

case study



Asset Tracking into the African Jungle with Real-time Visibility

NOTE: LXE's parent company, EMS Technologies, was acquired by Honeywell in August 2011.

Increasing global demand for mineral resources has sent many mining operations further into Africa to access its rich mineral deposits. These deposits, some of which are yet to be discovered, are by definition in the least accessible, most inhospitable, and most dangerous areas of the continent. This case study examines

such an operation in the most remote jungle area of Gabon, on Africa's western coast.

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Before a mine can be established, geologists must drill many core samples deep into the earth. The drilling rigs and associated consumables are very expensive. Due to the complexity of the business and almost no local supply capability, the parts, consumables, and even fuels need to be supplied from South Africa, over 3,000km (1,875 miles) away.

The challenges are numerous:

- How does one create a supply chain into these areas?
- Can technology help and if so, can it be done quickly and effectively?
- How does someone in a jungle in the Democratic Republic of Congo (DRC) know when an urgent drilling component or a new compressor is en route and where it is in the supply chain?
- How does the supply and logistics company ensure that orders are tracked and that every component is delivered?
- How does anyone know what stock is on hand in any of over 40 supply stores at various base camps throughout Africa?

This paper is a case study on the design, implementation and rollout of this difficult supply chain and the systems to support it. Not only is the system currently in place, but goods are moving all over Africa, supported by bar code technology and systems with satellite communications.

Supply and Logistics (Pty) Ltd is the company that created the supply chain and is responsible for operating it and making the goods flow. Cradle Technology Services (Pty) Ltd designed and implemented the technology systems that support this supply chain. The mobile computer that enables these systems to work is LXE's light and compact MX8, and the ultra-rugged MX9.

Situation Overview

How do you handle order changes up to the last minute, in a place where one can hardly purchase milk and bread?

The mining exploration process requires core samples to be extracted from depths that are only accessible with expensive drilling equipment. Diamond drill bits, shafts, cutting oil, fuels, and pumps are all rapidly consumed in places where one can hardly purchase milk and bread.

The challenge for Supply and Logistics, a South African based supply company, is to keep a continuous stream of product flowing from Johannesburg to over 40 drill sites across Africa. The key to a continuous flow of product is a continuous flow of real-time information:

- Customers place urgent orders and need real-time feedback on the order progress.
- Component suppliers are starved for information on the performance of their products and their consumption rate in order to implement true demand planning.
- Transportation partners need to perform resource planning. Advance notice of shipping volumes and destinations are all standard requirements, but historically, are almost impossible to provide.

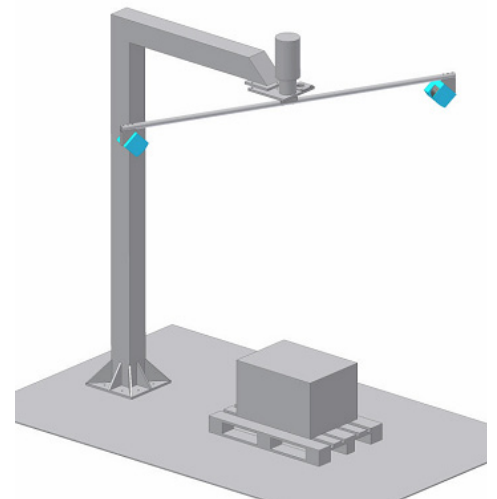
The business driver for this supply chain is speed. To deliver speed, everything has to be managed extremely well. Orders must be chased down, transport must be booked in advance and cost is seldom a very important factor. In many cases, urgent components are added to an order up to the last hour before shipping. This means that the ability to process orders into a shipment, and modify the shipping details at a moment's notice is critical.

The Solution

Marc Olyott, CEO of Supply and Logistics, was a geologist in a previous life. He had the vision to recognize the opportunity that this business presented and followed up the vision by creating a solution to meet these challenging requirements. As interest grew in Marc's vision, he knew he had to invest to make the business work. He went to market and appointed Cradle as development partner. What started as a small tracking system rapidly evolved into a sophisticated supply chain tracking solution.

Today, the system has its root in a warehouse in Brakpan, South Africa, where goods are received, labeled and checked using a bar code scanner. The goods are packed into shipping containers, and those the containers are labeled and scanned, linking them to destinations. A Rotating Volume Scanning System (RVSS), shown below, is then employed to capture the shipping container volume and weight data which is then added to a waybill.

