WHITE PAPER

The Mine is the Network

The State of IT & OT Mining Connectivity.

A special report by Harbour based on exclusive research.



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Introduction from Harbour

Connectivity underpins everything in our inter-networked, digital world. Silicon Valley internet computing giant Sun Microsystems used to say that "the network is the computer", meaning that, without being able to communicate and send/receive information, our digital tools are massively limited. Today, we can take this further to argue that, for the mining industry, the network is the mine.

From the advent of email, local-area networks and the web to the real-time Internet of Things, smart tools and immersive XR visualizations, the digital experiences we need could not exist without the network fabrics to which they connect.

In mining, core aspects such as predictive maintenance are based on sensor networks, and insights from analytics derived from equipment and motion tracking are key. Networks attach us to other people, to safety systems, to systems monitoring, to simulations like digital twins, to underlying data that inspires smart decision-making and auditable actions, and even to on-site entertainment at the end of a hard day.

For all this, the common denominator is that we need fast, reliable, scalable networks. Any network downtime has knock-on effects in terms of fiscal penalties, health & safety risks, lost team and partner collaboration, and decision-making that's based on partial or old data.

In researching this report, we confirmed that respondents run a high number of apps and a blend of network types, that they generally observe a return on investment from their technology spend, and that they see the value of AI and machine learning for the next round of technology investments.

But we also learned that miners are often frustrated by their network services and that this frustration is causing delays in broader technology investments. In short, miners need better networks and better partners that can illuminate the exciting possibilities of the digital mine.

SES Introduction

As this white paper demonstrates, network performance plays a critical role in mining operations, impacting both production efficiency and the ability to capitalize on new technology investments.

Throughout the paper, look for **SES Insights** to discover how SES's design expertise, technology, and MEO (medium-Earth orbit) solutions can enhance operations and create new growth opportunities.

Section One

Network Settings: How Miners Use Connectivity Today

Digital Everywhere: Apps and services are ubiquitous but tech to support ESG is surprisingly lagging

Our data suggests that miners have embraced the 'Digital Everything' model, much like every other sector. Miners deploy technology widely, from video monitoring (77%) to real-time sensor networks (73%), ore analysis and data quality systems (60%), and data analytics platforms (67%).

But Environmental, Social and Governance frameworks (ESG), despite being the number one risk factor for miners, according to Mining Journal research, and being predicted by Grand View Research to be a market worth $9.55B by 2033, remains relatively underserved.

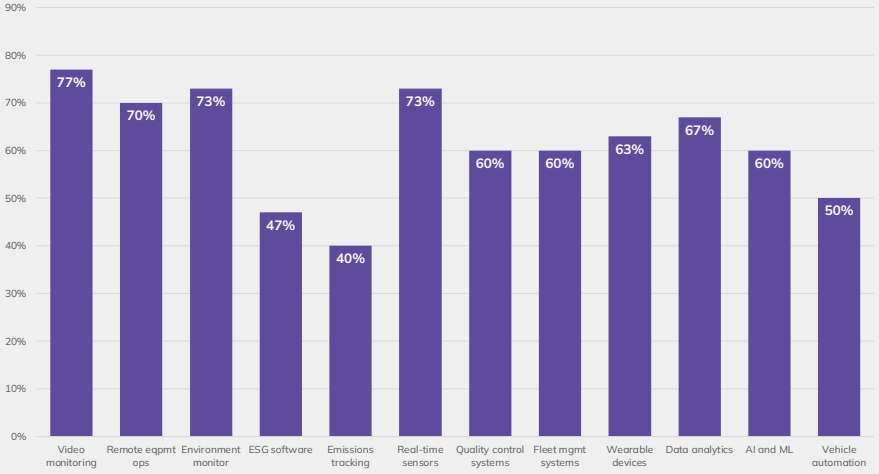
Although environmental impact monitoring has been deployed by 73% of respondents, carbon emission reporting (40%) and ESG-specific software/solutions (47%) trail behind. That's a strange omission given the criticality of 'green' corporate governance mandates.

Another area that should rise in the near future is vehicle automation apps, used by just half of the audience today.

SES Insight

As digital mining grows, networks need to handle larger volumes of simultaneous, bi-directional traffic. SES MEO delivers download speeds of up to 1 Gbps and upload speeds up to 500 Mbps – 10x higher than most competing satellite services to enable data-heavy environments such as video monitoring, data collection, and real-time sensor aggregation.

