

# PREVENTING A VANISHING ACT

Cargo tracking in places like Ghana shows it's possible to protect precious cargo with the use of technology.

BY LAURA BILLINGSLEY

Imagine for a moment a container filled up with humanitarian aid and supplies. A ship carrying the container docks in a port of Ghana, Kenya, or any of a number of developing countries. The boxes of supplies are taken off the ship and loaded onto trucks. Then, imagine those supplies vanishing.

This scenario occurs every day in ports or on roads in countries around the world. Some estimates put the amount of cargo that disappears at as much as 40%. And that's not just humanitarian aid. That goes for all cargo coming into these countries, representing millions of dollars worth of goods that never make it to their intended destination.

The latest statistics from the U.S. Bureau of Transportation Statistics indicate for the EMEA (Europe, Middle East, and Africa) region, 3,756 reported incidents of cargo crime occurred during 2008 with the total value lost estimated at more than €170.6 million, or about \$226 million in today's money. For

nations that already have a comparatively low GDP, the loss of these goods is a heavy burden to bear.

Vanishing cargo means humanitarian aid doesn't reach the people who need it, and for regular merchandise, commerce is reduced and tax collection squeezed. Lost aid can also make donors hesitant to send more supplies. Much of the cargo lost is bonded freight, which drives up insurance rates because the cost for insuring that category of cargo is high. In short, cargo that disappears is a loss that goes far beyond the dollar value of the goods.

But where does lost cargo go? It can be stolen by anyone from a petty criminal to the soldiers of a well-connected warlord. Some may simply be misplaced—lost among the many other shipments traveling across the country. With difficult roads and a shaky communications infrastructure, it's not hard for cargo to go missing somewhere along its journey for non-nefarious reasons.

Vanishing cargo may be a problem in developing countries right now (and in developed countries like the U.S. as well), but it's a problem with solutions, and governments and companies are fighting back in an effort to keep track of cargo and end its disappearing act.

## EYES ON THE TRUCKS

Ghana, located on the sub-Saharan coast of Africa, is home to more than 25 million people. Of its 62,221 kilometers of roadways, just 9,955 are paved. Like other developing countries, it has a problem with missing cargo. This problem is of great interest to SGS, an international company headquartered in Switzerland. It's hard to find an industry in which SGS doesn't have a stake, but most of what the company does revolves around inspection, testing, certification, and verification services.

Logistics is a big part of the business, including making sure goods end up where they are supposed to and in the

condition they should be in. In short, SGS wants to track the cargo. So does Ghana. The two entities had an existing partnership that eventually resulted in a tracking solution. "SGS has, through its subsidiary, GCNet, become the trusted partner of the government (of Ghana)," says Roger Kamgaing, who is vice president, Governments and Institutions Services, for SGS.

SGS supplied the government of Ghana with a system for tracking cargo as it moved within the country on trucks. Cargo tracking is a fairly straightforward application, and one that's been around for a long time, but in Ghana it requires special care for a number of reasons.

In most developed nations, "truck" means an 18-wheel semi-tractor trailer with a professional driver backed by a professional company and maintenance. This is not usually the case in Ghana. Here, cargo may be transported in an open truck—"mostly flatbed trucks with canopies/tarpaulins to cover cargo," says Kamgaing. Cargo is vulnerable and special solutions are needed.

The SGS solution uses components from Savi Technology, a company focused on asset tracking. Savi provides a combination of hardware and software to SGS, which then markets a solution called SGS OMNIS to countries like Ghana. Savi has a long history of tracking high-value assets for the military, and that expertise translated easily to the world of cargo tracking in Ghana.

During the past year or so, Savi has been branching out more into the commercial world, including work with SGS on electronic tracking solutions for Ghana and Kenya. To keep track of the cargo means keeping track of the trucks hauling it, and that means a large number of sensors.

"You need to know more than where something is; you need to know things about its condition. So depending on

what the particular cargo is, (that might include) the temperature, vibration, humidity, radiation, etc.," says Bill Clark, president and CEO of Savi Technology.

The technology also has to be smart enough to take on savvy, organized criminals. In 2009, TAPA (Transported Asset Protection Assn.) predicted the global economic downturn would lead to an increase in incidents of cargo crime. While this has proven true for some regions, it has not been the case everywhere. In the FreightWatch Intl. Global Threat Assessment, released in March 2012, Ghana is assessed as a country of "Moderate" risk, though it's bordered on two sides by "High" risk nations.

Kamgaing explains that in Ghana, cargo is most likely to go missing due to "diversion off route or long stops where part of the cargo may be offloaded."

"You're dealing with a criminal element that's very sophisticated, so you need a technology solution that's also very sophisticated ...," Clark explains. To do so, the tracking solution involves a number of pieces all working together to closely monitor the truck and the cargo.

