Photo courtesy of ITS

The Tenacity of Technology

Tim Newbound takes a look at just some of the many market trends, advancements and deals in the sphere of terminal operating systems...

Given the rate at which new achievements are reached in the world of information technology and communications systems, it's perhaps unsurprising that there's always a vast surplus of information for *World Port Development's* annual terminal operating system (TOS) survey. This year is no exception, with the many suppliers around the world eager to share news and views - so much so, that just touching upon selected case studies and opinions still means squeezing in super post-Panamax proportions of information. That's not least because, as TOS developers such as South Korea's CyberLogitec attest, the growing reliance on automation at the largest terminals makes this an exciting time for the market. Just like the multi-device internet of things plays an intertwined role in our everyday lives, TOS solutions are increasingly required to integrate and complement a vast array of systems and technologies throughout a port. This symbiotic relationship of systems communicating with each other is vital in evermore sophisticated and large-scale automated terminal operations.

On trend(s)

Data such as real-time location, job information of the yard equipment and key performance indexes must be transferred and updated on the TOS to have full control over the terminal's operation and achieve performance enhancements. With this in mind, CyberLogitec has continued to develop its OPUS TOS, which supports more than 90% of container handling operations in South Korea, to guarantee high system reliability alongside scalability and offer the best total cost of ownership based on individual customers' needs. To offer flexibility, it states that OPUS is suited to, and can be optimised for, conventional as well as automated terminal operations. In fact, Pusan Newport Company Ltd is, according to CyberLogitec, the world's first "mega-hybrid" terminal, operating a combination of conventional and automated operations via a single OPUS TOS. One of the major benefits that CyberLogitec highlights in the development of TOS technology and its integration with other systems is the removal of human error, alongside reducing labour costs. And, while the subject of automation and reducing the need for manual intervention (and ergo man hours) may not always be a comfortable one to broach, the emphasis on such plus-points

within TOS development is notable throughout the industry. UK company International Terminal Solutions Limited, for example, has a business that focuses on specific elements of automation, providing systems such as tracking and positioning. And in recent years, its Head of Business Development, Allan Jones, has noted a stronger trend than ever for tight integration of these solutions with the TOS, thus minimising the human workload. This may include, for example, automatically recording the grounding and lift locations for containers, enforcing TOS work orders so that only valid moves can be performed, or even managing the human interface so that the operator needs to be involved only for exception handling. Through close integration with systems such as those supplied by International Terminal Solutions Limited, automation can act as the "eyes and fingers" of the TOS – tracking the progress of a piece of container handling equipment (CHE) in real-time as it makes its way through different zones of the terminal. Without automation, the operator of the CHE is required to manually advise the TOS that a job step has been reached, which has the potential to impact upon operational efficiency (time, accuracy etc). This makes it important for a TOS to be 'open' in its ability to a number of external systems, using modern techniques such as web services and XML, adds Jones. US-headquartered Tideworks Technology also notes the ongoing trends in the market towards optimisation and automation. This, the company states, makes it imperative for TOS suppliers to provide effective integration with third-party automation technologies and other business-critical systems. With this being the case, terminals continue to seek technologies that can enhance efficiency and reduce their overall costs, and suppliers need to be flexible around those needs. Meanwhile, Australia's Realtime Business Solutions (RBS) lists similar factors in the market's current development, including the use of big data and openness to other software and hardware.

Security of mind

While Russian developer Solvo.TOS also acknowledges the familiar goals of increasing efficiency and reducing labour costs, it adds that the security benefits of a TOS should not be underestimated. As with automation processes, this relies on the system effectively integrating with wider port technologies. Combined with a terminal's checkpoints, gates and other related software, the developer

states its TOS can "virtually eliminate" cargo theft at terminals. This starts with the process of accrediting truck drivers as they enter the terminal. Solvo.TOS incorporates a registry of drivers for verification, including details such as passport data. To gather the information initially required to implement these checks, information about each driver who is set to visit the terminal is entered by a forwarder into Solvo.TOS in advance using a secure web portal - a process verified by an authentication code sent to the forwarder's

certificate, a copy of which is then sent to the forwarder. If OCR or video surveillance equipment is available, photographs of the damage can be attached automatically. Solvo adds that security responsibilities for the TOS don't end at entry and exit points. Accurate tracking through CHE driver logins and the integration of GPS/GLONASS satellite positioning systems and equipment provide full accountability, traceability, and make containers being 'lost' on the yard virtually impossible.

