![3D-P Technology Connected]

Guaranteeing Mission Critical Wireless Connectivity with a

Hybrid LTE/Instamesh® Client

LTE provides undeniable benefits to the unique network challenges encountered both in open pit and underground mining. These include predictability and Quality of Service (QoS) as well as potentially improved connectivity at greater distances. With LTE infrastructure becoming more affordable, the connectivity benefits of LTE are becoming available to more and more miners.

I.　The realities of LTE in Mining

Experience with LTE at multiple sites around the world has highlighted advantages and challenges presented by the technology. In some cases, challenges with configuration, management, and throughput over limited available bandwidth are items that must be considered, particularly where autonomy is part of the roadmap.

1. **AVAILABLE THROUGHPUT:** As more real-time applications are installed, and particularly as video becomes a more important part of the solution, throughput limitations as a result of limited bandwidth from the spectrum licensed, asymmetrical links, etc. may become a limiting factor, affecting the performance of the network.

2. **GAPS IN NETWORK COVERAGE:** The long-distance capabilities of LTE promise deployments of lower infrastructure counts. The downside is the risk of the appearance of blind spots as vehicles continuously move in and around other equipment, and the topology of the mine evolves. This is particularly of concern when higher frequencies are used for the LTE network. These challenges have the potential of affecting reliability of the network.

3. **COST CREEPING UP:** In the case of LTE over consumer infrastructure, the costs of data sent over the LTE network can rapidly creep up, particularly where peer to peer communication is required, along with additional video traffic.

4. **L2 CONNECTIVITY:** Many legacy mining applications require L2 connectivity, however LTE is L3 technology. Additional solutions must be deployed in order to resolve this challenge, however, an appropriate technology selection must be made to avoid impacting network performance and additional maintenance.

II. Increasing coverage and reliability of LTE with a hybrid LTE/InstaMesh Client

Leveraging the multi-radio meshing capability of Rajant's InstaMesh technology, 3D-P is proud to introduce its new hybrid LTE/InstaMesh Client.

Designed to complement the LTE technology, the hybrid LTE/InstaMesh Client guarantees mission critical connectivity, extending the coverage and performance of LTE networks through the addition of true peer to peer meshing capability.

3D-P Client

1. **RELIABLE AND COMPLETE COVERAGE:** The meshing capability of the 3D-P hybrid client allows mobile equipment to remain connected, even when outside LTE coverage, through meshing with connected neighbors or infrastructure.

   In addition, the hybrid solution can provide significant throughput increases in high traffic areas where the deployed LTE network may be reaching its throughput limit. The hybrid solution allows traffic to be routed through locally deployed meshing infrastructure providing load balance and increasing available throughput in the area.

2. **SEAMLESS ROAMING:** Even in LTE deployments, roaming challenges can arise. This typically occurs where either the client device is required to roam between separate LTE networks, or where the client may be roaming between a Wi-Fi network and an LTE network. These roaming events can take over a minute, with the device out of coverage. during that period.

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The 3D-P hybrid solution leverages the Rajant InstaMesh algorithm to deal with roaming events all together by establishing multiple active connections to infrastructure or nearby client devices who have uplinks available. All of those connections are analyzed on a packet by packet basis, to determine the best route for that particular traffic. Instead of roaming off one connection, and onto another, the device simply sends the traffic over the best currently available link. If a link is dropped, no harm done, as the device already has available alternate links, and can route traffic over them without the delays required for connection.

