> We have identified underground connectivity as key step in our digitalization journey and learnings suggest that there is no one-size fits all approach due to the uniqueness of each asset. We see Plexus PowerNet™ as a frontrunner for user-friendly, tactical connectivity that provides ruggedised infrastructure that is easily maintained and extended underground. Being able to connect with our fleet and most valued asset, our workforce, provides for a paradigm change in safer and effective mining practices.
>
> **-Quote from Client**

SIBANYE STILLWATER BATHOPELE MINE

MINE/PROJECT LOCATION:
Rustenburg, South Africa

MINE:
Bathopele Mine

CLIENT:
Sibanye-Stillwater

ORE TYPE:
Platinum (PGM)

PROBLEM:

A key enabler for digitalization in underground mining is securing mine-wide, robust and resilient broadband wireless connectivity. The nature of underground mining is such that digital infrastructure must operate and be maintained in a harsh, often unforgiving environment. Whilst legacy fibre installations are established and commonplace, these are generally terminated with a network switch at level access or waiting places with limited connectivity available up to the working face, known colloquially as the “last-mile”.

Without connectivity in the “last-mile” there is limited opportunity to receive and trend real-time data for asset and personnel intelligence and optimisation. To remedy this, Dwyka Mining Services (DMS) partnered with precious metals mining company Sibanye-Stillwater to roll-out a proof of concept (POC) underground network to secure and extend its capability to aggregate real-time data in an active section at their Bathopele Mine through the

SOLUTION:

Complete Wireless Panel Coverage

The native benefits of the Plexus PowerNet™ planned to address two primary challenges for the client. First, it would allow for the establishment and extension of wireless connectivity from the belt tip to the working face. This was achieved by connecting and powering strategically positioned 802.11n wireless access points (WAP’s) from terminating nodes installed less than 40m from the face with min-ready, high-gain antennas to extend coverage into each panel as well as along TMM tramming routes. Second, since fiber splicing underground can be complex with humidity, dust and concussion in these locations, Plexus PowerNet™ will in time allow for pre-terminated connections as the tip advances for backhaul for increased installation flexibility and greater data integrity as a ruggedised alternative to the requirement of irregular fiber splicing performed underground.

Plexus PowerNet™ – The first gigabit network providing both data and power using coaxial cable

Plexus PowerNet™ – The first gigabit network providing both data and power using coaxial cable

Underground Installation showcasing Plexus PowerNet™ Nodes, Wireless Access Point and Antenna Configuration

Underground Wireless Site Survey Technology

As a global first site survey technology was utilized underground to take the guess work out of network design. These heatmaps were utilized to dynamically design and optimize the positioning of the WAP locations and antennas for maximum WiFi coverage. This wireless coverage confirmed wireless network parameters and maximized time ‘in-range’ for IOT.nxt Raptor units to ‘offload’ telemetry data operating at the face and along designated tramming routes. Stable coverage would allow for a real-time view of asset overall effectiveness, with added opportunity to gain deeper insight by trending historical data computed at the edge and stored in the cloud.

GOALS:

The primary goal was to establish an easily maintainable and extendable broadband wireless network with high up-time availability to ensure agreed levels of 802.11n wireless coverage in each working panel. Success for this goal involved ensuring data rate and range were managed and optimized to rapidly upload real-time data across multiple underground WiFi enabled devices.

The secondary goal working closely with eco-system partners IOT.nxt, was to provide a ‘last-mile’ backbone to connect their Raptor™ hardware and enable their cloud-based Commander™ IoT visualization software to visualize real-time trackless mobile machinery (TMM) availability, alarms and other mission critical sensor data whilst active at the face. Success for this goal could only be achieved by a stable wireless network with broadband coverage into the active working panels for data transfer.

RESULT:

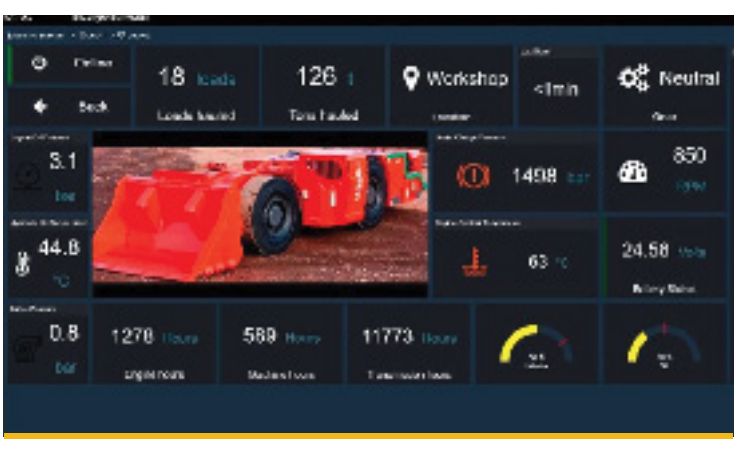
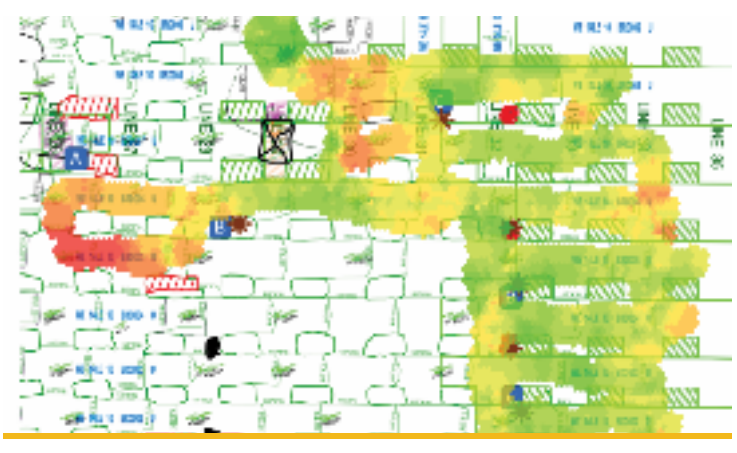
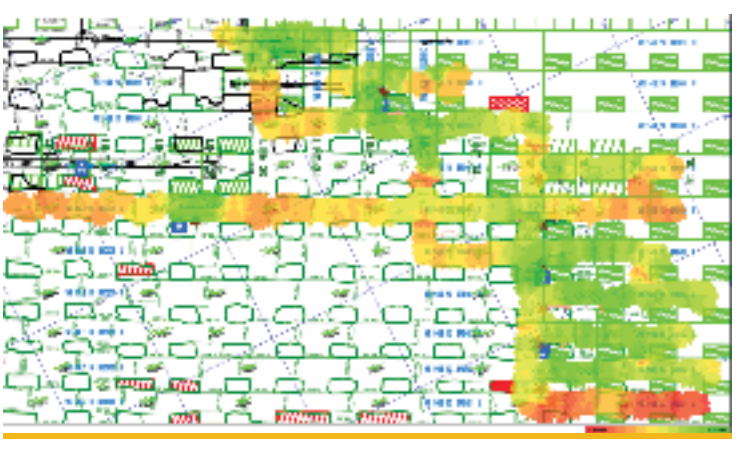
Maestro Digital Mine’s Plexus PowerNet™ was successful in providing high broadband connectivity into each working panel. This secured a robust and resilient broadband wireless connectivity and communication network to the face that allowed both human and machine to connect and communicate in arguably the highest risk and cost environment of the mine.

Alex Fenn: “Dwyka Mining Services has demonstrated it has the capabilities to deliver on its promises and exceed expectation. This proof of concept has proven that dependable connectivity is possible in the ‘last-mile’ and we are excited about pushing the technology further to expand its capabilities through the addition of other technologies that enhance our understanding and effective management of our operations.

Real-time network visualization on IOT.nxt Commander and regular underground network surveys, confirmed quality of wireless coverage and up-time diagnostics of connected TMM assets. This trended data allowed for workflow and operator analyses that highlighted valuable optimisation opportunities for the company to consider.

Carlo van Rensburg, Mine Manager Bathopele East Shaft: “Real-time data from our machines allowed us to unlock considerable asset and operator value. Empowered with this real-time data and ability to trend it historically from our mixed fleet, it is difficult to imagine not having this information at our fingertips going forward, so we see a bright future for this technology augmenting our team’s effort as we mine deeper and try to do so more safely.”

Dwyka Mining Services is a pan-African mining technology platform that assists underground mining clients to adopt and adapt to evolving technologies with a focus on supporting efforts to improve safety, health and environmental conditions in the collaborative pursuit of the digital mine of the future.

KEY TAKEAWAYS:

- Secured a robust and resilient broadband wireless connectivity and communication
- Maestro Digital Mine’s Plexus PowerNet™ was successful in providing high broadband connectivity into each working panel
- Real-time network visualization