Large number of digital applications being used



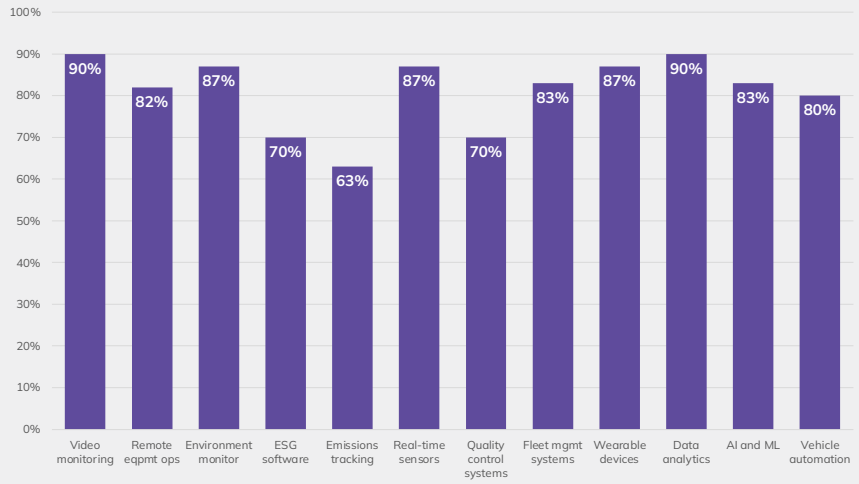
Q: Which digital applications are your mining operations currently using?

Is technology investment value for miners' money?

Miners feel they are getting good "bang for the buck" from security, monitoring, data mining, and other tech. But, following on from our earlier findings on ESG, they were less enamored by the perceived rewards of environmental tech stakes. This was especially the case with reference to IT respondents when we looked at responses by role.

Also, we noted when delving into the profiles of respondents that network experts were notably less likely to be awestruck by AI. Although they clearly appreciate the importance of AI, this perhaps represents a skeptical, tech-savvy audience familiar with, and perhaps a little wearied by, promises of technology silver bullets.

Miners see the value of technology applications. Security and monitoring are seen as critical.



Q: How would you rank the business value of the following technology applications?

SES Insight

With the use of SD-WAN and the availability of lower-latency services, satellite is increasingly being considered as part of the primary connectivity mix for mining sites, not just for failover. MEO-based solutions can support production-grade performance with SLAs, enabling predictable integration with fiber and microwave.

Network options and strategies

So, how do miners connect this portfolio of varied applications?

We found that they run various network types, with two-thirds of our panel (67%) having a pragmatic, hybrid model, but that still leaves a third (33%) that don't describe their networks in this way, leaving them exposed to a single point of failure.

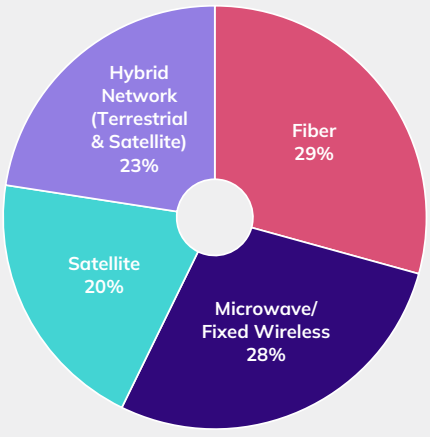
Press suppliers to share views on new and emerging technologies, and how they are performing in real-world mining scenarios. Ask for honest assessments based on experiences with your peers.

Fiber (87%) and microwave (83%) connectivity dominate, followed by satellite (60%). There is a lot of talk about satellite, with some viewing it as a fallback position in case other networks go down, while others see it as a way to deliver networking in even the most complex environments. There perhaps hasn't been enough debate over the strengths of satellite.

Ask your supplier for views on where satellite best fits your current portfolio. Seek suppliers that have a full range of network technologies and protocol options.

Miners need to see satellite as part of their network fabric, integrating it with complementary terrestrial technologies and deploying it where appropriate. It is not a cure for every ill, but a very useful addition to the connectivity portfolio, and it should be managed as such.

Current connectivity type used



Q: What type of connectivity do you have in your mines today?

SES Insight

When used as part of a connectivity plan engineered for performance consistency, satellite can support real-time operations and critical safety systems as a primary network component.