Grau, Port Director at Orbita, at the time of the announcement. "Orbita wants to be up to date and ready for any integration projects with the market leader in TOS systems." The testing work with Navis N4 2.6 was completed on all current versions of Orbita's GateSuite solutions, including the Gate Operating System (GateOS), GateKiosk, GateClerk and YardKiosk. This covers testing in a range of applications such as gate access control, license plate and container OCR, and trouble resolution in the Gate System and in N4.

Giving the customers (lots of) options

Of course, it's not only integrations between technologies from different suppliers that lead to success. As in most sectors, new installations are often an extension of a supplier's incumbent relationship with a client. Last year, for example, Canadian ferry company Marine Atlantic Inc selected Hogia Group's HT Complete solution to support operations at all three of its ports and improve service levels for its freight customers. This is an extension of the ferry reservation system BOOKIT, supplied by Hogia Ferry Systems in 2007. This integrated solution is purportedly "one of the first of its kind", with real-time synchronised data between a terminal management and ferry reservation system. This removes the need to duplicate data entry and offers a seamless interaction between terminal operation activities and ferry freight reservations. Such an ability to offer a range of complementary systems is a fillip within any company's product portfolio. CyberLogitec has an ace up its sleeve in this respect with Eagle Eye – a system of various sub-systems in container terminals that it boasts interfaces with any type of TOS. Whereas a TOS will handle macro-planning using long-term information of the berthing schedule, loading and discharging cargo inputs, gate transactions and other large-scale intermodal logistics, Eagle Eye's 'Virtual Terminal' is more granular. This is scalable around a terminal's set-up, and can provide visibility for the supervision of all real-time activities of equipment based on automatic and electromechanically updated event and position signals. Its major functions include, but aren't limited to:

phone. Solvo also makes a point of its forward-thinking use of electronic signatures in some instances across its operations - offering efficacy, a safeguard against forgery, and a reduction in paperwork. Other secure Solvo.TOS features include an interface for security personnel to manage in-gate and out-gate checks on either stationary PCs or wireless mobile devices. The Solvo.TOS can also be integrated with, for example, automatic gate opening and optical character recognition systems (OCRs). This can be used to record any damage to containers and the existence of proper seals. After inspection, Solvo.TOS prints a container inspection

All together now

Spanish automation technology and engineering company Orbita Ingenieria provides a good example of both third-party integration and the role TOS plays in security. In March, it announced that it had successfully completed the validation of its Gate Operating System (GateOS) with Navis N4 2.6 TOS, following a three-month collaborative effort. "The purpose of this work has been to provide Orbita's engineers with the knowledge of the gate processes and methods of N4 and to develop standardised and tested interfaces between our two platforms," said Francisco

☞ container and CHE position tracking and status monitoring
☞ Visibility via the Virtual Terminal interface

- A platform for integration of subsystems and peripherals
- Operation analysis and replays
- Emulations and simulations

CyberLogitec has high expectations for Eagle Eye, which has been picked up by major terminals in the Middle East and Far East. This includes an intention to reduce the gap between planning and operation. "Eagle Eye is able to help users solve unexpected situations with more flexibility and composure, leading to higher efficiency and providing full visibility of the operation," the manufacturer tells WPD.

Smarter systems, cleaner environment

Another example of Hogia systems in action can be found at Sweden's Trelleborg, which for a number of years has been working to become the Baltic's most environmentally smart port. This includes working with a modern IT set-up in which Hogia's terminal operating system (TOS), business system and Warehouse Management System (WMS) are fully integrated. This, Hogia states, creates a "goldmine of information for the port, customers, suppliers and other links in the logistics chain." As Scandinavia's busiest ro-ro port, Trelleborg averages 30 daily arrivals and departures in ferry traffic alone. It is also the Baltic's largest railway port and the second biggest in Sweden in terms of tonnes of cargo handled per annum. This places an emphasis on the importance of streamlining processes to achieve its environmental goals and reduce emissions. The multifaceted IT solution at Trelleborg means both the port and its operational customers can quickly see where cargo is, where it's bound and when. The TOS interface and digital reporting replaces a previous paper-based manual model, making it more contemporaneous and reliable. This includes reducing unnecessary driving and wasted journeys, thus helping to decrease diesel consumption for all work vehicles at the port by around 30% since 2010 – a period during which traffic and cargo volumes have increased.