### MAKING IT WORK

While Ghana may only be assessed as a moderate-risk country for cargo theft overall, it is still a big problem. Even

FreightWatch admits it can be difficult to know the exact status of many

nations, as far as cargo safety is concerned. The report offers little detail on any African countries, and makes a point of saying, "As in previous years, cargo crime data collection and incident reporting remained extremely poor throughout Africa in 2011." South Africa is an example of a country rated

as a "Severe" risk by FreightWatch. South African Police Service reports say 999 trucks were hijacked in South Africa between April 1, 2010 and March 31, 2011.

It's largely up to individual governments and organizations to do what they can to combat cargo diversion. The problem is large enough that the World Bank, among other organizations,

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actively funds investment in technology services to help alleviate the losses

In Ghana, the country is using SGS OMNIS. But how does the technology work? Imagine when a container is taken off a ship, the cargo is put onto a truck. It's secured under a canvas tarp with steel cables. The driver is supposed to take the truck from the coastal city of Takoradi inland to Kumasi. The journey should take a little more than four hours.

The truck's cargo is outfitted with special tags that are configured as part of a mesh network, which means they can talk to each other. In a mesh network, each node within the system can communicate with many other nodes, which allows for more than one pathway that information can travel. Because signals can be automatically rerouted along a new path if a single node is out of service, mesh networks are often referred to as "self-healing."

Much of the research on mesh networking has taken place in military applications. The way a mesh network works makes it useful for remote environments in which there may not be great wireless coverage. In the field, a mesh network can provide a way to transfer information even if some of the nodes aren't working. DARPA (Defense Advanced Research Projects Agency) has funded research on mesh networks for military use because of the ability

**\$159 BILLION =**  
REVENUE FROM THE GLOBAL CONTAINERIZED SHIPPING  
AND LOGISTICS INDUSTRY BY THE END OF 2012.

Source: IBISWorld

for mesh to self-heal and for its high reliability. For example, in battlefield applications connectivity needs to be assured, and a mesh network can provide multiple paths for data.

When monitoring a truck carrying cargo, there are a lot of potential trouble spots that could provide advance notice to an issue, if only you had a way to find out ahead of time. Sensors can offer an eye into the truck.

One tag is an IVM (in-vehicle module) that's wired directly to the power supply of the truck. It monitors truck functions and the fact the truck actually has power. Other tags are on the cargo itself, called a seal tag, to detect whether the cargo seal is broken. In this case, the tag is attached to the steel cables. Because the truck is carrying valuable cargo, there is also a sensor on the fuel door to detect if it's opened, and a light sensor in the truck bed to detect light where there's supposed to be only darkness. Because it's easy enough to cut a hole through the canvas tarp.

The truck itself can also give up clues. Did it go off its route? Has it been stopped for an unusually long period of time? GPS tracking and engine status reports can provide

insight into exactly where the truck goes and how long it is there. GPRS cellular technology is used

to send all the data back to a mobile traffic system, which provides a Web-based map to monitor the trucks. Clark compares it to "an air-traffic control system for container tracking in a country." The map allows for monitoring of all the transits going on at any particular time, on all the routes, via communications using cellular technology.

Using browser-based software, officials can keep track of the trucks and the cargo inside them. Clark says in Ghana, officials with the country's revenue authority are usually the people actually looking at the maps. They can also use

configuration options to create "geofences" for trucks and to set up custom alert parameters based on actions by the driver, for instance, if the truck makes a U-turn.

"The idea is you want to have a system that's flexible enough to alert anything that might signal a diversion or a problem in realtime so you have the opportunity to take some action, ultimately to make a significant impact on this loss of cargo," Clark says.

The solution has been live in Ghana for close to a year, and SGS reports that results have been good. Before implementing the tracking system, the country was losing approximately 10-30% of the cargo in transit, and that number is now just less than 2%.

Kamgaing says it's hard to determine precise figures because of flaws in the previous technology.

"After our implementation, at least 15 attempts were clearly identified in the first three months of the new implementation and resulted in interceptions. But more importantly, we can confirm that at the end of 2012, 98.1% of transit shipments had exited the borders without incident," he says.

Clark adds, "When you see numbers like that, you know you've really solved a problem."

Kamgaing says Ghana's reputation has also benefited. "There is an improved perception of the transit regime in Ghana. In addition, this improvement



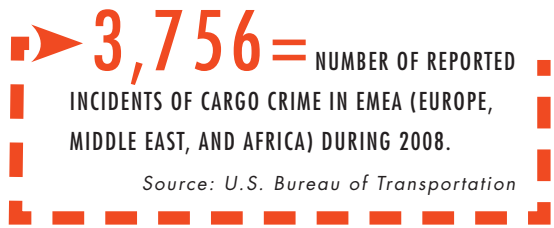
When roads are unpaved, accidents are more likely. Tracking technology can make sure someone is alerted as soon as a problem occurs.

is very important for the neighboring countries, as trade is benefitting from this system as well and they are seeing the safety of their cargo enhanced."

