

Edge computing could solve SA's illegal mining crisis

By [Rudie Opperman](#)

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Illegal mining, also known as artisanal mining (Zama Zamas), continues to pose a significant challenge for South Africa's mining industry. The issue has far-reaching economic, social, and environmental impacts. It costs the sector and national fiscus billions of rands each year, poses significant health and safety risks to those who participate in it, contributes to an increase in crime and illegal trade, and can contaminate precious natural environments.



Rudie Opperman. Source: Supplied

However, as technology and digital tools advance, there's an opportunity to deploy these solutions in the fight against illegal mining. Edge computing has a significant role to play. With the right implementation, it can enhance the effectiveness of anti-illegal mining efforts in the country.

South Africa regularly bears witness to the consequences of illegal mining. In July, it was reported that at least 17 people in a settlement in Gauteng had been killed after being poisoned in a gas leak, with the victims believed to be illegal miners. Though the cause of the recent 'Joburg explosion' that took place on Wednesday 19 July has yet to be confirmed, the event highlighted the threat of illegal mining to the city's gas and pipeline infrastructure.



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The advent of edge computing could be a meaningful change in this scenario. By processing data closer to the source, edge computing can provide real-time insights and responses, potentially allowing for quicker detection and prevention of illegal mining activities. This technological advancement could be the key to mitigating the impacts of illegal mining and ensuring the safety and sustainability of South Africa's mining industry.

A breakthrough at the edge

Private industry players and public institutions have a responsibility to deploy the latest security innovations in combatting illegal mining. Edge computing represents an opportunity to achieve maximum insight from video surveillance without having

to rely on 24/7 human surveillance or excessive protection measures for assets that are no longer valuable, such as sealed mines.

Edge analytics also allows for faster response times in the event of an incident, saving lives and positively contributing to an important sector.

Edge computing is a decentralised computing paradigm that brings data processing and computation closer to the source of data generation, typically at or near the edge of the network. In traditional cloud computing models, data is sent to centralised data centres for processing and analysis. Edge computing shifts this processing to local devices or edge servers, reducing the latency and bandwidth requirements associated with transmitting substantial amounts of data to the cloud.

By processing data locally, edge computing enhances the efficiency and performance of various applications. This is particularly useful in scenarios where real-time data analysis and quick decision-making are crucial, such as in mining operations.

Real-time data for ready responses

Because edge computing enables the processing of data closer to the source of collection, it could be extremely valuable for combatting illegal mining. By deploying edge devices, such as sensors and cameras, directly at mining sites or vulnerable areas, real-time data can be gathered and analysed on-site.

This instantaneous processing of data allows for immediate detection of unauthorised mining activities, preventing further damage and illegal extraction. Edge computing enables the processing of geospatial data collected from satellites and drones.

This data can be used to create detailed maps of mining areas, track changes in land use, and identify areas prone to illegal mining activities. The timely analysis of this geospatial data assists law enforcement agencies in planning targeted interventions.

Remote, but still reacting

Illegal mining often occurs in remote or hard-to-reach areas, making traditional surveillance and monitoring challenging. Edge computing solutions enable the deployment of advanced surveillance systems that can monitor remote locations effectively.

Real-time video analytics can identify suspicious activities and trigger immediate alerts to security personnel or relevant authorities. With the integration of Internet of Things (IoT) devices, edge computing facilitates seamless communication and coordination between various sensors and devices.



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Connected IoT-enabled devices such as seismic sensors, environmental monitors, and geolocation trackers enable authorities to gain valuable insights into potential illegal mining activities, including ground disturbances, unauthorised equipment usage, and irregular movement patterns.

In remote areas with limited or unreliable internet connectivity, edge computing solutions can function in offline mode. This means that the data collected at mining sites can be processed and analysed locally without dependence on continuous internet access – critical with South Africa's current power crisis.

Once a connection is available, the relevant data can be transmitted to central databases for further analysis and reporting.

Each incident is unique

Each illegal mining operation poses its own challenges. And, while it's difficult to suggest a single solution, the advantage of edge computing in combatting illegal mining cannot be ignored. Its ability to process real-time data, facilitate enhanced surveillance, and integrate IoT devices enables more effective monitoring, detection, and prevention of these activities.

By leveraging edge computing solutions, authorities and mining companies can improve their response capabilities, mitigate environmental impacts, and protect valuable mineral resources from exploitation by unauthorised individuals or groups.

Edge analytics in network surveillance should be seen as a component of a holistic security strategy. Therefore, it's important to work with expert product vendors to establish a scalable, edge-enabled ecosystem for long-term growth and increased efficiency.

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