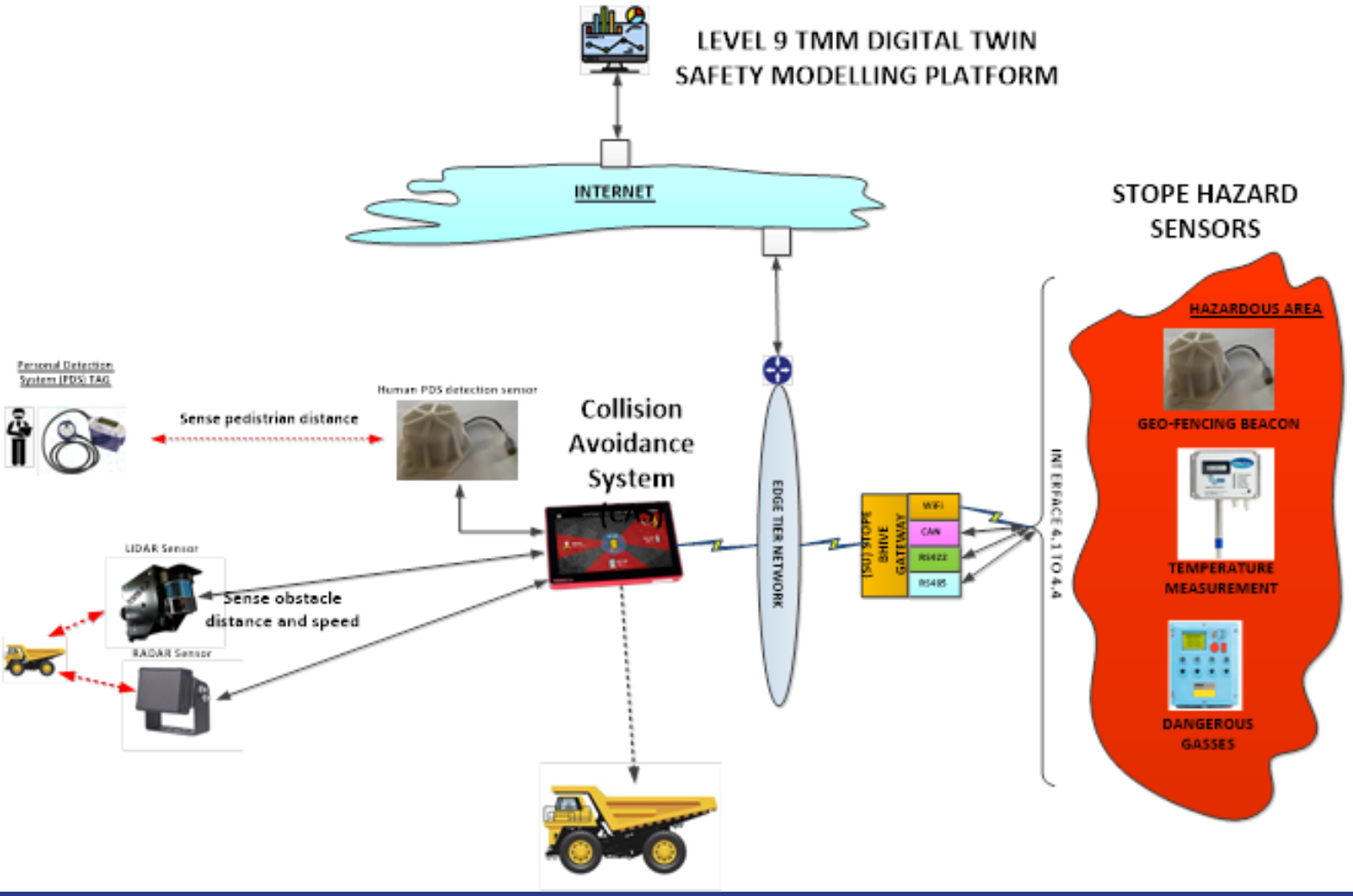
USE-CASE CONCEPTUAL INTERFACE CONCEPT



- **The RTIMS mesh-communications modules can be utilized to integrate the CAS sensor suite to the L9 TMM digital twin platform.**
- **In future, stope hazard condition sensors could be used to provide data regarding possible hazard conditions to the L9 TMM Digital Twin platform (Gasses, dust, temp, etc).**

