



## COMMUNICATIONS & NETWORKS

# Staying connected

With productivity, safety and efficiency at the forefront of every mine manager's priorities, the need for effective communication and network protocols are of paramount importance, Daniel Gleeson learns

*A reliable network helps personnel underground access critical information*

*Photo: MST*

If there is a piece of equipment or person running around a mine, one can bet there is a sensor, or two, positioned on them.

The need to track assets underground and on-surface has led to some interesting developments in the communications and network space.

Radioing in the dumping of a load underground, or warning other operators that an LHD is coming round the corner via some code word, is slowly being replaced by much more innovative and safer protocols, changing the ways companies use this technology.

"Managing and maintaining your own communications technology and networks is expensive, and

requires specialised expertise. Always on, always-available network technologies must withstand the rigours of constant operation in difficult environments and have built-in redundancy to ensure uninterrupted service," Oliver Zuber, Motorola Solutions lead executive for mining in Europe and Africa, tells *Mining Magazine*.

Why is this important?

Safety is, obviously, the main reason. If a mine relies on a wireless backbone to enable many of its applications and personnel to communicate, the suspension of connectivity could lead to a potential injury or damage to costly equipment.

But this is only one aspect. The sheer amount of data a typical mine

site comes into contact with, in tandem with a need for increased productivity and cost cutting over the past few years, has placed even more importance on mines establishing a reliable wireless connection.

"The increasing complexity of mining equipment, big data and Internet of Things (IoT) applications have greatly influenced the amount and types of information that mines now generate non-stop," Modular Mining Systems tells *Mining Magazine*. "The use of feature-rich management systems, asset-health monitoring solutions, machine guidance and streaming video applications, to name a few, are now the norm in most mining operations."

Mine Site Technologies' interna- ▶

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**FLEX YOUR OPERATION**

Rajant recently installed its Kinetic Mesh network in Goldcorp's Porcupine mine in Timmins, Ontario  
Photo: Goldcorp

tional business manager, Denis Kent, extends the point. "It all hinges around having a network in place to support some of the things they want to do with other third-party fleet-management vendors, or data analytics back on surface, or in the cloud. At the end of the day, all of these need a good in-mine network to enable them," he tells *Mining Magazine*.

Leaky feeder systems were once thought of as the best way to connect to equipment and personnel underground, but as Kent says, this has changed dramatically.

"Leaky feeder has been a good voice system for mines for many years, and still is, and they have stretched a bit of data out of it – you can switch a pump or fan on or off – but when it gets to streaming video, real-time tracking and real-time data of vehicles, it is just not up to it. It simply does not have the bandwidth," Kent explains.

But, with a huge amount of companies offering networking solutions with varying bandwidths, it is hard to know which one to choose.

"It's not just a simple case of putting in an access point you have sitting at home underground. In theory that works, it is the identical system you are creating, but when you have multiple devices with different priorities and importance of data coming through, it is the network-management side that makes the difference," Kent says.

#### RADIOING IN

Taking a step back from networks, there is still a need to improve the communications side. Motorola Solutions recently launched its MTP8000Ex Series Tetra (terrestrial trunked radio) ATEX digital two-way radios, which Zuber says enables "safe communications under hazardous working conditions".

"Radios used in mining must keep workers safe and connected while withstanding the rigours of daily use in some of the most extreme environments in the world. Having loud and clear audio with noise suppression to ensure workers can hear and be heard is absolutely essential," he says.

This series of two-way radios are built to withstand all an operating mine can throw at them, leading to "safer, smarter work anywhere in the mining environment", according to Zuber.

Motorola Solutions is not developing such products in isolation, though.

Its Wave Work Group Communications product enables the transfer of data and voice communications via a broadband push-to-talk (PTT) solution that works through the existing network to connect the two-way radios to smartphones, laptops, landlines, tablets and handhelds.

"Users can use the devices they already have and the networks they already subscribe to, and PTT with other teams and individuals both inside and outside their communication system," Zuber notes.

The system comes in two different settings – WAVE 3000 and WAVE 5000. The former is built for smaller underground operations with minimal personnel and equipment, and connects securely through a dedicated server. WAVE 5000 can help larger organisations build "a more connected and manageable PTT communications environment", Zuber says.

Zuber states that the real test with all communications systems – WAVE included – is not the relay of data, but rather deriving usable intelligence from what is generated.

"We see on-site command and control centres providing great benefits, especially in effective emergency management. With real-time monitoring of the location of all personnel and equipment, a response to any incident is greatly enhanced," he says.