Is satellite a substitute?

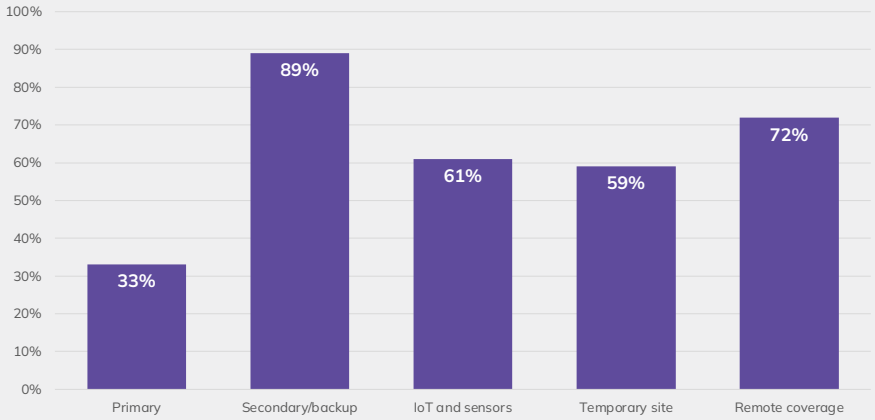
Do respondents view satellite technology as simply a 'Plan B' backup option? Because, if so, they are missing out on some unique advantages.

That notion of the perception of 'satellite as substitute' being commonly held was reinforced when the audience answered a question about the primary purpose of their satellite assets. Almost nine in 10 respondents (89%) said their satellite links are there mainly because of concerns over the reliability of other technologies.

Don't see satellite as a drop-in or backup. Use it to add unique value.

Against this, more progressive answers include using satellite for hard-to-reach areas (72%), the Internet of Things (61%), and to provide temporary coverage (50%).

Satellite connectivity seen as a back-up rather than preferred choice



Q: If you are using satellite connectivity, what is the primary use of such connectivity at your mine sites?



How much bandwidth is enough?

A sidenote here is that respondents have ideas of bandwidth that likely don't match reality, with 33% feeling they need 1 Gbps links.

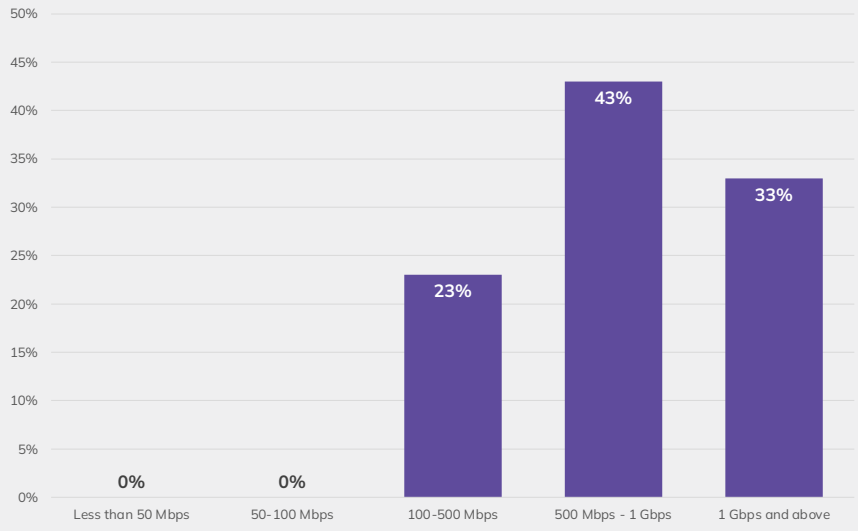
Is there a clear understanding of the bandwidth metrics needed and what can be done with faster links? Certainly, with bit-hungry applications like XR and video, more bandwidth is always welcome, but capacity value must be traded off against cost. Miners should be aiming for network options that fit their application schemas and target consistency, low latency and best-fit for their IT and OT architectures. They should declare these needs to partners who can offer scoping, testing and consulting with tariffs that match network capacity, reach and performance needs.

Ask for justification for appropriate bandwidth allocation and source contracts with burst options that let you conveniently add capacity on occasions and without paying a high tariff in quieter periods.

It could be argued that a highly consistent network operating at lower speeds may be more valuable than a spiky connection that rarely reaches its flashy uppermost speeds. Asking for guarantees of performance, low latency and quality-of-service levels will be key.