Other companies are also working on the problem of cargo tracking using technology. In Senegal, Cotecna has been helping to bring transparency to the transport of goods. The company has been helping Senegal secure cargo during transport since 2009. Cotecna's Cotrack solution uses GPS and RFID to collect realtime data on truck and container locations. It includes three main components: A mobile unit is installed on the vehicle or container while it's in transit. Fixed tracking units are also distributed to customs officials' patrol cars. Finally, a software system tracks the data and issues alerts.

In 2012, Cotecna announced a partnership with Orange Business Services to offer track-and-trace solutions for customs transit monitoring. The two companies developed a solution that uses Orange's SIM (subscriber identity module) that can communicate around the world. The solution has been live in Togo, West Africa, since December 2011.

In Kenya, Hi-G-Tek and Navisat Telematics announced a solution in 2010 called Kenya's Electronic Cargo Tracking System. The system allows the





and the data is sent back to home base using cellular networks. The lack of any one of these pieces would make it much more difficult to follow the goods as they move.

### MOVING AHEAD

The world of cargo tracking has come a long way during the past 20 or so years. For one company, armed guards have been replaced with tracking technology. FreightWatch Intl. was founded in 1998, and initially provided cargo escort services in the form of guards to shippers of high-value, at-risk products. But in 2005, a new division was created, called FSN (FreightWatch Security Net). This division focused on developing electronic freight-surveillance technology. Today, FSN uses a variety of tracking devices equipped with hybrid AGPS (assisted GPS) location technologies. With AGPS, the devices can provide location data in situations where traditional GPS devices may lose signal, such as urban canyons.

According to Bill Games, president of FSN, cargo tracking often calls for advanced GPS technologies. “Traditional GPS technology fails in severely embedded environments, such as when embedded inside cartons, inside pallets, (or) inside aluminum containers.” To overcome this, many tracking devices use alternative location methods, such as cell tower data, to provide location.

It’s also important to keep the tracking data secure, even when it’s transferred over the cellular network. FSN uses CrossBridge Solutions as an MVNO (mobile virtual network operator) partner. An MVNO acts as a company that bundles wireless service from multiple carriers and resells it to customers, along with value-added services. In this case, the cellular connectivity is bundled along with the tracking service for customers. “While some tracking devices send their data ‘in the clear’ over the public Internet, FreightWatch establishes private network connections directly with CrossBridge Solutions. All communication between the tracking devices and the tracking platform

traverses its private network using advanced authentication and encryption. Using secure networks makes data less susceptible to interception or theft,” Games says.

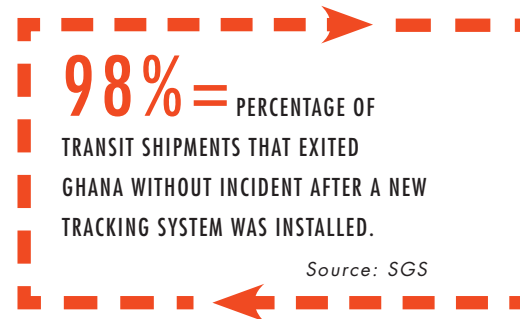
These types of advanced cargo tracking solutions are being deployed around the world. Back in Kenya, SGS and its technology partners have also deployed a solution. In addition, the companies are working on other programs around the world. But Ghana provides a good example of what is possible when connected technology is put to use. Cargo is an enormous

Kenyan Revenue Authority to require importers, exporters, clearing agents, and transporters to comply with regulations by installing electronic seals.

Hi-G-Tek designed the system to integrate with the Kenya Revenue Authority’s existing systems and procedures. A variety of M2M technologies are part of the solution, including RFID, GPS, and cellular communications. After container goods are unloaded from ships, they are affixed with programmable Hi-G-Locks. These electronic seals can contain geofence and delivery information related to the cargo, and officials use a short-range terminal to write the data directly into the device.

When a truck leaves the area through the gate, a fixed tracking reader registers the cargo is departing. The data is transmitted to the Kenya Revenue Authority operations center and other checkpoints, and the cargo’s ultimate destination is updated with the expected arrival time. Any changes to the schedule, or any deviations from the plan, are reported in realtime.

For cargo solutions such as this, the use of the three communications technologies working together—RFID, GPS, and cellular—is the key. RFID allows cargo to be marked with an identifier; GPS monitors the cargo’s location,



industry, and one that’s only going to grow as the world becomes smaller and goods are shipped faster. IBISWorld predicts total revenue in the global containerized shipping and logistics industry will increase from \$151 billion in 2007 to \$159 billion by the end of 2012. That’s a lot of cargo.

All that cargo provides more opportunities for thieves to try their hand at a quick score. In Africa, FreightWatch says thefts can prove particularly violent. The 2012 assessment says, “Violence or the threat of violence is present in most cargo theft incidents in Africa. As in previous years, the most common MOs in 2011 were armed robberies and truck hijackings. Road blockages and theft by deception, in which thieves pose as police officers, were other methods used by thieves, though to a lesser extent than hijackings and armed robberies.”

With the threat of violence a constant in the world of cargo transport for countries like Ghana, connected tracking solutions can save not only money and goods, but human lives. 🚚