In this respect, Motorola Solutions' two-way radios provide safety benefits, according to Zuber.

"Data from GPS-enabled two-way radios constantly updates a console at a command and control centre so that controllers can quickly see incidents on-screen and the location of affected workers, first responders and any potential dangers. This data provides an entirely new way of managing a critical incident."

While health and safety – and the data to help improve this – is, undoubtedly, of paramount importance underground, mining companies are only just starting to realise the potential of the networks available to them, according to Kent.

"They [existing customers] are thinking about more ways to use the network than they were before and how to use the data that is available. Tracking people and equipment is good, but actually pretty useless in



day-to-day operations on its own unless you use it productively," he suggests.

#### EXTRACTING VALUE

And this is where MST's ImPact digital network comes in, helping its customers make the most of all the data available to them.

"For example, cycle times can be analysed to see if they are in the average parameters. In coal, it can be managing activities in the mine during big longwall moves and making sure everything gets into the right place.

"That's getting real value for them, so they [mines] are putting more money back in to expand the [wireless] coverage," Kent says.

The work that MST is doing with Glencore at its Mount Isa operation in Queensland, Australia, is a case in point.

"They're constantly expanding the network. They have got good leaky feeder [systems], which we supply and which covers the entrance into the mine, but what they have now done is 'hot spotted' or 'Wi-Fied' all of the active working areas," Kent explains.

This has saved Glencore a lot of money, according to Kent. "Instead of spending millions to Wi-Fi the [whole] mine, which wasn't necessary, they just concentrated on the working areas where that coverage was essential," he says.

MST is also building reports for Glencore from this data.

**"Having loud and clear audio with noise suppression to ensure workers can hear and be heard is absolutely essential"**



"We've started to do a lot of reporting to supervisors and production guys. It's not full on fleet management, more knowing how many trips a truck has done, what the average cycle time was – the basics of what a production supervisor

wants to know. Then, if an operator goes outside of those normal parameters, an alert can be raised," Kent says.

Kent adds that this sort of work – refining and expanding on existing systems – is slowly becoming a staple for the company, as fewer new mines and expansions come on stream and their existing customers look to 'wring more value' out of their existing systems.

Another example of this is the work MST is carrying out with Anglo American at its Moranbah North coal mine in Queensland.

"Moranbah has been looking at short-interval control where they are putting a lot of effort into managing all the processes that go into the mining cycles," Kent says.

The company's recent work with MST involved bringing down its short-interval control time, allowing the company to react quicker to problems that may happen during a normal production cycle.

"Historically, if tasks drifted off from plan, or something didn't turn up in the right place, they weren't finding out the process had broken down until the end of the shift.

Their aim at the moment is to get their short-interval control down to two hours... meaning it is a maximum of two hours before they realise there is deviation from plan," Kent comments.

At Freeport Indonesia's Grasberg mine, MST is helping the company transition from an open-pit to an underground block-cave mine, which will have both semi-automated and automated functions, according to Kent.

"We have got multiple vehicles running around with two cameras on them, plus the control systems that all have their own peculiarities and latency requirements. We're handling it very well. It has all been designed from the beginning to handle it," he says.

MST has also carried out some new network installations underground in a Russian potash mine and in a Turkish coal mine.

The work for Anglo American and the Russian potash mine has also involved feeding into third-party process-management tools. For Anglo, it is the Fewzion application, which the diversified miner uses to access data it needs to update work ▶

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One of Motorola Solutions' communications installations in Australia



► plans 'on the fly'; and in Russia, it is MICROMINE's Pitram system.

This is one of MST's key differentiators, according to Kent. "We have purposely made our network to be open-source. We use it for what we need, but are happy to provide it to any third party that wants to use that data, and will stream it through seamlessly to their applications."

#### APPLICATIONS

One company that has developed such applications for underground operations is Modular Mining Systems.

Its Dispatch Underground 2015 fleet-management system has real-time automated production tracking, equipment location and time-tracking capabilities, which allows managers – potentially located in a central office – to make critical decisions from their chairs.

The system, reportedly being trialed in an underground hard-rock mine in North America, helps increase equipment utilisation and productivity, reduce waste and operating costs, and enhance safety, according to the company.

The company has also developed remote real-time monitoring solutions in the form of its MineCare 3 product and its MineAlert collision avoidance system (CAS).

Modular is able to stream all of these through its own wireless network backbone.

