TOS designers make hub transitions easy

Terminals looking for cost-efficient and simple ways to adapt to changing market conditions are being offered a variety of products, writes Melanie Dayasena

With the evolution of modern container terminals requiring more boxes to be handled and higher productivity levels, terminal operating systems (TOS) are increasingly relied upon to improve efficiency levels while saving costs for the operator and the end user.

In the recent past, many terminals have had to accommodate rapid volume growth requiring scalable systems that can keep pace, while today, as the global recession begins to bite, they may require the flexibility to adapt to lower volumes or changing cargo types.

Modern, new terminals require an efficient TOS to attract important customers such as Maersk Line, which began calling at Poland’s DCT Gdansk in December 2008.

"Maersk is significant in that they are a world player and equally sophisticated in their informational requirements as they are in their need for operational excellence," says Michael Pearce, chief information officer at the terminal, which operates the Jade Master Terminal (JMT) TOS.

"We see that we can offer our customers increased extra value by seeing information technology as a great enabler and marketplace differentiator. In addition to offering incredible throughputs and efficiencies, our terminal is able to technically integrate into local, national and international value chains."

Navis, part of Zebra Enterprise Solutions at US-headquartered Zebra Technologies, is today the dominant player in the TOS market. Over the past few years, the company has developed its Java-based Sparcs N4 TOS architecture, which Zebra highlighted as "a great platform and it’s an important part of our plans" when it acquired Navis in October 2007.

Despite the strength of Navis – and notwithstanding the demise of terminal-owned suppliers such as MTLS and more recently Cosmos’ withdrawal from the market (see news p15) – there are still a number of other suppliers offering rival products that they argue achieve cost savings and improve efficiency for terminals.

Managing costs is a prime advantage of using a modern TOS and capturing all revenue streams is a priority for terminal operators.
An important factor in reducing cost is to manage revenue leakage, argues Gavin Mitchell, head of marketing, sales and channel management at New Zealand-based Jade Software.

The JMT TOS automatically captures every transaction that is billable in the system.

"You make sure you capture every piece of revenue that you are entitled to charge the customer and that is one of the major cost savings for many terminal operators," says Mitchell. "With any manual process there is an opportunity for revenue leakage. As the system is highly automated, particularly in planning and billing activities, the customer is going to be charged fairly."

The cost of installing and running the TOS itself is, of course, also important to terminal operators. Mitchell says the cost of a Jade system varies according to the size of the terminal, type of cargo, throughput and type of gate system.

"With software, maintenance, support and all those other things, our customers find that the total cost of ownership of a Jade system would be significantly cheaper than other systems that they have evaluated," he claims.

Navis makes similar assertions about its technology, as Robert Inchausti, VP of maritime product management explains: "The key benefit for Sparcs N4 is the ability to lower the total cost of ownership beginning with the initial deployment and extending through the full lifecycle of the product at the customer. This is provided not only by allowing deployment on different platforms but also from a configuration and adaptation point of view as the customers business needs and requirements change over time." Because terminals do vary in size, and change over time, many want a system that is affordable with low volumes and is scalable as requirements change.

Mitchell says that Jade’s software has potential benefits for small as well as large terminal operators.

"We are finding that small terminals are using a TOS like this that can grow as they grow," he says. "It’s the smaller ones that often have the more complex needs because they have multi-cargo and have to be flexible for customers around different types of contracts."

He argues that while large terminals have always recognised the benefits of IT, smaller operators are increasingly looking at IT to drive efficiencies. "We are seeing that many smaller operators have grown quite rapidly with the expansion of containerised traffic and are increasingly looking to IT to help them manage their growth," he says.

Hui-Ju Oh, senior manager of business consulting and project management at Korea-based Total Soft Bank (TSB) says that the company’s Computer Automated Terminal Operation System (Catos) can be tailored to meet the client’s needs.