Tideworks: Baltic & beyond

A further Baltic case study can be found in Tideworks Technology's announcement in March that it had successfully implemented its latest electronic data interchange (EDI) offering at Baltic Container Terminal (BCT) in Gdynia, Poland. This EDI PorterSM as a Platform (EPaaP) solution is for customers

who want the benefits of Tideworks' hosted EDI, but prefer to administer their EDI infrastructure in-house. Tideworks president Michael Schwank explains that BCT is perfectly suited to this type of solution, thanks to the experienced group of IT professionals at the terminal. The EPaaP solution is configured and installed at the customer's site, including the entire suite of EPaaP applications. Once Tideworks has set up the system and provided training, the customer can easily manage their EDI autonomously at the terminal. Software upgrades are provided free of charge as part of Tideworks' maintenance and support programme. Also in March, Tideworks announced that CSX Intermodal Terminal Inc (CSXIT) had successfully deployed its Tideworks Intermodal Pro TOS and Traffic Control work order dispatch and equipment control system at its 318-acre Winter Haven intermodal facility in Florida. This facility has the capacity to process and transport up to 300,000 containers a year. These systems will help to enhance multiple operational aspects, including container inventory, railcar inventory, control of container movements and coordination of activities to and from trucks. This new system replaces CSXIT's in-house TOS and was delivered as part of an ongoing, multi-terminal relationship between Tideworks and the operator.

New Tideworks Technology

From a product development perspective, Tideworks has recently introduced numerous feature sets to optimise rail terminal operations, which can also be deployed in a marine terminal context. These include 'live lift' capability, job prioritisation, dynamic divisions for wide span cranes and work list optimisation, among others. The company is also nearing completion of extensive integration and development work at its first automated stacking crane (ASC) marine terminal. Tideworks states that it has developed some "very advanced" features for this project to take advantage of the capabilities of ASCs. These include automated set-asides, automated housekeeping and 'dynamic yard allocations', which enable the yard allocation ranges on the system to dynamically expand and contract. The set-aside feature selects the destination location of a container based on a process that ultimately minimises the probability of that box needing to be set aside again. Additionally, there are features that minimise travel distances for the ASCs and ensure work is evenly distributed among

the cranes to facilitate efficient use.

Joy for Jade Software

Elsewhere, New Zealand-headquartered, multinational developer Jade Software states that it enjoyed a successful year in 2014, capped off by a multi-terminal sale of its Master Terminal port management software to Abu Dhabi Port Company (ADPC). This includes seven terminals, with the company stating the deal further enhances its reputation as "the mixed cargo terminal operating system of choice in the Gulf region." ADPC will use Master Terminal to manage all aspects of its general cargo operations, including bulk, breakbulk, project and ro-ro cargo. Master Terminal replaces a legacy general cargo system, with the first ports to benefit from the technology being Mina Zayed in the north-eastern area of Abu Dhabi, and Khalifa, a deep water port midway between Dubai and Abu Dhabi. This order follows on from notable, multi-terminal deals across the world, including contracts from customers in Europe, Africa and the Middle East. These Quarter 3 orders brought Jade's total new marine terminal contracts to 29 for the year.

Global automation for RBS

Australia's RBS can also happily reflect on a number of recent orders and installations around the world. This includes the implementation of its TOPOVN foundation system at Saigon New Port Cat Lai Terminal in Vietnam. The terminal's operator, Saigon Newport Cooperation (SNP), was a long-term incumbent client for RBS before this latest project went live in February. The new TOPOVN replaces a previous system responsible for managing container data. It will work in parallel with another module from the RBS Terminal Operation Package System (TOPS) – the TOPX, which was installed in 2008 and is responsible for executive planning. At a total investment of $1.1 million, the new combination of RBS technologies has a purported capacity to manage 4.5 million TEUs per annum. By simplifying procedures, it could result in notable time and labour savings - reducing handling times from 2-3 hours per container to 50 minutes. Other recent TOS go-live projects for RBS include the Lamong Bay Terminal in Surabaya, Indonesia, which is running 20 Konecranes ASCs. In another contract with an Indonesian client, the company will also supply the TOS for the new Petikemas Semarang terminal on Java. This will involve the supply of the full
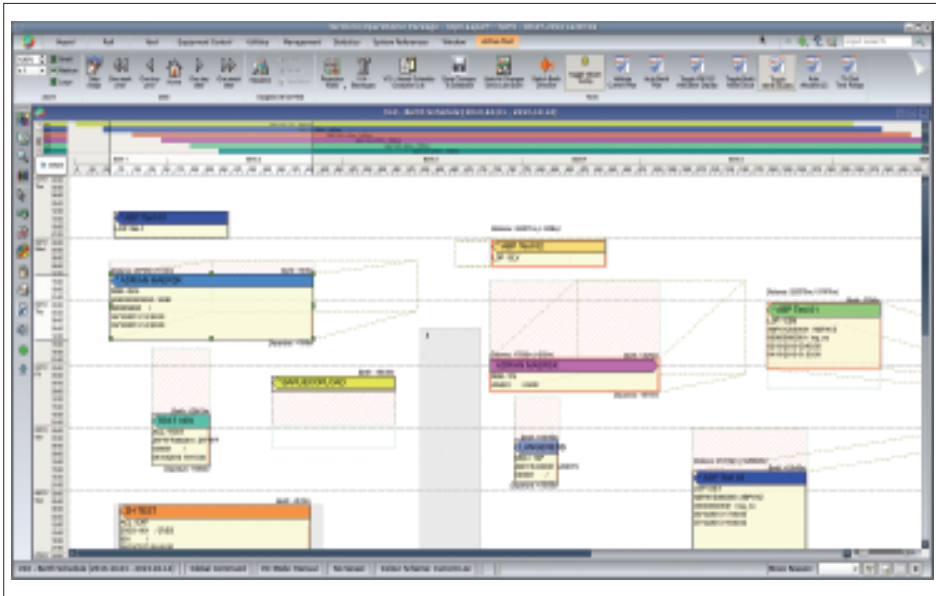
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operational package TOPX at the world's first automated terminal to work with automated RTGs from Konecranes. "After already implementing and running an automated terminal for several years with our TOPX system in Tokyo, the two terminals in Indonesia are adding to the success story with RBS automation," the company states.