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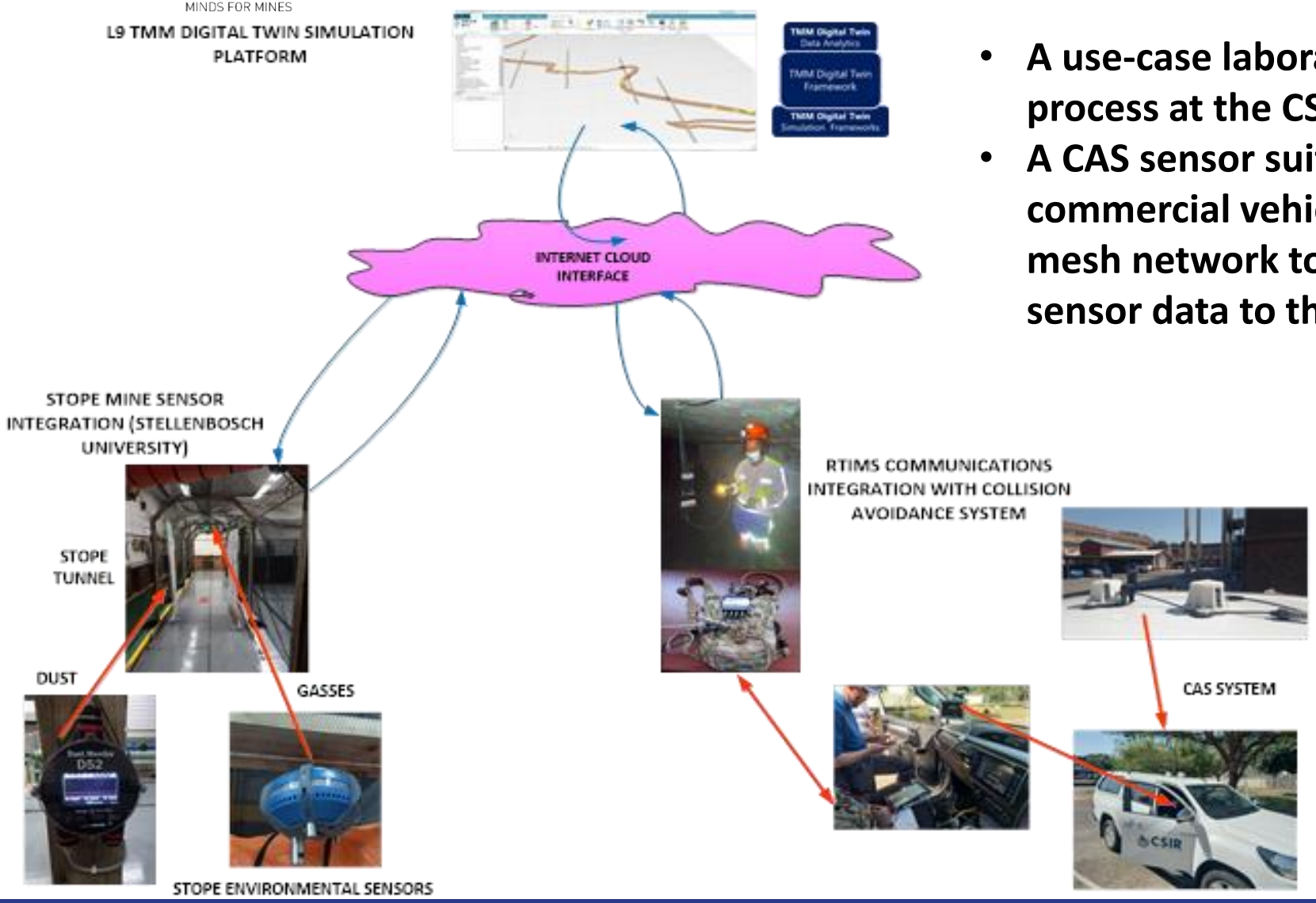
CURRENT USE CASE INTEGRATION



- **A use-case laboratory integration is currently in process at the CSIR**
- **A CAS sensor suite has been installed within a commercial vehicle and interfaced with the RTIMS mesh network to communicate near-real time sensor data to the L9 TMM Digital Twin platform.**

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IN SUMMARY

- The current laboratory integration between a vehicle-installed CAS sensor system, RTIMS was successful
- CAS sensor data was communicated between the CAS system, via the RTIMS mesh-communications network to the L9 TMM Digital Twin platform, (*digital twin data integration in progress*) while the CAS-vehicle were moving.
- Hazard area identification: Stope sensor integration between the US stope sensor tunnel and L9 TMM Digital Twin platform is in progress
- Future planning: A first use-case integration could be completed in the next two weeks, and current planning is to test the concept at an open pit mine operation, subject to mine safety/operational requirements.

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THANK YOU

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