"It is easy to expand the system scope upon an increased volume of cargo and to meet the changes of business processes in the future," says Oh.
Realtime Business Solutions (RBS) tells Cargo Systems that there is no limit on a terminal’s throughput up to 100m teu per year using its Tops Advance TOS.

"Tops uses only one instance of the application regardless of the size of the terminal operation and the application is scalable to accommodate future growth due to increased container traffic, new customers, information from new data sources and/or new business processes without degrading performance," says Harry Nguyen, chief technology officer at the Australia-based company.

Nguyen believes both small and large terminals can benefit from using Tops. He says the software can help to reduce staffing requirements and vessel/truck/rail turnaround time, lower equipment cost and increase productivity and efficiency.

Inchausti says Navis Sparcs N4 was designed to fit both extremes of the terminal size spectrum. For small terminals, he says, it can offer affordable license fees and infrastructure that is simple and efficient to manage, while large terminals are offered scalability, third-party integration and the ability to include automated equipment in their operations.

Today, there are many operators with multiple terminals that want to manage operations through one system. Mitchell says JMT’s integrated system is one of the prime advantages for such terminal operators. "It is a fully integrated system for ship planning, yard planning, gate and warehousing [operations] all built into the same system and running on the same database," he says. "The same piece of cargo can be viewed by any parts of the organisation, whether you need to know where it is or how it is going to be planned.

"Port Otago [Jade’s first terminal customer] needed tools to be able to manage the growth of throughput at their terminal. Initially they had a low throughput of 40,000teu but they still did large turnarounds on ships. They were looking for tools to help them improve the management or flow of cargo through the terminal."

Other operators handle a variety of cargo types and want a single system that can accommodate this. JMT, for example, allows for multiple cargoes – including containers, breakbulk, general cargo, container freight stations, bulk and logs – to be managed on the same database.

"As container volumes decrease, terminals will need to diversify their business in order to maintain revenue and profit," says Mitchell. "This will mean increasing competition from the non-container business. In order to be competitive, the terminals will need to move away from manual management of these types of cargo and look for computer-based management solutions."

RBS points out that its Tops software can also be configured to operate multiple terminal locations due to its centralised database structure. The systems’ capabilities include yard and vessel management, berth management, crane allocation, container handling equipment management, rail and gate management and user security and access control.
The potential to boost productivity and improve turnaround times are an attractive aspect of modern TOS systems. Mitchell argues the use of JMT enhances productivity through better and more automated planning. "As a piece of cargo arrives at the gate, the system can make decisions automatically about where that piece of cargo is going to be placed and which piece of cargo handling equipment will collect it and take it to the location that is going to store it," he says. "It takes decision making away from humans where that can be done and it speeds up the whole process so it happens in real time."

Inchausti believes a TOS is measured by its rate of response to changes in order to optimise operations and to make the best use of all resources.

"We have shown that the ability to quickly deal with new business or operational requirements is key in ensuring not only a low total cost of ownership but a high level of productivity," he says.

Tideworks Technology claims its Spinnaker Planning Management System improves planning capabilities, enhances container visibility in the yards and on vessels and increases inventory control. "Our solutions provide enhanced productivity, faster vessel and truck turn times and a quick return on the technology investment for the operator," says Michael Schwank, president of the US-headquartered firm.

The needs of terminal operators are evolving and as well as facing pressure to be more efficient, there is an increasing requirement to be more environmentally friendly.

"Environmental concerns and regulation compliance will continue to be on the forefront and take on ever increasing importance. Being green will no longer be considered innovative, but rather a necessity and a driving force in many of the decisions terminal operators will face," says Schwank.

He says Carrix-owned Tideworks measures the success of its products in relation to the operator’s ability to complete more tasks. "We are successful when our customer succeeds and this ultimately is measured by increased efficiency and cost savings to the operator," he says. TSB argues that terminals need to be equipped with optimised TOS solutions to guarantee productivity. "The productivity of the container terminal is intimately associated with the productivity of quay cranes, the utilisation of yard and equipment, the decrease in truck turnaround time and so forth," says Oh.