"All that data is pushing most mines' wireless networks to the point of collapse. As a result, our customers are looking to us for wireless solutions that can meet their large bandwidth requirements, as well as coverage needs," Modular Mining Systems states.

Modular says its MasterLink Enterprise system delivers speeds of up to 300Mb/s and is compatible with current Wi-Fi protocols, enterprise-level security and hardware such as Cisco and Radwin.

#### CONNECTING ON SURFACE

While there have been a number of developments underground to help improve network coverage, on surface Rajant has become one of the market leaders in the connectivity field.

Having recently signed an agreement with heavyweight telecommunications firm BT, the company reveals that its core Kinetic Mesh technology is winning favour with many open-pit mines.

"The industry no longer looks at wireless as simply speeds and feeds, but rather application availability and operational efficiency. Application availability is the only way to drive operational efficiencies," CEO Bob Schena tells *Mining Magazine*.

"Rajant's Kinetic Mesh wireless has been designed from the ground up to ensure application data is always available. Many vendors can offer up lots of bandwidth or, at least most of the formidable vendors can if they want to be in the game, but the fact is bandwidth is only one component that impacts where a network can handle a multitude of applications running over the network when everything is in motion," he says.

The differentiating factor for Rajant's technology is this movement.

"What may have started out as a cool marketing phrase truly embodies the fact that a 'living network' is a network that handles change. In a mine environment, change is indica-

tive of motion. Rajant's Kinetic Mesh technology allows private wireless networks to not only exist in environments that embody change, but also to embrace the change leveraging that movement to result in the connectivity, capture and delivery of vital and timely analytical data," he explains.

Haul trucks can be equipped with nodes, as can auxiliary vehicles, which move around continuously, establishing a "kind of broadband bubble over the entire mine", according to Schena. This allows all kinds of applications, from vehicle tracking to video applications, to work effectively.

It is also where the partnership with BT comes in.

"We take their [BT's] capabilities and push them right to the edge of an industrial site, such as the mine," he recently told *Mining Magazine's* sister publication *Mining Journal*.

Rajant effectively takes BT's network-management skills into the 'heart of the mine', gathering data from thousands of devices such as sensors, autonomous vehicles, industrial machines, high-definition cameras and VoIP systems, and relating this to miners' corporate network and data centres, Rajant says.

Such an agreement is important for the company considering the way the industry has changed, according to Schena.

"Traditional challenges for the mining sector have included landscape shifts, safety, security, extreme weather, regulatory and spectral climate, more bandwidth and network stability concerns. Now mining has the additional complexities of personnel shortages, economic uncertainty, terrorism and new environmental compliances.

"These additional challenges have partly contributed to the mining industry's critical evaluation of existing wireless network infrastructures, and goes back to my earlier point that wireless network infrastructures are no longer about just speeds and feeds," he comments.

Companies need to justify investments in this sort of technology, which means they need to utilise the full capabilities of the networks available.

"Mining operators want specific performance criteria built into their networks, so that they can defend their network investments beyond a connectivity measure, but on an ROI ►

"The industry no longer looks at wireless as simply speeds and feeds, but rather application availability and operational efficiency"



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Rugged... One of MST's wireless switches installed in a salt mine



**“We are ecstatic about the sheer number of applications we are supporting on a single network”**

▶ [return on investment] measure,” he says.

This is where Rajant's networks have exceeded even their own expectations, according to Schena.

“We are ecstatic about the sheer number of applications we are supporting on a single network. As an example, we are supporting 10

autonomous drills at a mine in Quebec, and have a mine customer in the north-western US where our Kinetic Mesh network supports 17 different applications on its network.

“Until you have actually deployed multiple applications on a network and understand the associated complexities of doing so with a high

degree of reliability and no downtime, it is hard to understand how significant an accomplishment this is,” he notes.

Downtime of the network could mean that equipment condition monitoring does not function, leading to an unexpected machine failure. All of this translates to lost revenues, or increased costs, something companies will do their utmost to avoid.

Rajant has recently installed its Kinetic Mesh networks at the Asarco Ray copper mine in Arizona in the US and Goldcorp's Porcupine gold mine in Ontario, Canada.

“[These] have proven to be particularly exciting for us as we have built private wireless networks in extremely difficult mine locations that represent challenges that go well beyond those of typical mine sites,” Schena says.

With mining companies showing no signs of setting up shop in cities and established towns in the near term and automation only increasing, the need for robust wireless solutions to support a growing number of applications is only likely to increase. ♥

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