Also, network needs are massively application dependent. Synchronous versus asynchronous topologies, need for real-time analysis versus regular reporting, or web versus database interfaces will all have major impact. Try to establish exactly what you need, share this knowledge with partners and test before committing or specifying technologies or performance parameters that may be way over the top or hopelessly insufficient.

Do mining companies understand the bandwidth they need?



Q: What bandwidth capacity would your operation need to achieve all desired digital initiatives?

SES Insight

When considering satellite options, higher peak-throughput numbers may not always translate to better performance. SES MEO offers committed information rates (CIR) and predictable latency and jitter to deliver better operational outcomes than best-effort capacity with high variability.

Section Two

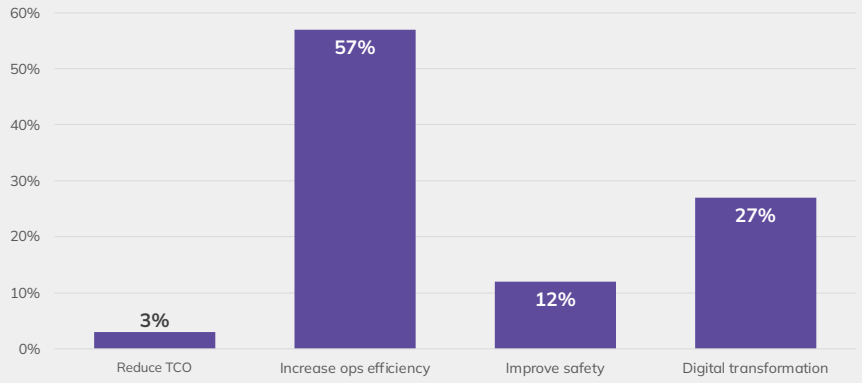
Room for Improvement: What Miners Want from Their Networks and How They Plan on Using Connectivity

Wanted: Networks for operational efficiency

The primary requirement miners have of their network suppliers is simple: for them to enhance operational efficiency. That is the key motivation for improving connectivity for 57% of respondents, underlining the importance of networks in strengthening underlying performance.

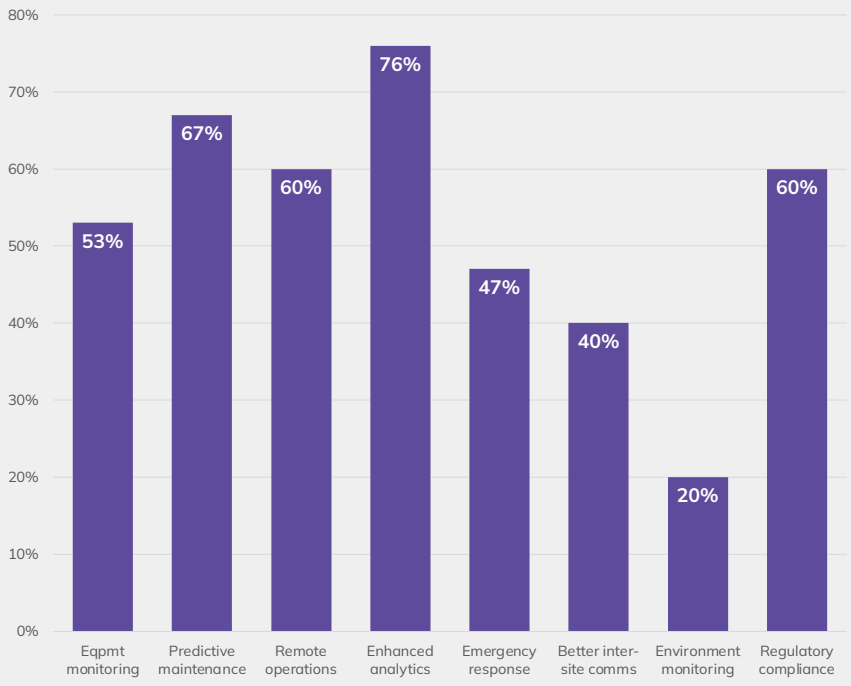
Digital transformation efforts and improved safety trailed behind the broader operations category.

Connectivity improvement is driven by the need to improve operational efficiency



Q: What is your PRIMARY goal for improving connectivity at your mine sites?

To achieve operational efficiency, predicative maintenance and data analytics are seen as key - but views differ by function



Q: Which specific operational benefits contribute to achieving this primary goal?