System automation is one way that terminals can enhance efficiency, reliability and cost control, and this applies to automated handling technology as well as automated IT functions. "The automation and planning process, visibility of resources and of work queues aids enormously the whole operation of the terminal. It means you can minimise the number of resources you need to work in the terminal and you can plan more effectively around outages," says Mitchell.

Navis’ Sparcs N4 supports automated stacking crane operations today and the company has short-term plans to extend this to other types of automated terminals.
"The future will certainly bring an expansion of automated stacking cranes. This new technology is nearing the stage of maturity where vendors with previous experience will be able to have speedy and cost-effective implementations," says Inchausti.

Schwank argues that automated terminals are a complex issue and one that Tideworks takes a careful and metered approach on.

"First and foremost, advanced automation tools do not necessarily deliver the financial return desired for smaller to medium sized terminals," he argues. "Secondly, Tideworks believes that it is much better to be on the ‘cutting edge’ of technology rather than the ‘bleeding edge’ of technology."

Many terminals want a TOS that can be adapted and expanded quickly when additional functionality is required, without the need for the system supplier to be on site.

Terminals using JMT can request additional modules and functionality when required, says Mitchell. "With our application, we literally send through an electronic key by email and that functionality is switched on and is available instantly when the customer wants it," he explains.

"As it is all in the same database, they have access to information on the resources. Invoicing is automatic because it is just another transaction that they are not capturing that could be invoiced," Mitchell explains. "Potentially the cost of adding new functionality, the speed in which it can be implemented and the ease of training is all improved when you have a system that is fully inclusive."

Inchausti says Sparcs N4 allows access to new features and modules through the installation of a new license file, whether in trial mode or permanent. A TOS, coupled with technologies such as GPS, RFID and OCR, can make operations more accurate and efficient.

JMT offers the benefit of being supplied as GPS- and RFID-ready. Mitchell says the interconnectivity with other technologies is automatic and in real time. "What that means for the customer is that when they implement those technologies, the accuracy of identifying either container handling equipment or the cargo itself becomes much more automatic, more accurate and faster," he explains.

With GPS identifying precise information on where a container is placed, it eliminates the risk of operator error. "GPS lets us identify in which row in the stack [the container is located]. All the data will go electronically into the database."

Tideworks also says its solutions can be integrated with various technologies such as scale interfaces, legacy gate systems, mobile computing systems, gate and quay crane OCR, GPS and RFID. TSB, meanwhile, says its Catos TOS can be integrated with Supervisory Control and Data Acquisition (Scada) including a container recognition system, crane maintenance and monitoring system, gate automation system, position detecting system, reefer container monitoring system and weighing scale.
With new technology continually being developed and the needs of the terminal industry evolving, what can we expect from the TOS of the future? Many TOS suppliers predict that systems will become more intelligent and intuitive.

Mitchell sees a trend towards more automated container handling equipment. "We are adding integration into the automated systems so we can provide work queues to these automated container handling devices, which improves the whole operation," he says.

Other developments include the use of intelligent agents, which Jade is already adding into its software. "It is essentially an application that monitors activity inside the main application, which is tasked with some very specific items," he explains. If, for example, there are problems on a work queue or there are too many jobs queued up, it will have a series of decision making capabilities that can influence the planning in the system and it can automatically re-plan around the bottlenecks, says Mitchell.

"It will make decisions that people would normally make but it will make them quicker and more intuitively," he says. "The more difficult decisions will be flagged up for operators to look at, particularly in areas where safety is an issue."

Jade is also exploring the possibility of adding simulation to its system to make planning easier and to enable "what if" scenarios to be created. Tideworks’ vision for the future includes automated vessel stowage, further developments in its offering for intermodal rail operations and the incorporation of graphical planning tools within its multipurpose terminal solutions.