3. **L2 SUPPORT:** 3D-P's hybrid client provides access to L2 network functionality over an L3 network like LTE. The solution minimizes impact to applications because very little latency is introduced to mining applications that rely on L2 capability. This capability is also available to users with very little management overhead at deployment.
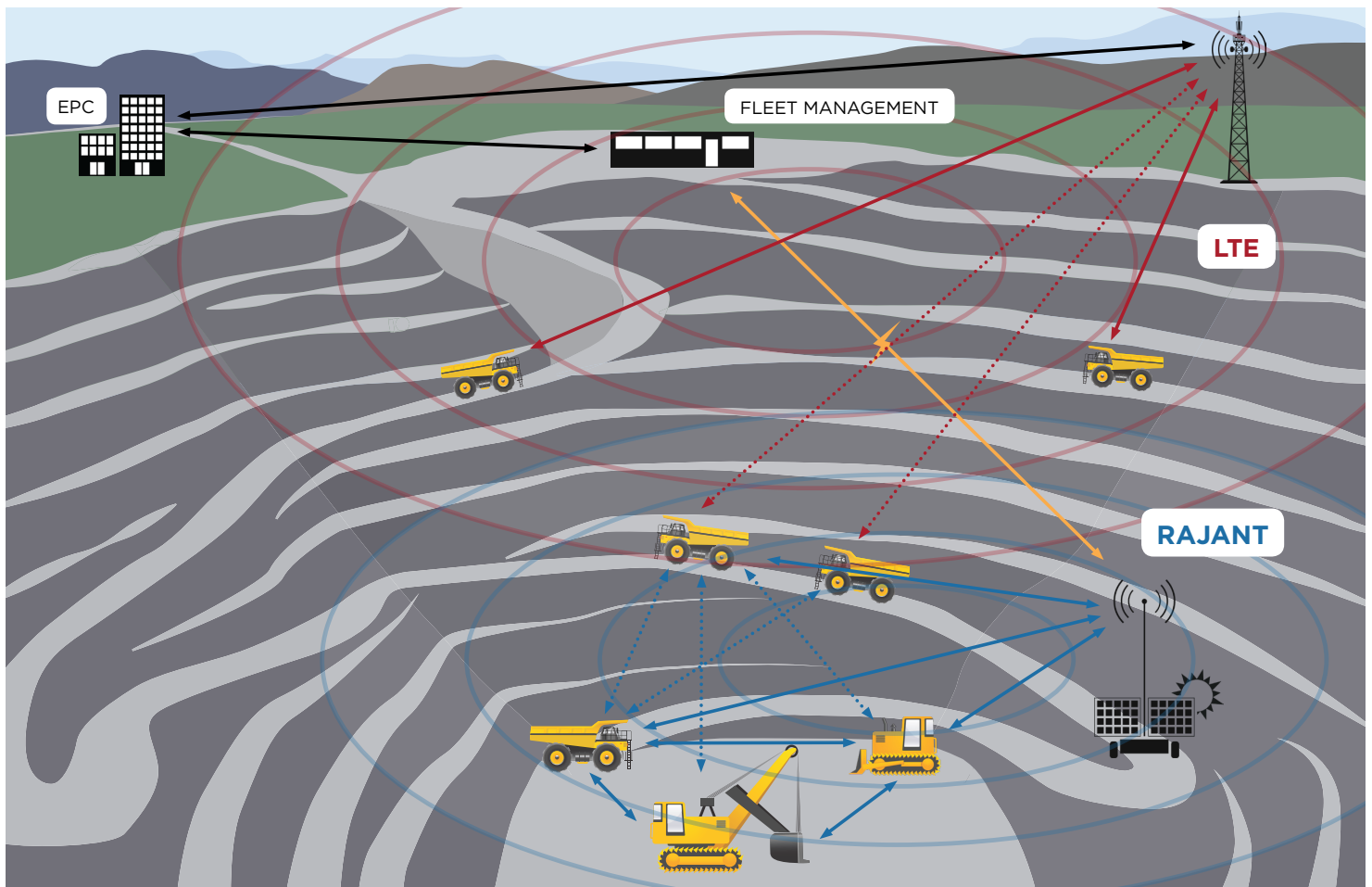
III. Supporting your mine towards autonomy

With its non-event roaming capability, the hybrid LTE/InstaMesh solution ensures your autonomous equipment has mission critical connectivity with high throughput, low latency and the necessary level of redundancy. Where connectivity to the network is king, the hybrid solution stands alone. The solution provides the ultimate in redundancy, ensuring delivery of every packet.

Supporting network design requirements where desired, the 3D-P hybrid client can also support the segregation of your network allowing the autonomous application to reside on its own network, while the other applications reside on a separate network, providing additional control of the network for autonomy.

IV. An integrated wireless solution for your underground operations

Underground wireless connectivity is particularly critical at the mine face where equipment operations are heavy and the associated data is generated. Unfortunately, infrastructure such as power and backhaul typically aren't available in these areas until after much of this activity is complete. Providing a solution that can support the large amounts of throughput necessary for remote controlled or even autonomous operations in these environments, without the necessary infrastructure, is challenging. While all wireless technologies have their pros and cons, they are not all equal when it comes to last mile connectivity.

The hybrid LTE/InstaMesh solution provides your mine with the ability to leverage the Rajant meshing technology to provide high performance connectivity throughout most of your active areas, while leveraging an LTE or even standards based Wi-Fi network throughout the rest of the mine.

LTE

RAJANT

LAST MILE CONNECTIVITY

ME4

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To learn more, call 3D-P at **+ 1.403.203.3018**

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