

Container handling equipment mobile computing

comes of age

Steven Brandist, International Terminal Solutions Limited, explains how terminal operators' expectations of equipment based information and reporting systems have changed considerably.

It wasn't that many years ago that a container terminal that installed vehicle mounted terminals (VMT) using text based remote dumb terminals was considered a cutting edge forward looking terminal. Ten years ago some terminals started connecting GPS receivers to the VMT using an auxiliary port designed for barcode scanners. Whilst a lot of early systems were unreliable and had to be augmented by secondary systems (that again were unreliable) it was however a significant step forward. Now with a range of proven mature technology available, the terminal operator's expectations of

equipment based information and reporting systems have changed considerably. Some of the more switched on specialist systems integrators in the ports and terminal sector have embraced the technology enhancements and now offer real time information systems aimed at optimising operating efficiency for both Operational and Engineering management. An example of this is International Terminal Solutions (ITS), whose founders were some of the early pioneers in container terminal RDT and Real Time Location Systems (RTLS) and have seen the requirements and needs of the terminal operator expand significantly. They have developed modular systems with the ability to perform multiple tasks encompassing all aspects of the operational requirements, including automated data capture, management information systems and operational automation systems. The heart of the mobile

system is based around the Radio Data Transmission system and the RTLS module. In ITS' case this is called G-POS. Whilst the system can run using an existing VMT, the system is designed to replace the old VMT making its own direct wireless connection and adding a host of other functions that could not be supported by a standard VMT.

Making sure that information is available when it is required and in a format that is clearly understood is a key element of the system.

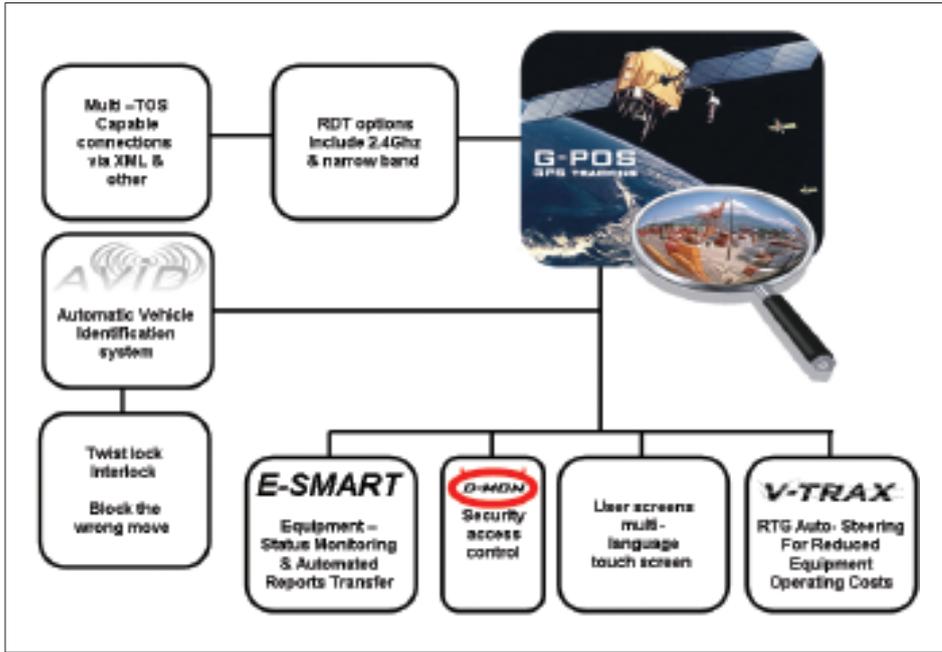
The system is radio frequency backbone independent, being able to support a 2.4 GHz WiFi network, a dedicated narrow band solution operating in the 380 to 480 MHz frequency band, and other country specific frequency requirements.

Real time location system

The G-POS RTLS (Real Time Location System) is a multi-technology platform that incorporates RFID, GPS and other technology. This is embedded unobtrusively in the terminal's operation to automatically keep track of every piece of mobile equipment on site, track its movements, provide a messaging system for the operators and monitor the storage and retrieval locations for the containers. From the moment they come off the ship all container movements can be automatically identified and their locations tracked. Whilst G-POS is multi technology capable, ITS admits that most of their implementations are based on Differential GPS. Some of their customers however prefer the RFID version, mainly for historic reasons and sales last year were of both types. ITS are also working on G-POS solutions for other port activities as well as containers, and are currently looking at positioning solutions for bulk terminals for ship loaders and stacker/reclaimers. The methods they use for our position calculations lend themselves easily to mapping sites very quickly with a very limited number of reference points needed to map an entire site. Not only does this make it rapid to deploy in container terminals but also easy to adapt to other applications.