Solvo success in St Petersburg

In March, Solvo announced that it had introduced a new registration system for the arrival of drivers of external road transport at Container Terminal Saint Petersburg (CTSP). Dubbed the 'electronic truck-driver' queue, Solvo both developed the software for this system and managed its delivery and installation of all the necessary equipment. CTSP has an ongoing relationship with Solvo, with the Solvo.TOS in action at the terminal since it started operations at the end of 2010. This included the provision of the Solvo.VBS (Vehicle Booking System), a time-slotting subsystem to manage bottlenecks that enabled the allocation of specific time

windows in which a vehicle could be processed. Despite this, due to the infrastructure surrounding CTSP (including a railroad crossing over the road into the terminal), drivers were frequently arriving en masse at the beginning of an allocated time-slot. But congestion and frustration at the entry point was only part of the problem. When a large number of drivers arrive to the terminal simultaneously, it's often the case that multiple drivers attempt to get an import container from the same stack, and the terminal would need to perform non-productive container moves as a result. To solve both issues, the new driver queue system has reorganised the order in which vehicles enter the terminal - taking the location of the import containers each driver will collect into account, and integrating with the driver accreditation module of Solvo.TOS. This way, a driver has to only scan his electronic permit at the kiosk and confirm registration by pressing one button on the kiosk's sensor screen. Then, once in the terminal, unnecessarily inefficient processes are kept to a minimum.

Cool runnings

And finally, a further example of Solvo's work at CTSP can be found in this year's introduction of an automatic reefer (refrigerated container) monitoring system at the terminal. Brought in over the spring, this represents a collaboration between Solvo and Emerson Climate Technologies. It integrates Solvo.TOS technology with the Emerson REFCON control system. The latter enables operators to check on the status and temperature of reefer containers and their cargoes across the world, both on vessels and on terminal yards, via remote monitoring modems (RMMs). RMMs are installed on 60% of the world's reefer containers, while the Emerson REFCON system is successfully operating on over 70 container terminals worldwide and 2,500 container vessels of leading shipping lines. Within the automated set-up at CTSP, information regarding the required temperature and the location for the container is received by the Emerson REFCON system from Solvo.TOS. Correspondingly, after its automated checks, all collected information about the container status is sent back by REFCON to Solvo.TOS, verifying whether the container's status is as should be expected. The great advantages of such automated monitoring include:

- Preventitive monitoring - the system signals when there is a problem with the container before the load can even be damaged.
- A reduction in operating and payroll costs - when automated checks aren't run on a regular basis, these must be done manually.
- Removing human error - the system will never allow a container to 'slip through' unchecked and will never specify incorrect temperature data.
- Better work safety - automated operations remove the need for the staff to enter busy areas of the container yard.

Solvo states that CTSP is the first and only terminal in Russia to implement such a state-of-the-art automated reefer monitoring system. Most of the reefers arriving at CTSP are transported by the MSC line, and it's expected that soon the proportion of these containers equipped with modems will reach 95%. With this being the case, the share of manual monitoring at the terminal will become increasingly insignificant, and the benefits of the automated system more pronounced. All of which seems very much on trend for the market as a whole.