But, digging deeper, predictive maintenance (67%) and data-enabled analysis (77%) are viewed as key initiatives, followed by simpler compliance routines and advanced remote operations. Here we may be looking at the tension between what IT leaders and OT leaders want.

Involve both IT and OT experts in discussions on key technology investment areas to ensure you have a holistic view of needs.

And, breaking down the numbers, C-suite respondents were most keen to tap data analytics. That should come as no surprise as they pursue the hard-won evidence to make strategic determinations.

The dangers of downtime: When networks fail, miners lose more than connections

What happens when networks fail? Loss of monitoring ability and interrupted production flows lead the way, followed by failure to react to emergency situations.

Priorities differ by role, however. The top impact named by C-suite survey respondents was production schedule disruptions, while Operations respondents named the inability to communicate with teams as the top impact.

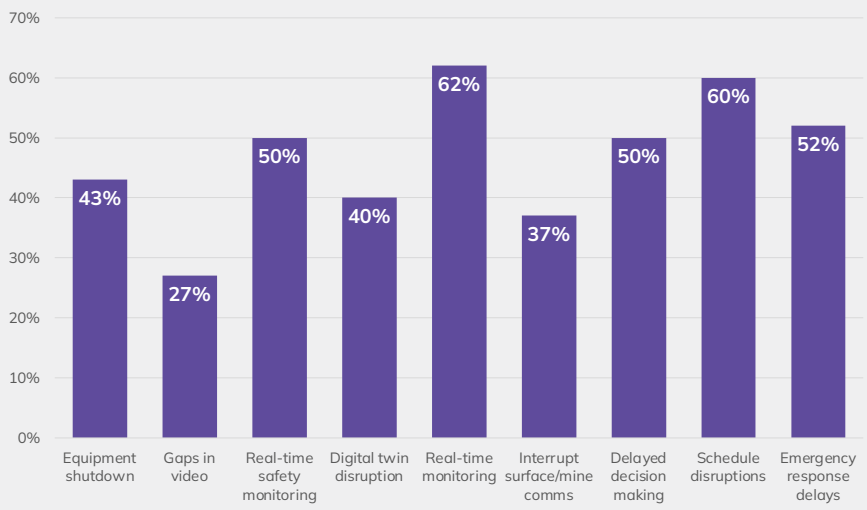
Data communications are like the power grid. Without either, miners suffer enormous harm to their productivity and even safety: both the IT digital platform and the OT operations suffer.

SES Insight

Downtime risk isn't just about hard outages—it can also result from performance degradation under load. SES MEO is engineered to maintain stable latency and throughput even as demand scales, reducing exposure to hard-to-diagnose performance failures.



Monitoring, worker safety, and schedule disruptions are all impacted when connectivity fails, although (again) priorities differ by role



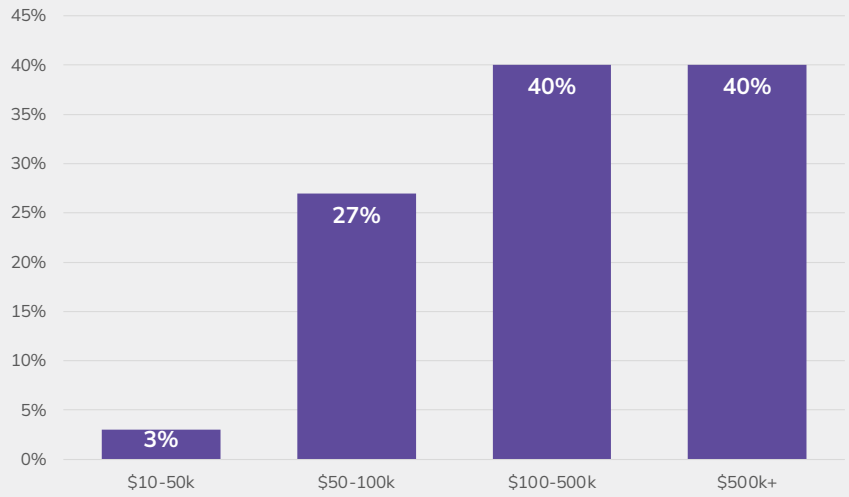
Q: What is the operational impact when connectivity fails?