The RVSS is the first of its kind installed in South Africa. It can calculate the volume of an irregular shaped container, up to 3m x 3m x 3m, in mere seconds.



Rotating Volume Scanning System



As shipping containers are weighed and their volume is captured, they are added to waybills, which airline agents are able to monitor. This advanced notice of shipping volume allows rapid planning and ensures agility in the shipping process.

At the appropriate, latest moment, the airline finalizes the transport. The goods are then scanned and loaded onto the transport vehicle and head straight to the airplane for shipping.

Once the shipment arrives at a primary sorting airport in Africa, e.g., Entebbe in Uganda, an operator scans each shipping container. The scanner is used on the runway, connecting to a Cisco Wireless LAN access point at the airport. This, in turn, connects to the Internet using a satellite link.

The LXE mobile computer scans each shipping container in real time to update its status, providing the customer with a view of the current location of each item in the shipment. Shipping containers are sorted, scanned, and loaded onto relevant vehicles—including trucks, local aircraft, chartered flights, donkey carts or tractor trailers—for transportation to remote stores.

Finally, on arrival at a remote store, the shipping containers are scanned and “EXPLODED.” Each item in a container is scanned and recorded as being delivered to the remote store stock holding, connected to the internet via wireless LAN and satellite link. To streamline this process, the team at Cradle ensured that the same software used in the warehouse in Brakpan is available remotely in the jungle of Gabon via the customer’s browser.

Customers can view stock holding of remote stores to check availability of items. This includes critical items, maintenance items, consumable items and even fresh meat, wine and toilet paper.

As each item is taken from the store, it is scanned and that information is sent out to the relevant cost center, which removes the item from stock but still maintains a record of the item from purchase to consumption.

In May 2009, Supply and Logistics shipped and tracked over 200 tons of diverse product into locations where most companies fear to tread. Even more remarkable is that this was achieved with less than five warehouse staff members and three administrative workers. They are now

reliant on the system, and as the volume grows each month, plan to increase velocity and flexibility without increasing staff.

The Right Software

When Supply and Logistics went to market for a development partner, they did not know how the system would look, how it would work or what was needed. They also had no idea how rapidly the business would grow. In a case like this, the developer has no way to scope the system or estimate how much to charge. The key was a new development methodology called Agile. Proponents of Agile sign a document called the Agile Manifesto. The following points are central to this approach.

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

Agile includes a set of key principles. The principles that applied to this project are:

- Satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer’s competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Working software is the primary measure of progress.
- Continuous attention to technical excellence and good design enhances agility.

With Cradle on board as an Agile development partner, Supply and Logistics could proceed to explain the vision to

the customers, allowing the developers to focus on creating the system and selecting hardware.

Future Opportunities

Supply and Logistics is intent on increasing volume without increasing overhead expense. To achieve this, they recognize the importance of velocity. If all of the suppliers up the supply chain used a similar, aligned system, orders that are pre-labeled and pre-packed could simply be delivered to the warehouse.

Supply chain integration to suppliers is seldom a reality in small organizations. In this unique and challenging global supply chain, the first steps have been taken, as one supplier is in the process of implementing an integrated scanning system. When the supply chain is completely integrated, a manufacturer of diamond drill bits in Canada will label and package items using a browser-based program. These items are then shipped to South African distributors. After being received, stocked and picked, they are packed for the end user in Africa and delivered to the Supply and Logistics warehouse in Brakpan. Here they are received, packed and shipped into Africa. Finally they are used on a drill rig in the DRC. During the operation, an operator records the cutting performance of the bit, also using a mobile computer. In Canada, the manufacturer gets to see the entire life of the drill bit.

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The Right Device



Key technology and hardware decisions had to be made. The development partner had full reign over these decisions. The main criteria were:

- To utilize the internet for application programs – thereby making them available anywhere in the world
- To ensure that the application is simple and light on resources, so that satellite links can be used for uplink
- To utilize Microsoft® technology including .NET and MS SQL Server 2005
- To utilize the best hardware for the job

CISCO Wireless LAN technology and LXE industrial radio frequency (RF) mobile computers were selected. The units provided by LXE are the light and compact, IP54-rated MX8, and the ultra-rugged, IP67-rated MX9. The MX9's proven ability to withstand the toughest environments made it ideal for use at the remote customer locations throughout the DRC and Gabon, while the MX8's ergonomics and processing speed suit the unit well to the demands of the warehouse in South Africa.

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