Automatic gantry steering

Another area where ITS' mapping technique has proven useful is for automatic RTG crane steering. Again, responsible for some of the early pioneering work in Auto-steering back in the late 80's, this experience and the mapping technique led to the rapid development of the ITS V-TRAX passive automated steering system. V-TRAX automatically and accurately steers the container handling equipment along a virtual track as it travels along the runway.



The system uses the same high precision Differential GPS hardware as the G-POS RTLS and is either a cost effective addition to G-POS or can be implemented in isolation. The system is used to locate the equipment and provide both the current position and heading. V-TRAX uses a twin antenna calculation allowing the system to determine the heading even before the equipment starts to move. This provides a superior heading resolution allowing earlier steering corrections than most other systems and provides a smooth accurate motion for the crane. One of the early lessons ITS learnt after riding in an RTG fitted with a competitor's system was to ensure the system implemented for any automated crane function has a number of in-built safety devices. That's why with V-TRAX the driver has full override control allowing manual steer at any time. Clear signalling and audible warnings are provided to inform and advise. At all times the driver knows what the system is doing and who is steering, V-TRAX or the driver.

Equipment monitoring

The ITS E-SMART (Equipment – Status Monitoring & Automated Reports Transfer) system was developed with the direct input of container terminal operations and engineering staff. The system provides a terminal with valuable live equipment status overviews, performance statistics and automated EDI functions. The system is a module of the GPS system but can be implemented as a stand-alone system as has been shown by one of ITS' clients who has installed it on all his quay cranes. The system works by using automated EDI to transfer field reported equipment breakdowns and

fault reports to an Enterprise Resource Planning (ERP) system. The maintenance supervisor can instantly see the status of all the equipment in real-time using the colour coded icons. The yard location is also displayed allowing the rapid dispatch of a repair crew. Simply by clicking on the icon the supervisor can see the detailed history and status of the equipment. He can also change the status of the equipment or mark the equipment for planned maintenance. The system provides remote access for management and key terminal personnel. From their desktops they can view the terminal status in real-time with live information and also access details on equipment history. The maintenance department can easily see the instant an equipment repair request is received and also the active status of the ongoing work. Once complete, Operations can see that the equipment is available for immediate work and if the equipment has been out of service over a shift change, can ensure an operator is assigned to utilise the equipment. Using the



statistical analysis tool provided with E-SMART authorised users can analyse the operational outages in various different ways. The generated reports are easily exported into Microsoft office products to allow management to fashion custom reports.

Controlling entry & operation

To meet various maritime security conventions, additional security on the mobile equipment can be implemented using the D-MON access and control system. This can be fitted to all container-handling equipment and stops unauthorised personnel from operating the handling equipment by requiring them to insert an industry standard RFID security card into an equipment based reader. The system operates over a wireless data link and only allows authorised and trained operators to use the equipment on their specified shifts. With the large number of equipment mounted readers and hundreds of operators, the centralised control and system administration is essential, making it easy to revoke access to lost cards or to operators no longer in the company's employment. The implementation of an equipment based card reader can monitor operators working double shifts, ensuring operators comply with working time limits, assigning collision damage responsibility, monitor terminal and building access and provide a location status for site evacuation purposes.

Automatic vehicle identification

As part of the ongoing development programme ITS have also developed and successfully implemented the AVID Automated Vehicle Identification system. The system provides the automatic identification of the trucks, containers carried, and planned positions in the container yard. The system is provided another module of the G-POS system and is based on a multi-technology platform using RFID or IRID hardware to identify the trucks. The system provides a seamless post gate automated data transfer and container movement confirmation system. ITS have already integrated this system successfully with an interlock to stop yard movements being carried out incorrectly, and preventing containers including high security or suspect cargo being misidentified or placed in the wrong location. The paperless and keyboard free system leaves no scope for yard operatives to misidentify the containers or yard locations ensuring full data integrity. The integrity the system provides allows the terminal to plan with confidence for the optimum stack locations, increased density and reduces the yard checking and number of re-handles. 