And it's not just soft issues: downtime costs dollars. Network underperformance and outages can have a big bottom-line impact on miner performance, with four in 10 saying they faced an outage-caused fiscal impact of greater than U.S. $500,000 and 80% seeing numbers of over U.S. $100,000.

Make clear demands on suppliers to support uptime and performance needs, through hybrid network fabrics, flexible tariffs, and backup capacity.

Those figures are a compelling argument for treating network purchases as strategic investments worthy of deep consideration, contractual commitments, and support packages.

40% of miners face a $500K+ impact due to downtime



Q: What is the estimated fiscal impact (in USD) of connectivity downtime per incident at your mine operations?



Section Three

Frustrating Experiences and Roadblocks

Networking is not (always) working

So, we know that networks are key to miners, but are mining buyers of networks impressed by what is being served up? In a word, no!

Specifically, respondents feel that they can't be confident in the quality and reliability of their links, and they are piqued by frequent outages occurring. Bandwidth, latency and coverage reach were also frequently stated concerns.

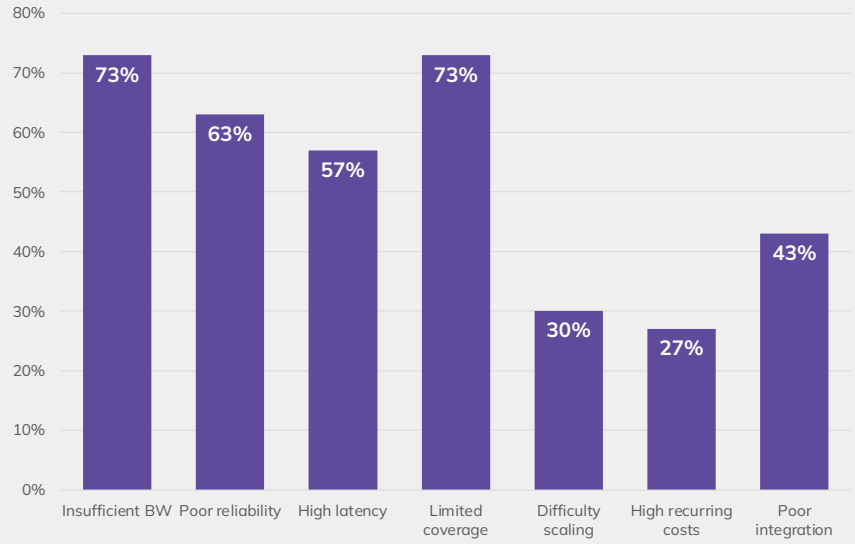
Make connectivity a strategic decision-making process that is adequately costed for value.

Furthermore, network issues are not just 'issues for admins' because suboptimal links are blockers to other technology-enabled progress. They leak into aspects of planning, often stifling related projects that can add value. An overwhelming 83% of respondents say they have either delayed or cancelled one or more technology investments due to their connectivity limitations. That is a major finding in this report and should act as a reminder of communications' strategic importance.

SES Insight

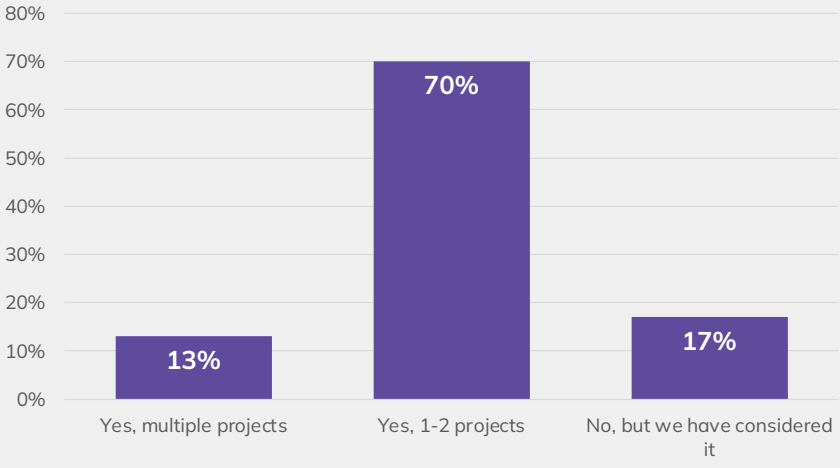
When poor connectivity limits investment, the issue may be lack of predictable performance, not just lack of service availability. Satellite solutions designed with assured throughput and service-level agreements unlock the ability to move forward with digital transformation initiatives.

