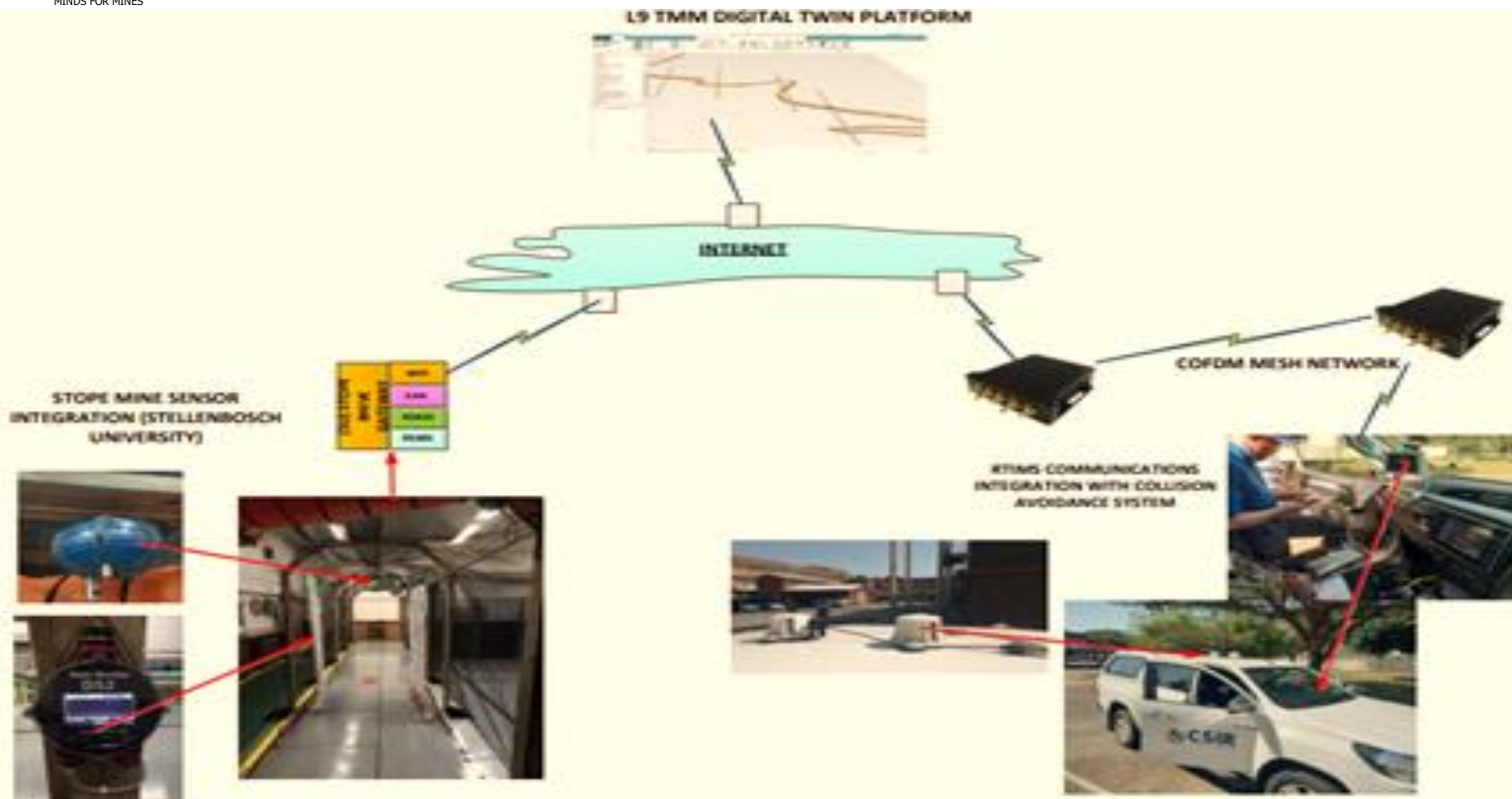




TMM L9 SUPPORT

Technical Detail:

- The RTIMS L9 use-case was implemented using a modular architecture based on the RTIMS Common Core Framework and IIRA model. CAS sensors (Booyco) were installed on moving vehicles, while stope environmental sensors (temperature, dust, smoke) were deployed in a laboratory mine-stope simulation. Data was transmitted through a six-node COFDM mesh network operating at 2.265 GHz with 10 MHz bandwidth, achieving stable 10 Mbps throughput. Sensor data was formatted using a JSON protocol and interfaced through standard Ethernet, WiFi, RS485, and CAN protocols. Real-time updates were successfully visualized on the L9 TMM Digital Twin platform, including geo-location tracking, braking, and speed data, enabling responsive safety interventions and hazard forecasting.

Benefit:

- The integration of RTIMS communication and sensing technologies into the Level 9 (L9) TMM Digital Twin platform significantly enhances mining safety management. By enabling near real-time updates (every 5 seconds) from vehicle-mounted Collision Avoidance System (CAS) sensors and stope environmental sensors, the platform provides proactive hazard detection and intervention capabilities. This reduces the response time for safety managers, supporting dynamic mitigation actions such as designating no-go zones or enforcing speed limits. The system promotes compliance with recently mandated L9 safety legislation, improves situational awareness, and offers a scalable, vendor-agnostic architecture. Its demonstrated reliability and openness to integration position it well for future commercial deployment and broader adoption across the mining sector.

