Shannon Katary, Maestro Digital Mine, Canada, describes how the company's IIoT technology has helped the mining industry overcome the challenges associated with the use of more traditonal forms of communication.

ENABLING THE DIGITAL MINE

The concept of enabling the digital mine is built upon the use of critical data to increase production, reduce costs and enhance worker safety. Most often, underground mines choose fibre optic cable as the means to extend connectivity from each level out to the working areas. In addition, a separate cable run is required to power the wireless access points, cameras and other end-point devices.

Fibre presents several challenges to the underground mining industry; for instance, terminating fibre underground is difficult, time-consuming and requires expensive specialised training, which is frequently the biggest contributing factor limiting the advance of connectivity. These types of delays inhibit the agility and pace needed to enable the digital mine and bring communications to the mine face.

Identifying the mining industry's rising demand for real time data, Maestro Digital Mine works with mining companies around the world, such as Newmont Goldcorp, to address the challenges associated with traditional communication backbone solutions (broadband and fibre). Maestro Digital Mine manufactures Industrial Internet of Things (IIoT) measurement and control instrumentation for the optimisation of underground mine ventilation and underground digital networks for the last mile of communication.

Maestro Digital Mine's products are made exclusively for underground mine automation, technology (IT/OT) and ventilation sectors that deliver energy savings and productivity improvements, while meeting the highest health and safety standards.

Figure 1. Plexus PowerNet.

Figure 2. Plexus PowerNet B node.

Case study

Newmont Goldcorp's Borden mine became one of the first mines to integrate Maestro Digital Mine's Plexus PowerNet™, which addresses the challenges associated with extending fibre optic-based communication backbone solutions for 'last mile' data applications.

Newmont Goldcorp's Borden mine is located in Northern Ontario, 11 km northeast of Chapleau (Canada). Newmont Goldcorp is the world's largest gold producer, and approximately 15% of its direct gold production comes from Northern Ontario. The battery powered, all-electric underground mine is the first of its kind in Canada.

Newmont Goldcorp is a proven leader in implementing innovative solutions into its operating mines, partnering with like-minded technology suppliers, such as Maestro Digital Mine, to improve health and safety performance and reducing greenhouse gas (GHG) emissions. Borden mine first started using Maestro's digital ventilation technology, the Vigilante AQS™ air quality station, to measure environmental conditions for worker health and safety and to reduce installation infrastructure costs. With this initial success, Borden mine soon became one of the first mines to integrate the Plexus PowerNet, which addresses the challenges associated with extending fibre optic-based communication backbone solutions for 'last mile' data applications. The Plexus PowerNet system quickly extends communication and end-point power using copper coaxial cable to the face.

Addressing the challenge

The Borden mine all-electric vehicle fleet sets the conditions for a safer workplace for employees, while resulting in a smaller environmental footprint. Newmont Goldcorp expects to begin commercial production at the mine in 2H19. Borden mine depends on real time digital technology and intelligent controls, including teleremote technology to maximise equipment use for continuous mining. Part of getting an underground mine online for production means embedding and advancing critical communication infrastructure throughout the mine and towards the face. Borden mine uses fibre optic cabling as far as the level entry or electrical substation, as do most modern mines.

While fibre optic cable provides high data rates and reliability, it also presents challenges to the underground mining industry. Extending delicate fibre optic cable to the high traffic headings, such as the mining face, where the data is essential is challenging, and the fibre optic cable can get damaged, causing production delays. Terminating fibre underground is difficult, time-consuming and requires expensive specialised training, which is frequently the biggest contributing factor limiting the advance of connectivity. At Borden mine, 144 strand fibre cable is run from the surface control centre to each level entry via the ramp and terminated in a fibre patch panel where a CISCO network switch is added. Borden mine was constrained by communications from the network switch out to the face.

Borden mine required a durable solution that could bring both data and power to the face of each mine level that was easy to install, advance and repair with robust components that could be transparently integrated to a regular IP base network. The decision to implement the Plexus PowerNet solution was made on 7 December 2017, and the technology was integrated into the design and construction phase of the mine.

The last mile solution

The Maestro team jumped at the opportunity to partner with this landmark mine and co-ordinated with Newmont Goldcorp's team at Borden mine led by Electrical Manager Patrick Gilbert and ITT Infrastructure Analyst Paul Fortin, to bring their team up to speed on the technology and how to install and use the Plexus PowerNet nodes.

Gilbert remarked: "Plexus is easy to install, easy to advance and easy to navigate. All of this can be done by our technicians, including any emergency repairs."

He added: “One of the advantages of the Plexus PowerNet nodes is that they arrive with the durable aluminium plates already pre-drilled and with all the required electrical connection fittings. So, we just bolt it to the wall and go. For example, when you are in a jam at the face, you just go the source of the damage, cut the coaxial cable and put a new section of the rugged coax on with a splice and you are back at it. Back in business. No time delays. For the IT department, the Plexus PowerNet delivers a high speed, low latency, low jitter digital communication network.”

Figure 3. Newmont Goldcorp's Electrical Manager Patrick Gilbert on the surface at the Borden mine.

Figure 4. Maestro’s Plexus PowerNet is enabling connectivity at the face.

Newmont Goldcorp now uses the Plexus PowerNet in conjunction with CISCO access points to extend their network from the fibre patch panel to the internal workings. Their primary and most demanding application was to run Sandvik’s – AutoMine® lift, haul, dump (LHD) teleremote application. Teleremote applications increase safety by removing the miners from their most dangerous jobs and at the same time allows the LHD to return to the face immediately after a blast thereby increasing vehicle uptime. Borden mine understood that without a reliable and high bandwidth connection, any automation project will fail. The Plexus PowerNet provided all of this and more.

The Plexus PowerNet nodes allowed Borden mine to connect multiple devices, such as high definition Power over Ethernet (PoE) cameras, Maestro’s Vigilante AQS air quality station, teleop laser safety barriers and underground fleet telemetry at each level.

Newmont Goldcorp’s Borden mine continues to expand the Plexus PowerNet on each new level to provide a solid communication network in time for full production.

Gilbert reflected: “The Plexus is a proven technology at Borden mine, it works. We are at a critical time in our production schedule and the simplicity of the Plexus PowerNet is working well with the team and will play an important role for monitoring the activity and keeping our workers safe at the face.”

Michael Gribbons, Vice President of Sales and Marketing at Maestro Digital Mine, reiterated the advantages of Plexus, stating: “Plexus PowerNet delivers a high speed, low latency digital communication network that provides PoE+ power to wireless access points, cameras and any other IP-based device. The system eliminates the need for costly outside fibre optic contractors and can be installed and maintained by any internal tradesperson. Maestro is honoured to be collaborating with Newmont Goldcorp. The clients come first; we believe in leaving no one stranded as we assist with integrating our digital solutions into operating mines in this digital age of mining, Industry 4.0.”

Conclusion

The Plexus PowerNet is currently installed and being expanded at 21 mines in Canada, the US, Spain and Finland. Maestro Digital Mine’s current clients have compared other gigabit network solutions and concluded that CAPEX can be decreased in the area of 40 - 60% without any compromise of network speed or capability. The Plexus PowerNet can be used in mines with or without a fibre optic network. The Plexus has been designed for the quickest ‘last mile’ of communication. GMR