Despite finding that technology in the port industry has lagged behind other industries, Schwank believes the sector is becoming more and more tech savvy. "The technology gulf between the port sector and other sectors is continually being bridged," he says.

Inchausti believes the port industry is now catching up with other sectors. "In the last few years, port industry technology has increased rapidly to gain the required efficiencies that growing volumes have required," he says. "We foresee this continuing but more from the perspective of cost containment as the business and economic climate has quickly changed."

Navis is leveraging its expertise in hardware components – ranging from passive and active tags to GPS-based devices – to not only offer real-time location system (RTLS) type solutions but to incorporate operational data to increase efficiency.

TSB has plans to add a web-based management system to Catos, which it will call "Web-TOS". It will transfer relevant information for terminal planning and operation and provide the most efficient data control and management via the internet. "So it is easy to receive and control the data without delays," remarks Oh.

Following the emergence of mega vessels and hub ports, TSB is looking ahead to TOS products equipped with functions for business intelligence and full robotised logistics control. Today, of course, terminal operators are having to get to grips with the reality of the global economic downturn; something Nguyen suggests could have an effect on future expectations of IT systems.
"With the world financial crisis and in the increasingly demanding and competitive container business, surely customer requirements will be much more in the future in order to cut cost and increase productivity to compete with others," he says.

'What if' tools provide fine tuning. Emulation tools linked to the TOS can be used to simulate "what if" scenarios in a virtual environment.

Netherlands-based TBA’s emulation tool – Container Terminal Optimised Logistics Simulation (Controls) – is used for testing and tuning control software such as TOS and for training operators of the TOS.

Controls simulates a virtual terminal, according to Klaas Pieter van Til, CEO of TBA. "It is a tool to find out what happens if you change the operation in certain ways without changing the reality," he explains.

The emulation tool allows for offline experimentation with the TOS. TBA also offers a regular fitness check to review the terminal performance and optimise the specifics of the terminal and its changing conditions.

Virtual Terminal Optimization (ViTO), the Institute of Shipping Economics and Logistics’ (ISL) simulation/emulation tool, can be used as a test bed for the TOS, according to Holger Schutt, head of ISL’s Competence Centre for Optimisation and Simulation, Information Logistics.

ViTO was recently purchased by Eurogate IT Services, which will use the system for TOS planning and implementation at Eurogate group’s terminals. "The terminal operator may use ViTO for the acceptance test of each new release of the terminal software," says Schutt. "He may check various scenarios without impact to real life at the terminal. This reduces the risk of breakdowns and unproductive phases caused by the malfunction of the new software release. Due to this, it leads to an increase in the availability and stability of the terminal and reduces the time needed for start up with the new TOS."

Schutt says that ViTO provides online interfaces to the single device – such as quay crane, RMG or straddle carrier – as well as an interface to an intermediate level of the control system.

"Due to the fact that every type of equipment will be modelled by its emulator, the user may switch between the real terminal and ViTO by changing the communication channels only," he says.

Maximising RTG use

Rotterdam-based IT developer ARL Consulting tells Cargo Systems that it will launch an RTG planning tool during the first half of 2009. The system is intended to optimise the number of RTG cranes in use, provide faster and more streamlined RTG work order distribution and allow instant RTG dispatching.
The new system will be offered alongside ARL’s existing suite of IT systems, which includes the Berthing Optimization Tool (BOT). BOT is used to optimise the berthing process in the terminal with fewer clashes in terminal operations, higher financial savings, therefore enabling more vessels to be accommodated at the terminal, says Rene Bendt, director and CEO at ARL Consulting.

The system can visually assign berthing space to incoming vessels and import data on planned vessels’ arrival and departure from the TOS system. "If you are congested, it also improves efficiency through cost savings," says Bendt. The company can also attach resource planning modules to the berthing plan to assist terminals to plan related resources.

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