Miners are frustrated with connectivity



Q: What are the limitations of your current connectivity solutions?

Connectivity issues are delaying miners' journey to digital transformation



Q: Have you delayed or canceled technology investments due to connectivity limitations over the past 12 months?

Section Four

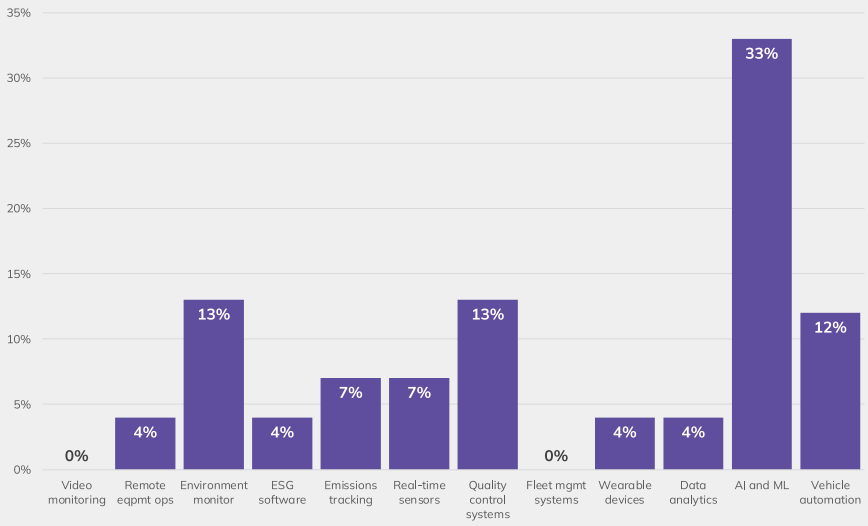
The Future: Spending to Invest in Technology-enabled Transformation

AI is sky-high in terms of next tech spending plans

AI/ML is by far the biggest recipient of pending tech budgets, ahead of vehicle automation, quality control, environmental impact assessment and sensor networks.

It's good to see that mining is so progressive and AI has plenty to offer, from automated documentation and permissions to smarter planning and analytics. However, AI also has enormous compute demands and tariffs are high and changeable. Smart mining CIOs and CTOs will also be examining implications for network setups and performance.

Investment in the next 12-months are led by AI and ML

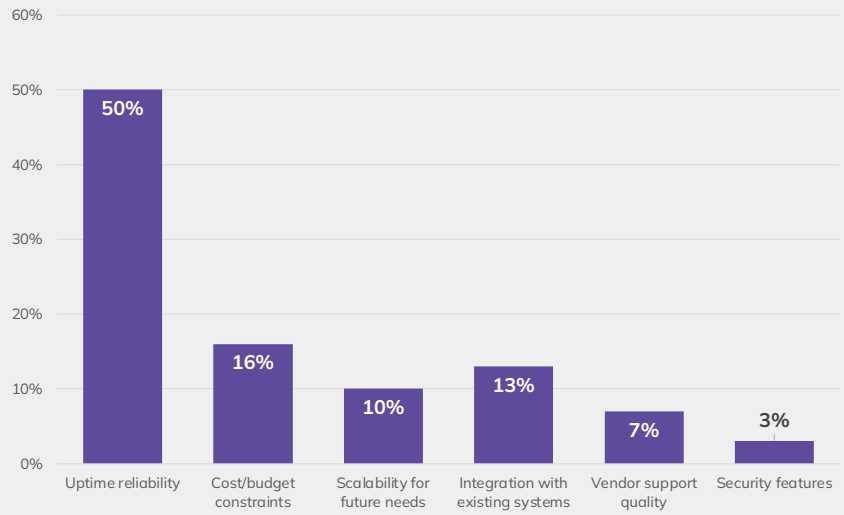


Q: What are you planning to implement/upgrade in the next 12 months?

Beyond these technology changes, as we have seen, buyers aren't awarding gold stars to their current network providers. ICT teams want greater reliability, scalability, and support from their providers.

Try to find a supplier that is a true partner rather than a transactional vendor. A partner should be interested in understanding your organization, its unique needs, and its budgets.

Connectivity suppliers need to be reliable and provide the flexibility to increase capacity



Q: What factors drive your connectivity investment decisions?

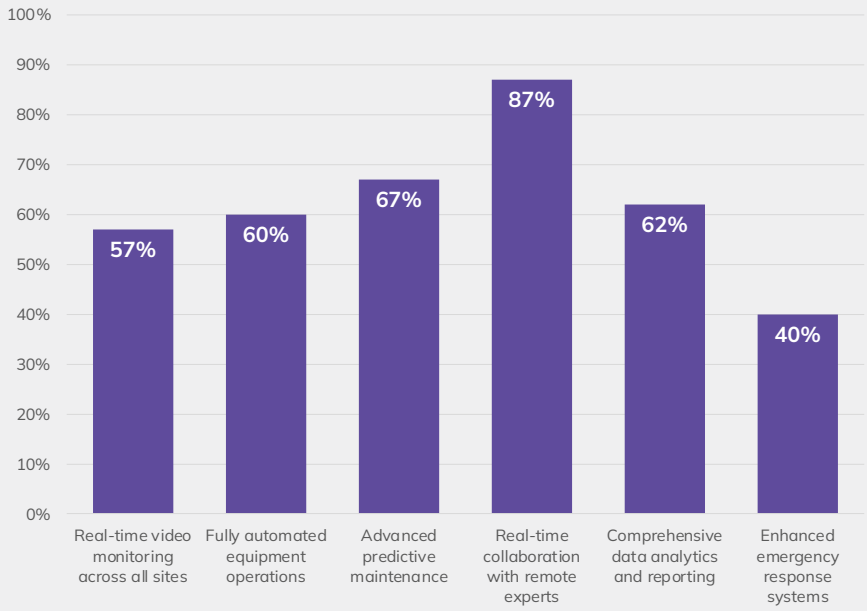
SES Insight

AI-driven mining workflows that require robust cloud access will rely on a combination of edge-deployed resources and connectivity like SES MEO that combines predictable performance with high upload speeds.

Collaboration and communications inspire co-creation (the 'three Cs'), where there is a virtuous coming together of ideas, know-how and practical implementation. But network vendors need to do better to support these benefits.

Not all network providers are created equally. Perform due diligence to ensure you have the tools, tariffs, consulting and support options you need.

Collaboration with remote teams is a real challenge miners face



Q: Which operational capabilities are you unable to implement today due to connectivity constraints?

SES Insight

Modern mining operations generate large volumes of upstream data, from fleet telemetry and safety systems to environmental monitoring, automation, and centralized analytics. As we've seen in this report, unpredictable latency, transient outages, and limited return path capacity can disrupt operations, increase operational risk, and delay decision making. The SES portfolio combines the benefits of the only commercial MEO (medium-Earth orbit) offering, the world's largest geosynchronous orbit (GEO) fleet, and managed low-Earth orbit (LEO) services to deliver solutions optimized to customers' application and operations needs. Look to SES for satellite services to enable and expand your operations wherever they may be.





Methodology

Research was based on 30-50 mines from 150 leading companies based on market capitalization with both open pit and underground operations.

Markets covered comprised of Canada, USA, Africa, Australia, Asia, Brazil, Peru and Chile.

Respondent roles included Chief Technology Officer, Head of Digital Transformation, Chief Operating Officer (COO), VP of Operations, Head of Innovation / Digitalization, IT Director/CIO, Mine Manager, Site Operations Manager, Network/Communications manager.

About Harbour

Harbour is an advisory group for the natural resources sector, using proprietary research and data to guide targeted marketing and communications strategies. Combining deep mining-industry expertise with modern marketing technology, Harbour helps vendors and producers build evidence-based campaigns with precise distribution and transparent reporting.
Learn more at https://www.askharbour.com/.

About SES

At SES, we believe that space has the power to make a difference. That's why we design space solutions that help governments protect, businesses grow, and people stay connected—no matter where they are. With integrated multi-orbit satellites and our global terrestrial network, we deliver resilient, seamless connectivity and the highest quality video content to those shaping what's next. Following our Intelsat acquisition, we now offer more than 100 years of combined global industry leadership—backed by a track record of bringing innovation "firsts" to market. As a trusted partner to customers and the global space ecosystem, SES is driving impact that goes far beyond coverage. The company is headquartered in Luxembourg and listed on Paris and Luxembourg stock exchanges (Ticker: SESG). Further information is available at: www.ses.com.

Solve.
Empower.
Soar.

Learn more about our purpose-built satellite and connectivity solutions at ses.com

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